



PERSPECTIVE

With this first issue, *Organization Science* inaugurates a new editorial format called "Perspective." It is intended as an occasional forum for featuring theoretical or critical essays that challenge accepted thinking or established empirical approaches in organization studies.

Perspective articles will be selected from among those already accepted for publication in *Organization Science*. The nomination will be made by the Senior Editor who accepted the paper for publication in *Organization Science*. The determination for publishing in Perspective will be made on the basis of demonstrated significant potential to redirect contemporary thought and methods relating to important topics and issues in the field. Perspective articles will appear in the earliest possible issue.

The paper, "The Black Box of Organizational Demography," by Barbara Lawrence, undertakes the challenging task of questioning and clarifying the logical and methodological underpinning of organizational demography which so far has not been subject to sustained critical reflections.

This thoughtful and balanced paper, which questions assumptions and identifies major problems affecting this well-established stream of research, offers new directions that could enrich and redirect organizational demography research.

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The Black Box of Organizational Demography

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Abstract

Since its definition in the early 1980s, organizational demography has become an influential research area. Scholars map the relationship between demographic variables and organizational outcomes, examining such questions as whether increasing work group diversity leads to greater turnover and whether decreasing tenure similarity within a top management team leads to more numerous strategic reorientations.

Asking such questions requires only a demographic predictor and an outcome, but answering them often requires additional theoretical constructs. For example, the relationship between work group diversity and turnover might be explained by communication and conflict. As work group diversity increases, communication within the group may become more difficult, resulting in greater conflict and thus increasing turnover.

Despite the important, sometimes critical, role of such additional theoretical concepts, researchers often leave them loosely specified and unmeasured, creating a "black box" filled with vague, untested theories. This article presents a critical analysis of this approach. The results show that simple demographic explanations may generate multiple, mutually exclusive, often implicit theories involving numerous additional concepts. An evaluation of these more complex theories against previous research shows that they receive only weak support. Hence, the black box approach to organizational demography presents serious theoretical problems. Examples are provided to illuminate these problems. Four directions are suggested for research in organizational demography: deepening current variance explanations, creating dynamic models, exploring factors that produce demographic distributions, and moving beyond the variance model. (*Organizational Demography; Organizational Theory; Levels of Analysis*)

In 1981 and 1983, Pfeffer proposed organizational demography as a new field of study and outlined an ambitious research agenda that has been followed with enthusiasm. Organizational demography is generally defined as the study of the composition of a social entity in terms of its members' attributes (Pfeffer 1983, p. 303). The compositional component of this definition distinguishes organizational demography from most previous demographic approaches. Organizational demography focuses on attributes as aggregate-level rather than individual-level variables, and suggests that they influence behavior independently of individual-level attributes. Thus, organizational demography encompasses a theoretically distinct class of variables.

One of Pfeffer's central arguments for using demographic variables was methodological. He suggested that because critical concepts such as attitudes, cognitions, and values cannot be measured directly, significant problems plague organizational research: measurement error, differences in conceptual definitions, violations of theoretical parsimony, and low levels of explained variation. He then argued that demographic variables may prove superior to these better known concepts because they are easily measured and produce more parsimonious explanations.

This is a provocative argument. In its strong form, it proposes abolishing an entire class of variables that has been central to organizational research. Yet researchers in organizational demography have accepted it without debate or discussion. Typically they have hypothesized various subjective concepts that explain

the significant association between demographic predictors and outcomes. Although such concepts are not directly observable, they can be operationalized, and the resulting measures can be tested for reliability and validity. However, by invoking Pfeffer's justification, researchers usually leave the concepts unmeasured and the hypotheses untested. As a result, subjective concepts and their relationships within research models have become the "black box" of organizational demography.

Undoubtedly organizational demography is extremely useful and broadens organizational research by adding an important class of variables. However, Pfeffer's instrumental approach, emphasizing prediction over explanation, has serious limitations. By assuming that all subjective concepts have equal theoretical value or by dismissing them altogether, this approach eliminates numerous explanations for the relationship between demographic predictors and outcomes. Important questions such as whether subjective variables operate as true intervening processes or whether demographic predictors act as indicators for these variables become irrelevant for study.

This article presents a critical analysis of this approach to organizational demography. The problematic "congruence assumption" is elaborated in the next section. A clear understanding of the congruence assumption provides an important starting point and perspective for understanding organizational demography. Then a more detailed introduction to organizational demography, including its definition and boundaries, is furnished. This is followed by an evaluation of the congruence assumption based on previous research and scrutiny of alternate explanations. The conclusion is that demographic studies involving hypothesized but untested subjective concepts run a high risk of spurious explanation. The final section builds on the implications of this evaluation by proposing that scholars develop organizational demography by deepening current variance explanations, creating dynamic models, exploring factors that produce demographic distributions, and moving beyond variance models for alternate interpretations of demographic phenomena.

The Problem with the Congruence Assumption

The issue addressed in this article is how organizational demographers interpret the relationship between demographic variables and outcomes. Their interpretations typically include subjective concepts, yet

most organizational demography studies neither measure the subjective concepts nor test the related inferences. The problem is not so much with this procedure itself, as research frequently includes inferences based on unmeasured variables or untested hypotheses, but with the presumption that testing the inferences is somehow unnecessary.

Organizational demographers justify this presumption, either explicitly or implicitly, by making a *congruence assumption* based on Pfeffer's original discussion. Pfeffer argued that demographic variables may prove superior to widely used subjective concepts because (1) demographic variables are directly observable, and hence more reliable and valid measures, and (2) by supplanting subjective variables, demographic variables produce more parsimonious models of human behavior (Pfeffer 1983, p. 302). In this argument, parsimony results from replacing several subjective concepts with a smaller number of demographic ones. However, the rationale for why subjective concepts can be replaced by demographic ones is not clearly delineated.

As shown in the following statements, scholars typically justify such replacement by assuming congruence between demographic predictors and subjective concepts. In other words, demographic variables not only are more easily and accurately measured than subjective concepts, but also capture the variation in these concepts, which therefore can be eliminated from study.

It is possible for demography to do a better job at explaining variation in the dependent variables than measures of the presumed intervening constructs, for the reason that many of the subjective concepts are mental processes (attitudes toward various elements of compensation, for example) that are more difficult to access and reliably measure (Pfeffer 1983, p. 351).

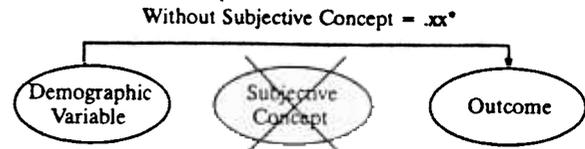
Although it is important to examine the effects of demography on actual communication behavior it is also useful to see whether or not direct indicators of demographic composition can be used as explanatory variables, eliminating the need to gather communication information, sociometric choice data that may be prone to errors in recall (Wagner et al. 1984, p. 80).

True, demographic indicators may contain more noise than purer psychological measures. For example, a person's educational background may serve as a muddled indicator of socioeconomic background, motivation, cognitive style, risk propensity, and other underlying traits. But, given this weakness, if demographic data yield significant findings, then the upper echelons theory will have been put to a relatively stringent test (Hambrick and Mason 1984, p. 196).

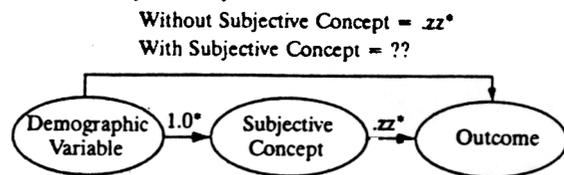
The advantage of the congruence assumption is that scholars can eliminate subjective concepts without compromising a model's predictive or explanatory accu-

Figure 1 Interpreting Relationships with Instrumental, Indicator, and Intervening Theories

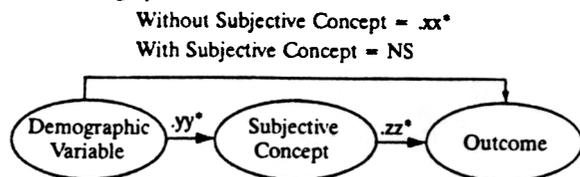
Asterisks (*) indicate significant relationships.
Instrumental Prediction: Demographic variable predicts outcome.
Prediction rather than explanation.



Indicator Explanation: Demographic variable is an indicator of a subjective concept that explains outcome.



Intervening Process Explanation: Subjective concept intervenes between demographic variable and outcome.



rary. The disadvantage is that it obscures clear thinking. At first glance, the quoted statements appear relatively straightforward. Each suggests that demographic variables capture the variation in subjective concepts, which then have reduced importance in a given study. However, these statements are open to several mutually exclusive interpretations of the relationship between demographic variables and subjective concepts. Three possible interpretations, shown graphically in Figure 1, can be used to reexamine the statements.

The first interpretation treats demographic variables as predictors in an *instrumental* theory. Instrumental theories differ fundamentally from typical organizational theories because they concentrate on accurate prediction rather than explanation. Explanation is seen as essentially antithetical to prediction. Hence, such theories are more or less effective rather than more or less true. In this approach, demographic variables prove good predictors when they provide effective, consistent predictions for some outcome, regardless of the context in which the relationship is studied (Boyd 1991; Cartwright 1991; Suppe 1974, p. 29). Once a predictive relationship is demonstrated, explanatory relationships

between demographic, subjective, and outcome variables are unnecessary and irrelevant. Many organizational scholars would not consider instrumental theories as "theory" at all because, by definition, they do not answer the question "why?" (Sutton and Staw 1995).

More traditionally, in the second and third interpretations, demographic variables are predictors in an explanatory theory. The second interpretation treats demographic variables as *indicators* of subjective concepts that produce some outcome. In this approach, demographic variables prove good predictors when they show reliability and validity as measures of the subjective concept. When reliability and validity are high, demographic variables provide reasonable substitutes for subjective concepts. These substitutes can be used to test hypothesized relationships between subjective concepts and outcomes with some accuracy.

The third interpretation treats subjective concepts as true *intervening processes*, also called mediators (James and Brett 1984, Rosenberg 1968), in their relationship to both demographic predictors and outcomes. In this approach, demographic variables prove good predictors when they predict some outcome because both predictor and outcome are related to the intervening process. The demographic predictor is antecedent to the subjective concept, which is itself antecedent to the outcome. When the intervening process is included in the relationship, the predictor and outcome are no longer related. In other words, the intervening process "accounts for" the original relationship between the demographic predictor and the outcome.

When we consider these alternate interpretations, the quoted statements become more difficult to understand. Hambrick and Mason's (1984) is the simplest of the three, primarily suggesting an indicator interpretation. Hambrick and Mason state that "a person's educational background may serve as a muddied indicator" of a variety of underlying traits. Thus, they perceive single demographic predictors as capturing variation, albeit with some error, in a wide variety of subjective, individual characteristics.

The statement by Wagner and his coauthors is slightly more complex. The first phrase implies an intervening process approach: "... it is important to examine the effects of demography on actual communication behavior." This suggests that demographic variables are antecedent to actual communication behavior, and thus implies that communication behavior acts as an intervening process. However, the next phrase suggests an instrumental approach: "... it is also useful to see whether or not direct indicators of demographic com-

position can be used as explanatory variables, eliminating the need to gather communication information..." In other words, if demographic variables work as direct predictors of outcomes, perhaps one can eliminate the need for gathering subjective data.

Pfeffer's statement also produces multiple interpretations. It identifies "mental processes" as "intervening constructs," thus suggesting an intervening process approach. Demographic variables predict mental processes that act as intervening processes between demographic variables and outcomes. However, the statement also suggests an indicator approach. Pfeffer says that demographic variables may "do a better job at explaining variation in the dependent variables" than subjective constructs, because subjective constructs "are more difficult to access and reliably measure." The implication is that demographic variables may provide better indicators of subjective concepts than attempts to measure such concepts directly, and thus perform better at explaining variation in outcomes. Finally, the statement can be interpreted as implying an instrumental approach. It says that intervening constructs are only "presumed," suggesting that although other scholars feel such constructs are important, in fact, such constructs may be altogether unnecessary.

These justifications of the congruence assumption gloss over several distinct understandings of the relationship between demographic variables and outcomes. Yet scholars employ the assumption uncritically, creating studies that propose a variance-capturing relationship between demographic predictors and subjective concepts, without specifying precisely why the relationship occurs. An example of a typical study follows.

A group of early organizational demography studies examined the relationship between organizational tenure and turnover (McCain et al. 1983, Pfeffer 1983, Wagner et al. 1984). McCain and his colleagues (1983, p. 628) suggest that the greater the gaps in years between tenure cohorts (demographic predictor 1) and the larger the size of the tenure cohorts (demographic predictor 2), the more difficulty members of different cohorts experience in communicating with one another (subjective concept 1), the more likely members of different cohorts are to have power struggles and conflict with one another (subjective concept 2), and the more serious the power struggles and conflict are likely to be when they occur (subjective concept 3). This set of difficulties was then hypothesized to produce turnover (outcome). People who dislike conflict and communication problems (subjective concept 4) would be likely to leave and people who are losers in power struggles (subjective concept 5) may either choose or

be asked to leave. McCain et al. found that 39% of the variation in turnover across faculty groups and 12% to 21% of the variation in turnover within various faculty subgroups was explained by two demographic variables: cohort size and cohort gaps. Thus, their results supported the proposed demographic explanation.

The congruence assumption used in this example is appealing. Obtaining organizational tenure information from organizations is clearly easier and less burdened by reliability and validity issues than obtaining communication and conflict perceptions from representative organizational members. However, the assumption creates a black box whose contents remain unknown and may have little to do with the hypothesized explanation. Is the relationship between organizational tenure and turnover really explained by communication difficulties, conflict, and power struggles? Do the five subjective concepts operate in the sequential process proposed in the explanation? Do they represent true intervening processes or is organizational tenure an indicator for one or more of the concepts? Is one or more of the concepts more important in explaining the outcome of the study, and if so is the relationship conditional on other individual or situational factors? Are tenure cohort gaps and size appropriate measures for the five subjective concepts? Assuming away these alternate explanations and potential measurement issues seriously limits the study's contribution.

Before we consider the congruence assumption in more detail, it will be helpful to examine the characteristics that define organizational demography and develop some general language for it. These characteristics are important for several reasons. First, they define what is and what is not organizational demography. Many of the problems with the congruence assumption result from definitional confusion, so we need a common understanding of the defining characteristics of organizational demography. Second, the characteristics provide boundaries for studies of the congruence assumption in general, and for the evaluation presented here in particular. Not all organizational demography studies require the congruence assumption, and the differences between ones that do and ones that do not need clarification.

A Short Introduction to Organizational Demography

Like many fields in early development, organizational demography lacks precision. In its original version (Pfeffer 1981, 1983), organizational demography was

defined by its two main contributions: compositional variables and methodological ease. Organizational demography researchers refer to this definition, but their elaborations venture beyond these features, leading some people to wonder whether there is anything that is not organizational demography. The following discussion outlines the dimensions of the problem and provides general boundaries for the ensuing evaluation of the congruence assumption.

As shown in Table 1, five characteristics define the boundaries of organizational demography: the *demographic unit* selected for study, the *attributes* of the demographic unit, the *domain* within which the attributes are studied, the *measures* of the attributes, and the *mechanism* by which the attributes predict outcomes. Each can be construed either broadly or narrowly. A broad construal does not distinguish organizational demography from most other studies of organizational behavior. A narrow construal excludes works currently considered within the organizational demography domain.

Demographic Unit

The demographic unit is the level of analysis to which theoretical generalizations will be made. Organizational demography currently accommodates a relatively broad definition of this characteristic, including individuals within groups (e.g., Ferris et al. 1991), dyads (e.g., Tsui and O'Reilly 1989), groups (e.g., Ancona and Caldwell 1992), and organizations (e.g., Shenhav and Haberfeld 1992). Studies that use individuals as the demographic unit (e.g., Waldman and Avolio 1986), although numerous, are not generally defined as organizational demography. A broad definition would include these individual-level studies, as well as studies employing demographic units larger than organizations such as niches, regional areas, or industries.

Attributes

Attributes are defined at the level of analysis at which data are collected rather than at the level of analysis of the demographic unit. Organizational demographers currently study individual attributes almost exclusively. Individual attributes generally fit into three categories: attributes that describe immutable characteristics such as age, gender, and ethnicity; attributes that describe individuals' relationships with organizations, such as organizational tenure or functional area; and attributes that identify individuals' positions within society, such as marital status. These three categories of attributes are readily detectable by other people and generally unchanging. They exclude personal attributes, such as

Table 1 Characteristics Defining the Boundaries of Organizational Demography

| Characteristics | Definition | Examples |
|------------------|---|---|
| Demographic Unit | The entity to which theoretical generalizations will be made. Demographic units range from small to large, where "small" might be an individual and "large" might be an industry. | Individuals, dyads, groups, networks, organizations, occupations, organizational populations, and industries are demographic units. |
| Attributes | The entity characteristics used to depict the demographic unit being studied. An attribute's level of analysis is always lower than or equal to that of the demographic unit it represents. | Organizational tenure is an individual-level attribute. Taskforce time for project completion is a group-level attribute. <i>K</i> -type and <i>r</i> -type are organizational population-level attributes. |
| Domain | The social system within which the attributes of a demographic unit are studied. A domain's level of analysis is always higher than or equal to that of the demographic unit being studied. | Dyads, groups, networks, organizations, occupations, organizational populations, and industries are domains. |
| Measures | The empirical definition of the attributes that depict a demographic unit within a domain. Measures are either simple or compositional. Simple measures are defined at the level of analysis of the attribute. Compositional measures are defined at a level of analysis higher than that of the attribute. | The organizational tenure of an individual within a group is a simple measure. The Euclidean distance based on group members' organizational tenure is a compositional measure. The average organizational tenure of members within a group is a compositional measure. |
| Mechanism | The process by which the attributes that depict a demographic unit within a domain predict outcomes. The mechanism is either indirect or direct. | A demographic model that requires subjective concepts uses an indirect mechanism to predict outcomes. A demographic model that does not require subjective concepts uses a direct mechanism to explain outcomes. |

commitment or locus of control, that are subject to varied interpretation by other people and generally more mutable (see Jackson et al. 1995; Jackson et al. 1993, p. 56).

A broader definition of attributes would include personal attributes, such as preferences or beliefs (see Glick et al. 1993), which may produce interesting compositional effects independent of their individual influence on behavior. Moreover, it would include attributes for a broader range of demographic units, such as a taskforce's length of time for project completion, the extent to which a team uses external resources, and the distribution of *r*- and *K*-types within organizational populations. Thus, the adjective "organizational" in organizational demography would denote a meaning similar to the "organizational" in organizational behavior and organizational theory by including phenomena at many levels of analysis related to organizational life.

Domain

A domain is the context within which a demographic unit is studied. Several domains may be involved in a

given study. For instance, a group-level demographic unit may be studied within business unit, organizational, and industry domains. The proximal domain is the domain closest in level of analysis to the demographic unit that holds significance for the theory being tested. Although results generalize to the level of analysis of the demographic unit, the domains within which demographic units are studied may also influence generalizability. For example, the impact of top management team attributes on organizational performance is often examined in samples of organizations (see Pettigrew 1992, for a review). The demographic unit is the team and the domains include both the organization and the sample of organizations. The results generalize to teams within organizations, but the results' generalizability to teams across organizations depends on the representativeness of the sample. Organizational demography currently accommodates a relatively narrow definition of domain. For the most part, demographic units are studied within groups, organizations, or samples of organizations. A broader definition would include domains appropriate for demographic units

defined at the organizational level of analysis or higher. For example, the business unit attributes of organizations could be studied within niches, regional areas, or industries.

Measures

Organizational demography currently uses two types of measures, simple and compositional. *Simple* measures (Tsui and O'Reilly 1989) describe attributes at the level of analysis at which the data were collected. The level of analysis of a simple measure is always the same as that of the attribute and the demographic unit it represents. For instance, an individual's gender and age are simple measures of individual attributes where the individual is the demographic unit. An organization's ROI and ROE are simple measures of organizational attributes where the organization is the demographic unit.

In contrast, *compositional* measures describe attributes at a level of analysis that differs from that at which the data were collected. The level of analysis of a compositional measure is always higher than that of the attribute. Compositional measures depend empirically on the demographic unit they represent. For instance, the similarity of each taskforce member's organizational tenure to the organizational tenure of other taskforce members is a compositional measure of individual attributes in which the individual within the group is the demographic unit. Each individual's organizational tenure similarity value depends on the organizational tenures of other members. It cannot be measured without assessing the organizational tenure of all group members. Thus, although organizational tenure remains an individual-level attribute, organizational tenure *similarity* represents an individual-within-the-group-level demographic unit. Other compositional measures include averages, the coefficient of variation, cohort sizes, and ratios.

Mechanism

The final criterion is the mechanism that explanatory theories use to justify why a demographic unit's attributes produce specific outcomes (Lawrence 1987, pp. 40-41). Demographic explanations that do not require subjective concepts explain outcomes as the *direct* result of the demographic variable under consideration. For instance, a direct explanation for the relationship between tenure cohort size and organizational turnover is that tenure cohorts retire or are terminated at relatively similar times; hence, the larger the tenure cohort, the higher the organizational turnover. Note that unlike the communication, conflict, and power

struggle explanation, this explanation requires no subjective concepts. The times at which full professors retire and assistant professors are terminated after negative tenure decisions are somewhat (although not completely) independent of turmoil that occurs within the department.

Standard personnel practices provide another example of a direct mechanism. Using assumptions about retirement ages, hiring ages, growth, and internal promotion policies, we can predict the age distribution of an organization in 2017 with reasonable accuracy by knowing its age distribution in 1997. Given some knowledge of future personnel requirements, we do not need subjective variables to explain the relationship between the organization's current age distribution and the organization's hiring needs in 2017. The works of White (1970), Stewman (1986), and Stewman and Konda (1983) on vacancy chains and internal labor markets provide examples of such direct demographic effects.

The focus of this article, in contrast, is demographic models in which subjective concepts explain outcomes as the *indirect* result of demographic predictors through their relationship with other variables, such as conflict, communication, and social norms. A study by Bantel and Jackson (1989) provides an example. These researchers suggested that demographic characteristics such as age, tenure, and functional background characterize the cognitive abilities, attitudes, and expertise of the top management team. They proposed that these subjective concepts explain the relationship between the team's demographic characteristics and its innovativeness. In this example, individual characteristics (demographic predictors) explain innovativeness (outcome) indirectly, through their inferred relationship with team members' abilities, attitudes, and expertise (subjective concepts).

The mechanism characteristic tends to distinguish macrosociological studies of organizational demography (Stewman 1988), most of which are in the direct explanation category, from social-psychological studies, most of which use indirect explanations.

A Few Thoughts on Boundaries

The large differences between narrow and broad definitions of these five boundary characteristics suggest that organizational demography's current boundaries are somewhat loose and flexible. Indeed, it seems premature for them to be otherwise defined.¹ Two ground rules are adopted to simplify the following discussion. First, only research that invokes instrumen-

tal theories or indirect explanations for demographic effects is examined. Explanations that assume a direct relationship between demography and organizational outcomes require no subjective concepts or congruence assumption, and are outside the scope of this article. Second, the discussion relies heavily on studies that evolved after Pfeffer's original work, that scholars tend to define as organizational demography, and that focus on compositional measures.

Evaluating the Congruence Assumption

What empirical standards can be used for evaluating the implicit theories underlying the congruence assumption, and does previous research meet these standards? What kind of measurement problems result from the congruence assumption and how can they be evaluated and corrected?

Standards for Assessing Implicit Theories of Congruence

Appropriate assessment of the congruence assumption depends on the theory invoked. Different theories for the role of subjective concepts require different acceptance criteria. The three theories introduced in the problem presentation—instrumental, indicator, and intervening process theories—serve as examples for discussing such differences. The point in selecting these particular theories is not to enumerate all invocations of the congruence assumption. Numerous additional possibilities exist including moderator, extraneous, component, antecedent, suppressor, and distorter theories (James and Brett 1984, Rosenberg 1968). Rather, the point is to examine the thinking that underlies assessment.

The following discussion describes evaluation criteria for each theory and illustrates their application using previous research. The research examples selected are similar in their independent and dependent measures. They do not all employ the theory they are used to illustrate, and hence should not necessarily be held to the evaluation standards presented. Moreover, the analysis cannot assess measurement or specification errors for either demographic predictors, subjective concepts, or outcomes. Therefore, the conclusions from this discussion, although suggestive of certain patterns, should be interpreted with caution.

Criteria for Instrumental Theory. Strictly interpreted, instrumental theories require prediction, so the test for instrumental theory is a significant relationship between demographic predictors and outcomes. The characteristics of the setting, conditions, controls, sub-

jects, occupations, and so forth should make no difference in the results. Consequently, in contrast to almost all organizational theory, instrumental theory explicitly excludes explanation. Because organizational scholars would find it difficult to accept a single study showing a single significant association as proof of anything without an accompanying explanation, it seems reasonable to require that instrumental theories show consistent results in multiple studies as a standard for acceptance. Hence, a first criterion for accepting instrumental theory is a significant relationship between the demographic predictor and the outcome in all studies, after accounting for measurement error. In other words, the demographic predictor should consistently predict the outcome. A second, more rigorous criterion is a level of explained variation that is the same in all studies, after accounting for measurement error. Again, what matters is the consistency rather than the absolute size of the effect.

Consider six studies (Jackson et al. 1991, McCain et al. 1983, O'Reilly et al. 1989, Wagner et al. 1984, Wiersema and Bantel 1993, Wiersema and Bird 1993) that examined the relationship between tenure and turnover in groups. Using the first criterion, we can accept the congruence assumption if the relationship between tenure and turnover is significant for all groups. On the basis of subgroup results, which show more significant relationships than group results and thus have greater probability of meeting the first criterion, the six studies show a significant relationship in seven of twelve groups. A binomial test shows that when twelve significant relationships are expected, the probability of getting only seven significant relationships due to measurement error is extremely low ($p < 0.001$). Thus, although by some standards these results seem strong, they do not meet the first criterion for an instrumental interpretation of the congruence assumption.

A more careful match of predictors produces similar results. The studies can be divided into two sets that use identical demographic predictors. The first set consists of the Wagner et al. (1984), Jackson et al. (1991), and Wiersema and Bird (1993) studies. They used the same attribute, individual organizational tenure, for the same demographic unit, top management teams, measured by the same compositional measure, the coefficient of variation. The three studies show a significant relationship in only one of four groups. A binomial test indicates that when four significant relationships are expected, the probability of getting only one significant relationship due to measurement error is extremely low ($p < 0.01$).

The second set consists of the O'Reilly et al. (1989), Wiersema and Bantel (1993), and Wiersema and Bird (1993) studies. These are very similar to the Wagner et al. (1984) and Jackson et al. (1991) studies except the attribute used was individual group tenure rather than individual organizational tenure. The three studies show a significant relationship in one of four groups. A binomial test indicates that when four significant relationships are expected, the probability of getting one significant relationship due to measurement error is extremely low ($p < 0.001$). Hence, even when the studies are matched as closely as possible, the results do not meet the criterion for an instrumental interpretation of the congruence assumption.

The second criterion for accepting the congruence assumption is that the relationship between tenure and turnover must show consistent levels of explained variation from one study to the next. We have already observed that only seven of the original twelve groups have the required significant relationship. However, assume that these seven groups represent all studies of the phenomenon, thus meeting the first criterion for instrumental theory. By the stricter criterion, the five groups for which sufficient data are given (all within the McCain et al. study), should exhibit similar levels of explained variation. The results show that the level of explained variation, independent of control variables, ranges from 12% to 21% with an average of 17.4%. One could argue that a range of 9 percentage points in five groups represents good consistency, or that it represents too much spread to justify consistency. Therefore, if the first criterion had been met, evaluation by the second criterion would have been inconclusive. Combining the results, we see that an instrumental theory should be rejected, which suggests that explanatory theory (e.g., indicator, intervening process, or some other type of explanation) is required.

Criteria for Indicator Explanations. Indicator explanations require high reliability and validity. A single- or multiple-item demographic variable indicating a subjective concept should have a lower limit of 0.7 as a reliability standard for exploratory research (Nunnally 1978, p. 245), and, for this lower limit, an upper boundary of 0.84 for validity.

Four studies (Ancona and Caldwell 1992, Hoffman 1985, South et al. 1982, Zenger and Lawrence 1989) provide data that allow assessment of demographic variables as indicators of communication frequency, a subjective concept often cited by organizational demographers. The studies report 15 relationships between five demographic attributes and communication

frequency. The attributes are defined at the individual level of analysis within group and organizational demographic units using compositional measures: sex composition (six relationships), race-ratio (three relationships), tenure similarity (three relationships), age similarity (two relationships), and functional diversity (one relationship). For these 15 relationships, the reliability values computed by using r^2 average 0.06 and range from 0.002 to 0.19. On the basis of these values, the upper boundary of validity averages 0.19 with a range of 0.04 to 0.43. Hence, the studies provide little support for using single-item demographic variables as indicators of communication frequency.

A fifth study (Lincoln and Miller 1979), frequently cited as providing evidence for the relationship between demographic variables and communication, also generates little support for an indicator interpretation. This study differs somewhat from the other four in that it examined simple rather than compositional demographic variables. Moreover, a different communication measure was used. The impact of five individual attributes (authority, education, sex, race, and branch) on communication was studied in five organizations. The communication measure was path distance, the minimum number of communication links connecting each pair of individuals. The results, reported for 42 relationships between attributes and communication within work and friendship networks, were similar to those in the other four studies. Using η^2 as a counterpart to r^2 shows the average reliability of single-item demographic variables as indicators of communication to be 0.04, ranging from 0.001 to 0.31. The average validity for these variables is 0.17, ranging from 0.03 to 0.56.

The same five studies provide data for assessing several multiple-item demographic indicators of communication. As expected, multiple-item measures perform better than single-item measures. For three two-item measures, the average reliability is 0.59, ranging from 0.50 to 0.67, and the average validity is 0.78, ranging from 0.74 to 0.82: individual organizational tenure and functional diversity as attributes of group demographic units (Ancona and Caldwell 1992), individual age and group tenure as attributes of a group demographic unit (Zenger and Lawrence 1989), and individual age and organizational tenure as attributes of an organizational demographic unit (Zenger and Lawrence 1989). In the Lincoln and Miller (1979) study, the average reliability for 10 five- and six-item measures is 0.15, ranging from 0.02 to 0.36, and the corresponding validity for these measures averages 0.36, ranging from 0.13 to 0.58. None of these results meet

the $\alpha = 0.7$ reliability criterion, but they suggest that with some additional work, multiple-item demographic measures may provide reasonable indicators for communication. Overall, however, the single- and multiple-item results from the five studies suggest that previous research does not support demographic variables as indicators of communication.

Criteria for Intervening Process Explanations. Intervening process explanations require empirical validation of specific interdependencies between demographic, subjective, and outcome variables (Rosenberg 1968). Because the final test of an intervening process explanation requires measuring the subjective concept, it is not possible to provide evaluation criteria for such explanations under the congruence assumption. However, intervening process explanations do not rule out alternate interpretations or situations that might explain a null result as do instrumental theories, nor do they require high proportions of explained variation as do indicator explanations. Hence, once the subjective concept has been measured, acceptance conditions for these explanations are considerably more forgiving than those for either instrumental theories or indicator explanations.

A description of what defines an intervening process and an empirical example help highlight these issues. By definition, an intervening variable accounts for the original relationship between an independent variable and a dependent variable. When an intervening variable is included in the analysis, the original association between the independent and dependent variables disappears. Assume, for example, that regression analysis shows a significant relationship between organizational tenure and turnover. If conflict is the intervening process through which that relationship occurs, when conflict is included in a second regression, organizational tenure is no longer a significant predictor and it directly explains no variation in turnover.

Heilman (1980) provided an example of an intervening process explanation in her study of how varying the sex composition of an applicant pool influences personnel evaluations of female applicants. In her study of 100 MBA students, subjects were asked to evaluate eight applicants for a managerial position in a large insurance company. The sex composition of the eight applicants was varied from 12.5% women to 100% women. The original results consistently showed that sex composition was associated significantly with personnel evaluations. Women in applicant pools in which the proportion of women exceeded 25% received more positive evaluations than women in applicant pools

with 25% or fewer women. Heilman hypothesized that this sex composition effect resulted from an intervening process: the job's gender characterization. In other words, she hypothesized that subjects used the sex composition of the applicant pool to assign the job a gender characterization. The higher the proportion women, the more likely subjects would be to classify the job as having "female" stereotypical characteristics. Such gender characterizations would then produce evaluation differences. Women applying for jobs classified as female would be evaluated more positively than women applying for jobs classified as male.

To test this intervening process explanation, Heilman first tested and found a significant relationship between sex composition and gender characterizations of the job. She then retested the original relationship between sex composition and personnel evaluations with subjects' gender characterizations of the job as the covariate. In this final test, no significant effects involving sex composition were observed. Thus, Heilman showed that the original relationship in which sex composition predicted personnel evaluations occurred because sex composition influenced the way in which subjects stereotyped jobs by gender characteristics. Cleveland et al. (1988) found a similar intervening process effect for applicant pools that vary by age. The original age composition effects on personnel ratings disappeared when the age-type of the job was used as a covariate.

Thus, in these studies intervening process explanations were evaluated by testing the impact of the subjective concept on the original relationship between the demographic predictor and the outcome. Research using congruence assumptions cannot provide such tests.

Criteria for Other Explanations. Other explanations for the congruence assumption include antecedent and moderator explanations. Although no attempt is made here to explicate all possibilities, an upper limit for accepting them can be established. At a most basic level within explanatory theories, the congruence assumption suggests that demographic variables and subjective concepts are related. Hence, the number of significant relationships between these variables provides an upper limit for those cases in which the congruence assumption is plausible. A review of such relationships provides some support for this conclusion. The 19 articles² shown in Table 2 report 348 predictions about relationships between demographic variables and subjective concepts.

Of the relationships that can be evaluated by significance tests, 42% (127 of 305 predictions) are

Table 2 Studies of the Relationship Between Demographic Variables and Subjective Concepts

| Study | Subjective Concepts | Predictions (N) | | | Sig. Estimates (N) | | |
|-------------------------------|--|---------------------|------------|------------|--------------------|-----------|--------------------|
| | | Simple ^a | Comp. | Total | Simple | Comp. | Total ^b |
| Ancona and Caldwell (1992) | Internal process, external communication | 0 | 4 | 4 | 0 | | |
| Cleveland et al. (1988) | Job and applicant stereotypes, performance, advancement expectations | 0 | 5 | 5 | 0 | 2 | |
| Cleveland and Hoffmann (1990) | Perceptions of job, perceived salary, education, performance expectations | 0 | 6 | 6 | 0 | | |
| Glick et al. (1993) | Comprehensiveness, communication, cohesion | 0 | 18 | 18 | 0 | | |
| Heilman (1980) | Gender-based work orientation | 0 | 4 | 4 | 0 | 2 | 2 |
| Hoffman (1985) | Interpersonal, organizational, and interorganizational communication | 15 | 3 | 18 | 9 | 1 | 10 |
| Izraeli (1983) | Leadership stereotype, role entrapment, personal influence | 2 | 6 | 8 | 1 | 3 | 4 |
| Judge and Ferris (1993) | Supervisor's affect toward subordinates | 0 | 1 | 1 | 0 | 1 | 1 |
| Lawrence (1988) | Career level perceptions | 0 | 1 | 1 | — | — | NA |
| Lincoln and Miller (1979) | Work and friendship communication | 42 | 0 | 42 | — | — | NA |
| Shore and Bleicken (1991) | Perceptions of work quality, work quantity, judgment, initiative, teamwork, and dependability | 12 | 6 | 18 | 4 | 1 | 5 |
| Smith et al. (1994) | Social integration, informal communication, communication frequency | 3 | 12 | 15 | 1 | 7 | 8 |
| South et al. (1982), ASR | Male coworkers', female coworkers', and male supervisors' communication | 30 | 6 | 36 | 6 | 3 | 9 |
| South et al. (1982), W & O | Supervisor perceptions, group morale, job satisfaction | 20 | 4 | 24 | 5 | 0 | 5 |
| Spangler et al. (1978) | Volunteer to speak in class, think about withdrawing, informal and formal integration, faculty interaction | 0 | 28 | 28 | 0 | 14 | 14 |
| Sutcliffe (1994) | Perceptions of environmental instability and munificence | 2 | 4 | 6 | 0 | 2 | 2 |
| Tsui et al. (1992) | Commitment, intent to stay, overall attachment | 18 | 15 | 33 | 7 | 12 | 19 |
| Tsui and O'Reilly (1989) | Reputational effectiveness, supervisory affect, role ambiguity, role conflict | 48 | 24 | 72 | 17 | 13 | 30 |
| Zenger and Lawrence (1989) | Project group and organizational communication | 5 | 4 | 9 | 3 | 3 | 6 |
| TOTAL: | | 197 | 151 | 348 | 53 | 74 | 127 |

^aIncludes demographic control variables.

^bNA = not applicable or not assessed.

significant. Single demographic variables explain 30% of the variation in a subjective concept in two cases: the relationship between tenure similarity and group integration (O'Reilly et al. 1989), and the relationship between age composition and age stereotypes of jobs (Cleveland and Hollman 1990). Multiple demographic variables explain more than 30% of the variation in a subjective concept in three cases: the explained variation in work-related communication chains exceeds 30% in two organizations when the predictions of five simple demographic predictors are summed (Lincoln and Miller 1979); and the explained variation in work-related communication frequency outside project

groups exceeds 30% when the predictions of two simple demographic predictors are summed (Zenger and Lawrence 1989). This simple, broad-brush evaluation shows that, for these studies, all forms of the congruence assumption are rejected in 58% of the predictions.

This high rejection rate warrants attention as it probably represents a best-case estimate. An effort was made to err on the side of producing the highest number of significant relationships between demographic predictors and subjective concepts. Further, most of the studies actively sought these relationships and probably would not have been published without

them. Therefore, although this finding does not cast doubt on the importance of demographic predictors, it does raise serious questions about the blanket inclusion of unmeasured subjective concepts in demographic theories.

Standards for Assessing Measurement

Ambiguities in Congruence

Once an implicit theory is established, the next step is assessing whether a model's constructs are measured appropriately. This evaluation does not differ from measurement evaluations in other studies. However, the congruence assumption seems to distract scholars from including subjective concepts in the evaluation process. As a result, ambiguities in levels of analysis are common in organizational demography research.

Two central measurement criteria are that (1) demographic measures must plausibly capture proposed theoretical constructs and (2) theoretical and empirical levels of analysis for the proposed constructs must match. The current organizational demography literature does a relatively good job with the first criterion. Most demographic measures provide plausible metrics for the demographic concept and for at least one of the proposed subjective concepts. The current literature has more difficulty with the second criterion. The theoretical or empirical levels of analysis for the proposed concepts are not always clearly stated, and the result is conceptual ambiguity.

There are no "tests" for levels-of-analysis ambiguities, but examples can help us explore the subtleties of the issue.³ First, levels-of-analysis *matches* are constructed to show how slight differences in demographic models and their interpretations produce significant and sometimes contradictory differences in hypotheses. Then an extended example of levels-of-analysis *ambiguity* from the literature is reviewed.

Three Examples of Levels-of-Analysis Matches. Let us consider three theoretically similar hypotheses, each involving the relationship between a team's organizational tenure (demographic predictor) and its communication frequency (outcome). At the outset, the congruence assumption for this relationship seems relatively straightforward: as organizational tenure increases, communication frequency either increases or decreases. However, although this statement captures the similarity of the three hypotheses, it also masks their differences. Each hypothesis involves subtle differences in explanation. As shown in Table 3, the correctly specified hypotheses, including constructs with matching demographic units, domains, and measures, bear similarities to the statement but also differ from it and sometimes contradict one another.

HYPOTHESIS 1. *As an individual's organizational tenure increases, his or her communication frequency within large groups increases.*

Table 3 Three Examples of Levels-of-Analysis Matches

| Example | Demographic Unit | Attribute | Proximal Domain | Measure | Mechanism | Hypothesis |
|---------|-----------------------------|---------------------------------------|-----------------|--|-----------|---|
| | Individual | An individual's organizational tenure | Group | Simple: An individual's organizational tenure | Indirect | As an individual's organizational tenure increases, his or her communication frequency within large groups increases. |
| 2 | Group | An individual's organizational tenure | Organization | Compositional: Average organizational tenure within the group | Indirect | As a group's average organizational tenure increases, communication frequency within the group decreases. |
| 3 | Individual Within the Group | An individual's organizational tenure | Group | Compositional: Euclidean distance similarity of an individual's organizational tenure to that of others in the group | Indirect | As the similarity of an individual's organizational tenure to that of others in a group increases, the individual's communication frequency with others in the group increases. |

The explanation underlying this hypothesis might be that an individual's organizational tenure provides a surrogate for his or her characteristics or experiences. Individuals with short tenure are assumed to know fewer people than individuals with long tenure. Hence, the longer people have worked in an organization, the more people they know, and the more likely they are to communicate frequently. Because getting to know all members of large groups is difficult, people who already know more people in the organization are likely to know more people within a large group in the organization. As a result, as an individual's organizational tenure increases (demographic predictor), he or she knows more people (subjective concept) and therefore, given a large group, is likely to communicate more frequently with people within the group (outcome).

A typical problem in designing an appropriate study might be confusion of the domain with the demographic unit. Specifying the group's size encourages the use of groups as the demographic unit, so scholars might use a group-level measure such as average organizational tenure as the demographic predictor. However, the theory underlying the relationship between the demographic predictor and the subjective concept suggests an individual-level explanation. Therefore a group-level measure is inappropriate. In this case, the group is the domain rather than the demographic unit.

HYPOTHESIS 2. *As a group's average organizational tenure increases, communication frequency within the group decreases.*

The explanation for this hypothesis, in which the negative association between organizational tenure and communication frequency directly contradicts the positive association predicted in the first example, might be that groups with homogeneous organizational tenure develop a common bond among members that facilitates communication. During the initial years of organizational tenure, the group requires frequent communication to complete tasks. However, over time, the group develops work routines that decrease the need for frequent communication. Hence, as a group's organizational tenure increases (demographic predictor), it develops work routines (subjective concept), and thus its communication frequency decreases (outcome).

A typical problem in designing an appropriate study might be confusion of individual-level effects with group-level effects. In this example, the explanation assumes that groups are relatively homogeneous in organizational tenure. Yet without prior knowledge,

theoretical rationale, or testing for within-group similarity and between-group differences, one cannot expect a group of individuals with a random set of organizational tenures to have experienced the suggested bonding. The individuals within such groups are independent on the criterion of interest. The possible within-group variance is too high to predict whether bonding will occur.

HYPOTHESIS 3. *As the similarity of an individual's organizational tenure to that of others in a group increases, the individual's communication frequency with others in the group increases.*

The explanation for this hypothesis might be that the similarity of an individual's organizational tenure to that of others in a group is related positively to the number of his or her shared experiences and the level of his or her comfort with those others. Perhaps the more similar people are to others in a group, the more experiences they share, the more comfortable they feel with one another, and thus the more frequently they communicate.

A typical problem in designing an appropriate study might be confusion of the domain with the demographic unit or misinterpretation of the demographic unit. The hypothesis examines tenure similarity within groups, which suggests that the demographic unit is the group. As a result, scholars might tend to use a group-level measure such as average organizational tenure. However, the theory underlying the relationship between the demographic predictor and the subjective concept suggests an individual-within-the-group-level explanation. The group is the domain rather than the demographic unit. Also, because this congruence assumption appears similar to that in the first example—both suggest a positive association between organizational tenure and communication frequency—scholars might tend to generalize results of both studies to the same level of analysis. Such generalizations would be inappropriate because the demographic unit in the first example is the individual, whereas the demographic unit in this third example is the individual-within-a-group.

An Example of Levels-of-Analysis Ambiguity. Finkelstein and Hambrick's (1990) research on top management teams is useful for extended examination because it provides an important contribution to its literature. It is one of the few organizational demography studies that both hypothesizes the existence of and evaluates the moderating effect of a subjective concept

(managerial discretion). However, it also exhibits levels-of-analysis ambiguities. The intent here is not to criticize the study, but to show how the congruence assumption hides ambiguity in levels of analysis, even in high quality research.

The authors use the "upper echelons argument" to explain the general impact of a firm's leaders on organizational outcomes. They hypothesize that as a top management team's firm tenure increases, the firm's strategies become more stable and more similar to the industry average, and its firm's performance becomes more similar to the industry average (Finkelstein and Hambrick 1990, p. 497). The demographic unit in this theory is the team, the attribute is an executive's firm tenure, and the measure is the average firm tenure of executives within top management teams.

The authors are quite clear that their concern is group-level effects on organizational outcomes. However, as in the preceding "organizational tenure influences communication frequency" example, their simple hypothesis masks demographic and subjective concepts at several levels of analysis. Whether the outcomes are really group effects is unclear. They may also be individual or even individual-within-the-group effects. The following extended quotations provide a representative feel for these levels-of-analysis differences. The point is not that the explanations are incorrect, but that they introduce concepts at different levels of analysis that are not then included in the study.

Explanations at the group level:

We draw from available literature to argue that a top team's tenure in the organization affects (and serves as an approximation for) the team's commitment to the status quo, its informational diversity, and its attitudes toward risk. In turn, team tenure is expected to affect organizational outcomes. (p. 486)

The top team as a whole tends to develop similar repertoires because long-term acculturation of team members creates a common perspective or organizational paradigm . . . (p. 487)

Explanations at the individual level:

As individuals spend time in an organization, and particularly as they succeed and climb the organization's hierarchy, they become convinced of the wisdom of the organization's ways (Wanous 1980). They become committed to their own prior actions, especially when those actions were taken publicly and were explicit, as typically characterizes strategic choices . . . (p. 487)

Related to the effects tenure has on commitment to the status quo are those it has on risk taking. At one level, commitment derives from certain "psychological risks" of change . . . However, more tangible risks are also associated with tenure,

particularly for senior executives. Such individuals may have struggled for years to achieve their top spots; their competencies have been deemed important for the firm's current configuration; as long-term employees, they have more firm-specific than general human capital; and they typically are well established in their communities, social circles, and family life-cycles . . . Essentially, they have far more to lose than to gain by taking "unnecessary risks" . . . (p. 487)

One could argue that using individual-level arguments to describe the team's behavior makes little difference to the analysis because teams with individuals having higher levels of specified characteristics will behave differently than teams with individuals having lower levels of those characteristics. However, if the relationship between firm tenure and organizational performance is really an individual-level effect, it is not necessary to study the team at all. One could literally examine the firm tenures of a large sample of executives, independent of their team or firm, and expect either the same or better results. If the relationship between firm tenure and organizational performance is really an individual-level effect, studying it at the group level may attenuate the relationship.

A second problem is that, in addition to individual- and group-level effects, individual-within-the-group-level processes may be operating. The second statement quoted above could be interpreted as either a group-level or an individual-within-the-group-level argument. That is, it might not be just the average length of team members' organizational tenures but the similarity among their organizational tenures that produces a common perspective. These two distinct explanations require different compositional measures.

Table 4, showing a simple example involving two groups, clarifies the potentially distinctive information. In both groups, the average organizational tenure is three years. However, Aztec has lower average similarity among its executives' organizational tenures than Baxso. This means that although average organizational tenure is the same in both firms, top management team members at Aztec are more similar to one another in their organizational tenure than top management team members at Baxso. If average organizational tenure is used to predict the common perspective of the two teams, identical commonality in perspectives is predicted. Yet, an organizational tenure similarity measure suggests that Aztec's team will have a more widely shared organizational paradigm than Baxso's team. (See Zenger and Lawrence (1989, p. 371) for another discussion of this issue. See Klein et al. (1994) for a detailed discussion of such levels-of-analysis issues.)

The result of this levels-of-analysis ambiguity is that Finkelstein and Hambrick's demographic predictor, the top management team's average firm tenure, captures the group-level but not the individual-level or the individual-within-the-group-level relationships suggested by the authors' explanations for their congruence assumption. To include these components, the study would require two additional demographic predictors: individual firm tenure and a similarity measure of individual firm tenure. More importantly, the missing predictors raise several questions. Did Finkelstein and Hambrick miss additional explained variations in organizational outcomes because they did not include all three demographic predictors? Are the phenomena they uncover really team-level phenomena or are they better explained by individual behaviors or similarity effects? Do all three demographic predictors help explain the relationship between these executives and their firms? The issue here is not the contribution of the study, but how the congruence assumption tends to obscure complex and intriguing relationships and associations that could have been specified, studied, or noted as limitations for further study.

Conclusions about the Congruence Assumption

The results from the preceding examination of evaluation criteria for and subsequent assessment of the congruence assumption are mixed. Many demographic variables are related to subjective concepts, but many are not. Demographic predictors often capture variation in some of the hypothesized subjective concepts. However, the congruence assumption seems to encourage levels-of-analysis misspecifications. This observation does not diminish the importance of demographic predictors, but does raise questions about the appropriateness of applying the congruence assumption indiscriminately.

A first conclusion about the congruence assumption is that *some theories are more probable than others*. Scholars who use the congruence assumption frequently hold several implicit and perhaps explicit theories for their model. Yet some theories are more likely than others. For instance, the stringent requirements for accepting instrumental theory decrease the probability that it will work for many demographic predictors. Indicator theories, which require high reliability and validity, also must surmount substantial empirical hurdles for acceptance. In contrast, intervening process theories, which do not require high proportions of explained variation in subjective concepts, seem more

Table 4 Simple and Compositional Measures of Organizational Tenure

| | | Demographic Unit | | |
|-------|---------|------------------|--------------------------------|---------|
| | | Individual | Group | |
| | | Simple Measure | Compositional Measure: Average | |
| Aztec | | | | |
| | Jose | 3 years | 1.22 | |
| | Susan | 2 years | 1.66 | |
| | Wing | 3 years | 1.22 | 3 years |
| | Ravi | 2 years | 1.66 | |
| | John | 5 years | 2.35 | |
| Baxso | | | | |
| | Sabine | 1 year | 3.54 | |
| | Richard | 1 year | 3.54 | |
| | Seong | 1 year | 3.54 | 3 years |
| | Cynthia | 6 years | 4.33 | |
| | Carlos | 6 years | 4.33 | |

likely to fit a given dataset than their instrumental or indicator counterparts. Similarly, given that in many cases there is *no* relationship between demographic variables and subjective concepts, it is also likely that either no theory is appropriate or the appropriate theory is quite complex. Inadequate data therefore may pose a serious limitation for demographic studies rather than an acceptable omission. Differences between theories are important and should be accorded thoughtful treatment.

A logical extension of this conclusion is that *the probability of misspecifying demographic models increases with the number of possible theories*. When the role of subjective concepts is left unspecified, the list of theoretical possibilities expands. The greater the number of possible theories, the greater the likelihood that any given theory is incorrect, important variables are left out, unimportant variables are left in, unnoted interactions are present between unmeasured variables, and variables are measured inappropriately. At present, researchers appear to use "convenience" explanations that amalgamate a variety of plausible processes without assessing which processes actually belong and which do not. The problem is that the congruence assumption leaves the possibilities unstated, which makes it difficult to assess whether the models are well specified.

A third conclusion about demographic research involving the congruence assumption is that *the theoretical power of the models decreases as the number of possible subjective concepts increases*. Theoretical power is a model's ability to provide an unambiguous and parsimonious explanation for some phenomenon. Pfeffer (1983) originally proposed demographic variables as superior to social-psychological variables as predictors because they provide more parsimonious explanations requiring fewer variables and multiple interactions. However, the evaluation presented here suggests that demographic predictors are just as limited as their social-psychological counterparts.

First, the results do not provide much support for the more parsimonious instrumental and single-item indicator theories. Further, although the results suggest that multiple-item indicators may operate as reliable measures of some individual behaviors or characteristics, there is no measurement parsimony advantage to using multiple demographic variables rather than multiple social-psychological variables. Moreover, there is apparently no evidence that demographic variables provide better measures of individual behaviors or characteristics than social-psychological measures. Face validity suggests that social-psychological variables designed to capture theoretical components of some subjective concept have a better chance of achieving high construct validity than multiple demographic variables, which are theoretically more distant.

Second, the results suggest that, although intervening process theories have a higher probability of working for demographic models than either instrumental or indicator theories, intervening process theories may be quite intricate, involving multiple subjective concepts and interactions (see Pelled 1996, for an example). Hence, for these more probable incarnations of the congruence assumption, one loses the parsimony sought in the first place. Moreover, research suggests that other complex explanations are also likely, further decreasing theoretical parsimony. For instance, several studies show demographic variables involved in antecedent (Lawrence 1988) and moderator explanations (Finkelstein and Hambrick 1990; Lincoln and Miller 1979; South, Corder and Markham 1982; Tsui et al. 1992; Zenger and Lawrence 1989).

In sum, the congruence assumption probably masks elaborate relationships between demographic variables and outcomes. This is "paper" parsimony, parsimonious only because the more complicated interactions are assumed away. The black box seems full of questions. What is the appropriate theory or theories for the observed outcome? What theories should be in-

cluded or excluded? If an explanatory theory is required, what subjective concepts should be included or excluded? Under what conditions do those concepts produce the predicted outcome? What dependent or independent associations are present among the proposed subjective concepts? These inevitable questions make demographic explanations involving the congruence assumption ambiguous. Demographic variables commonly predict organizational outcomes, but the underspecified role of subjective concepts within such models greatly reduces their theoretical power.

Is the Congruence Assumption Reasonable? A Summary

Let us now return to our original concern: Is the congruence assumption a reasonable substitute for subjective concepts? Clearly the answer is no. The congruence assumption is unreasonable for several reasons. The first and most important is that the data do not provide strong support for its use. Second, it discourages careful thinking about how demographic predictors really work and under what conditions. Third, studies that use it seem to run a high risk of spurious explanation. The congruence assumption moves researchers farther and farther away, both empirically and theoretically, from the actual mechanisms underlying observed relationships. Such distance is always problematic in social science, and particularly for quantitative studies whose measures necessarily trade descriptive completeness for replicability and generalizability. This distance from phenomena should concern us. In the final analysis, who cares whether empirical relationships are present between demographic variables and organizational outcomes if the reasons for these relationships cannot be explained? Demographic variables should play no role in organizational studies unless we understand what role they are playing.

Despite this criticism, organizational demography is an important and useful field of study. It is not the class of predictors that is at issue. These variables have desirable properties. They are distinct theoretical constructs that help explain organizational outcomes. They are easy to collect and relatively accurate (although anyone who has carefully cleaned an organization's demographic data knows that they are not 100% correct!). They are relatively unambiguous, thus providing high content validity and replicability, which is an important consideration in a field where replication is all too infrequent. Researchers need not be concerned that employees in one organization interpret the phrase "chronological age" in a different way than employees in another organization. Further, studies consistently

show significant relationships between demographic variables and organizational outcomes, suggesting a systematic association that warrants further exploration.

Finally, the problems identified in this analysis of organizational demography are normal for any developing field of study. The difficulty is not that these problems exist, but that using the congruence assumption tends to (1) obscure them, (2) minimize the importance of exploring solutions, and (3) allow demographic variables either a larger or smaller role than may be justified.

Theoretical Implications for Organizational Demography

As suggested at the beginning of this article, the congruence assumption conceals many interesting demographic questions. The preceding critique indicates that quite a bit of action occurs inside the black box about which little is known. Many questions and suggestions about that action have already been raised, and exploring all the possibilities would necessitate numerous articles. However, several ideas can be offered on directions for organizational demography.

Deepening Variance Explanations

One direction is to further explicate and test relationships in current variance explanations (Mohr 1982) of organizational demography. Instrumental, indicator, and intervening process theories have been examined in some detail. The following discussion provides examples of questions that other theories, such as moderator or antecedent theories, might generate.

Moderator theories, in which demographic variables exert conditional effects on organizational outcomes, offer some intriguing possibilities. The basic question is: Under what conditions does a specific demographic variable or set of demographic variables produce a given outcome? For instance, scholars might explore the conditions under which individuals experience similar (or different) effects based on their position along different dimensions of a demographic variable. Tsui et al. (1992) found that as an individual's age becomes increasingly different from that of other people in his or her work unit, the individual's intention to stay decreases. Further, that result was independent of the individual's age. In other words, both young and old employees reacted the same way. The researchers did not find such symmetric results for gender. As work units became increasingly gender-diverse, men showed decreasing and women showed increasing organiza-

tional commitment. What happens along other dimensions such as functional area, hierarchical level, or prior industry experience?

Another moderator theory question involves the impact of diversity on organizational outcomes. For instance, demographic variables such as age, tenure, gender, race, and education seem likely to produce distinct organizational outcomes. Yet demographic studies frequently treat such variables as an overall diversity measure without theoretical development of the potentially distinct outcomes (e.g., see Pettigrew's 1992 discussion of this problem in the top management team literature). Kanter's (1977b) important work on proportions in organizations does not address whether a racial minority experiences the same intraorganizational problems as a gender minority. Yet minority groups' social status seems likely to generate differences in their experiences. Such status differences might produce strong differences in the minority-group experiences of women and African Americans across regions within the United States, as well as cross-nationally.

Antecedent theories, in which the demographic variable is causally prior to whatever variable predicts the outcome, provide other interesting questions. Most organizational demographers ignore antecedent theories completely because demographic variables hold no significant association with outcomes in these models. One use for antecedent theories is in exploring how demographic variables act as organizational signals (Spence 1974) that acquire meaning, which differs from the role demographic variables play in indicator theories. In indicator theories, the demographic variable represents a measure of the subjective concept. In an antecedent theory where demographic variables play a signaling role, the demographic variable and subjective concepts are conceptually distinct. The subjective concept is generated by the social constructs people attach to their perceptions of the demographic variable.

Studies of the signaling relationship between reality and perception may explain how demography influences organizational culture. Previous research (Lawrence 1984, 1988, 1990, 1996) provides an example of such signaling processes, suggesting that people use their organization's age distribution as a signal of how the firm values employees. For instance, people who are seen as young in relation to others in the same job are more likely to have "star" reputations and to receive high performance ratings than people who are seen as old. Thus, age demography influences organizational outcomes not because of the characteristics of actual age, but because age acquires meaning when people evaluate themselves and others. Interestingly,

managers' perceptions of their own age in relation to that of others in the same position are frequently inaccurate, but the perception rather than the reality is what influences work attitudes and involvement. Studies of a broader range of signaling processes, organizational structures, and demographic distributions would generate a detailed picture of the relationship between formal and informal structure. Given that managers control demography to some extent through recruitment, retention, and mobility, such understanding might generate powerful intervention strategies.

Mixed theories, in which a given relationship between demographic variables and outcomes requires several distinct explanations for complete specification, provide perhaps the richest landscape for exploration. Ancona and Caldwell (1992), for instance, found that a team's diversity influenced performance both directly and indirectly. Moreover, that influence operated differently for a team's tenure composition and its functional diversity. Tenure composition exerted a direct impact on performance but no indirect impact. Directly, the more heterogeneous the team, the worse the team's adherence to budget and schedule. Indirectly, the more heterogeneous the team, the better the team's internal processes. However, internal processes did not predict adherence to budget and schedules as would be expected in a complete intervening-process model. Because more than one theory is needed to explain these results, the congruence assumption would have produced a Type II error: a positive association between tenure composition and performance, even though the predicted intervening process does not occur.

Functional diversity had both a direct and an indirect impact on performance. Directly, the greater the group's functional diversity, the lower its management-rated innovation. Indirectly, the greater the group's functional diversity, the greater its external communications and the higher its management-rated innovation. One cannot help but agree with Ancona and Caldwell that "Taken together, these findings show the complexity with which the demography of a group can influence outcomes. Further, they suggest that our models of group demography have to become more clearly specified with respect to type of diversity, the type of group process under investigation, the performance being assessed, and perhaps even the nature of the group's task" (1992, p. 337).

Creating Dynamic Models

The second direction for organizational demographers is to create dynamic models in which the relationship between demographic predictors and organizational

outcomes is not explicitly unidirectional, linear, and variance-capturing. One possibility is models that require nonrecursive explanations. In a dynamic model, demographic variables might produce organizational outcomes, then organizational outcomes might alter the organization's demography, then a new relationship between demographic variables and organizational outcomes might result, and so forth. One study (Lawrence 1988), for example, suggests that age distributions drive the development of age norms, which in turn influence employee behavior. However, this "does not imply that reciprocal relationships do not occur. In fact, age norms may influence age distributions, and employee behavior may alter age norms. For instance, over time, an age effect such as managers' ratings of employees' performance may influence the positions employees hold, thus affecting the age distribution of those positions and the norms that develop" (pp. 313-314).

Kanter's (1977a, p. 63) notion of homosocial reproduction and Schneider's (1983, 1987) related attraction-selection-attrition model, in combination with the relationship between heterogeneity and turnover (McCain et al. 1983, Pfeffer 1983, Wagner et al. 1984), suggest another dynamic model. Both Kanter and Schneider suggest that employers tend to replace organizational members with people who are similar to themselves. Even if we leave open the interesting question of whether this process is generated by situational pressures, psychologically based decisions, or some combination of the two, employers are likely to use turnover to replace "different people" with "similar people." Because heterogeneity seems to encourage turnover, homosocial reproduction is likely to make heterogeneous organizations more homogeneous over time, and turnover will decline. Ultimately, the process may produce a homogeneity equilibrium, a point at which organizational members achieve a comfortable balance of similar others. In this explanation, turnover both results from demographic heterogeneity and creates demographic homogeneity.

Explaining What Factors Produce Organizational Demographic Distributions

A third direction for organizational demographers is to explicate those conditions that give rise to organizational distributions in the first place. Such research is a staple in population demography, but organizational scholars have done little thinking on this dynamic.

Several sets of questions are of interest. First, what factors *inside* organizations influence organizational distributions? Second, what factors *outside* organiza-

tions influence organizational distributions? Inside the organization, the dynamic processes cited above would influence the organizational distributions that evolve over time. Tolbert and Oberfield (1991) found that employers' preferences for associating with certain social groups, although not posited as a dynamic process, influenced organizational distributions. People are more likely to hire employees with characteristics they prefer, and an organization's demography reflects those preferences. Outside the organization, Haveman (1995) found that ecological processes such as organizational births, deaths, mergers, and acquisitions within an industry exert little influence on tenure dispersion within organizations. These processes do, however, influence mean organizational tenure and job mobility. Wiersema and Bird (1993) found that ethnological context, including national structural characteristics and culture, alters the relationship between top management team characteristics and turnover. Demographic heterogeneity explains more of the variation in top management team turnover in Japan than in the United States.

Although research on antecedents of organizational demographic distributions is limited, even the three studies cited here suggest other questions. What other internal and external factors influence organizational distributions? Are ecological processes always ineffective as predictors of dispersion? Do changes in the characteristics of the workforce influence the dispersion of those characteristics within organizations and, if so, how? What is the relative impact of internal versus external factors in producing organizational distributions? How do economic disruptions affect organizations demographically? Does the process by which a demographic distribution is produced influence the impact it has on outcomes that require indirect explanation? Certainly, considerable room is available for detailed studies on a wide variety of intriguing questions.

Beyond the Variance Model

A final direction for organizational demographers is to examine demographic theories in which the relationship between "predictors" and organizational outcomes cannot be explained by partitioning the variation in outcomes. All organizational demography, including most of the discussion in this article, assumes a variance explanation (Mohr 1982). In other words, it assumes that if the right demographic predictors are identified, they will consistently explain some percentage of the variation in organizational outcomes. However, process explanations, based on a narrative ap-

proach (Abbott 1992), may prove more appropriate. For instance, average group tenure may explain little of a group's social integration. Yet, in combination with other factors such as stressful conditions, it may produce the correct primordial soup to push social integration over some threshold necessary to influence performance. In other words, social integration may explain little variation in performance unless the correct ordering of the correct conditions is achieved over the correct time period. Consistent with other revolutionary change theories (Gersick 1991), a light push from increasing group tenure at a given time may produce dramatic changes in performance.

Pettigrew (1992) argues for process studies of elite teams such as top management teams or boards of directors, an area of study dominated by organizational demographers. He suggests that process studies would not replace, but would complement current cross-sectional studies. By focusing on temporal interconnectedness, multiple levels of analysis, and holistic as opposed to linear explanations, process studies of elite teams might examine questions such as "Why and how do interlocking ties emerge, consolidate and dissolve? What mixed motives are behind the offering and acceptance of multiboard membership? ... How are influence processes conducted in the network and is it possible to unravel the place of influence processes from coordination, information giving and control?" (p. 177). These are only a few of many questions provoked by eliminating the congruence assumption and adopting a nonvariance explanation approach. Although no studies to date suggest such alternative explanations, the possibility should not be discounted in future thinking about demographic phenomena.

These several sets of questions do not provide exhaustive examples of new directions for demographic studies, but they do represent some areas in which organizational demography can continue making constructive and important contributions to organizational studies.

Final Thoughts

This article is not just about organizational demography, but about all organizational theory. Neither good measures devoid of explanation nor intriguing explanations lacking testable implications produce strong theory. One cannot answer the question "Why?" without exploring the tight interdependence between theory and method. Theories begin with notions about a phenomenon that emerge from many sources, such as

reading materials and personal observations. These nascent theories are then tested, possibly with colleagues or an exploratory study. This step produces more carefully specified theories, which in turn are subjected to further empirical confirmation, and so forth. In truth, theories are always in progress, navigating iteratively, although perhaps not linearly, through the territory between thought and experiment.

Strong theories provide clear directions for this navigation. They define location and heading by elaborating the current iteration. They denote distinctions from previous thinking, provide boundaries on present ideas, and foreshadow future destinations. Such theorizing requires strict attention to method in its broadest sense: the observing, relating, synthesizing, and explaining that marks the theorizing process (Weick 1995). Kurt Lewin's famous remark that "there is nothing so practical as a good theory" (Marrow 1969) is really recognition that good theories work precisely because of their close connection to empirical observation. Strong theory does not exist without method, and our job as scholars is to make that connection explicit.

It is in specifying this connection that organizational demographers have fallen short. Demographers frequently invoke untested subjective concepts to explain the relationship between demographic predictors and organizational outcomes. The explanations are not necessarily wrong, but their explanatory gloss ignores the self-correction of iterating theory with method. As a result, untested subjective concepts remain poorly defined and their relationships, timing, and context consistently underspecified. Available data substantiate this problem. The literature does not show reliable, strong relationships between demographic predictors and the subjective concepts commonly used to explain organizational outcomes. Thus, the congruence assumption has produced weak theory: it creates a black box whose contents remain unknown.

Despite this sometimes serious limitation, demographic variables are important for theoretical and practical reasons. They represent a distinctive class of theoretical concepts that frequently show predictive value and are easy to measure. The challenge is to develop stronger theory, to make sense of how and under what conditions these structures work. When data limitations preclude such explorations, researchers should provide careful specification of the missing processes for future testing. The increasing number of studies that do include tests of these processes and conditional demographic effects suggests a promising future for the field of organizational demography.

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Endnotes

¹This raises several questions. First, what kind of attributes should organizational demography include: both demographic and personal attributes or only demographic attributes? Second, what kind of measures should organizational demography include: concepts defined by both simple and compositional measures or only concepts defined by compositional measures? A look at how "real" population demographers define their disciplinary boundaries provides some perspective on these questions. Population demography examines the "size, distribution, structure, and change of populations" (Shryock et al. 1980, p. 2). In other words, population demographers describe the current population composition, explore how it got the way it is, and predict what it will be in the future. In its narrowest form, population demography's definition includes only individual attributes such as age and gender. However, this constraint results more from historical data limitations than from basic philosophy. Population demographers now study almost any attribute relevant for compositional study, including attitudes and other mutable individual characteristics (personal communication with Mark Hayward).

Organizational theorists are certainly not limited by how population demographers define their field; however, their definition does suggest a broad view of attributes and a focus on compositional rather than simple measures. Given such definitions, organizational and population demography would be distinguished by two features. Organizational demography uses compositional variables as theoretically distinct concepts, whereas population demography uses such variables for their descriptive value only. In addition, organizational demography does not at this time focus on describing and explaining compositional change, whereas that is a primary goal of population demography.

²These studies do not represent a complete list of works examining the relationship between demographic predictors and subjective concepts. They were selected because they: (1) are generally considered organizational demography studies, (2) are cited by organizational demographers as evidence supporting a particular congruence assumption, or (3) examine the relationship between compositional variables and subjective concepts. Although the included studies focus on compositional demographic variables, some include simple demographic variables, and predictions for both compositional and simple variables are noted.

In many cases, a judgment call was made in deciding which variables to include. For example, from Spangler et al. (1978) grades earned and area of specialization were not included as subjective concepts because they represent subjects' immutable characteristics. From Cleveland et al. (1988) a subject's hiring recommendation was not included as a subjective concept because it represents a decision. From Glick et al. (1993) preference and belief diversity were not included as demographic predictors because such mutable, personal attributes are not typically defined as demographic variables.

³The levels-of-analysis issues discussed here are similar to those presented in Klein et al. (1994, p. 198). The demographic unit is similar to their "level of theory" in that the demographic unit "describes the target (e.g., individual, group, organization) that a theorist or researcher aims to depict and explain. It is 'the level to which generalizations are made'" (Rousseau 1985, p. 4). The level of analysis of the attribute is similar to their "level of measurement," which describes the actual source of the data: "the unit to which data are directly attached (e.g., self-report data are generally individual level, the number of group members is measured at the group level)" (Rousseau 1985, p. 4). Measures can be distinguished by using Klein and her coauthor's assumptions of variability on the level of theory. Simple measures assume the independence of the attribute's level of analysis from the demographic unit. Compositional measures assume either homogeneity (averages, coefficient of determination) or heterogeneity (relational).

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