A Research Agenda for Survey Network Data

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ABSTRACT

Taking advantage of conceptual and substantive developments in network analysis, coupled with the inferential power of survey sampling, we propose a research agenda identifying and coordinating multiple lines of methodological research to establish a standard set of network items for survey research. As a standard, these items are to be (a) efficient in the sense of being quickly administered, (b) reliable in the sense of being stable over short periods of time and random errors in respondent perceptions, and (c) valid in the sense of minimizing biases in respondent perceptions of relationships and maximizing the variance in subjective response data accounted for by network data purporting to capture the interpersonal socializing environment in which opinions are formed and maintained. We explain why this is a timely and significant research problem, describe kinds of data to be obtained, and describe lines of analysis to be pursued.

Building on the General Social Survey network items as a benchmark, five lines of research are described: (a) Observed data distributions and computer simulations are proposed to establish the interview time that each of the final network items can be expected to require from different kinds of respondents. (b) Alter telephone interviews and test-retest interviews are proposed to explore item reliability. (c) Subsample analyses of background items, extended name generators, and extended alter data are proposed to study network stability across alternate research designs. (d) Extended name generators and factorial items are proposed to study the meaning of the network data across item wordings and social strata of the American population. (e) Extended name interpreter data, traditional background items and survey opinion items are proposed to establish construct validity propositions involving the network items.

The product of this research agenda would be fourfold: (a) A standard set of network items for survey research. (b) Description of survey network item efficiency, reliability and validity, focusing on sensitivity to item changes and distortions within age, race, sex, and socioeconomic strata of the American population. (c) A richer understanding of methods by which network item properties can be documented. (d) More effective -- precise and cumulating -- survey research into phenomena contingent upon the structure of interpersonal environments, i.e., more effective social survey research.

CONTENTS

THE SURVEY NETWORK DATA PROBLEM AND ITS SIGNIFICANCE

Survey research has flourished with the development of sampling strategies matched to the assumptions of classical statistical inference. Fundamental among these assumptions is the requirement that respondents be drawn, independent of one another, with known probability, from a large study population. Precise statements about the population can then be made using well known statistical models to describe the independent sample observations.

This research design has long been decried as an offense to sociological sensibilities. It ignores the social environment in which emotions and behaviors are formed and maintained. An extensive sociological literature posits that what we do and say is in large part determined by the people in whose company we express ourselves.

Not surprisingly, variations from the standard survey design began to be developed by sociologists early in the post World War II explosion of survey research. These variations were promulgated by Paul Lazarsfeld and several associates in studies of voting during the 1940 and 1948 presidential elections (crudely at first, e.g., Lazarsfeld, Berelson and Gaudet, 1944:171, but in some detail later, e.g., Berelson, Lazarsfeld and McPhee, 1954:352, 358) and became established with Lazarsfeld's students advocating survey network data in a range of research designs, some doing little damage to standard survey design (e.g., Rossi, 1966), some leaning toward more traditional sociometric designs (e.g., Coleman, 1958). In all of the variations, data are obtained on the interpersonal environments of survey respondents. A respondent is asked to identify people with whom he has a specific kind of relationship and then asked to describe various features of the people named. These data are studied to detect ways which a respondent's emotions and behaviors can be attributed, under appropriate sociological propositions, to the interpersonal environment in which emotions and behaviors are expressed.

The study of interpersonal environments has matured over the last thirty years in the more general study of social networks. With this growth has come renewed interest in the use of network items in area probability surveys. Such interest has a dual significance.

For structural theory, the development of quality survey network items holds scientific and institutional benefits. High quality network data in probability samples of large populations make it possible to explore structural hypotheses with powerful and precise statistical models. They speed up the refinement of structural hypotheses by providing a communal data base that competing network models should be able to describe. Further, the development of survey network items can be expected to expand the talent pool researching sophisticated structural hypotheses, expanding the current audience of select academics and clinical workers to the more general academic audience utilizing survey data as well as the many social scientists who work with survey data in government agencies tracking client populations, political lobbies tracking voter populations, and private corporations tracking consumer populations. The net benefit of quality survey network data to structural theory is faster, easier cumulation of precise, empirically tested hypotheses describing a broader range of social phenomena.

For survey research, the development of quality survey network items promises two benefits; increased precision in survey measures of the social conditions under which expressed emotions and behaviors were formed, and expanded research opportunities. Conceptual developments in network analysis offer a variety of indicators describing theoretically significant aspects of a respondent's interpersonal environment -- social integration, social participation, and exposure to normative pressures, among others. Beyond being interesting in their own right, network data offer, in interaction with traditional survey response data, insights into the ways in which a respondent's interpersonal environment distorts and enriches his abilities, aspirations, attitudes and behaviors. This point is illustrated in our discussion of construct validity below. We present propositions linking various kinds of survey response data to the structure of relations in a respondent's interpersonal environment: (a) personal attributes with the strength of individual relationships; (b) satisfaction and feelings of well-being with the overall strength or density of relations in the environment; (c) political preference with the social pressure created by a cohesive, politically homogeneous environment; (d) stereotypical perceptions of sex roles with the extent to which the environment is segregated into cohesive, sexually homogeneous factions; and (e) inequality in socioeconomic achievement with the interpersonal skills developed in environments providing opportunities to broker contact between others.

Our view is that network data can play an analytical role in survey research similar to the one currently played by occupation data. Like occupation data, network data are interesting in their own right, explain variation in diverse survey response data, and explain variation in the strength of associations between traditional survey response variables (see Burt, 1984, for elaboration). Occupation is a basis for modern social differentiation and not surprisingly predicts diverse survey response data, but network data speak to a more fundamental condition. They are the form and content of interpersonal relations and so represent social differentiation directly.

Unfortunately, there has been no definitive research on network items like the research reported by Albert Reiss, Otis Duncan, Paul Hatt and C. North (1961) establishing a standard set of occupation items. This shortcoming became painfully obvious during deliberations over the inclusion of network items in the General Social Survey (GSS). The GSS Board of Overseers, with its diverse substantive interests, quickly agreed that the enrichment possible with GSS network items was greater than that possible with any other significant modification ready for the survey, but serious questions were raised about item efficiency, reliability, and validity. In collaboration with leading experts familiar with survey network items, these questions were addressed, if not answered, by pasting together bits and pieces of evidence drawn from local probability and quasi-probability surveys. In particular, two surveys were helpful for their methodological and institutional similarity to the GSS; Edward Laumann's 1966 Detroit Area Survey and Claude Fischer's 1977 Northern California Communities Study.

Informed by collaboration and strengthened by the withering scrutiny of survey research experts on the GSS Board of Overseers, a set of network items was adopted for the 1985 General Social Survey. For the first time, network items carefully crafted in the collaboration of experts have been administered to a national probability sample to reconstruct the interpersonal environments of Americans. In construction and implementation, the GSS network items define the new benchmark for subsequent research.

This kind of effort is impossible to mobilize for every survey that would benefit from the inclusion of network items. Argument and evidence helpful in the deliberations over GSS network items have been published to facilitate the efforts of others (Burt, 1984), but there is still no definitive evidence on the efficiency, reliability and validity issues raised during those deliberations. We propose an agenda of research activities to nail down these issues, research building on the benchmark GSS network items to establish a standard set of network items with known properties of efficiency, reliability, and validity. Having such a set of items available would improve the quality of survey network data gathered in serious research. It would facilitate the inclusion of network data in research by persons aware of the social significance of interpersonal environments but unfamiliar with items eliciting quality data on them. And, by making network data comparable across surveys, it would facilitate the cumulation of research results on the manner in which standard survey response data reflect the interpersonal environment in which they are obtained.

In what follows, we first describe the GSS network data that will serve as a point of departure for the proposed methodological research. We next describe the new data proposed to resolve the pressing methodological concerns raised and left unanswered in debate over the GSS network items. These issues include item efficiency, reliability, stability, and validity, and are covered in detail following description of the proposed data. We conclude with the construct validity propositions mentioned above, discussing concerns of both method and substance.[1]

THE GENERAL SOCIAL SURVEY BENCHMARK

A brief description of the GSS network items is in order before we describe the content and purpose of the proposed research. The GSS network items are deliberately rather routine, marked less for their innovative qualities than their consensual acceptability and breadth of applicability. The respondent is first asked (through a "name generator" item) to identify people with whom he has a particular kind of relationship and then asked for various attributes of the people he named and his relations with them ("name interpreter" items). The exact items are reproduced in Appendix A.

Figure 1 illustrates the form of the network recreated around each respondent. The respondent names a handful of important discussion partners; the exact wording of the item eliciting the names is given in the caption to figure 1. The respondent then indicates which among the people named are especially close to him and

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[1]This is a convenient point for an aside distinguishing two strategies for improving the quality of network data on large populations. One strategy is to develop research methods dedicated to estimating especially informative aspects of network structure. For example, Pool and Kochen (1978), Killworth and Bernard (1978; Killworth, Bernard and McCarty, 1984), and Sudman (1985) discuss strategies for estimating network size. Granovetter (1976), Morgan and Rytina (1977), Erickson and Nosanchuk (1983) discuss strategies for estimating network density. We are pursuing a different strategy. We are after a set of network items that could function as a questionnaire insert for any standard survey research design. In order to enhance the exchange between network analysis and social survey research, we wish to minimize the departures from standard survey research design needed to obtain high quality network data. These two strategies for improving the quality of network data on large populations are obviously more complementary than competitive, but each sets its own priorities. The difference between them therefore merits note in the interest of effectively pursuing either one.

which pairs of them are especially close to each other. The respondent also indicates pairs of discussion partners who are strangers in the sense that they would not recognize one another if they were to meet. The net result is a six by six symmetric matrix in which three categories of relationship are distinguished; especially close, some relation (acquainted but not especially close), and stranger. There are a variety of informative network measures that could be computed from no more than these purely formal data (e.g., network size, density, hierarchy, centrality, some range measures).

Figure 2 illustrates how these purely formal data are enriched with more substantive data in the General Social Survey. A series of name interpreter items elicit data on the kinds of people named as discussion partners and the nature of each person's relationship with the respondent. Included among these data are the sex, race, education, age, and religious preference of each person named. Measurements are also obtained on the frequency with which the respondent contacts each person, the length of time for which he has known each person, and ten different roles that might be included in the respondent's relationship with each person. The exact wordings of the GSS name interpreter items appear in Appendix A. Over one hundred network response variables are generated by the GSS network items. The net result is that diagrams such as figure 2 can be constructed for each of the 1460 to 1600 GSS respondents. These data can then be studied to make powerful and precise inferences about the interpersonal environments of Americans.

THE PROPOSED DATA

In order to establish the efficiency, reliability, and validity properties of the GSS network items, improving them where necessary, we propose several lines of research. Specifically, we propose that:

(a) personal interviews of about one hour be conducted with a national probability sample of Americans,

(b) a subsample of respondents be drawn for a half-hour reinterview two weeks after the initial interview (items to include background items, the GSS name generator, name interpreters, and some of the construct validity opinion items from the initial interview),

(c) brief telephone interviews be conducted with one alter drawn at random from those named in each initial interview with a subsample respondent (items to cover the name interpreter data gathered from the subsample respondent), and

(d) computer simulations of the final network items be run to establish estimates of the time required to administer each item to respondents in specific age, sex, race, and socioeconomic strata of the American population.

In what follows, we briefly describe kinds of data to be collected. Further details are offered in subsequent sections as we describe ways in which the data could be studied to yield methodological insights into survey network data.

Study Population

It would be more convenient and less expensive to conduct the research with sample data on local study populations rather than a national study population. Our preference for a national study population stems from the purpose of the needed methodological research.

If the purpose were to identify methodological *problems* in survey network data, then a local sample such as those drawn for the 1966 Detroit Area Survey or the 1977 Northern California Communities Study would be appropriate. Samples for these surveys were carefully drawn and represented large, heterogeneous populations. A problem in network data reliability or validity observed in such data would be a problem for future investigators to bear in mind when obtaining or analyzing survey network data -- even when studying populations entirely different from those observed in Detroit or northern California.

Developments have progressed this stage. Available evidence is sufficient to believe that network data can be reliable and valid. Beyond establishing problems, research is needed now to establish the methodological *properties* of a standard set of survey network items for future research. Consider this goal in the light of how survey questionnaires are constructed. There is precious little theory to guide the development of traditional survey items, let alone the comparative novelty of network items. The craft of formulating items with optimal properties depends upon experience, upon empirical generalizations from valid surveys. In other words, empirical generalizations would be a central product of the proposed research. Description of survey network data properties -- the manner in which reliability and validity dissolve across increasingly complex structural conditions -- would be valuable as a reference for future research to the extent that a study population relevant to future research was described. For the purposes of this one time methodological study, therefore, it is important to have a study population that is as relevant as possible to the largest volume of important future research projects. Thus our preference for a national study population observed in a standard survey research sampling frame.

Name Generators

The "discussing important matters" criterion was adopted for the GSS as the single best sociometric criterion for an opinion survey (see Burt, 1984:315-320, for elaboration). The reasons for that decision remain intact and the fact that "discussing important matters" is the GSS criterion makes it the benchmark against which alternative sociometric criteria are to be evaluated. Therefore, any methodological research of the kind under consideration should at least include the GSS name generator verbatim to elicit the names of important discussion partners. We propose, however, that network data be recorded on an upper limit of ten names for this one time methodological study. The ten alter upper limit is discussed in the section on alter subgroup analysis below. Formal data such as those illustrated in figure 1 would be obtained on the relations among respondent and discussion partners. Pending further discussion of alternative kinds of network items, we propose merely to expand the GSS items in Appendix A to an upper limit of ten discussion partners.

At least five additional name generators ought to be used to elicit the names of the people with whom the respondent has other kinds of relationships. Given limited interview time and respondent patience, these items need not be accom-

panied by items eliciting formal data on relationships among alters. The following five kinds of relationships ought to be elicited: (nuclear kinship) Are you married or living with someone? If yes, what is his/her name? Are your parents still living? If yes, name them. Do you have any brothers or sisters? If yes, name them. Do you have any children over the age of 21? If yes, name them. (advice) Of all the people you know, whose judgment do you rely on the most in making your most important decisions? (socializing) Beyond your family, who do you see most often in your leisure time? (closeness) Of all the people you know, who are the people closest to you? (work) Of all the people you work with, who are the people you most often discuss your work with?

These five sociometric criteria have been selected to represent the range of relationships observed in the most extensive survey network data available, Fischer's Northern California Communities Study. The ways in which various relation contents were combined into relationships in these data were studied to identify kinds of relationships (see Burt, 1983a, for details and figure 7 below for illustration). Nuclear relatives and advice span the range of kinship relations. Socializing and closeness span the range of friendship relations. Co-worker discussion represents the narrowly defined range of work relations.

Name Interpreters

A list of all people named in the interview could be assembled in the usual manner so that name interpreter items could be used to elicit data on the kinds of people named and their relationships with the respondent. This list could involve twenty to thirty names, so the the data would have to be recorded somewhat differently from the way in which this is done on the GSS questionnaire. Appendix B lists fifteen proposed name interpreter items. Ten of these items are taken verbatim from the GSS name interpreters. Asterisks mark the following five items that are new, or constitute modifications of GSS items:

Item Q9 elicits the number of years for which the respondent has known each alter. The corresponding GSS item has three response categories: recent relationship (less than 3 years), established relationship (3 to 6 years), and old relationship (6 or more years). These response categories were calibrated to improve the item's speed and reliability with data from the Northern California Communities Study (see Burt, 1984:324-326). Definitive response categories could be recalibrated with the national sample data.

Item Q10 is identical to the corresponding GSS item, but the "advisor" and "other" response categories are to be coded to see if these categories should be disaggregated, eliminated, or redefined.

The last three items in Appendix B did not appear on the GSS. Item Q13 is the political party item that was proposed and pretested for the GSS, but deleted for reasons of interview time and suspect reliability (see Laumann, 1973:30-32). The item is included here because it is short, it is most obviously pertinent to the extensive survey research on political participation, there is reason to expect it to be associated with respondent political data (see construct validity discussion below), and its inclusion here would make it possible to estimate its reliability with national sample data.

Item Q14 is the occupation name interpreter that was used in Laumann's 1966 Detroit Area Survey. Alter occupation can be obtained with very high reliability

(Laumann, 1973:29-31 reports a .89 correlation between the prestige of an alter's occupation and the prestige of the occupation that the respondent reported for the alter) and is strongly associated with social relations (e.g., Laumann, 1966; Verbrugge, 1977; Killworth et al., 1984). It was not included among the GSS name interpreters because it is expensive to code. The same consideration is likely to exclude it from future surveys. It is included here to determine how much information is lost if alter education is the only socioeconomic indicator obtained and to explore the feasibility of summary response categories for an occupational name interpreter item.

Item Q15 elicits one or two words describing the most important topic discussed with each alter. It is the only clue provided to the subject matter discussed with alters. The GSS name generator is deliberately ambiguous on this point. Although the GSS Board of Overseers called for an item such as Q15, and although a similar item was considered and pretested for the GSS, time pressure and operational difficulties with the item prevented its adoption. It is included here as a probe to get some sense of what respondents have in mind when they respond to the "discussing matters important to you" criterion in the GSS name generator.

Relationship Semantic Differentials

While the interviewer is assembling the list of alter names, the respondent could be given a preassembled booklet containing some number of real and hypothetical relationships to be evaluated on accompanying semantic differentials. For reasons discussed below in the section on network content, the real relationships ought to include at least the first and last persons named as discussion partners. The hypothetical relationships would be vignettes assembled in an experimental design to study the dimensions and relative importance of specific aspects of discussion relationships.

Construct Validity Items

The name generators would be interspersed among traditional survey items eliciting data to be used to study the construct validity of the network items. The topics for these investigations are discussed below; specifications to be finalized later would elicit standard background data (respondent age, race, sex, education, income, and occupation) as well as data on respondent well-being, autonomy, political preference, and perception of sex roles.

We now turn to describing, in very broad strokes, the principal ways in which these data could be studied to establish a standard set of survey network items. Moving from the least to the most substantive issues, we discuss survey network item timing, reliability, subsample stability, content, and construct validity.

TIMING ESTIMATES

Time was a central issue in the deliberations over including network items on the General Social Survey. Like the standard set of occupation items, survey network items consume a large block of interview time. The GSS network items required about fourteen minutes to administer in pretest interviews, but this time estimate is exceedingly crude. We are concerned about failures to include network

items in surveys because of miscalculations of the time they would require to administer.

Unfortunately, survey network items are very difficult to time in a casual way, with a pocket stopwatch for example. More than almost any other kind of survey item, the time required to administer network items varies from respondent to respondent. The items require very little time to administer to a respondent naming one or two alters. They can require a great deal of time to administer to a respondent naming many alters connected in complex ways, many being strangers and many being especially close to one another.

In order to provide a sense of the interview time likely to be consumed by the GSS network items, a microcomputer program was used to simulate interviews. The distributions of network size and density in the Northern California Communities Study were used to define the kinds of networks likely to be elicited in the GSS and a thousand simulated interviews were run to predict the amount of interview time likely to be consumed as the number of alters increased (see Burt, 1984:310-314, for details).

With an eye toward facilitating the implementation of the final set of network items generated in this research, it would be useful to have a technical report indicating the amount of time that each network item can be expected to consume in interviews with specific kinds of respondents. Once methodological research is to the point of arriving at an optimal set of network items, a microcomputer program could be written to simulate the administration of the items in an interview. The time required to administer the items in general could be calibrated by interviewing a small panel of sample respondents, keying in the data to a microcomputer programmed to time the delays between entries. The network data obtained in the national probability sample could then be used to define probability distributions of the following variables within age, sex, race, and socioeconomic strata of the American population: number of alters named, number of ways in which alter and respondent are connected (name interpreter item Q10 in Appendix B), number of pairs of alters who are strangers, and number of alter pairs who are especially close. Simulations could then be run with hypothetical respondents drawn from these distributions to define sampling distributions of the time required to administer each item to respondents in each of the population strata.

These simulations would constitute a relatively minor and inexpensive part of the proposed research. Nevertheless, time is an important concern to address for future investigators. The report on simulated interviews would help investigators correctly plan the time required to administer the network items in specific study populations. Where interview time is limited, it would indicate the most efficient ways in which the network items could be truncated. More likely, it would show that the network items could be administered within available time limits.

RELIABILITY

To the extent that survey network data are reliable, they should be stable over short periods of time and should describe conditions on which closely related informants agree.

Evidence documenting survey network data reliability is almost nonexistent. The best available evidence comes from the 1966 Detroit Area Survey (Laumann,

1969; 1973:Chp. 2). A fourth of the respondents, some 250 randomly selected persons, were asked for the full name, address and telephone number of one of these "best friends" cited during the interview. Respondents were informed that this person would be contacted by telephone for a six- or seven-minute interview. Very few respondents refused (3.5%). Interviews were completed with a modest 59% of the alters identified for interviewing. By asking the best friend to describe various of his own attributes, a comparison could be made between the respondent's description of his best friend and his best friend's description of himself. The data were used to show that alter age, occupation, education and religious preference can be obtained with high reliability. These results were especially helpful in identifying reliable name interpreters for the GSS.

There is published evidence on the reliability of choice data in traditional sociometric research designs. Such evidence is appearing more frequently now after a hiatus during the gap between sociometry's popularity and recent interest in network analysis (e.g., Hammer, 1984; 1985). Notable are a series of papers by Russell Bernard, Peter Killworth, and colleagues decrying the inaccuracy of sociometric recall (see Bernard et al., 1984, for review), and an emerging series of papers by Kimball Romney and colleagues attempting to parameterize that inaccuracy (e.g., Romney and Weller, 1984). Nevertheless, current efforts pale in comparison to the volume of research carried out during the 1930s, 1940s, and 1950s to establish the reliability and validity of sociometric data. The most comprehensive review of methodological findings is still the handbook chapter by Lindzey and Byrne (1968), drawing in large part on comprehensive reviews conducted more than a decade earlier (Lindzey and Borgatta, 1954; Mouton et al., 1955). This work shows significant stability in sociometric choices over time periods of two weeks to several months.

An example of this early work is instructive. Austin and Thompson (1948) interviewed 404 sixth grade children at two points in time, asking them to name their best friends in the first interview and repeating the question in a second interview two weeks later. They report that 40% of the children named the same best friends in both interviews and another 38% named only one new friend in the second interview. Mouton et al. (1955:331) report that the hypothesis of no contingency between choices in the two interviews can be rejected at a .01 level of confidence.

Two points are illustrated with this example. First, sociometric reliability studies were typically carried out with students, usually children. In fact, a conclusion in secondary studies of these results is that reliability increases as children mature to adults (e.g., Lindzey and Borgatta, 1954:422; Mouton et al., 1955:358; Lindzey and Byrne, 1968:477). Second, rejecting the null hypothesis is a very weak statement of reliability. High test-retest reliability correlations (in the range of .8 to .95) are obtained for summary measures (usually choice status) over two weeks to several months, but reliability at the level of choice data seems modest.

Although sociometric reliability results typically fall below the analytical standards of modern inferential survey research, they offer leads for a rigorous assessment of survey network data reliability. We draw two points from these early studies. First, two weeks seems an appropriate time interval between the test and retest interviews. This interval yielded reasonable results in sociometry, seems short enough to minimize confounding between unreliability and actual change in respondent relationships, and seems long enough to erode a respondent's memory of

specific answers in the first interview. The longer the time interval between test and retest interviews, the more actual change will be confounded with unreliability and so the more difficult the task of estimating reliability. Second, sociometry reliability studies often found increasing reliability with (a) the length of time for which a respondent had known the people he cited and (b) the rank of people cited, reliability being highest for the first person cited, lower for the next person cited, and so on. These results lead us to expect reliability to increase with the strength of the relationship between respondent and discussion partner. The important fact we wish to establish with empirical data is the rate at which reliability declines with decreasing relationship strength so that we can identify the point at which data on weaker relations are likely to be unreliable.

This second point highlights a basic concern in the proposed reliability research. Network data on a respondent are multifaceted, difficult to reduce to a single datum. It seems wise to be less concerned with determining that network data are typically reliable or typically unreliable than to be concerned with establishing loss functions describing the rate at which network data become unreliable across specific structural or survey design conditions. We anticipate evidence of adequate reliability in general, but we expect reliability to vary significantly across different structural conditions; network data being highly reliable for some inferences, inadequate for other inferences.

Two kinds of interviews are proposed to assess reliability, alter interviews and test-retest interviews. Interviews with discussion partners could be used to measure the extent to which name interpreter data are stable across closely related informants. In the initial interview with the respondents selected for test-retest interviews, a discussion partner could be selected at random and the respondent asked for the person's full name, address and telephone number. Respondents would be informed that the discussion partner will be interviewed by telephone for a few minutes. The sole purpose of these alter interviews would be to gather corroborating information with name interpreter items on the discussion partner's attributes elicited from the initial respondent.

The proposed sample of alter interviews (400-500 persons) is larger than that obtained in the 1966 Detroit Area Survey (250 persons) for two reasons. First, attrition was high in the earlier survey. Only 59% of the sought after interviews were conducted. At that completion rate, the proposed research would only generate 200 to 300 alters (versus the 118 alter interviews completed for the earlier study). Second, we are focusing on the rate at which reliability deteriorates across increasingly detailed network data so we propose sampling discussion partners from all people named rather than sampling from the first two people named as in the earlier survey. This should increase the range of reliability estimates obtained in the proposed research -- judging from the sociometric findings that data on the first sociometric choice is more reliable than data on the second, third, and so on. It also means that a larger sample of alters would be needed to make equivalently powerful statements because reliability is being studied over a broader range of structural conditions than those considered in the 1966 Detroit Area Survey. As observed in the earlier survey, we expect more concrete name interpreters (e.g., sex, age, education) to yield more reliable data than less concrete items (e.g., political party affiliation, discussion topics). The empirical question to be established with national sample data is the *extent* to which each of the name interpreter items provides reliable data.

Complementing these alter interviews, test-retest interviews with respondents could be used to measure stability over a short time period. A subsample of respondents could be reinterviewed two weeks after the initial interview. The size of the subsample would be determined by the usual balance of cost and precision considerations. An initial suggestion would be about a third of the sample, some 400 to 500 randomly selected persons. The retest interview would be an abbreviated version of the initial interview, consisting only of the standard background items (sex, age, race, socioeconomic status), the GSS name generator, the full set of name interpreters, and indicator opinion items for the construct validity propositions (discussed below). Two general questions could be addressed with these data.

First, comparative reliability could be studied. How does network data reliability compare with the reliability of traditional background and opinion survey items? We expect the network data to be less reliable than very concrete background data such as sex, race, age, and education. We expect it to be no less reliable than the high reliability opinion items selected for construct validity testing.

Second, network data reliability could be studied directly. To what extent are the network data reliable in the sense of being identical in the two interviews? Are the same relationships elicited? For reasons already discussed, we expect reliability to increase with the extent to which a relationship is strong and prominent. Frequent, long standing, close relationships are more likely to be elicited in the test and retest interviews than rare, recently formed relationships. Relations with discussion partners of high prestige attributes and strong relations to other discussion partners are more likely to be elicited in the test and retest interviews than relations with isolated, average discussion partners. Similarly, we expect the reliability of network composition measures such as percent kin, percent coworkers, percent male, and so on, to be associated with attribute reliability. For example, the proportion of a respondent's discussion partners who are male should be more stable across the test and retest interviews than the proportion Democrat because sex is a more reliably elicited alter attribute than political party affiliation (judging from the 1966 Detroit Area Survey results). Beyond relationship stability, are the same networks elicited? We expect reliability to decrease with network complexity; data on large, sparse, heterogeneous networks being less reliable than data on small, dense, homogeneous networks. Complex networks require the respondent to remember more detailed information than simple networks and so should be elicited less reliably. To reiterate the general focus, network data reliability is to be described less on absolute terms than on relative terms, across varying structural conditions.

SUBSAMPLE STABILITY

Midway between the issues of reliability and construct validity is the issue of network stability across subsamples of data. If reliability and validity are unstable across significant subsamples, it is important -- to planning studies of local and specialty populations -- to know the extent to which these properties deteriorate within certain subsamples and the kinds of data affected. Analysis of variance models, jackknife, and bootstrap statistics are ideally suited to this line of research, describing the stability of results across subsamples and the extent to which individual subsamples deviate from the sample as a whole (e.g., see Finifter, 1972; Efron, 1982, for illustrative methodological discussion). Of the many possible subsamples, we discuss three that are especially relevant to future implementations

of survey network data: respondent subsamples, content subsamples, and alter subsamples.

Respondent Subsamples

Respondents could be grouped into age, sex, race, and socioeconomic subsamples to investigate stability across these often distinguished strata of the American population. This analysis would resemble a routine elaboration of findings obtained from the sample data as a whole. For example, how does the tendency for homophily in the overall sample vary between blacks and whites, between males and females, between high and low socioeconomic status? How does the interaction between network density, socioeconomic status, and well-being vary between males and females? Some construct validity propositions may be supported across respondents differing in age, sex, race and socioeconomic status. These propositions would be very strong construct validity criteria for future implementations of survey network items. It is more likely that sample-wide results will vary across these key strata, however, and the purpose of this section of the research would be to identify subsamples in which the network items work poorly relative to the sample as a whole. Such knowledge would guide future adaptations of the network items to studies of specialty populations in which certain age, sex, race, or socioeconomic strata predominate.

Content Subsamples

The network size, density, constraint and range measures specified in construct validity propositions could be computed from three subsamples of relationships; kinship relations, relations involving the respondent's work, and social relationships (nonadvisor, nonkinship, and nonwork relations). In the same way that respondents will vary in the density of relations among their discussion partners in general, they will vary in the density of relations among their kin, colleagues, and social acquaintances in particular.

Two conditions are likely to confound subsample analyses here. First, density will be higher within content domains than across domains. Two relatives are more likely to be close to one another than two discussion partners selected at random. Two people with whom a respondent often socializes are more likely to be close to one another than two discussion partners selected at random. Second, different kinds of respondents are likely to emphasize different kinds of relationships so the study of content subsamples will be closely tied to the study of respondent subsamples. For example, low socioeconomic status respondents are more likely than high socioeconomic status respondents to include relatives among their discussion partners.

These difficulties notwithstanding, it is important to document the extent to which the reliability and construct validity results are unstable across changes in relationship content. Changes in a general "discussion" sociometric name generating criterion can result in network data emphasizing one content over another (e.g., work and kinship are emphasized over friendship in the Northern California Communities Study "advice" generator, see Fischer, 1982:questionnaire item 78). The propriety of emphasizing one content over another depends on the purpose of a study, but the distortions created by emphasizing one content over another are unknown. At the conclusion of this subsample analysis, we want to be able to make statements of the following kind for future implementations of the final set of network items: "The change in the standard items proposed for this future

survey can be expected to increase the kinship related content (for example) of the network data and that emphasis can be expected to increase empirical support for certain kinds of propositions (in the following ways) while decreasing support for certain other kinds of propositions (in the following ways)."

Alter Subsamples

Implementing survey network items includes the selection of a maximum number of alters on whom network data will be recorded. The seeming lack of thought given in substantive studies to the implications of censored network data has led some to focus on it as a measurement error parameter in network data (e.g., see Holland and Leinhardt, 1973). Sometimes data are only recorded on the first name elicited by a sociometric name generator, sometimes data are recorded on three alters, sometimes more. Data on the first five alters are recorded in the GSS network items. We propose recording data on up to ten alters for the purposes of methodological research so that the marginal value of recording data on each alter can be defined. This information, in turn, would make it possible to establish optimal cut-off points for recording network data in future surveys of the American population.

Two considerations determine the recommended ten alter cut-off. First, future surveys incorporating network items are unlikely to have a higher cut-off (excepting some of the few surveys specifically designed to study social networks). This means that the ten alter cut-off would yield data on any probable cut-off point considered for future surveys. Second, the ten alter cut-off is well above the center of the distribution of number of names elicited by the "discussing important matters" criterion. Thus, data obtained under a ten alter cut-off should be sufficient to identify cut-off points at which the marginal value of an additional alter is negligible.

The selection of a five alter cut-off for the GSS is instructive here. The decision to record more than three alters was made on the substantive grounds that evidence of network range would be obscured with data on fewer alters. The time consuming option of recording information on all alters named was deemed excessive. The eventual adoption of a five alter cut-off point was a practical compromise with the time constraint. A mean of three alters was expected from past survey findings, so the five alter limit seemed judicious (see Burt, 1984:314-315). There was no evidence that additional data would substantially improve upon four or five alters. In fact, the name generator criterion was relaxed from "discussing personal matters" to "discussing important matters" in order to increase the number of respondents naming multiple alters. Regardless, three turned out to be the mean and median number of alters named in the 1985 GSS interviews.

Two widely held, if rarely stated, assumptions are implicit in these deliberations -- more is better and alters are elicited in order of strength of relationship with the respondent. Consider figure 3. Imagine the interpersonal environment in terms of concentric circles around a respondent listing the names of people with whom he has a particular kind of relationship. Let the people most strongly tied to the respondent appear in the first circle, people less strongly tied to the respondent appear in the second circle, and so on. Variations on this image are long standing in sociometry (e.g., Moreno's, 1934, social atom and Northway's, 1940, 1951, target sociogram). It is typically assumed in gathering network data that people in the first circle are most likely to be named in response to the appropriate name generator, people in the second circle are less likely to be named, and

so on. The more people on whom data are recorded, then the more likely that the resulting network data represent the inner circles around the respondent.

There are other criteria by which respondents could be listing names. Instead of naming them in order of the concentric circles in figure 3, they could be sampling them from specific areas of the respondent's interpersonal environment (striped in figure 3), areas that need not represent the people closest to the respondent under the name generating sociometric criterion. For example, respondents could be naming people with whom they have had the most recent contact, people with whom they have the most frequent contact, or those of their contacts with the highest prestige. Alternatively, it is possible that the first couple of people named are especially close (inner circle), but subsequent names come to mind for other reasons such as recent or frequent contact.

To the extent that people are listed by criteria unrelated to the strength of their criterion relationship with the respondent, then data analysis taking the power of the name generating criterion for granted can be misleading. Empirical questions of the following kind are raised: What distortions are introduced by limiting network data to a specific number of alters? How does reliability deteriorate across an increasing number of alters? How do these tendencies vary across different kinds of respondents?

Answers to questions such as these can be sought in analyses of alter subsamples. Studying alter subsamples would make it possible to ascertain the manner in which interpersonal environments are better described -- better in accuracy and better in revealing evidence of structural hypotheses -- as data on additional alters are recorded. At some number of alters, the cost of obtaining data on the next alter outweighs the value of the information that would be obtained. Three kinds of alter subsample analyses could be pursued to identify optimal alter cut-off points.

First, the order in which alters are named could be studied to detect criteria governing the order in which alters are named and the manner in which the reliability of alter data declines across successive names. As already discussed, there is reason to expect a decline in reliability with alter order. Order effects in the kinds of alters elicited are not well documented but Wellman (1979) provides some illustration. He shows that relatives tend to be the first people elicited by a "closeness" name generator while co-workers tend to be the last people named. The proviso here is that Wellman carefully instructed respondents to list alters in descending order of their closeness to the respondent (Wellman, 1979:1209n; see also Verbrugge, 1977). Our methodological concern is to estimate order effects for alters elicited by the typical sociometric name generator in which no ranking instructions are given. Our preliminary analysis of the GSS network data shows that the strength of relation between respondent and alter declines sharply with citation order.

Second, the rate at which network density declines across increasing numbers of alters could be studied as an indicator of cluster effects in survey network data. Network density can be viewed as a general indicator of intraclass correlation. The closer the relations among alters in a network, the more likely that the alters have similar attributes (race, age, socioeconomic status, and so on). In other words, network density is expected to be associated with intranetwork homophily on diverse attributes which in turn determines the intraclass correlation of alter attributes within respondent networks. Viewed in this light, network density is an

indicator of cluster effects in sampling respondent-alter dyads. Tracking network density and alter homophily across the number of alters on whom network data are recorded would make it possible to describe the extent to which network data on successive alters are redundant with network data on preceding alters. This has implications for statistical models of dyad data. Consider a table in which the rows are respondent occupation and the columns are alter occupation. The frequency in cell (i,j) is the number of discussion partners drawn from occupation j by respondents in occupation i. Statistics estimated from these data would have to be corrected for the level of intraclass correlation within networks. For example, ignoring interactions between intraclass correlation and cells of the table, corrected chi-square statistics will be smaller than uncorrected statistics to the extent that intraclass correlation is high (e.g., see Brier, 1980). If the intraclass correlation does not begin to drop appreciably until the third or fourth alter, one might be well advised to pool data on the first and second alter before estimating effects from dyad data. More importantly, this would mean that there is little value to including a single content set of network items in a survey unless data on three or more alters are to be obtained.

Third, and most generally, the various network measures specified in construct validity propositions could be computed under different restrictions on the number of alters. Four subsamples are of obvious importance because they are often used cut-off points: first alter, first three alters, first five alters, and all alters. Of course, finer subsamples could be drawn. One could then study the manner in which evidence of the construct validity propositions becomes increasingly obscure as data on fewer and fewer alters are recorded. For example, Holland and Leinhardt (1973:108-109) show how empirical support for the transitivity hypothesis increases -- dramatically and monotonically -- with the number of alters on whom data are recorded.

These questions are usually studied with very limited data, when they are studied at all. Building from traditional sociometry for example, the Holland and Leinhardt illustration is based on relations in a 24 person group. Wellman's analysis is based on survey interviews with a large sample, but one representative only of people living in East York, a section of Toronto, Canada. The data proposed for this methodological research would make it possible to speak to the alter cut-off issue in a definitive way. With a national probability sampling frame and network data on more alters than would be practical to record in a survey not dedicated to network data, we are assured of describing the balance of cost and benefits of any alter cut-off point likely to be considered in future surveys adopting the network items and identifying the optimal cut-off point for specific kinds of respondents.

NETWORK CONTENT

The issue raised most often in deliberations over the GSS network items was the selection of an appropriate sociometric criterion for the name generator item. This is not a new issue. Thirty years ago, Lindzey and Borgatta (1954:443) cited it as "one of the most frequent objections raised to sociometric measures." Several considerations led to the "discussing important matters" criterion finally adopted for the GSS. These included representing the socializing ties through which opinions are formed and maintained, providing a central point of overlap with other kinds of relationships so that name interpreters could be used effectively, maximizing consistent meaning across subpopulations, ensuring an appropriate

number of alters, and representing the diversity of substantive interests served by the GSS (see Burt, 1984:315-320, for further details). The extensive network data obtained in the 1977 Northern California Communities Study were very helpful in guiding the evaluation of alternative sociometric criteria, but no data were available with which to address the issue directly. The network content issue remains unresolved today.

To begin, we need to frame the network content issue for empirical research. A survey network name generator elicits people tied to the respondent by a specific kind of relation, e.g., the GSS "discussing important matters" relations. The respondent's relationship with each of these people is a mixture of relation contents -- kinds of interaction, roles, and personal attributes -- that give meaning to the relationship. The bundle of relation contents between respondent and a specific discussion partner is a naturally occurring relationship, contrasting with research investigator inspired, analytical, distinctions between contents within the relationship. Thus, the name generator criterion is less an end point in eliciting network data than it is a window for gathering network data. A relation content is used as a criterion in the name generator to elicit naturally occurring relationships and name interpreter items are then used to obtain data on the specific contents that comprise each elicited relationship. Once a discussion partner is identified in the GSS, name interpreter items are used to discover the relation contents that give meaning to the relationship, contents such as kinship, frequency, closeness, work, religion, education, and so on. These more detailed content data can be used to distinguish different kinds of relations in subsequent analyses.

It is important to remember Lindzey and Borgatta's (1954:443) caution against overemphasizing the network content issue. What a respondent "really means" in answering a question is an issue for most survey items. It is less critical to know what a respondent really means with sociometric citations than to know how patterns of citations are associated with respondent attitudes and behaviors.

Still, it would be reassuring to have some indication of what name generators such as "discussing important matters" mean to respondents so as to have some sense of the stability of the GSS network data across item changes and different respondents. The proposed discussion topic item (Q15 in Appendix B) will indicate what respondents discuss as important matters, but will yield no data on the meaning of respondent relationships with discussion partners. More to the point, the initial name generator criterion defines the window through which interpersonal environments are viewed. It is important that this view be as informative as possible. It is critical that the view not be distorted or so narrowly defined as to be trivial.

We propose two, highly complementary, lines of research into the meaning of the relationships elicited by the network items.

First, we propose studies of the content coincidence in relationships. The analysis of coincidence recovers the meaning of relation contents from a study of the manner in which contents are mixed together in naturally occurring relationships. The approach is analogous to componential analysis in linguistics. This line of research requires no additional items beyond the survey network items themselves yet makes it possible to distinguish kinds of contents in the relationships, indicate the manner in which those contents combine to define the meaning of the relationships, and indicate the manner in which that meaning varies across different kinds of respondents.

Second, we propose factorial survey studies of contents in relationship judgments. The analysis of judgments recovers content meaning from repeated semantic differential ratings of real and hypothetical relationships. It is a synthesis of meaning analysis in psychology and factorial survey analysis in sociology. This line of research would require a brief item booklet to be filled out while the interviewer is organizing the names of discussion partners before administering the name interpreter items. From the data obtained, it would be possible to estimate the independent contribution that specific aspects of a relationship make to the aggregate meaning of the relationship. This will enable us to distinguish kinds of contents, identify the contents most critical to relationship meaning, and identify aspects of relationships given negative value by some kinds of respondents.

The two lines of research are complementary in the sense of being strong where the other is weak. The study of coincidence is limited to recovering meaning from the mixtures of contents actually observed in relationships. The factorial study of relationship judgments provides a method of exploring the independent significance of contents in relationships as they are observed or as they might be observed. However, the approach is limited to hypothetical, experimentally constructed, relationships. This limitation is ameliorated by the fact that conclusions drawn from the factorial analysis can be examined for external validity against conclusions from the study of coincidence in actual relationships.

Recovering Meaning from Coincidence

Content meaning can be inferred from the manner in which contents are mixed together in naturally occurring relationships. Network concepts, methodology, and empirical illustration for this kind of analysis are available elsewhere (Burt, 1983a; Burt and Schøtt, 1985). The analysis develops in three stages; defining a coincidence matrix, studying content substitutability, and interpreting types of relationships.

A coincidence matrix is constructed to represent tendencies for specific contents to be mixed together in naturally occurring relationships. An illustrative coincidence matrix is presented in figure 4 based on network data obtained in the 1977 Northern California Communities Study. The results are sample means of coincidence relations for individual respondents. Burt and Schøtt (1985) discuss computations and missing data problems. Diagonal elements in the matrix give the probability of a kind of content occurring in a relationship. Element c_{jj} equals the number of relations in which content j occurs, n_{jj}, divided by the number of relations possible, N. For example, two out of three core relationships in the study contained friendship ($c_{11} = .67$) and one out of three involved discussing personal matters ($c_{55} = .35$). Off-diagonal elements give the conditional probability of a column content occurring in a relationship containing a row content. Element c_{ij} equals the number of relations in which contents j and i occur together, n_{ji}, divided by the total number of relations in which content i occurs, n_{ii}. For example, about one in ten of the core relationships involving the discussion of personal matters also involves discussions of work ($c_{53} = .13$). These off-diagonal elements indicate mixtures of contents in actual relationships. Ceteris paribus, the more often that respondents perceive content j in any relationship containing content i, i.e., the higher c_{ij} is, the less likely he is to think about content j as something distinct from content i.

It is assumed in this approach that people make distinctions among relation contents in so far as they are able to refer to different people, different relationships, with the contents. Distinct relationships are necessary for cognitive distinctions between relation contents. In the absence of any understanding of a content, some sense of its meaning can be obtained by observing the manner in which the content appears in relationships with other contents that are understood. In the same way that the meaning of a word can be derived in part from the structure of the words combined in sentences containing the word, the meaning of a content can be derived in part from the structure of the contents combined in the relationships in which the content is perceived. Thus, a coincidence relation is a semantic datum. It defines the extent to which one kind of relation, one content, is prominent in the interpretation of another content. The higher that c_{ij} is, then the more that content i contributes to the meaning of relationships in which content j occurs, i.e., the more that content i defines the situation in which content j is interpreted. For example, one gets a little sense of the meaning of discussing personal matters from the elements in row and column five of figure 4. Discussing personal matters occurs in one of three relationships. The general tendency to discuss personal matters does not increase in friendship relations (c_{55} = .35; c_{15} = .34) although half of the people with whom personal matters are discussed are friends (c_{51} = .56). The likelihood of discussing personal matters decreases if a relationship contains acquaintance, work or kinship content (the conditional probabilities c_{25}, c_{35}, and c_{45} are lower than the raw probability c_{55}).

Two points are to be noted here. First, the coincidence matrix in figure 4 is an average across respondents. It is different for different kinds of respondents, and a thorough study of content meaning would include the manner in which meaning changes across kinds of respondents. Second, it is tiresome and unreliable to visually scan a coincidence matrix for clues to the meaning of individual contents. This point is even more apparent when one considers the fact that few contents are distinguished in figure 4. Few data are available with which to interpret any one of the contents. The more detailed the contents identified in relations, the richer the interpretation possible in a study of content coincidence. An informative coincidence matrix would distinguish many more contents. Actually, the five contents in figure 4 are drawn from a 33 content matrix constructed from the Northern California Communities Study data (Burt, 1983a:44-45). Some 40 relation contents are distinguishable with the GSS name generator data (especially close, daily contact, weekly contact, monthly contact, recent relation, long standing relation, asian, black, male, female, graduate education, relative, friend, neighbor, colleague, Protestant, etc.). An enormous variety of discussion relationships can be distinguished as mixtures of these contents, even allowing for impossible mixtures excluded by mutually exclusive response options (e.g., a discussion partner cannot be male and female). In the network data proposed for this methodological study, up to 10 naturally occurring discussion relationships would be elicited in which at least 60 relation contents could be distinguished with the proposed multiple name generators and new name interpreters (or more, depending on how narrowly the years of acquaintance, age, and occupation name interpreter responses are grouped).

Fortunately, the task of interpreting contents can be made easier, more reliable and more powerful by using familiar models of network form to describe the structure of a coincidence matrix. Structural equivalence is an especially useful concept.

When two contents i and j have identical patterns of coincidence relations with other contents, they derive identical meaning from other contents and contribute identical meaning to other contents. To the extent that content meaning is reflected in these interdependencies among contents, contents i and j are semantically equivalent elements in relationships, or, more simply, they are substitutable in the sense that they refer to the same kinds of relationships. Familiar methods for detecting structural equivalence, applied to a network of coincidence relations, identify domains of substitutable contents; these are the general kinds of relationships differentiating a study population. Figure 5 presents a semantic space in which contents are close together to the extent that they are substitutable. The data are taken from the Northern California Communities Study and the figure is based on a smallest space analysis of Euclidean distances between sample mean patterns of coincidence relations.[2] Using standard cluster and factor analytic methods of operationalizing structural equivalence, four domains of substitutable contents were detected and tested. Domains are circled in figure 5: friendship contents, kinship contents, acquaintance contents and work contents. The concept of structural equivalence was also used to detect the extent to which the distribution of contents in the semantic space in figure 5 changed across different kinds of respondents. Mean coincidence networks were obtained for each of 58 social categories of respondents and compared for their similarity, respondents in two social categories giving similar meaning to contents to the extent that their relationships generate identical coincidence networks (Burt, 1983a:49-52). The principal differences among respondents were associated with age, socioeconomic status, and race; especially age and socioeconomic status. In sum, standard network methods of studying structural equivalence applied to coincidence matrices can be used to detect distinct types of relationships in a study population and kinds of respondents for whom these relationships have the most different meanings.

The final task lies in describing the meaning of the kinds of relationships that have been identified. This involves a comparison of coincidence relations within the sample mean coincidence matrix as well as comparisons with subsample mean coincidence matrices. Here again, familiar models of network form can be helpful in describing the pattern of coincidence relations in which a content is involved. For example, the network concept of prestige defined by the principal eigenvector of a network provides an elegant measure of ambiguity in content meaning (Burt and Schøtt, 1985). Final conclusions about the meaning of relations in the Northern California Communities Study were reached by comparing elements and ambiguity scores in seven coincidence matrices; the sample mean coincidence matrix, a coincidence matrix for young respondents versus a matrix for old respondents, a coincidence matrix for poor, uneducated respondents versus a matrix for prosperous, educated respondents, and a coincidence matrix for whites versus a matrix for nonwhites. Without repeating details available elsewhere (Burt, 1983a), three general conclusions can be repeated here beyond the fact that the four kinds of relationships in figure 5 characterized the content data: The component contents

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[2] Content substitutability is formally stated in terms of a Euclidean distance between patterns of coincidence relations (Burt and Schøtt, 1985:Eq. 3). Two contents i and j are substitutable to the extent that the following expression is zero or negligible:

$$d_{ij} = \left[(c_{ii}-c_{jj})^2 + (c_{ij}-c_{ji})^2 + S_k[(c_{ik}-c_{jk})^2+(c_{ki}-c_{kj})^2]\right]^{1/2},$$

where summation S is across all K contents excluding i and j. This equation defines distances between each pair of contents in a 2+2(K-2) dimensional semantic space.

of friendship relations were the most diverse and about twice as ambiguous as the least diverse, work relationships. This is the horizontal axis of the figure 5 semantic space. Kinship contents were mixed with the usual homophily indicators to distinguish the second major dimension of contents, closeness. This is the vertical axis in figure 5. Finally, the meaning of friendship shifted across socioeconomic status. Poor, uneducated respondents had less ambiguous friendship relations than wealthy, educated respondents. In the low socioeconomic strata, friendship was largely a matter of frequent interaction.

Recovering content meaning from coincidence has two general virtues. First, it requires no data beyond the standard network data obtained for other reasons. A thorough analysis of content coincidence can be conducted with the GSS network data using these methods even though the data were gathered for entirely different, substantive, reasons. Indeed, such analysis should be carried out before any final decisions are made about the name generator and name interpreter items to be used in subsequent methodological research. Second, the recovery of content meaning from coincidence takes advantage of understandings that are already in place among social scientists. It involves the application of familiar network models to a new kind of network data, coincidence relations. Since the operations being performed on the data are familiar, the data analysis conclusions should be more widely understandable than would be the case if a new class of models and a new kind of data were involved.

The approach has one striking weakness. It can only recover the meaning of contents as they are observed together in relationships. There are no controls to assess the independent significance of a content and there is no possibility of recovering the meaning of censored or negatively valued contents that do not appear in the relationships elicited from respondents. The study of respondent judgments is unencumbered by these problems.

Recovering Meaning from Judgments

Content meaning can be recovered more directly by asking respondents to evaluate the meaning of relationships by rating them with respect to specific aspects of relationship: closeness, distrust, hate, frequency, and so on. The semantic differential, established in psychology by Osgood, Suci and Tannenbaum (1957) as a basis for quantitative studies of meaning, is a useful vehicle for recording these respondent judgments. For example, when presented with the question in figure 6, a respondent would indicate the extent to which his relationship with the specified discussion partner is characterized by each adjective, the degree to which the relationship is strong versus weak, cooperative versus competitive, enduring versus fragile, and so on.

There is some precedent for such data in sociometric studies, but the impact on network analysis has been negligible. Lindzey and Byrne (1968:459) cite several references to early psychological studies. A more recent example of this tradition is Wish's (1976) spatial analysis of kinds of relations evaluated on semantic differentials. Precedents are not confined to psychology. In anthropology, Romney and D'Andrade (1964) have analyzed dimensions of kinship terms evaluated on semantic differentials. In sociology, Heise (1979) has used semantic differential ratings of identities and actions from student populations to describe expected actions within relationships and Laumann (1966; Laumann and Senter, 1976) has adapted Bogardus's (1959) social distance scales to measure the desirability of relations with people of specified attributes.

Note that these rating data ask for an overall evaluation of a relationship. The bundle of specific contents comprising a relationship are being evaluated as a whole, as they are in an analysis of content coincidence. There is no way of assessing the independent significance of component contents on respondent ratings.

Peter Rossi's work with colleagues on factorial survey designs is ideally suited to resolving problems of this kind (and closely related to Heise's, 1979, analysis if not his design). Detailed discussion of methodology and empirical illustration are available elsewhere (Rossi and Nock, 1982; Rossi and Berk, 1984). The basic idea is illustrated in figure 7. Respondents are asked to evaluate a series of vignette relationships constructed in an experimental design. For example, a relationship with a co-worker is evaluated at the top of figure 7. In the middle of the figure, a long standing relationship is evaluated. At the bottom of the figure, a relationship with a co-worker long known to the respondent is evaluated. Of course additional vignettes like the ones shown could be constructed, indicating, for example, a recently formed relationship between persons who are not coworkers. Comparing ratings of the first and third relationships in figure 7 would reveal the contribution of long standing acquaintance to the meaning of discussion relationships. Comparing ratings of the second and third relationships would reveal the effect of work content. More specifically, parameters in regression equations of the following kind would be estimated across 3N observations (N respondents each evaluating three relationships):

$$Y = b + b_W W + b_O O + b_{WO} WO + E,$$

where Y is a semantic differential rating or some combination of ratings on multiple differentials, W is a dummy variable equal to 1 if a relationship involves a co-worker, O is a dummy variable equal to 1 if a relation is an old, long standing relationship, and E is a residual term. Independent effects of contents on respondent judgments are given by the regression coefficients, b_W measuring the effect of work appearing in a relationship, b_O measuring the effect of having known the discussion partner for a long time, and b_{WO} measuring the effect of their interaction.

Figures 8, 9 and 10 provide more substantive illustration of this approach. The data are taken from a student research exercise. Twenty-five Manhattan women were interviewed on various topics and each was asked to evaluate ten vignette relationships, creating ratings of 250 vignettes. Each vignette was evaluated on a sample of one to ten semantic differentials. The task was quickly completed and seemed to engage respondent interest. (Osgood et al., 1957:80, observed that 100 semantic differentials required about ten to fifteen minutes to administer.) The data have no inferential value, but they illustrate the approach. Figure 8 presents summary results.

The first results define the dimensions of the semantic space in which judgments seem to be made. A factor analysis of the many semantic differentials on which vignettes were evaluated indicated three dimensions on which relationships were distinguished. The dominant dimension was evaluative, accounting for 50% of the variation in ratings and almost four times the variance described by the next largest factor. Relationships were most clearly sorted on a dimension of good versus bad. Strong correlates of this dimension are trusting versus suspicious, strong versus weak, and close versus distant. This dominant factor is a repeated

finding in semantic differential data (e.g., Osgood et al., 1957:37ff, report dominant evaluative factors describing two to five times the variance described by the next largest factor). Frequency was the second dimension and sharply distinct from the evaluative dimension. Relations were sorted for the frequency with which they occurred. There is no evidence of such a factor in semantic differential data generally, but one could argue that frequency is to social relations what activity is to general semantic differential data and activity is typically a second (much weaker than evaluation) dimension in such data. Moreover, frequency is rarely a concern represented in studies utilizing semantic differentials and there is evidence to suggest that frequency is a factor independent of closeness in the strength of relationships measured with survey network data (Marsden and Campbell, 1984). The frequency dimension therefore seems reasonable. A third dimension was evident in the semantic differential ratings, but difficult to interpret. Corresponding in some part to the potency factor often identified in such data, it was strongly correlated with a competitive-cooperative semantic differential and is labeled accordingly in figure 8.

A second result is the identification of empirical reference points on the dimensions for interpreting specific items being judged. Means are typically used. The dimensions in figure 8 intersect at their means. There was a positive bias in the ratings. Vignette relationships tended to be good rather than bad, frequent rather than infrequent, and cooperative rather than competitive. Also indicated in figure 8 are the mean ratings given to relationships with actual discussion partners. A name generator asked for the names of confidants, people with whom the respondent discussed important personal matters. Respondent relationships with the named people were then evaluated on semantic differentials as illustrated in figure 6 above. Not surprisingly, these relationships were viewed much more positively than the average vignette relationship. Relations with confidants were good, frequent, and cooperative.

Within the summary semantic space, figure 9 shows the effects of qualifying a vignette relation with specific role labels. Ratings of a vignette relationship became more infrequent, good, and competitive if they involved a member of the respondent's family. Ratings became more competitive and bad if they involved a stranger. Relations with friends were viewed as cooperative and good, but of average frequency. The point illustrated is that the meaning of a content appears as a direction and intensity of movement in the semantic space -- movement away from the center of the space, quantitatively measured on axes in the space. Both direction and intensity of movement are of interest. Figure 10 shows the effects of qualifying a vignette relation with the frequency of contact between respondent and hypothetical alter. Not surprisingly, relationships with often seen alters are rated as more frequent than relationships with rarely seen alters, but the intensity of movement in the space is unanticipated. The magnitude of negative effect on ratings from rarely seeing an alter is much greater than the positive effect from frequent contact.

Figure 11 is a frame of reference for describing the proposed factorial research. Good-bad, frequent-infrequent, and cooperative-competitive contrasts define the dimensions of evaluation. Evaluation need not be limited to these three contrasts, of course, even if these are the principal dimensions of evaluation (see Appendix C).

We propose that each respondent evaluate his relationship with at least the first and last discussion partner elicited in the network data. This would identify

two points in the space, indicated in figure 11, on opposite boundaries of the area in which actual discussion relations occur. The inner point is defined by the average judgments made on the last discussion partner mentioned. The outer point is defined by the average judgments made on the first discussion partner named. Under appropriate controls for the actual strength of relation to first and last discussion partners (controls possible with the name interpreter data), the distance between these two points is the diameter of the semantic area containing actual discussion relationships. That area is the target for evaluating contents in the factorial design.

Specifically, the mixture of contents in vignette relationships could be manipulated in an experimental design to identify three kinds of effects: effects identifying contents with similar meanings in the sense that they similarly move judgments away from the center of the space, effects of contents moving judgments toward the area of actual discussion relationships (e.g., "friend" in figure 9), and effects of contents moving judgments away from the area of actual relationships (e.g., "stranger" in figure 9 and "rarely seen" in figure 10). Note the similarity to an analysis of content coincidence. A semantic space is used to detect content domains composed of relation contents with similar meaning indicated by their spatial proximity and a content's meaning is inferred from its location in the space. The strategy and criteria for recovering content meaning are quite different here, but reliable, valid conclusions from the analysis of syntax should not be contradicted in an analysis of judgments. Beyond its corroborative value, the factorial design provides controls to assess the independent significance of specific contents for the meaning of relationships; we also can explore content meanings in a much greater diversity of relationships than those few actually elicited by sociometric name generators.

The principal vignette design issues to be resolved are identifying dimensions of content, defining categories on these dimensions, and weighting the likelihood of any one category appearing in a vignette. We provide a tentative resolution to these issues in Appendix C. The name generator sociometric criterion is one important content dimension. The decision to use "discussing important matters" rather than the more familiar "discussing important personal matters" as a sociometric criterion was adopted for the GSS in order to increase the number of discussion partners named. By comparing vignettes in which the two contents appear, we could assess the extent to which there is any difference in the meaning of the two kinds of relationships. Work related discussion is a third alternative distinguished in Appendix C. Other content dimensions and categories are distinguished in Appendix C by the name interpreter items and response categories proposed in Appendix B; sex, race, occupation, role label, age, and so on. Given a large number of respondents and the small number of contents being varied as factors in vignettes, unique respondent-factor interactions should not be a problem. In order to ensure sufficient data on contents of central concern, however, contents are given different probabilities of appearing in any one vignette. Weights are assigned to categories in proportion to the complexity of effects to be estimated from the category. For example, the unmodified "discussing important matters" name generator content would be put in more vignette relations than a "discussing important work related matters" content. There is interest in estimating the direct effect of the work related discussion content on judgments, but interaction effects between the unmodified discussion content and other contents are of more general interest because the unmodified discussion content is the GSS name generator. A larger sample of observations would be required for the latter task relative to the

former, so an unmodified "discussing important matters" would be assigned a high probability of appearing in any one vignette.

A final proviso to be noted here is the importance of controls for the actual relationships in which respondents are involved. The GSS network items describe the structure of a respondent's interpersonal environment and that structure is almost certain to affect the respondent's perceptions of vignette relationships. Even though respondents will be evaluating vignettes created and assigned to them in an experimental design, they will be making their evaluations within the limits of their experience with relationships. Drawing on the sex stereotyping proposition described in the next section, for example, a respondent whose discussion partners are strongly interconnected and all of the same sex is likely to make stereotypical evaluations of relationships in which sex is explicitly indicated. Drawing on semantic differentiation research, is there a connection between the dimensionality of a respondent's semantic space and social pressure from his interpersonal environment, with respondents in small, dense, homogeneous networks relying more on the evaluative (good-bad) dimension of meaning than respondents in large, sparse, heterogeneous networks? Such questions must await empirical data. For the purposes here, we merely indicate that conclusions drawn from the factorial study of content meaning will have to be tested for interactions with relevant network variables.

CONSTRUCT VALIDITY

Diverse network measures, each with diverse substantive implications, are available from the GSS network data (e.g., see Burt, 1984:302-305), so a wealth of substantive studies utilizing the data can be expected over the next several years. With an eye toward cumulative research and increasing the precision of substantive research, however, it would be valuable to focus collective attention on paradigmatic studies of a core set of structural propositions to establish construct validity criteria for survey network data. Candidates for the role of construct validity proposition should have several attributes. They should illustrate the diversity of network concepts. They should concern phenomena in which network theory offers greater precision and power than existing alternative propositions. They should speak to substantive questions with an active research tradition utilizing area probability survey data. Ideally -- recalling the intention of establishing a standard set of network items for survey research -- these propositions would become established as exemplars to provide central findings around which active research constituencies could develop. Briefly, in order of increasing sophistication of network concepts, we present five candidate propositions to be fleshed out (or replaced) in a final research agenda.

Heterogeneity and Social Integration

Survey network data are information on social integration at the level at which integration occurs, interpersonal relationships. The GSS network data indicate the mixture of sex, race, age and other socially significant personal attributes that occur in interpersonal environments. More than indicating contact with people of different attributes, network data indicate the mixture and relative prominence of specific attributes in interpersonal environments (cf. Burt, 1984:302-303, on the virtue of replacing the traditional "contact" items with "network" items on surveys measuring social integration). Beyond the individual, the heterogeneity in interpersonal environments -- extensive contact between people of different

attributes -- measures social integration within society more generally. The more that respondents confine their relationships to persons just like themselves, the more that they live in isolated, socially homogeneous groups. This often repeated theme is most articulately stated in Blau's recent work describing associations between personal attributes and social relations (Blau, 1977; Blau and Schwartz, 1984) and is widely known from preceding empirical research (e.g., Laumann, 1966, 1973; Verbrugge, 1977; Jackson, 1977; Wellman, 1979; Fischer, 1982).

The role of personal attributes in patterning social relations continues to be studied within square dyad frequency tables (isomorphic to the familiar social mobility tables) in which rows distinguish respondents by some attribute (e.g., occupation), columns distinguish alters by the same attribute, and cells indicate the frequency of relations from row to column attribute. We propose studies of heterogeneity in such tables as a construct validity proposition:

> *The strength of relationship between respondent and discussion partner is contingent on their personal attributes.*

The empirical question lies in identifying the extent to which specific kinds of attributes are attracted to each other; or, as Blau phrases the question, the task lies in identifying attributes that pattern social relations and so operate as structural parameters (cf. Marsden, 1981). A minimum set of tables would be defined by the standard social background variables in survey research; age, education, race, occupation, political affiliation, religion, and sex. Homophily effects would be indicated by high diagonal frequencies or interaction effects, indicating the extent to which people with the same attributes select one another for specific kinds of relationships (e.g., discussing important matters between persons with similar occupations). Heterogeneity would be measured by high frequencies or interaction effects in specific off-diagonal cells, indicating the extent to which people with specific pairs of different attributes select, or avoid, one another for specific kinds of relationships (e.g., discussing important matters between people of different racial groups). Descriptions of such tables would provide no more than empirical generalizations, but once established with national probability data the results would provide construct validity criteria for subsequent implementations of the survey network data. For example, the observed pattern of discussion relations between occupation categories in the proposed data should be replicated in subsequent surveys correctly implementing the network items.

There are several reasons for selecting heterogeneity and social integration as a construct validity proposition. First, it speaks to a central question in many social science arguments; How is social differentiation associated with a person's attributes? Second, there is plentiful evidence of homophily effects in past research, so we are assured of strong empirical results. With the notable exception of alter occupation, preliminary work on these effects in a national sample can be carried out with the 1985 GSS data. Third, these propositions involve almost no abstraction from the network data. No indices of higher order structural conditions are to be constructed. The results will merely document the connection between particular kinds of relationships and particular personal attributes, establishing construct validity propositions within the final set of network items.

Density and Well-Being

It is often argued that the density of relationships surrounding a person is associated with the individual's personal well-being. There are many variations on

this theme, but the best available evidence suggests a three way interaction between well-being, density, and socioeconomic status (see Fischer, 1982:151ff, for elaboration).

> *Personal well-being is associated with network density in interaction with socioeconomic status. Well-being decreases with increasing density for people of above average socioeconomic status. Well-being increases with density for people of below average socioeconomic status. These opposite effects combine in a zero association between density and well-being across high and low socioeconomic strata.*

Some preliminary work on this proposition can be carried out with the 1985 GSS data (Burt, 1984:308) but the GSS data on well-being are rudimentary. For the methodological purposes of the proposed research, more complete data would have to be collected, including items measuring positive affect, negative affect, global satisfaction and stress (see Andrews and Withey, 1976; Campbell et al., 1976; Burt et al., 1978; 1979, on dimensions of well-being items and Fischer, 1982:336, for related emotional stress items). The final set of well-being items would be defined with the advice of experts in the field.

There are two reasons for selecting the association between density and well-being as a construct validity proposition. First, there is some antecedent research, not to mention volumes of print, indicating that an association exists. Second, there is a large constituency in mental and public health interested in the proposition. A careful study of the proposition, established with national sample data, would improve current efforts to study the connection between personal well-being and interpersonal relations by providing an exemplary implementation of survey network items.

Social Pressure and Political Preference[3]

The direction and intensity of a person's political preferences are predictable from social pressures in his interpersonal environment. Specifically:

> *The more politically homogeneous and interconnected a respondent's discussion partners, the greater the social pressure on him to conform to their political preferences and so: (a) the more intense the respondent's preference will be in the direction of his discussion partners, and (b) the more uncertain his preferences that disagree with his discussion partners.*

Political party is the only political alter attribute now proposed for study. The Berelson et al. (1954, e.g., pp. 98-99) study first documenting social pressures on political preference used a stronger name interpreter, voting intention, to predict respondent political commitment. Appropriate name interpreter and opinion items would be selected, in consultation with experts in the field, to represent the direction and intensity of respondent political preference.

The use of network items to capture social pressure is illustrated in figure 12. Five interpersonal environments are presented with three measures of Republican

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[3]This proposition is drawn from a broader set of propositions involving network complexity and respondent preferences. The same general logic can be used to motivate the study of open-mindedness and intellectual flexibility as a function of the form and composition of interpersonal environments (cf. Laumann, 1973:Chp 4).

social pressure -- an attribute measure (the percentage of discussion partners who are Republican) and two network measures (the density of relationships involving Republicans, and the concentration of relationships in Republican discussion partners indicating network constraint from Republicans). The principal difference between the two network measures of social pressure is the rate at which social pressure declines with disunity among discussion partners, the network constraint registering very little Republican pressure when countervailing Democratic pressure is possible.[4] The network measure of social pressure most appropriate to the proposition will have to be determined with empirical data because there are many ways in which social pressure could be created to form political preferences and available research is insufficiently precise to indicate a single optimal measure. For the purposes of this discussion, relations are simplified to binary data (some relationship versus no relationship), but the finer measures of relation strength available in the GSS network data will be retained in the actual analysis.

The five respondents in figure 12 vary in the extent to which they could face social pressure to conform to Republican political preferences. Respondent A is subject to the greatest pressure; all five discussion partners are Republican and have strong relations with one another. Republican pressure and percent Republican are at a maximum. Respondent E is subject to the weakest Republican pressure; only one discussion partner is Republican and that person is isolated from the others. Respondents B, C, and D illustrate differences between measuring social pressure with network data rather than attribute data. All three respondents have three Republican discussion partners and so 60% Republican interpersonal environments. But the three respondents are subject to very different levels of social pressure because of the way that alter attributes are distributed with alter relationships. Respondent B is subject to high Republican pressure because all three of his Republican discussion partners have strong relationships with one another as well as the respondent's Democratic discussion partners who are themselves strangers. It would be difficult for an anti-Republican sentiment to circulate in this interpersonal environment. In contrast, respondent D's three Republican discussion partners are strangers to one another and isolated from his Democrat discussion partners. It would be difficult for the three Republicans to support one another in pressing the respondent toward their mutual preferences. Republicans and Democrats form two factions in respondent C's interpersonal environment so he is relatively free from social pressure by either group. Ceteris

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[4]The density measure is computed by summing all relationships in which Republican discussion partners are involved and dividing by the sum of all relationships. For example, Republicans are involved in 12 of the 15 relationships within network B in figure 12 for a .80 density of relations involving Republicans. The network constraint measure is discussed elsewhere (Burt, 1983b) as a development in studies of constraint on negotiations in markets (Burt, 1982:Chps. 7,8; 1983c). Let z_{rj} vary from zero to one measuring the strength of the relationship between respondent and discussion partner j of Q partners. Let z_{kj} vary from zero to one measuring the strength of relationship between discussion partners j and k. Let y_j be binary, equal to one if discussion partner j is Republican and zero otherwise. The following expression varies from zero to one with the extent to which discussion partner j is Republican and has strong relationships with every one of the respondent's discussion partners:

$$c_j = z_{rj}[(S_k\, z_{rk} z_{kj})/(S_k\, z_{rk})]^2 y_j$$

where summation S is across all discussion partners k. The average of these alter specific scores, i.e., $C = S_k\, c_j/Q$, varies from zero to one with the extent to which all of a respondent's discussion partners are Republican and connected by strong relationships. Figure 12 presents the value of C for each network.

paribus, Republican political preferences should vary across the respondents in figure 12 in the same way that they are variably exposed to Republican pressure, respondent A expressing the most intensely Republican preferences.

There are three reasons for selecting this proposition as a construct validity criterion. First, there is extensive evidence, albeit from nonprobability survey data, of peer group effects. Given the general network proposition that social cohesion creates opinion homophily, it is important to show that the proposition can be applied in area probability sample survey research. Second, there is some evidence of peer group effects on political preference even in the initial surveys establishing scientific survey research, the 1940 and 1948 presidential election studies. Third, there is a large constituency for the proposition in political science, political sociology, and applied political polling. Area probability surveys have become the data source for the most powerful political preference research. A careful study of the social pressure and political preference proposition by expert network analysts, using national sample data, would provide an exemplary implementation of survey network items and establish the importance of quality network data for explaining political preferences. The net consequence would be a clearer understanding of how political preference is contingent on interpersonal relations and an expansion of people working with network data to include the highly skilled research talent now working on political preference issues.

Role Segregation and Sex Role Stereotyping

The representation of social pressure within an interpersonal environment can be modified slightly to reflect the level of role strain created by conflicting pressures. Burt (1983b) proposes a network concept of role strain, arguing that stereotypical role performances can be expected from persons for whom role strain is intense. The concept is used to resolve some difficulties with Bott's (1957) widely cited study of sex stereotyping in conjugal roles. Building on the interest in, and frustration with, Bott's family study, and drawing upon recent developments in network theory, we propose to study the following as a construct validity proposition:

> *The extent to which a respondent expresses stereotypical opinions about the proper roles of men and women increases with sex role strain in the respondent's interpersonal environment, increasing with the extent to which the respondent's discussion partners: (a) are of the same sex as the respondent, (b) have strong relations with others of the same sex, (c) have no relations with members of the opposite sex, and (d) have no relations with each other if they are of the opposite sex.*

The first two structural conditions create social pressure on the respondent to live up to a stereotypical image of his or her sex. Structurally, these two conditions are identical to those used to measure social pressure on a respondent's political preferences. The last two structural conditions indicate the lack of countervailing pressure from the opposite sex.

The selection of sex role stereotyping indicators can be guided by Bott's (1957:70-84) study. With increasing sex role strain, there should be: (a) a taken for granted assumption that men and women have different interests (as opposed to assuming that the question is open to debate); (b) a tendency for husbands to control finance with wives controlling domestic events such as cooking, cleaning, rent, etc.; (c) a tendency to de-emphasize the importance of sexual compatibility

for a happy relationship; and (d) an assumption that personal relations between respondent and a close person of the opposite sex are the proper interest of respondent's friends (as opposed to keeping the relationship private). These indicators might have to be changed to reflect current sex role norms. The final set of sex role stereotype items will be determined in consultation with experts in the area.

Pending preliminary analysis of the 1985 GSS network data, the use of the proposed network data to capture role strain is illustrated in figure 13. Six interpersonal environments are presented with six network measures: two measures of social pressure from males, two measures of social pressure from females, and two measures of contact between the sexes. Here again, the density and constraint measures differ in the rate at which pressure declines with disunity among discussion partners.[5] Except for network A, the sex composition of discussion partners for each hypothetical respondent is the same, half male and half female. The figure illustrates how pressures toward sex role stereotyping are expected to emerge from the pattern of relationships among males and females in a respondent's interpersonal environment.

The six networks in figure 13 are ordered by the extent to which they would foster sex role stereotyping by a male respondent. The first respondent faces the greatest pressure to be a "man." He only discusses important matters with males and those males have strong relationships with one another. All the measures indicate that this person would tend to express stereotypical opinions on sex roles. The next two respondents have the same pattern of relations with male discussion partners as respondent A, but they have female discussion partners that would make it more difficult to maintain a stereotypical image of sex roles. Respondent B's female discussion partners, however, are isolated from his strongly interconnected male partners and so pose no direct questions on the propriety of sex role stereotypes propounded by the males. The strong connections between Respondent C's male and female discussion partners more clearly erode social pressure from the males. A new situation is introduced with respondent D. There are no strong ties between discussion partners of the same sex and so no sexually homogeneous peer group pressuring respondent D. Further, there are strong ties between males and females, giving this respondent the option of balancing any male inspired sex role stereotype with a countervailing female inspired stereotype. Sex role strain is at a minimum for respondent D. He is free to negotiate his sex role to suit his own preferences regardless of his discussion partners' preferences. The balance shifts to female preferences for the last two respondents because their male discussion

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[5] Density is computed as it was for the previous illustration. For example, 3 of the relationships within network D in figure 13 are between male and female for a .33 density of intersex relations. Constraint from each sex is also computed as before (see footnote 4 for details). Role strain is computed by disaggregating constraint through males from constraint through females. Given some discussion partner j, compute c_j in footnote 4 distinguishing males and females as conduits for social pressure. For example, a male in network C in figure 13 poses .25 constraint through males (himself and his two peers) and .03 constraint through females (his one contact with a female). Given each discussion partner's constraint through males and constraint through females, compute role strain as explained in detail elsewhere (Burt, 1983b): Discussion partner j's contribution to sex role strain increases with the extent to which he or she poses different levels of constraint through males and females,

$$s_{mfj} = [.5(c_{jm}-c_{jf})^2]^{1/2},$$

where c_{jm} and c_{jf} are j's constraint through males and females. Sex role strain in figure 13 is the sum of alter constraints across all Q alters divided by the maximum total possible; $S_j\ (s_{jmf})/(.7Q)$.

partners are isolated from one another and their female discussion partners are strongly interconnected, making it difficult for male oriented sex role stereotypes to circulate in either network; especially for respondent F.

It is clear that proper controls for respondent tendencies to express male versus female oriented sex role stereotypes, quite apart from interpersonal pressures, are necessary in testing this proposition. The tendency for respondents to express male oriented sex role stereotypes decreases down the respondents in figure 13, but freedom to express personal sex role preference increases toward the center of the figure with respondent D having the most freedom. The prediction of sex role stereotyping will be simultaneously a function of social pressure from males, social pressure from females, and role strain between the sexes but the final equation is an empirical question at this point.

Although there is little or no network analysis in this area, there is a large constituency of persons familiar with Bott's family study and interested in the acting out of sex roles in interpersonal relations. Moreover, network theory has something precise to say on the topic. An exemplary study of role strain would establish the utility of survey network data in sex role studies, thereby raising questions about the utility of network data in studies of strain in other kinds of roles; family roles, professional roles, and the presentation of self more generally.

Brokerage and Inequality

Several lines of argument join social structural complexity -- indicated for example by a respondent having many, isolated, discussion partners -- to instrumental action. Such an interpersonal environment provides an individual with the structural autonomy to negotiate relations to his own advantage at the same time that it requires him to be skilled in interpersonal negotiations in order to function in his environment (e.g., Hickson et al., 1971; Burt, 1982:Chps. 7,8; 1983b; 1983c:Chp. 2). It is also more likely to integrate the individual into the wider society providing more access to dispersed sources of information and potentially beneficial loci of influence (e.g., Granovetter, 1974; Lin, 1982; Campbell et al., 1985). Thus, the greater the range and structural autonomy provided by a respondent's network, the more likely that he or she is one of the high income achievers among persons with comparable occupations and levels of education. Of the many propositions consistent with this line of reasoning, we suggest the following as a construct validity proposition:

> *Income returns to education and occupation increase with structural autonomy, i.e., the extent to which a respondent's income is above average for someone of his education and occupation increases with the extent to which his discussion partners are many and isolated from one another.*

This income returns to education and occupation hypothesis is discussed in detail elsewhere with network measures of structural autonomy (Burt, 1983b).[6] The ratio of income over education, or income over occupational prestige, should be a

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[6]The principal indicator here would be constraint variables, indicating a lack of structural autonomy. For example, the constraint measure C in footnote 4 has been useful in research on economic markets. Applied to survey network data, it would be computed as described in footnote 4 except that the attribute variable y_j would be deleted from the computations.

monotonic, increasing function of structural autonomy. The proposition can be tested as the interaction effect in the following kind of regression equation (ignoring for the moment various control variables): $I = b + b_e E + b_a A + b_x EA + R$, where E is a measure of education, A is a structural autonomy measure, and the effect of their product, b_x, is a slope adjustment. The higher b_x is, the more that income returns to education increase with a person's structural autonomy. Although there is inferential evidence of this proposition in the sense that various crude measures of, or attributes arguably correlated with, autonomy have been correlated with achievement, there is no direct evidence on the proposition. A great deal of preliminary work on the proposition can be carried out with the 1985 GSS network data.

There are two reasons for including this proposition in the analysis of network item construct validity. First, it is a prime example of how relatively crude hypotheses stated in terms of attribute data can be made more precise with network data. Differences in income returns to education and occupation are often studied in terms of differences in race (blacks receiving lower returns than whites of equivalent education or occupation), sex (women receiving lower returns than males of equivalent education or occupation), and bureaucratic position (workers and employees in peripheral industries receiving lower returns than managers and employees in center industries, despite equivalent educations). The structural autonomy and achievement proposition replaces these attribute data with a measure of skill and opportunity in interpersonal negotiations. The precision and subtlety of effects it can isolate for study are a significant refinement over available attribute data. This assumes, importantly, that structural autonomy among discussion partners reflects a general skill that would affect job performances. This is an empirical question to be studied with 1985 GSS data. On the assumption that the 1985 GSS data show promising results, a second reason can be advanced for including this proposition in the construct validity analysis. Some of the most thoroughly trained people in sociology use area probability survey data to study income differentials in association with related problems in demography and occupational achievement. If it can be shown that survey network data can significantly improve our understanding of these differentials, network data would become a more standard part of such studies and the production of reliable network results would speed up substantially.

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FIGURES

You named LAST ALTER NAMED **as someone with whom you have discussed important matters.**

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

STRONG :_____:_____:_____:_____:_____:_____:_____: WEAK

The following are vignettes describing a relation between yourself and some imaginary person. **Indicate your evaluation of each described relation by placing an "X" in the appropriate space on each scale.** These relations are imaginary, so you might never have been involved in such a relation. Even if you have never been involved in a relation like the one described, we would like to know what your evaluation would be if you found yourself involved in such a relation.

Once again, make your evaluations quickly. Do not spend time going back to change your evaluations. It is your first impressions that are important here. **Please mark <u>one</u> category on each scale for each vignette.**

#. This is a person with whom you discuss...********
****
****
****

How would you evaluate your relationship with this person?

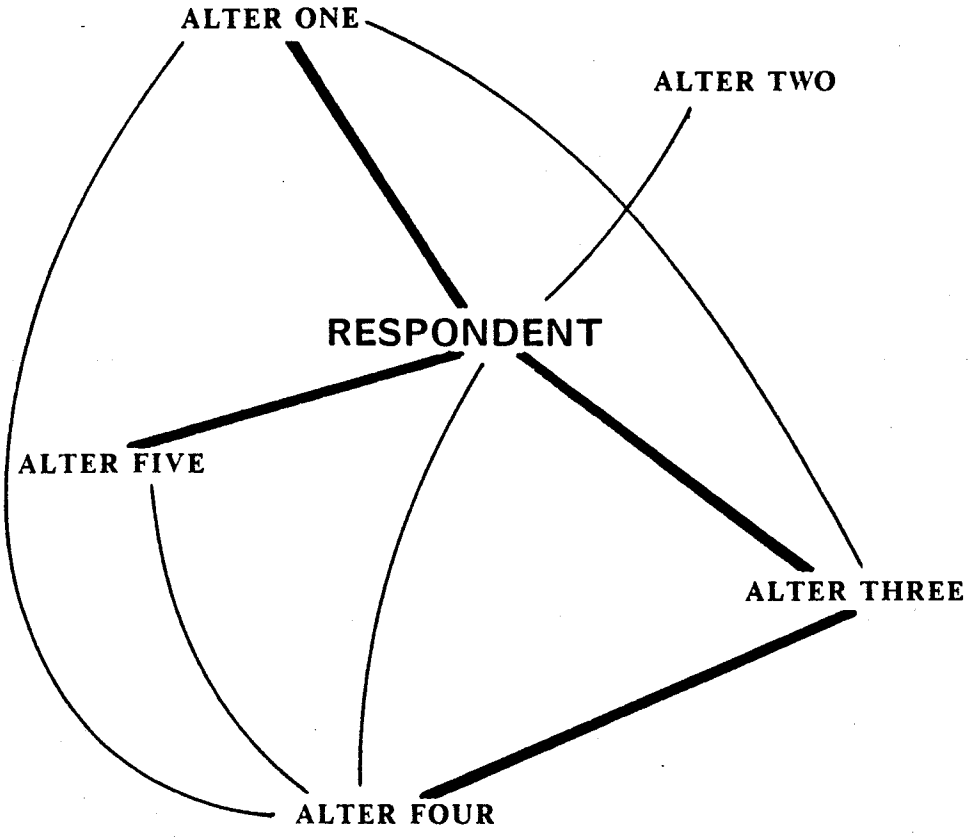
GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

STRONG :_____:_____:_____:_____:_____:_____:_____: WEAK

and so on...



---------- RESPONSE MATRIX ----------

respondent	-					
first alter named	2	-				
second alter named	1	0	-			
third alter named	2	1	0	-		
fourth alter named	1	1	0	2	-	
fifth alter named	2	0	0	1	1	-

Figure 1

Sociogram and Response Matrix of Formal Data

Name generator: "From time to time, most people discuss important matters with other people. Looking back over the last six months, who are the people with whom you discussed matters important to you? In the sociogram, "▬" indicates an especially close relationship, "——" indicates some relationship, and " " indicates strangers.

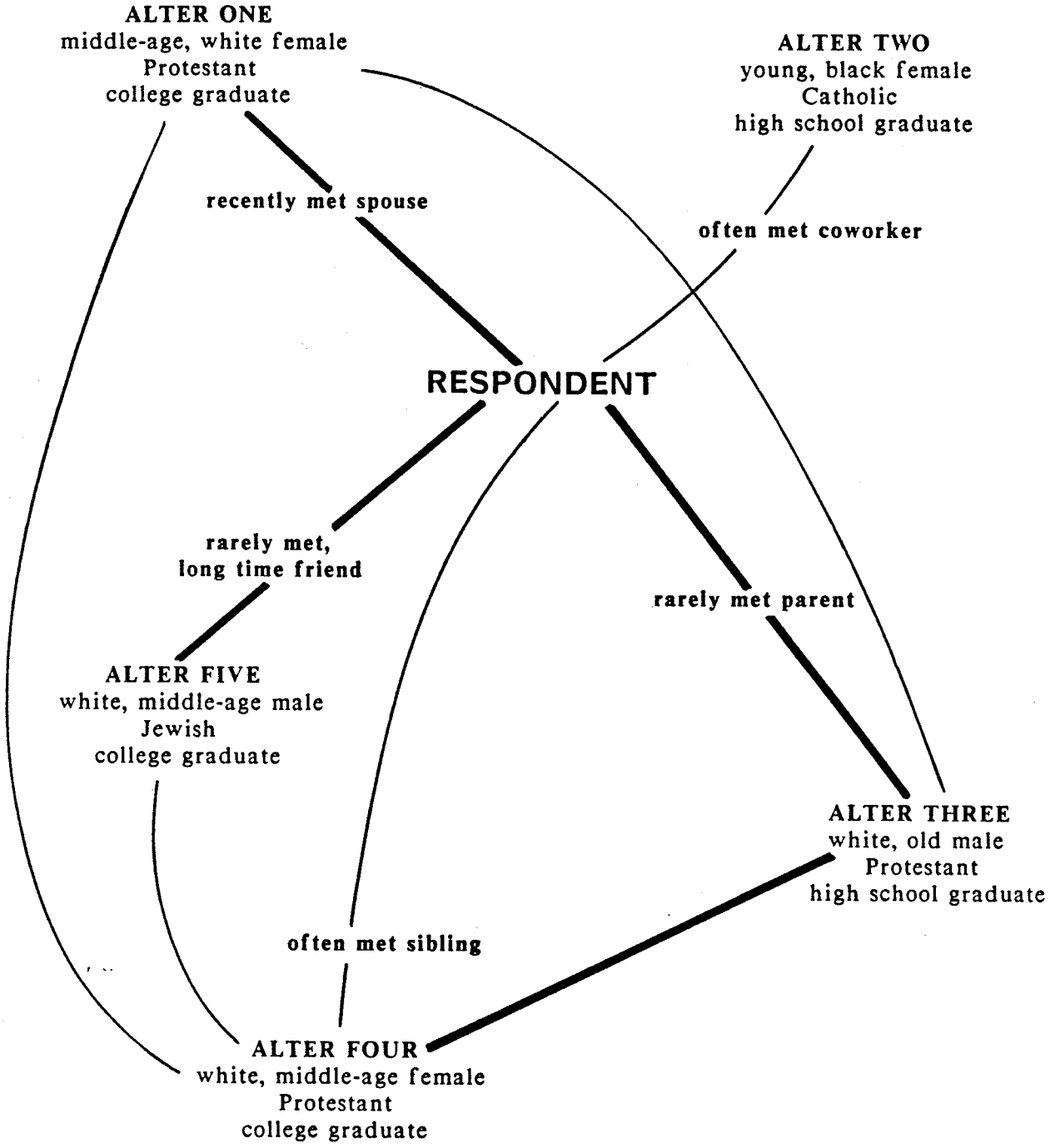


Figure 2

Formal Data in Figure 1 Enriched with Name Interpreter Data

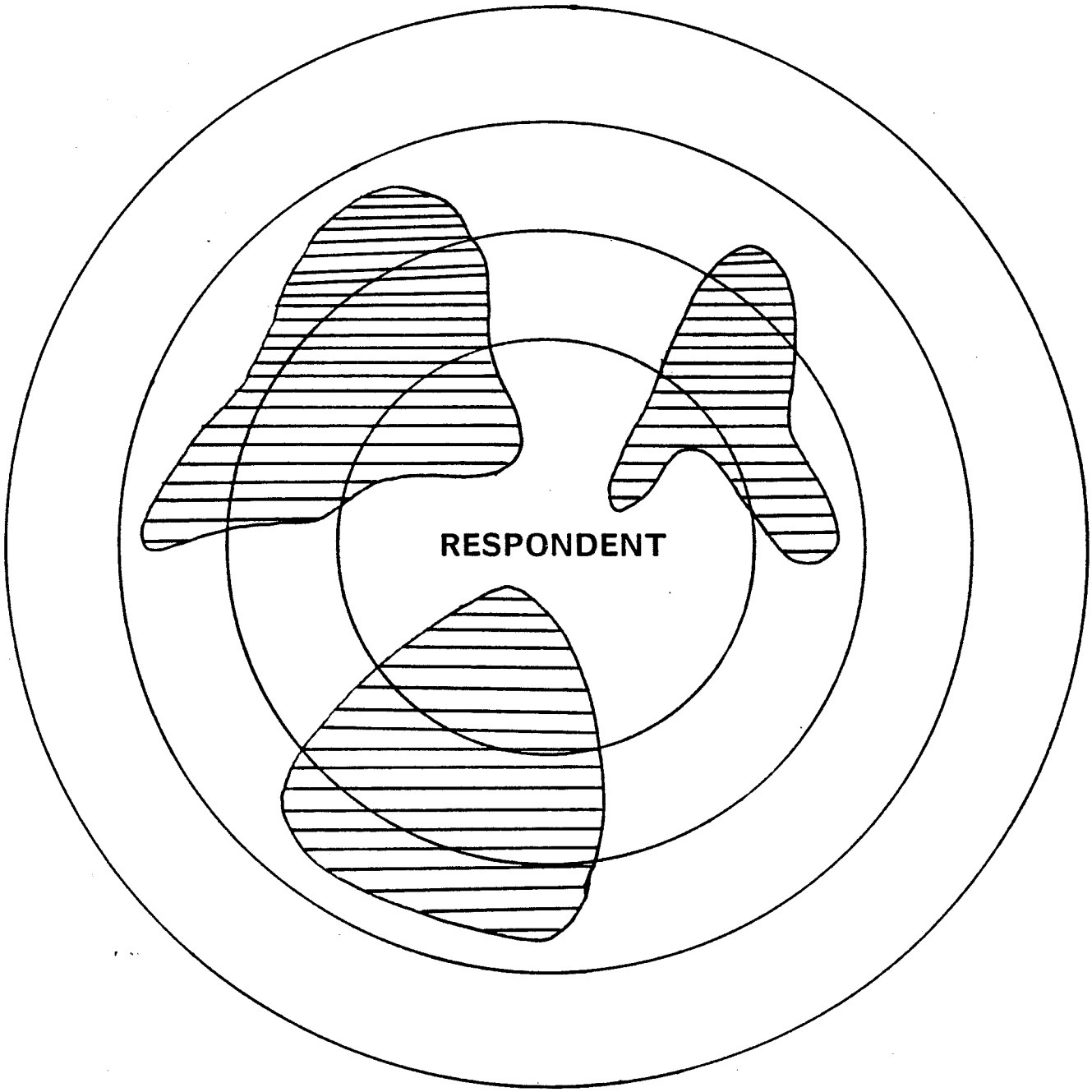


Figure 3

Areas in the Interpersonal Environment

.67	.37	.10	.11	.34	Friendship (1.81)
.59	**.26**	.06	.00	.21	Acquaintance (.69)
.22	.06	**.10**	.03	.18	Work (.30)
.23	.00	.03	**.26**	.20	Kinship (.69)
.56	.20	.13	.21	**.35**	Discussing personal matters (1.00)

Figure 4

Coincidence Matrix Among Indicator Contents

(taken from Burt, 1983a:41, with content ambiguity given in parentheses)

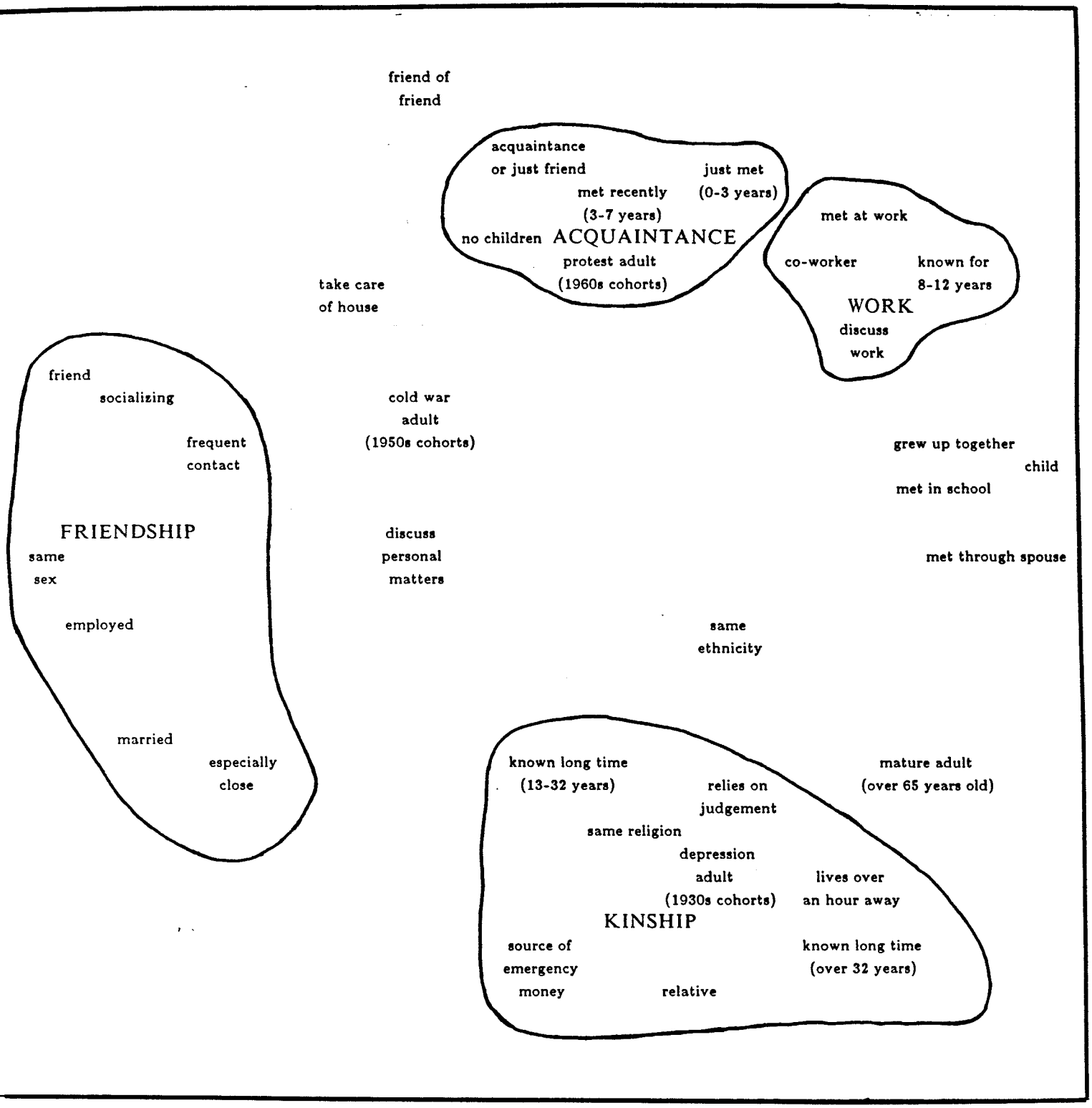


Figure 5

Semantic Space Based on Content Coincidence

(taken from Burt, 1983a:47, with content domains circled and substitutable contents close together)

You named ____Anne____ as someone with whom you discuss important matters.

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

STRONG :_____:_____:_____:_____:_____:_____:_____: WEAK

SUSPICIOUS :_____:_____:_____:_____:_____:_____:_____: TRUSTING

ENDURING :_____:_____:_____:_____:_____:_____:_____: FRAGILE

Figure 6

Example Item Eliciting Judgments of an Observed Relationship

This is a person with whom you discuss important matters. The person is someone who works where you do.

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

This is a person with whom you discuss important matters. The person is someone you have known for several years.

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

This is a person with whom you discuss important matters. The person is someone who works where you do and you have known for several years.

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

Figure 7

Example Items Eliciting Judgments of Vignette Relationships

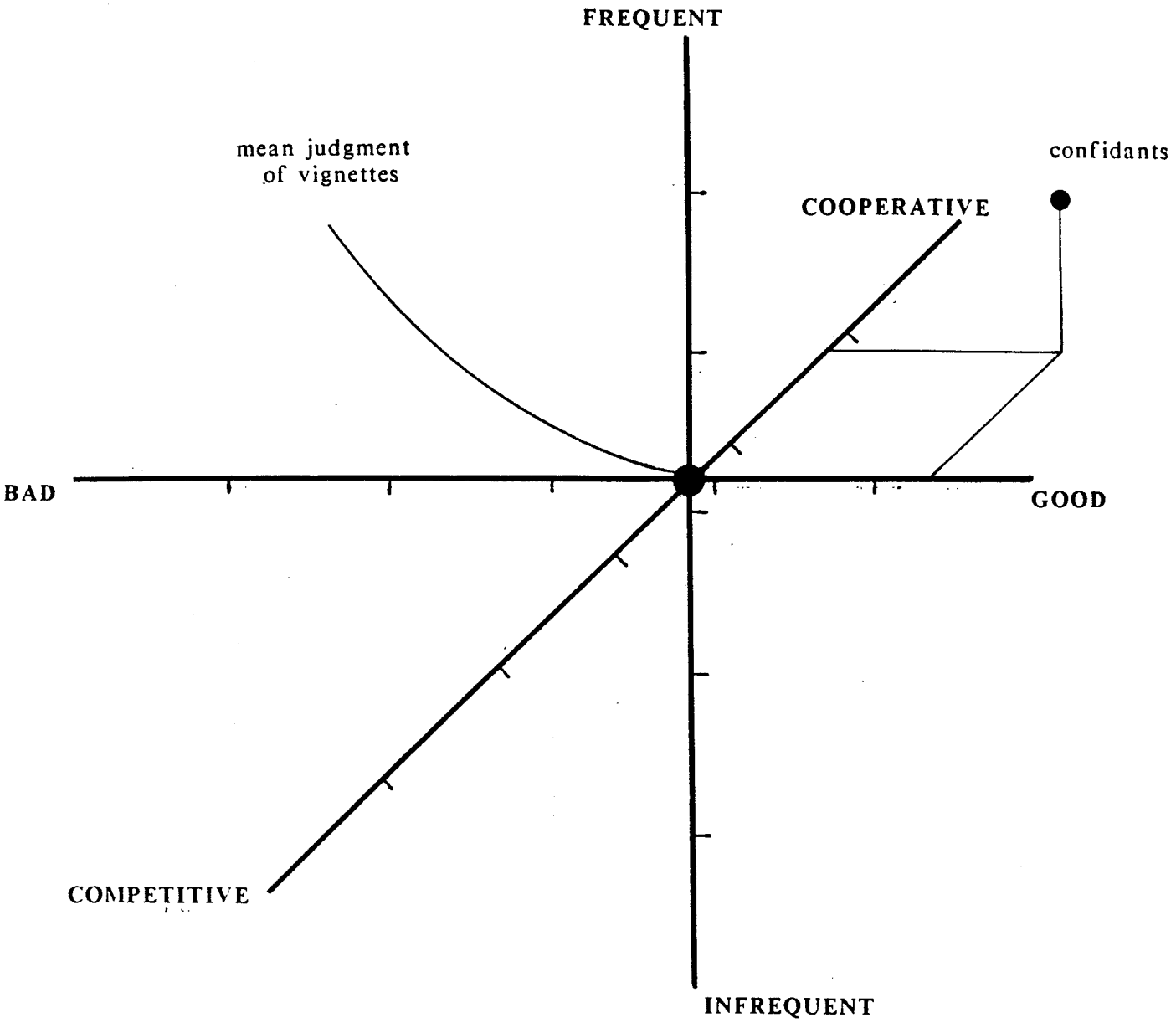


Figure 8

Summary Semantic Space Based on Judgments

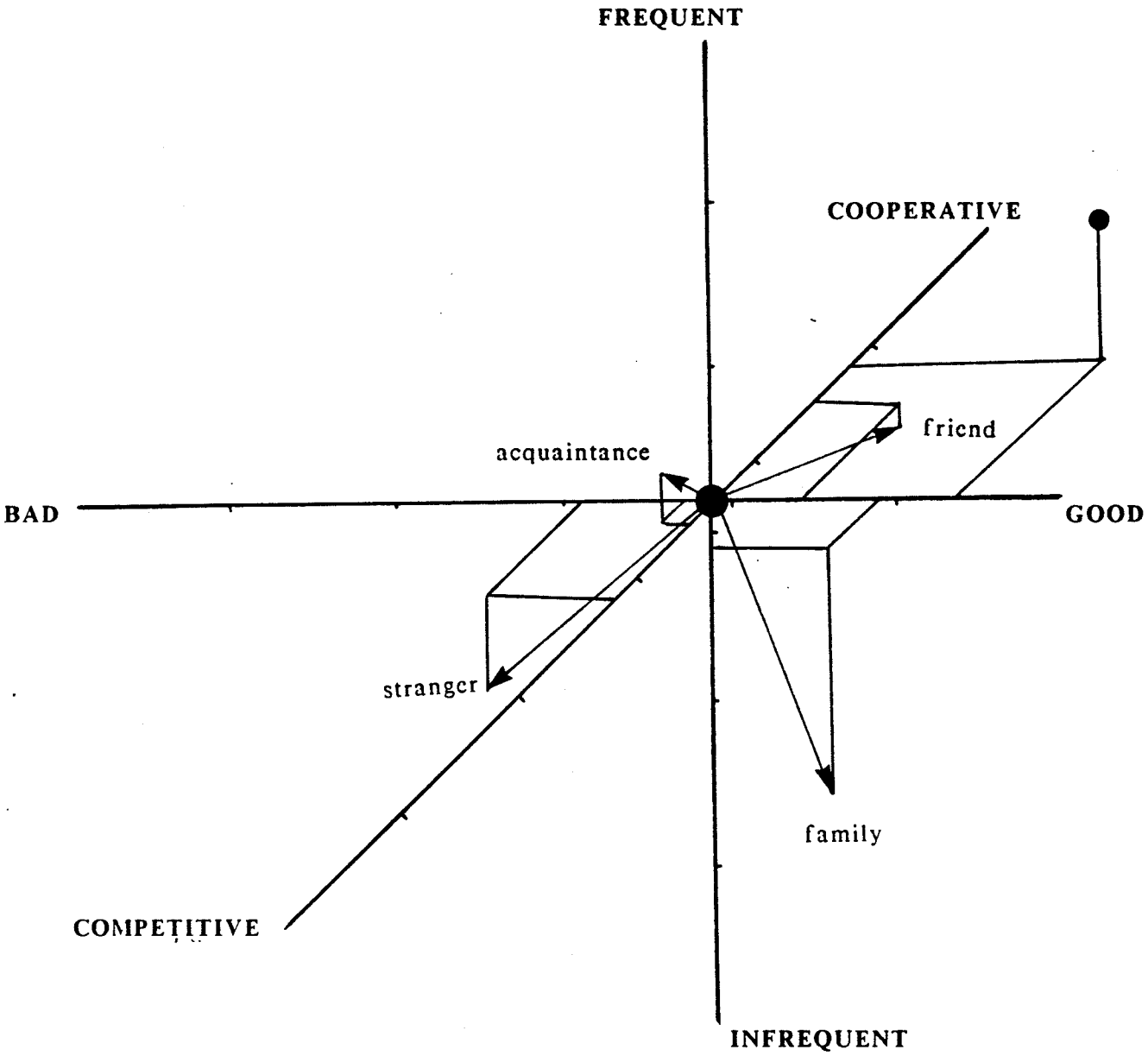


Figure 9

Effects of Role Label in Relation Vignette

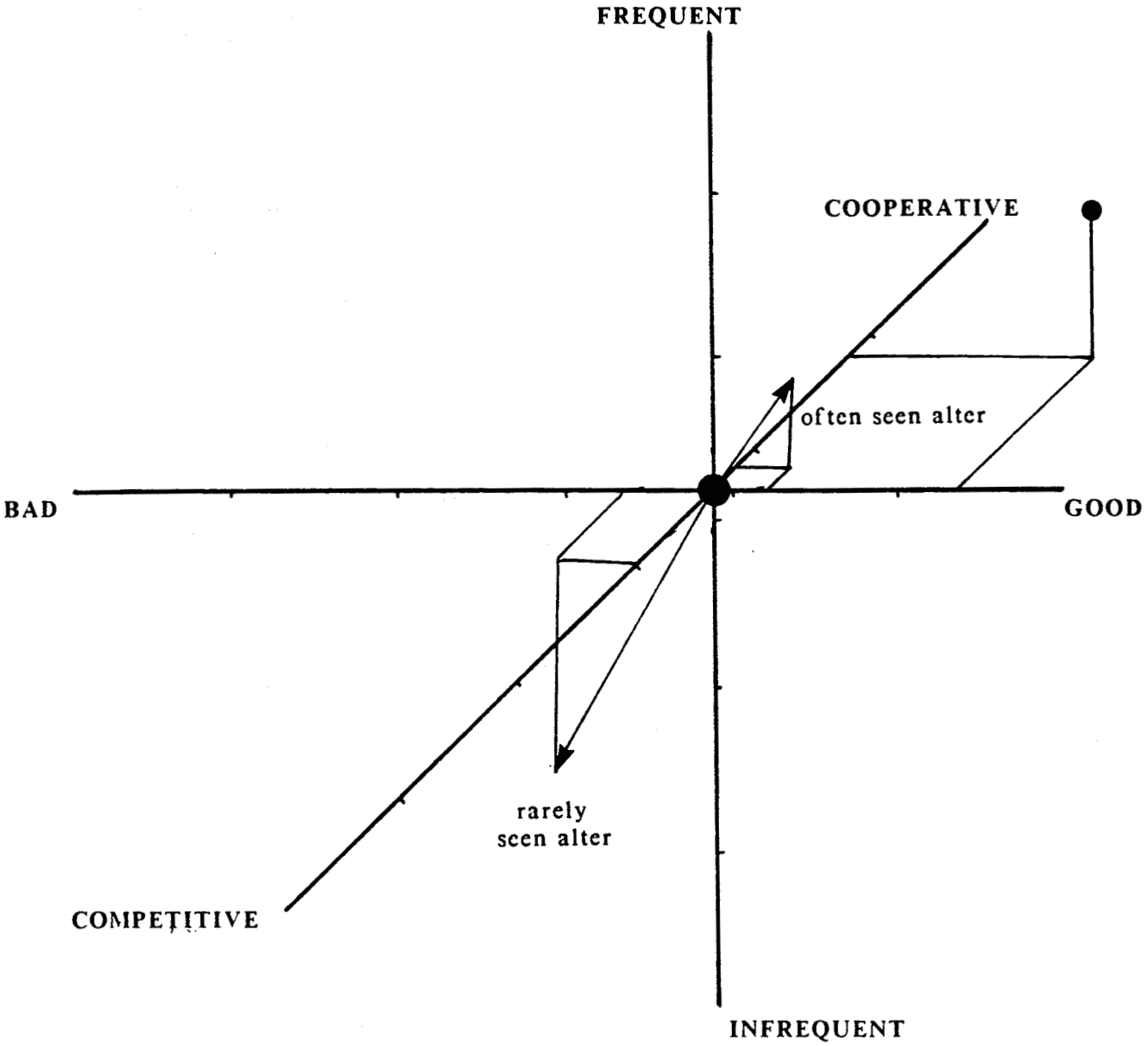


Figure 10

Effects of Contact Frequency in Relation Vignette

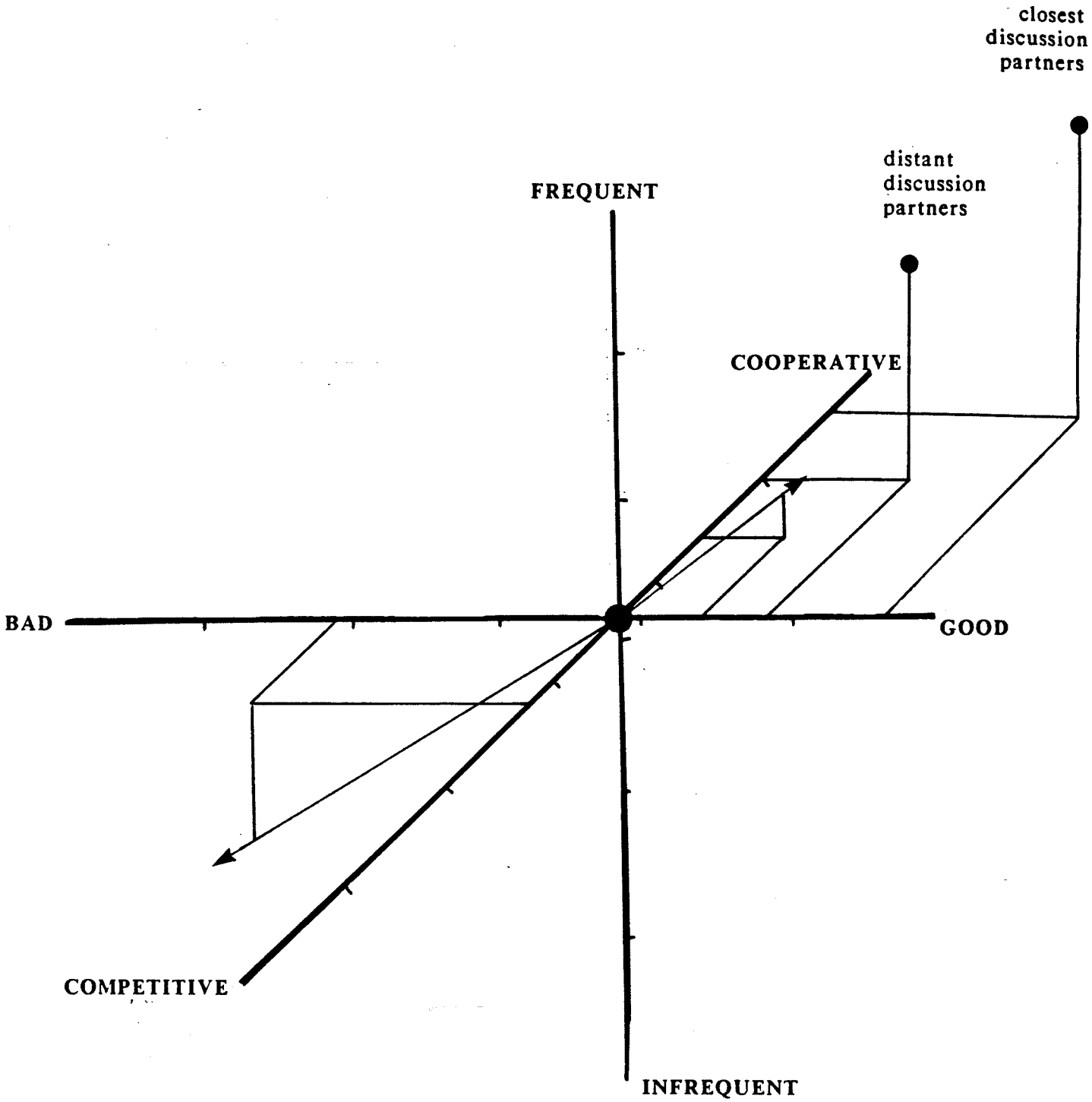
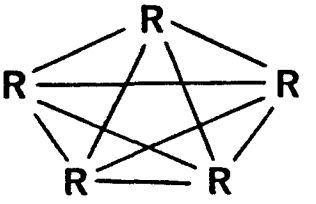


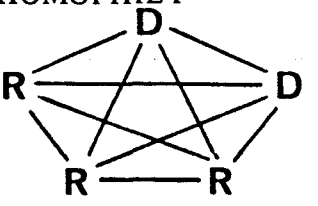
Figure 11

Summary Semantic Space in the Proposed Research

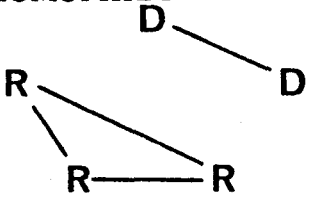
A. HIGH PRESSURE, HIGH HOMOPHILY
100% Republican
1.00 Republican density
1.00 Republican constraint



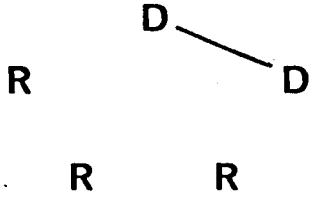
B. MODERATELY HIGH PRESSURE, MODERATE HOMOPHILY
60% Republican
0.80 Republican density
0.60 Republican constraint



C. MODERATELY LOW PRESSURE, MODERATE HOMOPHILY
60% Republican
0.67 Republican density
0.22 Republican constraint



D. LOW PRESSURE, MODERATE HOMOPHILY
60% Republican
0.50 Republican density
0.03 Republican constraint



E. LOW PRESSURE, LOW HOMOPHILY
20% Republican
0.09 Republican density
0.01 Republican constraint

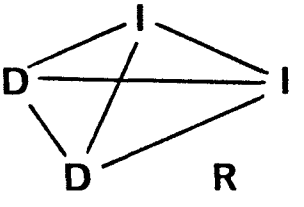
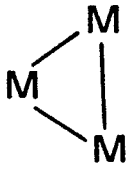


Figure 12

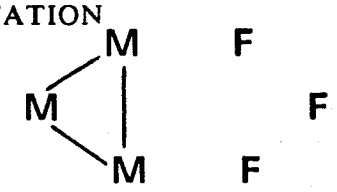
Illustration of Political Social Pressure

(Discussion partner relationships with respondent are not presented.)

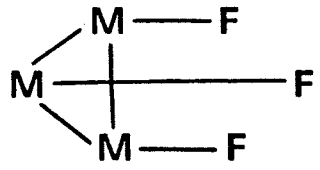
A. HIGH STRAIN, MALE ORIENTATION
1.00 male density, 1.00 male constraint
0.00 female density, 0.00 female constraint
0.00 intersex density, 1.00 sex role strain



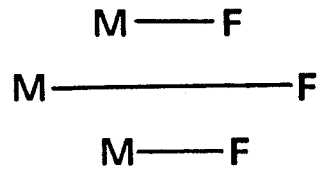
B. MODERATELY HIGH STRAIN, MALE ORIENTATION
0.67 male density, 0.13 male constraint
0.33 female density, 0.02 female constraint
0.00 intersex density, 0.14 sex role strain



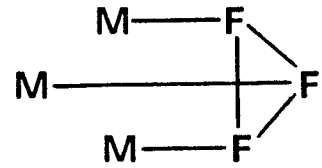
C. LOW STRAIN, MALE ORIENTATION
0.75 male density, 0.22 male constraint
0.50 female density, 0.06 female constraint
0.25 intersex density, 0.11 sex role strain



D. NO STRAIN, NO ORIENTATION
0.50 male density, 0.06 male constraint
0.50 female density, 0.06 female constraint
0.33 intersex density, 0.00 sex role strain



E. LOW STRAIN, FEMALE ORIENTATION
0.50 male density, 0.06 male constraint
0.75 female density, 0.22 female constraint
0.25 intersex density, 0.11 sex role strain



F. MODERATELY HIGH STRAIN, FEMALE ORIENTATION
0.33 male density, 0.02 male constraint
0.67 female density, 0.13 female constraint
0.00 intersex density, 0.14 sex role strain

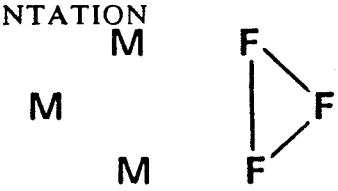


Figure 13

Illustration of Sex Role Strain

(Discussion partner relationships with respondent are not presented.)

Sampling Integers	Sampling Probabilities	VIGNETTE CONTENT	CONTENT DIMENSION
			(1) DISCUSSION
1-5	.5	This is a person with whom you discuss matters important to you.	
6-7	.2	This is a person with whom you discuss your personal life.	
8	.1	This is a person with whom you discuss politics and politicians.	
9-0	.2	This is a person with whom you discuss your work.	
			(2) SEX
1-4	.4	blank	
5-7	.3	MALE	
8-0	.3	FEMALE	
			(3) RACE
1-5	.5	blank	
6-7	.2	WHITE	
8-9	.2	BLACK	
0	.1	HISPANIC	
			(4) EDUCATION
1-6	.6	blank	
7	.1	SOMEONE WHO DIDN'T FINISH HIGH SCHOOL	
8	.1	HIGH SCHOOL GRADUATE	
9	.1	COLLEGE GRADUATE	
0	.1	HOLDS A GRADUATE DEGREE BEYOND COLLEGE	
			(5) "SOCIAL CLASS"
1-2	.2	blank	
3-4	.2	POOR	
5-6	.2	WORKING CLASS	
7-8	.2	MIDDLE CLASS	
9-0	.2	WEALTHY	
			(6) AGE
1-4	.4	blank	
5-6	.2	YOUNGER THAN YOU ARE	
7-8	.2	ABOUT YOUR AGE	
9-0	.2	OLDER THAN YOU ARE	

Figure 14

Vignette Contents Sampling Design

(7) MARITAL STATUS

1-8	.8	blank
9	.1	MARRIED
0	.1	NOT MARRIED

(8) INTENSITY

1-6	.6	blank
7-9	.3	SOMEONE ESPECIALLY CLOSE TO YOU
9-0	.1	STRANGER

(9) FREQUENCY

1-5	.5	blank
6-8	.3	SOMEONE YOU SEE ALMOST EVERY DAY
9-0	.2	SOME YOU SEE LESS THAN ONCE A MONTH

(10) DURATION

1-6	.6	blank
7-8	.2	SOMEONE YOU'VE KNOWN FOR LESS THAN A YEAR
9-0	.2	SOMEONE YOU'VE KNOWN FOR SEVERAL YEARS

(11) KINSHIP

1-6	.6	blank
7-9	.3	A MEMBER OF YOUR IMMEDIATE FAMILY
0	.1	A RELATIVE NOT IN YOUR IMMEDIATE FAMILY

(12) COWORKER

1-8	.8	blank
9-0	.2	SOMEONE WHO WORKS WHERE YOU DO

(13) RELIGION

1-8	.8	blank
9-0	.2	SOMEONE WITH YOUR GENERAL RELIGIOUS BELIEFS

(14) POLITICAL PARY

1-7	.7	blank
8	.1	SOMEONE WHO TYPICALLY VOTES FOR REPUBLICANS
9	.1	SOMEONE WHO TYPICALLY VOTES FOR DEMOCRATS
0	.1	SOMEONE WHO TYPICALLY DOESN'T VOTE

Figure 14 (continued)

Vignette Contents Sampling Design

APPENDICES

Appendix A. General Social Survey Network Items, page 1 of 5

This is the final set of network items adopted for the 1985 General Social Survey. Items have been renumbered here to function as an independent set for inclusion in other surveys. A name generator elicits the names of discussion partners from respondents. Name interpreter items then elicit relations among the first five five people named, attributes of those people, and qualities of relationship between respondent and each person. The network items were administered toward the end of the interview. The 1985 GSS went into the field during February, March, and the beginning of April with a target sample size of 1,500 respondents. Past surveys have returned completed interviews with 1,468 to 1,613 respondents. The respondents constitute a full probability sample of the "total noninstitutionalized English-speaking population of the continental United States, 18 years of age or older." The complete 1985 GSS data set will be available on computer tape in July through the Inter-University Consortium for Political and Social Research. Persons whose institutions are not members of the Consortium should obtain the data from the Roper Public Opinion Research Center (Box U-164R, University of Connecticut, Storrs, CT 06268). The network data will be available on the tape as raw response data. Construction of even the simplest network measures such as density or proportion of discussion partners who are kin will have to be carried out by end users. Detailed discussion of the items is available in "Network Items and the General Social Survey," R. S. Burt, *Social Networks*, 6(1984), 293-339. Further details on the GSS can be obtained by writing to Dr. Tom Smith, National Opinion Research Center, University of Chicago, Chicago, IL 60637, or by telephoning Dr. Smith at (312) 962-1200.

1. **From time to time, most people discuss <u>important matters</u> with other people. Looking back over the last six months -- who are the <u>people</u> with whom you discussed matters important to you? Just tell me their first names or initials.** IF LESS THAN 5 NAMES MENTIONED, PROBE, **Anyone else?** ONLY RECORD FIRST 5 NAMES.

LIST <u>ALL NAMES IN ORDER ACROSS THE TOP OF THE MATRIX</u> ON FACING PAGE. THEN WRITE <u>NAMES 2-5 DOWN THE SIDE</u> OF THE MATRIX.

---

2. INTERVIEWER CHECK: HOW MANY NAMES WERE MENTIONED? _____

0.....(SKIP TO Q. 13)
1.....(SKIP TO Q. 5)
2+.....(GO TO Q. 3)

---

3. **Do you feel equally close to all of these people?**

Yes.....(GO TO Q. 4).....1
No.....(ASK A).....2

A. **Which of these people do you feel especially close to?** REFER TO MATRIX ON FACING PAGE FOR NAME NUMBERS. CODE ALL RESPONDENT FEELS ESPECIALLY CLOSE TO, IF ONLY ONE MENTIONED, PROBE: **Anyone else?**

Name 1.....1
Name 2.....2
Name 3.....3
Name 4.....4
Name 5.....5

4. IF LESS THAN 5 NAMES MENTIONED CROSS OUT UNUSED BOXES.

Please think about the relations between the people you just mentioned. Some of them may be total strangers in the sense that they wouldn't recognize each other if they bumped into each other on the street. Others may be especially close, as close to each other as they are to you.

First, think about [NAME 1] and [NAME 2].
ASK Q. 4 FOR FIRST PAIR.

A. Are _____ and _____ total strangers?

IF YES.....ASK Q. 4A FOR NEXT PAIR DOWN
IF NO.....ASK Q. 4B

B. Are they especially close? PROBE: As close or closer to each other as they are to you.

IF YES.....ASK Q. 4A FOR NEXT PAIR DOWN
IF NO.....ASK Q. 4A FOR NEXT PAIR DOWN

PERSON	NAME 1	NAME 2	NAME 3	NAME 4	NAME 5
NAME 2	A. Yes...1 No....2 B. Yes...1 No....2				
NAME 3	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2			
NAME 4	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2		
NAME 5	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2	A. Yes...1 No....2 B. Yes...1 No....2	

INTERVIEWER CHECK: BE SURE YOU ANSWERED Qs. 2 & 3

FILL IN NAMES IN ORDER. ASK EACH QUESTION ABOUT ALL PEOPLE MENTIONED, THEN GO ON TO NEXT QUESTION.

We'd like to find out a little about each of these people.

Name 1	Name 2	Name 3	Name 4	Name 5

Q5. [NAME] is [male/female]? Is that correct? MAKE YOUR BEST GUESS BASED ON ALTER NAME. ASK FOR EACH NAME.

Male.....1	Male.....1	Male.....1	Male.....1	Male.....1
Female.....2	Female.....2	Female.....2	Female.....2	Female.....2

Q6. Is [NAME] Asian, Black, Hispanic, White or something else? ASK FOR EACH NAME.

Asian.....1	Asian.....1	Asian.....1	Asian.....1	Asian.....1
Black.....2	Black.....2	Black.....2	Black.....2	Black.....2
Hispanic.....3	Hispanic.....3	Hispanic.....3	Hispanic.....3	Hispanic.....3
White.....4	White.....4	White.....4	White.....4	White.....4
Other.....5	Other.....5	Other.....5	Other.....5	Other.....5
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q7. This card lists general levels of education (HAND CARD Q7). As far as you know, what is [NAME]'s highest level of education? PROBE: What is your best guess? RECORD VERBATIM IF NOT CODEABLE. ASK FOR EACH NAME.

1-6 years.....1	1-6 years.....1	1-6 years.....1	1-6 years.....1	1-6 years.....1
7-9 years.....2	7-9 years.....2	7-9 years.....2	7-9 years.....2	7-9 years.....2
10-12 years.....3	10-12 years.....3	10-12 years.....3	10-12 years.....3	10-12 years.....3
High School Grad...4	High School Grad...4	High School Grad..4	High School Grad..4	High School Grad...4
Some college.....5	Some college.....5	Some college.....5	Some college.....5	Some college.....5
Associate degree.....6	Associate degree.....6	Associate degree....6	Associate degree....6	Associate degree.....6
Bachelor's degree....7	Bachelor's degree...7	Bachelor's degree...7	Bachelor's degree...7	Bachelor's degree....7
Grad/professional...8	Grad/professional..8	Grad/professional..8	Grad/professional..8	Grad/professional...8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q8. Thinking about how often you usually talk to [NAME], on average, do you talk to [him/her] almost every day, at least once a week, at least once a month, or less than once a month? ASK FOR EACH NAME.

Almost every day...1	Almost every day...1	Almost every day...1	Almost every day...1	Almost every day...1
At least weekly.....2	At least weekly.....2	At least weekly.....2	At least weekly.....2	At least weekly.....2
At least monthly....3	At least monthly....3	At least monthly.....3	At least monthly...3	At least monthly....3
Less than monthly..4	Less than monthly.4	Less than monthly..4	Less than monthly.4	Less than monthly..4
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q9. Have you known [NAME] for less than three years, three to six years, or more than six years? ASK FOR EACH NAME.

Less than 3 years....1	Less than 3 years...1	Less than 3 years....1	Less than 3 years...1	Less than 3 years...1
3 to 6 years.....2	3 to 6 years.....2	3 to 6 years.....2	3 to 6 years.....2	3 to 6 years.....2
More than 6 years...3	More than 6 years..3	More than 6 years..3	More than 6 years..3	More than 6 years..3
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Name 1	Name 2	Name 3	Name 4	Name 5

Q10. Here is a list (HAND CARD Q10) of some of the ways in which people are connected to each other. Some people can be connected to you in more than one way. For example, a man could be your brother and he could belong to your church and be your lawyer. When I read you a name, please tell me all the ways that person is connected to you.

How is [NAME] connected with you? PROBE: Any other ways? ASK FOR EACH NAME.

Spouse.....01	Spouse.....01	Spouse.....01	Spouse.....01	Spouse.....01
Parent.....02	Parent.....02	Parent.....02	Parent.....02	Parent.....02
Sibling.....03	Sibling.....03	Sibling.....03	Sibling.....03	Sibling.....03
Child.....04	Child.....04	Child.....04	Child.....04	Child.....04
Other family.....05	Other family.....05	Other family.....05	Other family.....05	Other family.....05
Co-worker.....06	Co-worker.....06	Co-worker.....06	Co-worker.....06	Co-worker.....06
Member of group..07	Member of group..07	Member of group..07	Member of group..07	Member of group..07
Neighbor.....08	Neighbor.....08	Neighbor.....08	Neighbor.....08	Neighbor.....08
Friend.....09	Friend.....09	Friend.....09	Friend.....09	Friend.....09
Advisor.....10	Advisor.....10	Advisor.....10	Advisor.....10	Advisor.....10
Other.....11	Other.....11	Other.....11	Other.....11	Other.....11
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
_____	_____	_____	_____	_____
DON'T KNOW.....99	DON'T KNOW....99	DON'T KNOW....99	DON'T KNOW...99	DON'T KNOW....99

Q11. How old is [NAME]? PROBE: What is your best guess? ASK FOR EACH NAME.

ENTER AGE |__|__|	ENTER AGE |__|__|	ENTER AGE |__|__|	ENTER AGE |__|__|	ENTER AGE |__|__|
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q12. What is [NAME]'s religious preference? Is it Protestant, Catholic, Jewish, some other religion, or no religion? PROBE: What is your best guess? ASK FOR EACH NAME REPEATING CATEGORIES AS NECESSARY.

Protestant.....1	Protestant.....1	Protestant.....1	Protestant.....1	Protestant.....1
Catholic.....2	Catholic.....2	Catholic.....2	Catholic.....2	Catholic.....2
Jewish.....3	Jewish.....3	Jewish.....3	Jewish.....3	Jewish.....3
Other.....4	Other.....4	Other.....4	Other.....4	Other.....4
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
_____	_____	_____	_____	_____
None.....5	None.....5	None.....5	None.....5	None.....5
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

SPOUSE -- your wife, or husband, or a person with whom you are living as if married

PARENT -- your father or mother

SIBLING -- your brother or sister

CHILD -- your son or daughter

OTHER FAMILY -- for example, grandparent, grandchild, cousin, aunt, uncle, nephew, niece, or an in-law

COWORKER -- someone you work with or usually meet while working

MEMBER OF A GROUP TO WHICH YOU BELONG -- for example, someone who attends your church, or whose children attend the same school as your children, or belongs to the same club, classmate

NEIGHBOR -- someone outside your own household who lives close to you in your neighborhood

FRIEND -- someone with whom you get together for informal social occasions such as lunch, or dinner, or parties, or drinks, or movies, or visiting one another's home; this includes a "boyfriend" or a "girlfriend"

PROFESSIONAL ADVISOR OR CONSULTANT -- a trained expert you turn to for advice, for example, a lawyer or a clergyman

OTHER

Show Card Q10 Distinguishing Kinds of Relationships

Appendix B. Proposed Name Interpreter Items, page 1 of 4

(Asterisk indicates new or modified item.)

FILL IN NAMES IN ORDER. ASK EACH QUESTION ABOUT ALL PEOPLE MENTIONED, THEN GO ON TO NEXT QUESTION.

We'd like to find out a little about each of these people.

Name 1	Name 2	Name 3	Name 4	Name 5

Q5. [NAME] is [male/female]? Is that correct? MAKE YOUR BEST GUESS BASED ON ALTER NAME. ASK FOR EACH NAME.

Name 1	Name 2	Name 3	Name 4	Name 5
Male.....1	Male.....1	Male.....1	Male.....1	Male.....1
Female.....2	Female.....2	Female.....2	Female.....2	Female.....2

Q6. Is [NAME] Asian, Black, Hispanic, White or something else? ASK FOR EACH NAME.

Name 1	Name 2	Name 3	Name 4	Name 5
Asian.....1	Asian.....1	Asian.....1	Asian.....1	Asian.....1
Black.....2	Black.....2	Black.....2	Black.....2	Black.....2
Hispanic.....3	Hispanic.....3	Hispanic.....3	Hispanic.....3	Hispanic.....3
White.....4	White.....4	White.....4	White.....4	White.....4
Other.....5	Other.....5	Other.....5	Other.....5	Other.....5
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q7. This card lists general levels of education (HAND CARD Q7). As far as you know, what is [NAME]'s highest level of education? PROBE: What is your best guess? RECORD VERBATIM IF NOT CODEABLE. ASK FOR EACH NAME.

Name 1	Name 2	Name 3	Name 4	Name 5
1-6 years.....1	1-6 years.....1	1-6 years.....1	1-6 years.....1	1-6 years.....1
7-9 years.....2	7-9 years.....2	7-9 years.....2	7-9 years.....2	7-9 years.....2
10-12 years.....3	10-12 years.....3	10-12 years.....3	10-12 years.....3	10-12 years.....3
High School Grad...4	High School Grad...4	High School Grad..4	High School Grad..4	High School Grad...4
Some college.....5	Some college.....5	Some college.....5	Some college.....5	Some college.....5
Associate degree.....6	Associate degree.....6	Associate degree....6	Associate degree....6	Associate degree.....6
Bachelor's degree....7	Bachelor's degree...7	Bachelor's degree...7	Bachelor's degree...7	Bachelor's degree....7
Grad/professional...8	Grad/professional..8	Grad/professional..8	Grad/professional..8	Grad/professional...8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Q8. Thinking about how often you usually talk to [NAME], on average, do you talk to [him/her] almost every day, at least once a week, at least once a month, or less than once a month? ASK FOR EACH NAME.

Name 1	Name 2	Name 3	Name 4	Name 5
Almost every day...1	Almost every day...1	Almost every day...1	Almost every day...1	Almost every day...1
At least weekly.....2	At least weekly.....2	At least weekly.....2	At least weekly.....2	At least weekly.....2
At least monthly....3	At least monthly....3	At least monthly.....3	At least monthly...3	At least monthly....3
Less than monthly..4	Less than monthly.4	Less than monthly..4	Less than monthly.4	Less than monthly..4
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

*Q9. How long have you known [NAME]? PROBE: What is your best guess? ASK FOR EACH NAME.

Name 1	Name 2	Name 3	Name 4	Name 5
ENTER YEARS |_|_|	ENTER YEARS |_|_|	ENTER YEARS |_|_|	ENTER YEARS |_|_|	ENTER YEARS |_|_|
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Name 1	Name 2	Name 3	Name 4	Name 5

Q10. **Here is a list (HAND CARD Q10) of some of the ways in which people are connected to each other. ome people can be connected to you in more than one way. For example, a man could be your brother and e could belong to your church and be your lawyer. When I read you a name, please tell me all the ways at person is connected to you.**

ow is [NAME] connected with you? PROBE: **Any other ways?** ASK FOR EACH NAME.

Spouse.....01	Spouse.....01	Spouse.....01	Spouse.....01	Spouse.....01
Parent.....02	Parent.....02	Parent.....02	Parent.....02	Parent.....02
Sibling.....03	Sibling.....03	Sibling.....03	Sibling.....03	Sibling.....03
Child.....04	Child.....04	Child.....04	Child.....04	Child.....04
Other family.....05	Other family.....05	Other family.....05	Other family.....05	Other family.....05
Co-worker.....06	Co-worker.....06	Co-worker.....06	Co-worker.....06	Co-worker.....06
Member of group..07	Member of group..07	Member of group..07	Member of group..07	Member of group..07
Neighbor.....08	Neighbor.....08	Neighbor.....08	Neighbor.....08	Neighbor.....08
Friend.....09	Friend.....09	Friend.....09	Friend.....09	Friend.....09
Advisor.....10	Advisor.....10	Advisor.....10	Advisor.....10	Advisor.....10
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
Other.....11	Other.....11	Other.....11	Other.....11	Other.....11
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
DON'T KNOW.....99	DON'T KNOW....99	DON'T KNOW....99	DON'T KNOW...99	DON'T KNOW....99

11. **How old is [NAME]?** PROBE: **What is your best guess?** ASK FOR EACH NAME.

ENTER AGE |_|_|	ENTER AGE |_|_|	ENTER AGE |_|_|	ENTER AGE |_|_|	ENTER AGE |_|_|
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

12. **What is [NAME]'s religious preference? Is it Protestant, Catholic, Jewish, some other religion, or no eligion?** PROBE: **What is your best guess?** ASK FOR EACH NAME REPEATING CATEGORIES AS ECESSARY.

Protestant.....1	Protestant.....1	Protestant.....1	Protestant.....1	Protestant.....1
Catholic.....2	Catholic.....2	Catholic.....2	Catholic.....2	Catholic.....2
Jewish.....3	Jewish.....3	Jewish.....3	Jewish.....3	Jewish.....3
Other.....4	Other.....4	Other.....4	Other.....4	Other.....4
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
None.....5	None.....5	None.....5	None.....5	None.....5
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

Appendix B. Proposed Name Interpreter Items, page 3 of 4

(Asterisk indicates new or modified item.)

Name 1	Name 2	Name 3	Name 4	Name 5

*Q13. **Is [NAME] generally a Republican, Democrat, Independent, or what? PROBE: What is your best guess?** ASK FOR EACH NAME.

Republican.....1	Republican.....1	Republican.....1	Republican.....1	Republican.....1
Democrat.....2	Democrat.....2	Democrat.....2	Democrat.....2	Democrat.....2
Independent.....3	Independent.....3	Independent.....3	Independent.....3	Independent.....3
Other.....4	Other.....4	Other.....4	Other.....4	Other.....4
SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:	SPECIFY:
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

*Q14. **Is [NAME] employed? What is/was his/her main job?** IF RETIRED OR UNEMPLOYED, ASK ABOUT LAST JOB. PROBE TO GET SPECIFIC CODABLE OCCUPATIONS, e.g., LATHE OPERATOR, BANK TELLER, GARAGE MECHANIC. ASK FOR EACH NAME.

Employed.....1	Employed.....1	Employed.....1	Employed.....1	Employed.....1
Unemployed.....2	Unemployed.....2	Unemployed.....2	Unemployed.....2	Unemployed.....2
Retired.....3	Retired.....3	Retired.....3	Retired.....3	Retired.....3
OCCUPATION:	OCCUPATION:	OCCUPATION:	OCCUPATION:	OCCUPATION:
REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

*Q15. **Finally, in a word or two, what are the topics most important to you that you have discussed with [NAME] during the last six months?** ASK FOR EACH NAME.

REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8	REFUSED.....8
DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9	DON'T KNOW.....9

SPOUSE -- your wife, or husband, or a person with whom you are living as if married

PARENT -- your father or mother

SIBLING -- your brother or sister

CHILD -- your son or daughter

OTHER FAMILY -- for example, grandparent, grandchild, cousin, aunt, uncle, nephew, niece, or an in-law

COWORKER -- someone you work with or usually meet while working

MEMBER OF A GROUP TO WHICH YOU BELONG -- for example, someone who attends your church, or whose children attend the same school as your children, or belongs to the same club, classmate

NEIGHBOR -- someone outside your own household who lives close to you in your neighborhood

FRIEND -- someone with whom you get together for informal social occasions such as lunch, or dinner, or parties, or drinks, or movies, or visiting one another's home; this includes a "boyfriend" or a "girlfriend"

PROFESSIONAL ADVISOR OR CONSULTANT -- a trained expert you turn to for advice, for example, a lawyer or a clergyman

OTHER

Show Card Q10 Distinguishing Kinds of Relationships

APPENDIX C: PROPOSED SEMANTIC DIFFERENTIAL ITEMS

Semantic differentials are proposed to study network content, directly in evaluations of actual relations and indirectly in evaluations of factorial vignette relations. Pursuing this proposal requires; a selection of semantic differentials for evaluating relationships, a selection of actual relations, a definition of content dimensions in vignette relations, a definition of categories within each dimension, and a design for sampling vignette contents.

Selecting Semantic Differentials

We propose four semantic differentials as a core set for all evaluations; good-bad, frequent-infrequent, competitive-cooperative, and strong-weak. The first three of these are presented in figures 8 through 11. As discussed in the text, these contrasts seem reasonable in light of empirical research with semantic differentials or network data. The fourth contrast is proposed for two reasons. First, it is a contrast often used in colloquial and scholarly descriptions of relationships. Second, it is a contrast representing the potency dimension in semantic differential research, a dimension imperfectly reflected in the cooperative-competitive contrast in relationships.

Although there are advantages to using a small set of semantic differentials in all evaluations, there are reasons for including additional semantic differentials. There are straightforward statistical advantages to having multiple indicators of the core content dimensions. The evaluative dimension is best captured by the simple good-bad contrast, for example, but it is also reflected in contrasts such as attractive-repulsive or positive-negative that seem more relevant to evaluating relationships. Further, the range of description could be enriched by including content dimensions less significant than the core dimensions. Among the many possibilities are time (enduring-fragile, stable-changeable), ambiguity (ambiguous-clear, complex-simple), trust (suspicious-trusting, honest-dishonest), or reciprocity (equal-unequal, symmetric-asymmetric). Osgood et al. (1953:37ff) provide factor analysis data on a large number of contrasts that could be used to advantage in studying network data. Definitive empirical evidence is not available on the extent to which these and other content dimensions are correlated with the core dimensions in evaluating relationships. The nongeneralizable conclusion from interviewing 25 Manhattan women is that many additional dimensions *are* represented by the core good-bad, frequent-infrequent, cooperative-competitive contrasts. Pretest research is needed to to determine the extent to which the core semantic differentials represent relational semantic differentials more generally. If it is deemed wise to expand the core semantic differentials in the evaluations, a large number of additional contrasts could be included by sampling them in some fashion as is done with vignette contents. All semantic differentials beyond the core four need not be used to evaluate every vignette.

Selecting Actual Relations

As discussed in the text, we propose that the relations with at least the first and last alters named as discussion partners be evaluated with semantic differentials. These two are proposed in order to define the boundaries of the field in which a respondent defines his actual discussion relations (see figure 11). Interview time permitting, it would be valuable to have relations with more than two alters evaluated in order to (a) explore the meaning of the GSS discussion

relations more deeply, and (b) have a more reliable reference point for interpreting vignette evaluations.

Defining Vignette Content Dimensions and Categories

Each vignette relationship to be evaluated is a mixture of contents believed to determine the meaning of discussion relations for respondents. By studying the way in which evaluations of vignettes change with shifting mixtures of vignette contents, we can identify kinds of contents and the extent to which the meaning of a discussion relation is determined by specific contents. To begin with, we propose measuring the implications of changing the name generator from a general discussion relationship ("discussing important matters") to focus on personal matters ("discussing your personal life"), political matters ("discussing politics and politicians"), or job related matters ("discussing your work"). These are the restrictions most pertinent to the proposed construct validity propositions (social support, sexuality, political preference, socioeconomic achievement), and significant for the reasons explained in the selection of each construct validity proposition. Further, we propose that the additional thirty-one contents in figure 14 be distinguished in the vignettes. More or fewer contents could be distinguished, of course. The contents in figure 14 are merely taken from the proposed name interpreter items in Appendix B (a modest extension of the GSS name interpreters) with an eye toward better understanding the operation of interpersonal relations in the construct validity propositions. Some response categories have been collapsed to define vignette contents in order to obtain a sufficient number of observations to explore interaction effects between vignette contents (e.g., income and occupational responses have been collapsed to four vignette contents; poor, working class, middle class, and wealthy).

Sampling Vignette Contents

Each vignette relationship to be evaluated is a stratified random sample of contents. The 35 proposed contents are presented in figure 14 within 14 dimensions of content. Dimensions are used to order contents within a vignette (a first content listed, second, third, etc.) and define mutually exclusive contents (e.g., a relationship cannot occur with a person who is male and female). Blank contents are used to define the probability of each content dimension appearing in any one vignette (e.g., the religious dimension is 80% blank so religious homophily between respondent and alter would appear in 20% of the vignettes) and to simplify vignettes, making it unlikely that all fourteen content dimensions will appear in any one vignette. Specifically, the average vignette sampled from figure 14 will contain six contents and 78% of a large sample will contain between five and eight contents. The probability of any one content appearing in any one vignette is given by the weights attached to each in figure 14. As discussed in the text, high weights are given to contents to be explored in detail. The "discussing important matters" content, for example, is to be studied in detail -- both for its direct effect on evaluations and its interaction effects with other contents -- because it is the central name generator in the proposed network items. Across replicate samples, it would appear in 50% of the vignettes sampled from the design in figure 14. The "discussing politics and politicians" content is principally of interest for its direct effect on evaluations as an alternative to the GSS name generator. Across replicate samples, it would appear in only 10% of the vignettes sampled from figure 14.

Fourteen random numbers will be drawn to define each vignette. The first random number, a fourteen digit integer defines the category of each content

dimension to be included in the vignette. Sampling from figure 14, for example (where integers for each content are listed at the extreme right), the number **25901821934673** defines a vignette containing the second integer of dimension one ("discussing important matters"), the fifth integer of dimension two ("male"), the ninth integer of dimension three ("black"), and so on up through the third integer of dimension fourteen ("blank"). The second through fourteenth random numbers, a sequence of integers between 2 and 14 without duplication, define the sequence in which content dimensions appear in the vignette. For example, the sequence **2 11 5 4 13 8 3 12 6 9 10 14 7** defines a vignette in which the second content dimension appears second, the third content dimension is the eleventh listed, the fourth content dimension is the fifth listed, and so on. The following six content vignette is defined by the above two example numbers:

> **This is a person with whom you discuss matters important to you. The person is: Male. Holds a graduate degree beyond college. Black. About your age. Someone you see less than once a month.**

The vignette would then be evaluated on a series of semantic differentials. The following illustrates how the items could be presented to respondents.

Illustrative Semantic Differential Items

Each of the following scales is a contrast between opposite terms that you could use to describe your relation with someone. The relation could be good or bad, strong or weak, and so on. **Please describe your relation with each of the people listed below by placing an "X" in the appropriate space on each scale.** For example, if you have frequent contact with the named person, you would put a mark in the space closest to FREQUENT. If you have little contact with the person, you would put a mark in the space closest to INFREQUENT. If your contact is neither often nor rare you would put a mark somewhere in between the extremes of FREQUENT and INFREQUENT.

Make your evaluations quickly. Do not spend time going back to change your evaluations. It is your first impressions that are important here. **Please mark <u>one</u> category on each scale.**

You named <u>FIRST ALTER NAMED</u> as someone with whom you have discussed important matters.

How would you evaluate your relationship with this person?

GOOD :_____:_____:_____:_____:_____:_____:_____: BAD

FREQUENT :_____:_____:_____:_____:_____:_____:_____: INFREQUENT

COMPETITIVE :_____:_____:_____:_____:_____:_____:_____: COOPERATIVE

STRONG :_____:_____:_____:_____:_____:_____:_____: WEAK