Personality Correlates of Structural Holes[*]

Ronald S. Burt
Graduate School of Business and Department of Sociology, University of Chicago, Chicago, IL 60637, USA

Joseph E. Jannotta, Jr.
Right/Jannotta Bray, 100 North Riverside Plaza, Suite 1700, Chicago, IL 60606, USA

James T. Mahoney
Management Research Group, 43 Deering Street, Portland, Maine 04101, USA

We use survey network and personality profile data to explore the idea that personality varies systematically with structural holes. We draw two conclusions from the analysis: (1) Personality does vary with structural holes. The association is concentrated in a few items, but those few personality items describe three-fourths of the variance in network constraint. (2) The association is consistent with the structural hole argument. People in the least constrained networks claim the personality of an entrepreneurial outsider (versus conforming and obedient insider), in search of authority (versus security), thriving on advocacy and change (versus stability). We summarize with a network entrepreneur personality index that defines a surprisingly accurate probability of the respondent having an entrepreneurial network. We conclude with cautionary evidence from a survey of corporate staff in a large financial organization. Where the personality index is associated with entrepreneurial networks (lower ranks), neither the index nor the networks are associated with manager performance. Where manager performance is significantly linked with entrepreneurial networks (more senior ranks), the personality index is not associated with network structure, and performance is not higher for managers with more entrepreneurial personalities. The personality data are an interesting correlate, but no substitute, for sociometric data.

In our fascination with the nuances of social structure and processes revealed by network analysis, it is easy to neglect the individual personalities chained together by the network. It is not that personality is irrelevant so much as it is uninterestingly complex in comparison to the consequential and tractable complexity of network structure. There is reason to boldly assume that individuals have personality as a function of the history of network positions they have occupied — which frees us to ignore personality as emergent and focus theory on the underlying action and belief implications of network structure.[1]

---

[1]Personality was a key issue for the pioneers in sociometry who set the stage for contemporary network analysis, but network analysis in the 1970s was not as keyed to its sociometric roots as to

Accumulating research on a specific element of network structure, structural holes, fuels our concern in this paper with personality. Structural hole theory describes how social capital is a function of the brokerage opportunities in a network (Burt, 1992). The central premise is that an exchange is more difficult to negotiate, less rewarding, when it is locked into other exchanges. Discontinuities between exchange relations (structural holes) are entrepreneurial opportunities to broker the flow of <u>information</u> between people on opposite sides of the structural hole, and <u>control</u> the form of projects that bring together people on opposite sides of the structural hole. The conclusion is that individuals with relations to otherwise disconnected social groups are positioned for entrepreneurial action, building bridges between groups where it is valuable to do so. The argument draws on several lines of network theorizing that emerged in sociology during the 1970s (most notably Granovetter, 1973, 1974, on the strength of weak ties; Cook and Emerson, 1978, on the power of exclusive exchange partners; Freeman, 1977, 1979, on betweenness centrality; and Burt, 1979, 1980, on the structural autonomy created by network complexity).

Accumulating evidence for the structural hole argument is centered in three lines of research that also emerged in sociology during the 1970s (see Burt, 1992: Chaps. 1, 2, for review; Breiger, 1995, for integrative review of emerging research). First, small-group experiments are used to describe how resources accumulate in people with exclusive exchange relations to otherwise disconnected partners (e.g., Cook and Emerson, 1978; Cook et al., 1983; Markovsky, Willer, and Patton, 1988). Second, census data are used to describe how producer profit margins increase with the network disorganization of supplier and consumer transactions. Burt (1979, 1983) describes the association in 1967 with profits in American manufacturing markets, and extends the results into nonmanufacturing through the 1960s and 1970s (Burt, 1988, 1992). Burt, Yasuda, and Guilarte (1996) extend the results into the 1980s, highlighting the critical importance of foreign markets for performance differences between American markets. Using profit and network data on markets in other countries, similar results are observed in Germany

---

anthropological cousins. Personality was not a focus of attention. A change in recent years significant for the network broker measures in this paper is the strengthening presence of sociologists in business schools. Sociologists skilled in network analysis have mingled with the installed base of psychologists interested in organization behavior. Social context and groups broadly understood (e.g., in Leavitt, Pondy, and Boje's, 1989, widely-used organization behavior reader), have become more specific and concrete with network theory and analysis (e.g., Nohria and Eccles', 1992, collection on networks and organizations; several chapters in Kramer and Tyler's, 1996, collection on trust in organizations). In return, there is new network interest in the cognitive, the personal (e.g., with respect to organization behavior, see Kilduf and Krackhardt, 1994, on bringing individuals back in). Personality as a concept seems to be no more popular with psychologists than sociologists, but the exchange between sociology and psychology in organization behavior focuses attention on individual differences above and beyond differences attributable to network structure.

during the 1970s and 1980s (Ziegler, 1982; Burt and Freeman, 1994), Israel during the 1970s (Talmud, 1992, 1994), Japan in the 1980s (Yasuda, 1993), and Korea in the 1980s (Jang, 1995).

Third, and most relevant to this paper, survey data are used to describe the career advantages of having a contact network rich in structural holes. The earliest, most widely known, study is Granovetter's (1973, 1974) demonstration that white-collar workers find better jobs, faster, through weak ties that bridge otherwise disconnected social groups. Lin worked with several colleagues to present evidence of the importance of ties to distant contacts for obtaining more desirable jobs (e.g., Lin, Ensel, and Vaughn, 1981; Lin and Dumin, 1986; Lin, forthcoming). Related empirical results appear in Campbell, Marsden, and Hurlbert (1986), Flap and De Graaf (1989), Marsden and Hurlbert (1988). Moving to the top of organizations, Burt (1992, 1995, 1997) and Podolny and Baron (1997) present survey evidence from probability samples of managers (and see Table 3 below). Working with more limited data, Gabbay (1996) shows how promotions occur more quickly for salesmen with strong-tie (versus weak-tie) access to structural holes (cf., Meyerson, 1994), and Sparrowe and Popielarz (1995) innovatively reconstruct past networks around managers to estimate an event-history model of how structural holes in yesterday's network affect the likelihood of promotion today. The benefits that accrue to individuals aggregate to the management teams on which they serve. Studying TQM teams in several midwest manufacturing plants, Rosenthal (1996) shows that the teams composed of employees with more entrepreneurial networks are significantly more likely to be recognized for their success in improving the quality of plant operations.

Motivation is an issue for these studies. Network structure can be measured for its entrepreneurial opportunities. People can be compared for their relative achievement. There is empirical evidence of a correlation between opportunity and achievement (holding constant various individual differences in background). But opportunities do not by themselves turn into achievement, and some people are not comfortable pursuing the information and control benefits of structural holes. Thus the motivation issue: To what extent is the connection between success and brokerage contingent on having a personality suited to working with structural holes? The motivation issue can be assumed away,[2] dismissed as correlate of network structure,[3] or addressed directly.[4]

_____

[2]If individuals are rationally self-interested in a micro-economic sense, they drop out of the equation. To know who succeeds, you only need to know who has the opportunity to succeed.

[3]A more sophisticated dismissal is to assume that motivation is inherent in network structure (Burt, 1992:34-36). For reasons of a clear path to success (the average person is more likely to see entrepreneurial opportunities in a large, sparse network), or the personality of the person who constructed the network (people inclined toward entrepreneurial behavior build large, sparse networks), or the nature of the environmental factors responsible for the structure of the network (persons forced to live in large, sparse

The preliminary question is whether personalities differ across the structural hole continuum, changing in some systematic way from the cliques that provide little social capital to the large, sparse entrepreneurial networks rich in the social capital of structural holes. The only empirical evidence bearing directly on the question is Janicik's (1997) experiments with subjects learning social structures. He shows that learning a new social structure that contains structural holes is much easier for people whose current network contains structural holes. Whatever the explanation for Janicik's results — holes enhance the ability to learn, people see more clearly network structures with which they have experience, or more intelligent people better report the holes in the social structure around them — there is a clear association between structural holes and individual differences in learning. It is a short step to broader individual differences in personality.

DATA

Our data are questionnaire responses from University of Chicago M.B.A. students in two sections of a required course in organization behavior. Although students, these are toward the mature end of the distribution of student populations. They are typically in their late twenties, on average have several years of full-time work experience, and many were employed in a full-time job when they completed the questionnaires for this study (three fourths of the students were in the evening and weekend programs, programs designed for people who wish to continue in their jobs while they work toward their M.B.A.). Although the students are not a probability sample, they are informatively heterogeneous. They work in diverse industries. They span all stages of the degree program (41% are in their second year). A third are women (35%). A fifth are racial minorities (18%).

NETWORK DATA

More important to this analysis, the students operate in diverse network structures. We have network data from a survey network instrument completed at the beginning of the course to better tie the course content to each student's personal experience. The student's contact network is computer analyzed for structure and composition. Students can compare their network to to the networks of the sample managers discussed in class. The questionnaire is analogous to the survey network instruments in Burt's (1992, 1995, 1997)

---

networks are more likely to learn entrepreneurial skills) — large, sparse networks are more likely to surround a person motivated to be entrepreneurial.

[4]Familiar examples are Weber's (1905) argument that religion can encourage capitalism by making entrepreneurial behavior righteous, and McClelland's (1961) argument that the formation in childhood of a need to achieve is critical to later entrepreneurial behavior.

and Podolny and Baron's (1997) studies with probability samples of managers. Students were asked, with respect to their current or most recent job, to name their most important contacts for personal discussion (the 1985 GSS name generator), socializing, supervision, political support and career advice, as well as competitors, and especially difficult co-workers. The student was then asked to describe the relative strength his or her relationship with each contact, and between each pair of contacts. These data define a contact network around each student. Measuring the lack of structural holes in a network, network constraint decreases with the number of contacts in the network (network size), increases with the average strength of relations between contacts (network density), and increases with the extent to which relations among contacts are concentrated in a single contact (network hierarchy).[5] The student networks are as diverse in size, density, and hierarchy as networks we have observed around junior managers more generally.[6]

_____

[5]Described in Burt (1992:55-56, 125-126), network constraint C on person i is the sum of constraint c_{ij} in i's relation with each contact j; $C = \sum_j c_{ij}$, where c_{ij} equals $(p_{ij} + \sum_k p_{ik}p_{kj})^2$, $i \neq j \neq k$, where p_{ij} is the proportional strength of i's relationship with j (relation between i and i divided by the sum of i's relations in the network). We multiply C by 100 here and discuss points of constraint. Constraint c_{ij} increases with the extent to which (a) i allocates a high proportion of his or her network directly to the connection with j (p_{ij} is large), and (b) i has a large indirect allocation to the connection with j (the sum of $p_{ik}p_{kj}$ across k is large; the other people k with whom i has strong relations in turn have strong relations with j). If we regress C across size, density and hierarchy for the 555 junior managers in the benchmark population (next footnote) we see constraint decreasing with number of contacts (-.66 standardized regression coefficient), increasing with network density (.49), and increasing with network hierarchy (.23). The regression equation predicts 86% of the variance in C. The same three standardized coefficients for the student networks are -.58, .57, and .30 (predicting 87% of the variance in C).

[6]Mr. Burt has accumulated from teaching and consulting projects benchmark contact network data on 1,255 managers in diverse functions across three broad ranks; 555 junior managers, 552 middle managers (people who manage other managers), and 148 senior managers (president and CEO down through the senior level of middle managers, e.g., the level above vice president in the usual financial firm, or the level below vice-president in the usual manufacturing firm). The student networks vary in size from four to 20 contacts around a 13.5 average. The average strength of relation between contacts (network density measured on a 0 to 100 scale) varies from 6 to 100 points around a 26.5 average. The concentration of connections in a single contact (network hierarchy measured on a 0 to 100 scale with the Coleman-Theil inequality index, Burt, 1992:70-71; 1997b) varies from zero to 24.6 points around a 9.1 average. Bartlett chi-square tests with one degree of freedom for differences between the variances in the student networks and the 555 junior manager networks in the benchmark population (which includes some employed M.B.A. students from prior classes) are negligible; 2.24 for network size (P = .13), 1.96 for network density (P = .16), 0.97 for network hierarchy (P = .32). All three network conditions are slightly less variable across the student networks, however, so combining them to measure network constraint yields less variable levels of constraint in the student networks (7.89 chi-square, 1 d.f., P < .001). The student networks vary from 12 to 46 points of constraint, with a mean of 25 and a standard deviation of 7.6 (versus 11 to 67 across junior managers in the benchmark population with a mean of 28 and a 9.3 standard deviation). In short, what is missing among the students are the extreme cases of junior managers dependent on a few strongly interconnected contacts (usually someone whose contacts are limited to their immediate work group). This could be a training effect (students complete the network questionnaire at the end of the first class on social capital). Or, it is could be that junior managers who return for their M.B.A. are in fact more entrepreneurial.

PERSONALITY PROFILE

Personality data on the students are from a self-administered instrument widely used in human resource consulting. The instrument was developed by a commercial consulting firm, Management Research Group (MRG), to help respondents better identify features of their organizational personalities that were strong, or that needed development, or that were perceived differently by colleagues above, below, and around the respondent in the organization (see Mahoney and Mahoney, 1990, for reliability and benchmark results). Any of several alternative personality instruments could be used for this study. We use the MRG instrument for three reasons: (1) It includes a diverse array of personality items, which improves the odds of finding personality correlates of network structure if there are any. (2) The firm gave me permission to use the instrument for the exploratory purposes of this study. (3) We have confidence in the instrument's reliability because it has been refined over more than a decade of successful commercial use.

——— Figure 1 and Figure 2 About Here ———

The MRG instrument is a sequence of 252 statements that the respondent rates for the extent to which each describes the respondent. The 252 items are organized into 84 clusters of three items as illustrated in Figure 1. Each item cluster begins with a header phrase (e.g.; "When evaluating opportunities, I am likely to look . . .") followed by three alternative endings. The respondent's task is to rate the alternative endings for the extent to which each is characteristic of the respondent. The "most" descriptive ending is given a 5 or 4 (5 for especially descriptive). The "next" most descriptive ending is given a 3 or 2 (2 for less descriptive). The least descriptive is left blank (for an implicit rating of 1).

The personality data are thus 252 items on a 1 to 5 scale indicating the extent to which each of 252 sentences describes the respondent.[7] With 252 personality items and 51 respondents, a few items are sure to be associated with almost any variable, network or other. It will be important to see that the content of personality items associated with network structure is consistent with network theory.

TESTS FOR SELECTION BIAS

The network questionnaire was part of the course curriculum, but the MRG questionnaire was optional. Students were invited to participate in this study at the end of the course.

_____

[7]Given the many items, we tested for fatigue effects. Graphs and correlations show no evidence of response decay. Average ratings do not increase or decrease with item sequence (.06 correlation). The variance of ratings decreases negligibly (-.10 correlation with item sequence from 1 to 252). The strength of correlation with network constraint does not increase or decrease across item sequence (.04 correlation between item sequence and the item correlation with network constraint). The 26 network-relevant items distinguished in Figure 3 are scattered from the first to the last page of the instrument, and come equally from the three items within each cluster (eight A items, nine B items, and nine C items).

The relative importance of personality versus structure was an issue in class discussion from time to time, so this was a chance for interested students to see empirical evidence on the issue. Students who completed the questionnaire received $10 as a token of appreciation for their time, and had the option of receiving a copy of the analysis. We have MRG questionnaires from 51 of 122 students (42%).[8] All but four students returning a questionnaire asked to receive the analysis.

The fact that students self-selected into the study raises questions about selection bias. Although the professor stressed the voluntary nature of the task, it could have been viewed as an opportunity to curry favor with the professor, perhaps to add points to a poor grade, or to avoid the risk of losing points for being a non-respondent.

Selection bias seems not to be a concern. In the graph at the top of Figure 2, the solid dots are the 51 students (respondents) who completed MRG questionnaires. There is no difference between non-respondents and respondents in their course grades (negligible 1.3 t-test for difference on the vertical axis). There is no difference in network constraint (negligible -0.7 t-test for difference on the horizontal axis). The logit regression results at the bottom of Figure 2 show no variables predicting which students returned completed questionnaires. The strongest effect in the table is the negligible tendency for respondents to be the students more active in class discussion. This makes sense since people more interested in the subject should be more interested in the analysis, but even this strongest predictor can be put aside as negligible (1.8 t-test, P = .07). We use the eight non-network variables in Figure 2 as control variables in the analysis, but our summary conclusion is that respondents do not differ significantly from non-respondents (logit chi-square for the hypothesis of no difference on the ten variables in Figure 2 is 14.01 with 10 d.f., P = .17).

RESULTS

The first task is to see if any item clusters vary with network structure. Figure 3 contains histograms of correlations (absolute values) between each of the 252 personality items and variables measuring the lack of structural holes in a respondent's network. Most of the correlations are negligible, less than .2 in magnitude. A few exceed .3 in magnitude. Taking .3 as an arbitrary initial cut-off (corresponds to a t-test of 2.2), 26 of the 252 items are network-relevant in the sense of having a correlation of magnitude .3 or more with one

---

[8]This excludes from the 133 students in the two sections of the class three full-time Ph.D. students, six students who were only able to enroll after the network questionnaire had been administered (so we have no network data with which to predict MRG responses), and two students who returned unusable MRG questionnaires (both ignored the force-choice constraint, giving "most" ratings to all three items in some clusters and "next" ratings to all three items in other clusters).

of the three network variables. These 26 network-relevant items cannot be analyzed independent of the other items in their clusters. Thenetwork-relevant items come from 20 of the 84 item clusters.

AGGREGATE CORRELATION WITH NETWORK STRUCTURE

Item clusters are listed in Table 1 in descending order of their aggregate correlation with network density, hierarchy, and constraint. The header phrase for each item cluster is listed to display the diversity of organization behaviors described by the items. Aggregate correlation is measured by canonical correlations — the first two of which are listed in Table 1 with a summary chi-square statistic for the hypothesis of no association between the three network variables and the three items in the row cluster. The null hypothesis is clearly rejected only for the four clusters at the top of the table. At the bottom of the table, item clusters 80 through 84 have the weakest network correlations of all 84 clusters. But their canonical correlations are not much weaker than the canonical correlations for item clusters rank 15 through 20. In sum, the personality association with network structure is concentrated in the few item clusters at the top of Table 1.

——— Figure 3, Table 1, and Figure 4 About Here ———

Although concentrated in a small number of items, the association is strong. The canonical correlations at the top of Table 1 show strong association. The graphs in Figure 4 illustrate for the two item clusters at the top of Table 1 the data distributions responsible. The graphs are box charts showing the distribution of network constraint at each level of response on each item (box spans the interquartile range, bar is median). For example, there is a strong negative correlation between constraint and respondent's preference for item B in the item cluster most associated with network constraint (1B to the left of Figure 4). Respondents with networks rich in structural holes (low network constraint) look for opportunities to be in a position of authority (high rating on item 1B).

More specially, the personality items associated with network structure do well in predicting the level of constraint in each respondent's network. Figure 5 contains regression results predicting network constraint with items from the top ten item clusters in Table 1. The MRG clustering means that each item cluster associated with constraint contains an item that increases with network constraint, an item that decreases with constraint, and a third item least correlated with constraint. From left to right in Figure 5, each node on the horizontal axis expands the regression equation to include the two strongest predictors from each item cluster. For example, items B and C in cluster 1 are included because ratings on item A in the cluster are correlated .15 with network constraint versus correlations of -.44 and .35 for items B and C respectively (see the left side of Figure 4). When we predict network constraint from ratings on items 1B and 1C,

we describe 25% of the variance in network constraint, which is the first node on the solid line in Figure 5. When we add items 2A and 2B to the prediction (items 2A and 2B have the strongest associations with constraint, see the right side of Figure 4), the described variance increases to 41%, which is the second node on the solid line in Figure 5.

——— Figure 5 About Here ———

Three points are illustrated in Figure 5. (1) The solid line is high, showing that a large proportion of the variance in network constraint is associated with respondent differences on the personality items. Three-fourths of the variance in network constraint is described by the top ten item clusters. Gender, race, and other respondent differences in Figure 2 have no effect on this association.[9] (2) The solid line increases quickly across the first four item clusters, then increases less when additional item clusters are added to the regression equation. Most of the strong association between network constraint and the personality items is concentrated in the first four item clusters (61% with only the first four item clusters predicting constraint, 76% with all ten item clusters). (3) The dotted line equals or exceeds the solid line, showing that dichotomous personality items are no less accurate than continuous items in capturing the association with network constraint. The dotted line describes variance predicted by regression equations in which item ratings are reduced to a dichotomy; 1 if the respondent picks an item as "most" descriptive of him or herself, 0 otherwise. The dichotomous items describe 85% of the variance in network constraint (68% from the first four item clusters).[10]

CONTENT OF THE PERSONALITY DISTINCTIONS

The content of the personality items associated with network structure is consistent with the structural hole argument. The argument is that people who broker connections across

———————————————

[9]There are eight non-network respondent variables in Figure 2. Adding the eight variables to Figure 5 adds nothing to the prediction with continuous personality items ($F_{8,22} = 0.53$, P = .82), nor with dichotomous personality items ($F_{8,22} = 0.60$, P = .77).

[10]We include the dichotomous predictors for three reasons. (1) We don't want to over-fit these data. Coding whether a respondent picks an item as "most" descriptive of him or herself asks less precision of the data. (2) Associations with the network variables are not always linear across item ratings. For example, there is a strong negative correlation between network constraint and responses to item 2A in the upper right corner of Figure 4, but the correlation holds primarily across ratings 2 through 5. Persons giving item 2A a rating 1 (i.e., not rating it "most" or "next" descriptive of themselves) vary widely in network constraint. If we put aside the respondents giving item 2A a rating of 1, the correlation with network constraint across ratings 2 through 5 is -.63 (versus the -.35 in Figure 4). After seeing this pattern in a few items, we re-computed all 252 item correlations in two ways: (a) deleting the 1 ratings, and (b) converting item ratings to a dummy variable (1 if the respondent rated the item as "most" descriptive of him or herself, 0 otherwise). This added one item cluster to Table 1 that was below threshold when item correlations were computed with the full range of ratings. Otherwise, the same item clusters are identified as network-relevant though individual items vary in their correlations with the network variables. (3) The strong association with dichotomous items justifies replacing continuous ratings with simpler dichotomous paired comparisons for the network entrepreneur personality index in the next section.

structural holes can add value through the information and control benefits that reside in the holes. The motivation question asks whether people are equally likely to pursue the benefits. Individuals who pursue the benefits of structural holes — entrepreneurs in the language of the argument — are more the authors of their own social world. Establishing relations with otherwise disconnected people means negotiating ambiguity and conflicting demands, it means being an outsider. Remove the entrepreneur's ties to otherwise disconnected groups, and the groups drift apart. At the other end of the structural hole continuum, cliques and hierarchical structures of constrained networks are more stable, more secure, because interdependent ties sustain the network. Remove one person, and the network is still held together by ties between the other people in the network.

Compare the items at the top of Figure 6 with the items at the bottom to get a sense of the personality distinctions most associated with structural holes.[11] At the top of Figure 6, respondents in the networks richest in structural holes see themselves as players, people responsible for coordination and change. The two personality items most often claimed by the least constrained respondents are their desire "for a chance to be in a position of authority," and their belief that success will come because of their "ability to create an aura of excitement." These are independent people (looking for "position of authority," "won't let anyone make decisions for me," "go it alone"), concerned with the accuracy of their information on colleagues ("seek the advice of my colleagues," "trouble when people don't say what they really think," "let people know what I think of them"), experienced with resistance ("trouble when people won't listen to colleagues," "others should be more willing to follow the rules"), who enjoy convincing others ("ability to create an aura of excitement," "outspoken advocate," "getting a point across clearly," "my ability to express my thoughts readily," "sales abilities," "an extrovert").

——— Figure 6 About Here ———

In comparison, respondents in the most constrained networks see themselves as the stalwarts of their organization, adding value through the infrastructure and stability they provide. At the bottom of Figure 6, two items stand apart as characteristic of the most constrained respondents; their desire to "let well enough alone," and their preference for project teams to "closely follow the original mandate of the group."

---

[11]For each of the 252 personality items, we computed the average network constraint on respondents who selected the item as "most" descriptive of themselves. The lower the average constraint on respondents selecting an item as "most" descriptive of themselves, the more the item is associated with structural holes. To highlight personality differences, we standardized the 252 constraint averages and present in Figure 6 the 51 items with z-scores greater than one (i.e., 201 items lie in the empty space between 1.0 and -1.0 in the figure). For the aesthetic of putting items associated with structural holes at the top of the list, items are listed in the figure by the relative lack of constraint with which they are associated (vertical axis is -1 times z-score mean constraint).

In contrast to the entrepreneur's independence, respondents in the most constrained networks emphasize conformity and obedience ("conscientiously follow employer's wishes," "willing to support my superiors," "trouble when people are unwilling to compromise"), and thrive on the social support of close colleagues ("being easygoing," "overly empathetic," "help people feel better," "would do well in personal counseling").

In contrast to the entrepreneur's emphasis on change, these are risk-averse people ("let well enough alone," "take the safe approach"), focused on the technical details of their assignment ("do a strong technical job"), and drawn to stability ("follow the original mandate of the group," "emphasize systems and procedures," "show solid, considered judgments," "trouble when people lack stick-to-itiveness").

In sum, the personality distinctions associated with network structure are multiple, but of a theme: Respondents in the least constrained networks claim the personality items of independent outsiders (versus conforming and obedient insiders), in search of authority (versus security), thriving on advocacy and change (versus stability). The summary contrast, consistent with the structural hole argument, is between proactive and reactive. Respondents in entrepreneurial networks claim the personalities of people who are the authors of their own world. Respondents in constrained networks claim the personalities of people living in a world created by others.

NETWORK ENTREPRENEUR PERSONALITY INDEX

Our closing evidence of association between personality and network structure is a set of simple personality items that defines a surprising accurate probability of the respondent having an entrepreneurial network, a network rich in structural holes.

ITEMS

The paired comparison items in Figure 7 correspond to the ten MRG item clusters most associated with network structure (first rows of Table 1). The MRG items are simplified in two ways: The five-point MRG ratings are simplified to dichotomous ratings, and the three-item MRG clusters are simplified to paired comparisons. The three items in each MRG cluster are now only one item. These changes serve two purposes: The response task is simplified without eroding the association with network structure (judging from the results with dichotomous items in the preceding section and results to be presented), and the paired comparison items conceal the three items that jointly constitute the MRG item cluster and so protect the copyright on the commercial MRG instrument.

Each question in Figure 7 contains a positive and a negative personal quality. For example, the first question asks whether the respondent evaluates opportunities in terms of

"a chance to be in a position of authority" or "long-run implications." These are the two items within their MRG cluster most associated with network constraint. Respondents looking for "a chance to be in a position of authority" more than the "long-run implications" of opportunities tend to have low network constraint (see the graph for item 1B in Figure 4). This is a "positive" quality in the sense that it is associated with networks richer in structural holes. Respondents focusing instead on the "long-run implications" of opportunities tend to have constrained networks (item 1C in Figure 4). This is a "negative" quality in the sense that it is associated with more constrained networks. Pairs of positive and negative qualities were identified in the same way for the other nine items (e.g., the second MRG item cluster listed in Figure 1 has item correlations with network constraint in Figure 4, resulting in the paired comparison for item 2 in Figure 7).[12]

INDEX SCORES

A respondent completes the instrument by circling the response from each pair that better describes the respondent (see instructions at the top of Figure 7). The index score is the number of positive personal qualities chosen. The positive choices are 1A, 2B, 3A, 4A, 5B, 6B, 7A, 8B, 9B, and 10A. These personal qualities in these choices span the themes at the top of Figure 6 to describe an independent outsider, in search of authority, thriving on advocacy and change. A number of positive choices close to 10 indicates a personality associated with low-constraint networks, presumably a person comfortable with the entrepreneurial opportunities of structural holes. At the other extreme, the personal qualities in the negative choices in Figure 7 span the themes at the bottom of Figure 6 to describe a conforming and obedient insider in search of security and stability. A number of positive choices close to 0 indicates a personality associated with constrained networks, presumably a person uncomfortable with the information and control ambiguity of structural holes.[13]

_____

[12]There were two exceptions. For two of the top ten item clusters in Table 1, only one item in the cluster is strongly associated with network constraint. To create discriminatory paired comparisons for Figure 7, we took from another MRG cluster a replacement item strongly associated with network constraint. Replacement item 7A is at the top of Figure 6 and replacement item 8A is at the bottom of the figure.

[13]Thus, the index is a variation on Thurstone scaling. The procedure is to (e.g., Thurstone and Chave, 1929): (1) have a panel of judges rate many items on the psychological continuum to be measured by the scale, (2) use average ratings of each item to select a set of items that span the continuum in equal intervals from low to high (avoiding items given widely different ratings by the judges), and (3) administer the scale by asking respondents to select the items with which they agree. A respondent's score on the scale is the average rating of the items with which the respondent agrees. We use network constraint scores as judge ratings. Items are sorted in Figure 6 by the relative network constraint on respondents selecting each item as "most" descriptive of themselves. Items are paired in Figure 7 for maximum difference in the mean network constraint on respondents selecting each as "most" descriptive, and maximum difference in the correlation between network constraint and the five-point MRG ratings on each item. One way to score

From the student MRG responses, we counted the number of Figure 7 positive choices for each student. The response data are for MRG items in clusters of three as in Figure 1, not in clusters of two as in Figure 7. We coded a student's response as positive if his or her rating of the positive quality within a paired comparison in Figure 7 is higher than his or her rating of the alternative negative quality. The average respondent made 3.9 positive choices. Scores range from 0 to 9, with a 2.1 standard deviation.

ASSOCIATION WITH NETWORK STRUCTURE

The key question is how reliably this simple index distinguishes respondents in different network structures. Figure 8 shows a strong association with network constraint. The index predicts about half of the variance in network constraint (52%). Respondents are nicely clustered around the regression line in the graph. Gender, race, and other Figure 2 respondent differences do not affect the association ($F_{8,41} = 0.74$, P = .66).

The correlations in the table below the graph in Figure 8 show the reliability of the association with network constraint. The -.74 index correlation with network constraint is (1) -.75 if the index is computed only from the first four items in Figure 7 (corresponding to the four MRG item clusters at the top of Table 1 disproportionately responsible for the association with network structure, cf., Figure 5), (2) -.64 if the index is computed from only the odd-number items in Figure 7 (1, 3, etc.), and (3) -.66 if the index is computed from only the even-number items (2, 4, etc.).[14]

---

responses would be to sum the scale values of a respondent's choices from each paired comparison. Here are continuous weights for options A and B under each item in Figure 7 where weights are the z-scores used to position items on the vertical axis in Figure 6: 2.3 and -1.0 for item 1, -2.6 and 1.6 for item 2, 2.0 and -2.0 for item 3, 3.2 and -.9 for item 4, -1.4 and 2.4 for item 5, -1.5 and .9 for item 6, 2.6 and -4.6 for item 7, -3.8 and 2.3 for item 8, -2.3 and .4 for item 9, then .3 and -.9 for item 10 (the item 10 pair differ on hierarchy). For three reasons, we replace continuous weights with equal weights of 1 for positive choice and 0 for negative: (1) Our respondents are not a probability sample of managers so we don't want to over-fit these data. (2) Equal weights are easier for respondents to score (instead of adding a sequence of continuous weights). (3) Equal-weight scoring is strongly correlated with continuous-weight scoring (.97 correlation) and does about as well in predicting network structure. The -.74 correlation in Figure 8 between network constraint and the index defined by equal-weight scoring is -.75 if the index is defined by continuous-weight scoring. The 3.3 t-test for the logit coefficient predicting the probability of an entrepreneurial network from the index defined by equal-weight scoring in Table 2 is 3.1 if the index is defined by continuous-weight scoring.

[14]The items do not covary as indicators of a single personality dimension so much as they covary in their association with network structure. The .53 split-half correlation in Figure 8 implies a modest .69 reliability for the whole ten-item index (2r/[1+r], where r is the split-half correlation) — less than the index correlation with network constraint. More to the point, there is no dominant factor in a principal component analysis of the personality items, but strong canonical correlations between the personality items and network structure. The first factor (principal component) extracted from five-point ratings on the 20 items in the top-ten item clusters used to predict network constraint in Figure 5 describes only 13.0% of item variance. The second and third factors describe almost as much (10.3% and 9.7% respectively), and the subsequent handful of factors each describe about 1% less than the preceding factor. The items hold together in their association with network structure. In a Table 1 canonical correlation model predicting network structure from the 20 personality items in Figure 7, canonical correlations are near-maximum (.91,

Turning to aggregate network structure, we sorted respondents into three categories of networks significantly different in social capital arguments; entrepreneurial networks, cliques, and hierarchical networks (Burt, 1992; 1997b). The first cut is between respondents with flat versus hierarchical structures (a center-periphery structure in which relations among contacts are concentrated in a minority of contacts). Respondents with above average Coleman-Theil hierarchy scores have hierarchical networks (see footnote 6). The second cut is between dense and sparse flat structures. A respondent with a dense flat structure has a clique network (hierarchy below average, constraint average or higher). A respondent with a sparse flat structure has an entrepreneurial network (hierarchy below average, constraint below average).

——— Figure 8 and Table 2 About Here ———

Respondents are ordered across the columns of Table 2 by network structure and down the rows by their index scores. The most reliable discrimination is between cliques and entrepreneurial networks. Entrepreneurial networks are of special interest because they contain the respondents most directly involved in structural holes. Respondents at the top of Table 2 made few positive choices. They tend to have a clique network. Their probabilities of having an entrepreneurial network are near zero. Respondents at the bottom of the table made primarily positive choices. Their probabilities of having an entrepreneurial network are close to one. Almost every respondent making more than five positive choices from the ten paired comparisons in Figure 7 has an entrepreneurial network. The null hypothesis of no association is easily rejected,[15] the probability of an

---

.89, and .87). This is a setting for scaling methods that aggregate personality items based on covariance with network structure.

[15]Consider three rejections that display different aspects of the association with network structure: (1) The probability of a respondent having an entrepreneurial network increases with index scores. Here is the logit function predicting entrepreneurial networks versus something else; -4.20 + .86(index), which defines the probabilities in Table 2 and generates a 3.3 t-test for the logit effect, P = .001. (2) Index scores are significantly lower for respondents in clique networks and higher for respondents in entrepreneurial networks. Here is the analysis of variance predicting a respondent's index score from a dummy variable distinguishing cliques from other networks (CN) and a dummy variable distinguishing entrepreneurial from other networks (EN); 3.46 - 1.68CN + 1.99EN, in which the clique effect is significant (-2.6 t-test, P = .01), the entrepreneurial network effect is significant (3.9 t-test, P < .001), and so the index differs significantly across the three kinds of network structures ($F_{2,48}$ = 16.5, P < .001). (3) The three categories of network structure are contingent on broad categories of index scores. Here is Table 2 reduced to the broad categories of low, moderate, and high index scores:

6	5	0
3	13	6
0	6	12

where low is 0, 1, or 2 positive choices (probability of an entrepreneurial network is less than one in ten), moderate is 3 or 4 positive choices (for which the probability increases to one in three), and high is five or more positive choices (for which entrepreneurial networks are more likely than other networks). Rows and columns are not independent in the table (20.6 chi-square, 4 d.f., P < .001). Low index scores are associated

entrepreneurial network is independent of respondent gender and seven other respondent differences,[16] and discriminant functions of the index items correctly predict the network category of most respondents.[17]

CAUTIONARY EVIDENCE FROM THE FIELD

There are four interpretations of the evidence that we wish to caution against. First, there is no implied causal order. This is a story about personality correlates of structural holes. People put into a position spanning structural holes could develop the personality characteristics of a network entrepreneur, or, having such a personality could lead people to build networks rich in structural holes.

Second, the analysis is no more than an exploration of personality correlates. We are not equally informed about the two sides of the link between network and personality. We study structural holes in terms of network constraint because constraint has the construct validity of accumulated evidence showing the expected negative association between constraint and manager performance. Taking a more open-ended view of personality, we study 252 personality items in 84 clusters for association with network constraint. We already mentioned that such a large number of items means some items can be expected by random chance to be significant. Specifically, we can expect at a .05 level of confidence that 4.2 of the 84 item clusters will be associated by random chance with network constraint (.05 times 84 equals 4.2). Four clusters of items in Table 1 are the core of the association with network structure, and the broader set of items selected for the

---

with clique networks (2.9 loglinear z-score for cell 1,1; P < .01) and rare with entrepreneurial networks (-2.3 z-score for cell 1,3; P = .02). High index scores are associated with entrepreneurial networks (2.9 z-score for cell 3,3; P < .01) and rare with clique networks (-2.0 z-score for cell 3,1; P = .04).

[16]Adding the eight non-network respondent differences in Figure 2 to the logit equation in the preceding footnote adds nothing to the prediction (9.65 chi-square, 8 d.f., P = .29). If we just enter class participation and gender, the two variables in Figure 2 most associated with participating in the study, we still get no significant differences between respondents (3.95 chi-square, 2 d.f., P = .14).

[17]Discriminant function models give variable weight to the items and so more accurately predict the network distinctions. We estimated two discriminant functions, one using the 10 dichotomous items in Figure 7 to predict the three categories of network structure (1 for positive choice, 0 otherwise), and one using 20 continuous variables defined by MRG ratings on the individual items corresponding to each response option in Figure 7. Here is the tabulation of actual networks (rows) and predicted networks (columns):

entrepreneurial	15	3	0	15	3	0
hierarchical		2	18	3	3	17	4
clique	0	3	7	1	2	6

The left tabulation is the prediction by the dichotomous variables and the right tabulation is the prediction by continuous. The second prediction is no more accurate, despite requiring more information (five-point ratings on 20 items).

personality index in Figure 7 are held together more by covariation with network structure than by covariation among the items (footnote 14). Concern for the obvious risk of statistical artifact was our reason for focusing in the text on two results: (1) The strength of the association with network constraint — we can expect four item clusters to have nonrandom association with network constraint, but the observed association is much stronger than would be sufficient to reject random chance. (2) The substance of the personality items associated with constraint — it is reassuring to see personality qualities one might expect of entrepreneurs who span structural holes.

Third, our respondents are a convenience sample of M.B.A. students. The students are more mature than the usual M.B.A. student, many were employed full-time during the study, and they are a heterogeneous set of people (in terms of percent women, minorities, and diversity of the industries in which they work). Regardless, it is difficult to generalize with confidence from our results with the students.

Figure 9 provides a welcome frame of reference. We included the personality index items in a network survey of corporate staff in a large financial organization. The study population is several hundred employees in staff positions responsible for employment services, information services, training services, and so on. Respondents completed a survey instrument containing the items in Figure 7, and a survey network booklet similar to the one that the students completed. The 217 respondents are representative of employee backgrounds, gender, and job performance, but disproportionately senior people (middle and senior managers are 40 percent of the study population, 53 percent of the respondents). We used the survey network data to measure the network constraint on each respondent, and distinguish respondents with entrepreneurial networks (as in footnote 5 and Table 2 respectively). We used the personality items to define a network entrepreneur personality index score for each respondent (as in Figure 8).

Figure 9 shows an association between network structure and the personality index, but not for all employees. The association is strong for people in clerical and technical jobs, and for junior managers (our M.B.A. respondents would be at the high end of these ranks). The correlation between network constraint and the personality index is strong (.43, 3.6 t-test, P < .001), and the bold line in Figure 9 shows a strong tendency for employees with high scores on the entrepreneur personality index to have entrepreneurial networks (2.5 logit t-test, P < .01). The association disappears among middle and senior managers. The dashed line in Figure 9 shows that the personality index scores have no association with the tendency for a middle or senior manager to have an entrepreneurial network (and the .03 correlation between network constraint and the index is about the same).

——— Figure 9 and Table 3 About Here ———

The implication of our results from students combined with the Figure 9 results from the field is that personality and network structure are more associated in the lower ranks of an organization. The contingent value of social capital offers a plausible explanation. Networks rich in structural holes are more valuable to people who have more control over the substance of their work and so have to spend more time getting others to accept the way they chose to define their work (Burt, 1997). One consequence is that networks rich in structural holes are more valuable for more senior managers, which means that the networks around more senior managers are less discretionary — their networks are an integral part of their work. Informal relations between people low in the organization are more discretionary in the sense that work is more defined by the boss than by negotiation with peers. Personality and network structure are therefore more free to covary in the lower ranks of organizations.

The contingent association between personality and network structure is further illustrated with our fourth, and final cautionary note. The caution is that the personality items are no substitute for network items in predicting manager performance. The association between personality and network structure could be interpreted as an incentive to measure social capital with personality items, rather than the more costly strategy of using network items to measure social capital with sociometric data. The results in Figure 9 argue against such substitution because personality is not associated with network structure for all managers.

The results in Table 3 argue further against the substitution because personality is less associated with network structure where networks are more consequential. We have, from the firm's personnel records, background data on each employee including job evaluations. Employees are evaluated each year on an A, B, C scale with plus and minus used to distinguish higher from lower performances within grades. These job evaluations stay with the employee over time to determine compensation and promotion. In Table 3 we use the personality and network data to predict which employees receive the highest job evaluations (evaluation of A versus B or C).

Three points are illustrated. First, neither the personality nor the network data are associated with job evaluations in the lower ranks. These are the ranks where personality is most associated with network structure (Figure 9). In other words, where personality is associated with network structure, performance covaries with neither.

Second, female middle and senior managers with entrepreneurial networks are more likely to receive the highest job evaluations (2.5 t-test for entrepreneurial network, -2.1 t-test for network constraint). Men are hurt by having an entrepreneurial network. A man is better off with a constrained network of interconnected contacts (2.6 t-test). This reverses the usual gender effect. Where men significantly outnumber women, it is the

Figure 1.
Example MRG Personality Item Clusters

	MOST		NEXT	
1. When evaluating opportunities, I am likely to look				
a. to use my specialized skills	5	4	3	2
b. for a chance to be in a position of authority	5	4	3	2
c. for the long-run implications	5	4	3	2
2. My strength lies in the fact that I have a knack for				
a. getting a point across clearly	5	4	3	2
b. being easygoing	5	4	3	2
c. never breaking a promise	5	4	3	2

Figure 2. Tests for Selection Bias
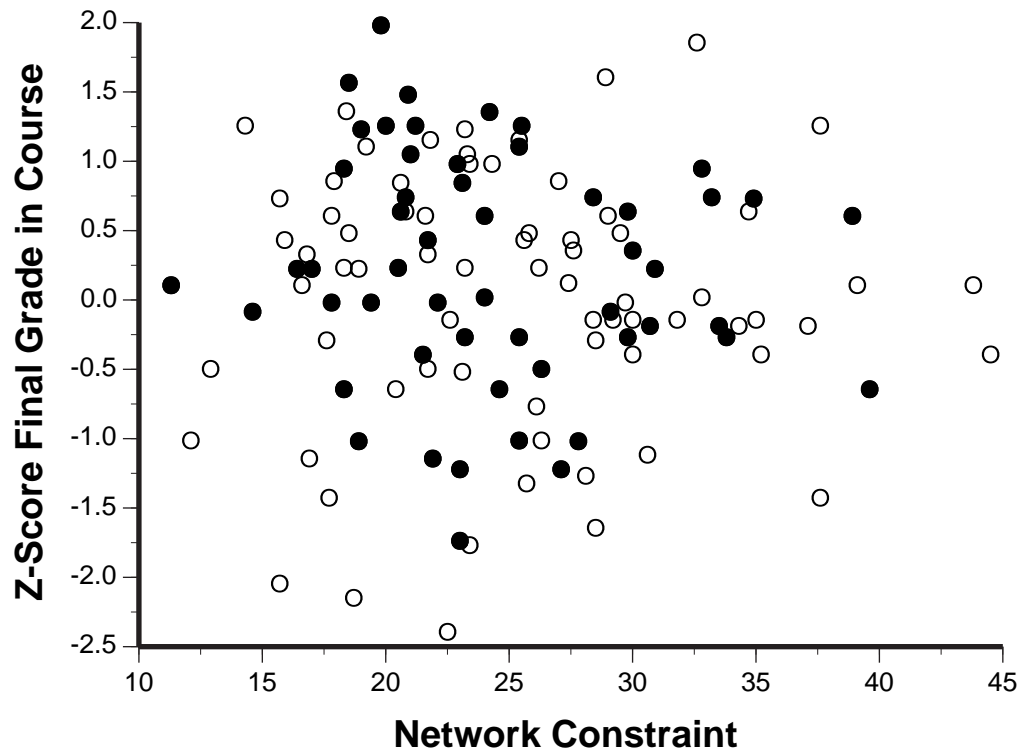
Predictor	Mean for the 51 Respondents	Logit Coefficient	Coefficient t-test
Enrolled in the Evening Program	.48	-.443	-.7
Enrolled in the Weekend Program	.24	.071	.1
In Second Year of M.B.A. Program	.41	.459	1.0
In Second Section	.47	.728	1.4
Z-Score Final Grade in Course	.26	.113	.4
Z-Score Class Participation	.31	.642	1.8
Female	.35	.743	1.6
Non-White	.18	-.566	-1.2
Network Size	13.98	.028	.3
Network Constraint	24.36	-.015	-.2

NOTE — Solid dots in the graph are people who completed the MRG questionnaire (51 completed questionnaires from 122 people). Logit coefficients in the table describe how the row variable changes the odds of a person completing the questionnaire.

Figure 3.
Item Correlations with Network Variables
(correlation magnitudes)

Figure 4.
Item Correlations with Network Constraint

2. My strength lies in the fact that I have a knack for

A. getting a point across clearly (-.35)

B. being easygoing (.49)

C. never breaking a promise (-.12)

Figure 5.
Personality Items Predict Network Constraint

dichotomous items

80%

70%

continuous items

60%

50%

40%

30%

20%

2   4   6   8   10   12   14   16   18   20

**Network Constraint Variance
Predicted by Equation**
(squared multiple correlation)

Number of Personality Items in Equation
(pairs of items within item clusters)

Figure 6. Personality Distinctions Associated with Structural Holes

Z-Score Relative Lack of Network Constraint Associated with Item

3.0

2.0

1.0

0.0

-1.0

-2.0

-3.0

-4.0

-5.0

look to be in a position of authority

trouble when people don't say what they really think

let people know what I think of them

won't let anyone make decisions for me

gregarious

loyalty to organizational principles

at getting everyone enthused

great enthusiasm

my ability to express my thoughts readily

too fussy about little things

set ever higher goals

explain objectives thoroughly

use others' abilities to help me reach my goals

sincerity and genuine caring about people

trouble when people lack stick-to-itiveness

would do well in personal counseling

the novelty of my ideas

others see me as planning for the future

trouble when people unwilling to compromise

willing to support my superiors

do a strong technical job

conscientiously follow employer's wishes

emphasize systems and procedures

being easygoing

let well enough alone

my ability to create an aura of excitement

seek the advice of my colleagues

best way to get things done: stick to the basics

others should be more willing to follow the rules

an outspoken advocate

let people know how they are performing

getting a point across clearly

sales abilities

many acquaintances

an extrovert

make sure things get done on time

go it alone

trouble when people won't listen to colleagues

want job that uses my boundless energy

for the long-term implications

admire people who make their own decisions

am very friendly to the new people I meet

show solid, considered judgments

help people feel better

overly empathetic

won people over to my views

motivating people to my views

talk straight from the shoulder

I set goals to constantly test my limits

take the safe approach

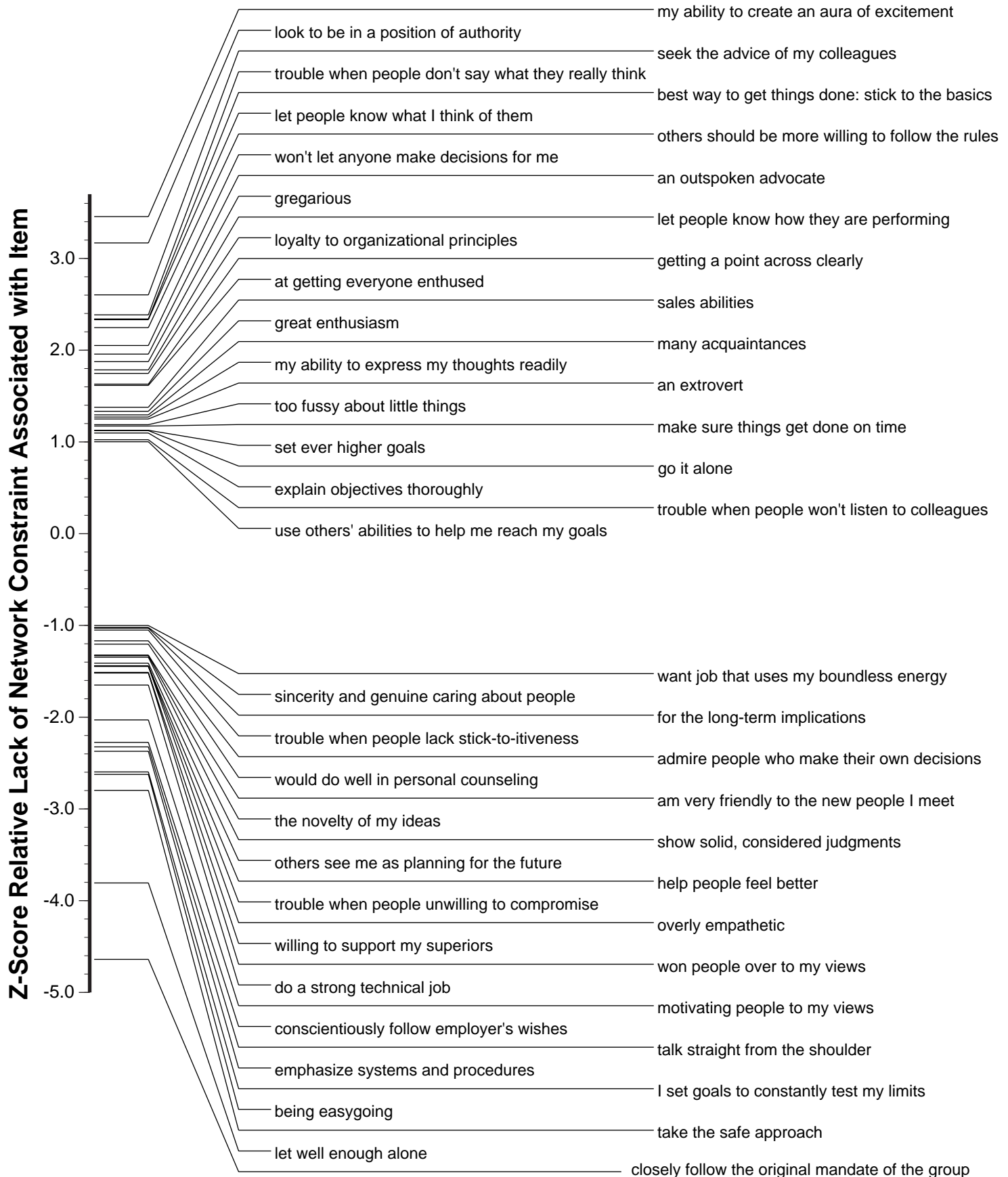closely follow the original mandate of the group

Figure 7.
Index Items

Select the phrase under each item that better describes you (circle A or B). Select only one phrase per item. If you disagree with both phrases, select the one with which you disagree less. With so few questions, it is important to select phrases that describe how you actually operate, rather than how you feel you should or would like to operate. There are no right or wrong answers. When you are finished, you should have a total of ten phrases circled.

1. When evaluating opportunities, I am likely to look . . .

      A. for a chance to be in a position of authority

      B. for the long-run implications

2. My strength lies in the fact that I have a knack for . . .

      A. being easygoing

      B. getting a point across clearly

3. In discussions among peers, I am probably seen as . . .

      A. an outspoken advocate

      B. motivating people to my views

4. In evaluating my aims in my career, I probably put more emphasis on . . .

      A. my ability to create an aura of excitement

      B. being in control of my own destiny

5. I believe that people get into more trouble by . . .

      A. being unwilling to compromise

      B. not letting others know what they really think

6. In a leadership role, I think my strength would lie in the fact that I . . .

      A. won people over to my views

      B. kept everyone informed

7. As a member of a project team, I . . .

      A. seek the advice of colleagues

      B. closely follow the original mandate of the group

8. Others are likely to notice that I . . .

      A. let well enough alone

      B. let people know what I think of them

9. In an emergency, I . . .

      A. take the safe approach

      B. am quite willing to help

10. I look to the future with . . .

      A. unshakable resolve

      B. a willingness to let others give me a hand

Figure 8.
Predicting Network Constraint from
the Network Entrepreneur Personality Index

$$C = 32.64 - 2.14(\text{Index})$$
$$(r = -.74)$$

Network Entrepreneur Personality Index
(number of positive choices)
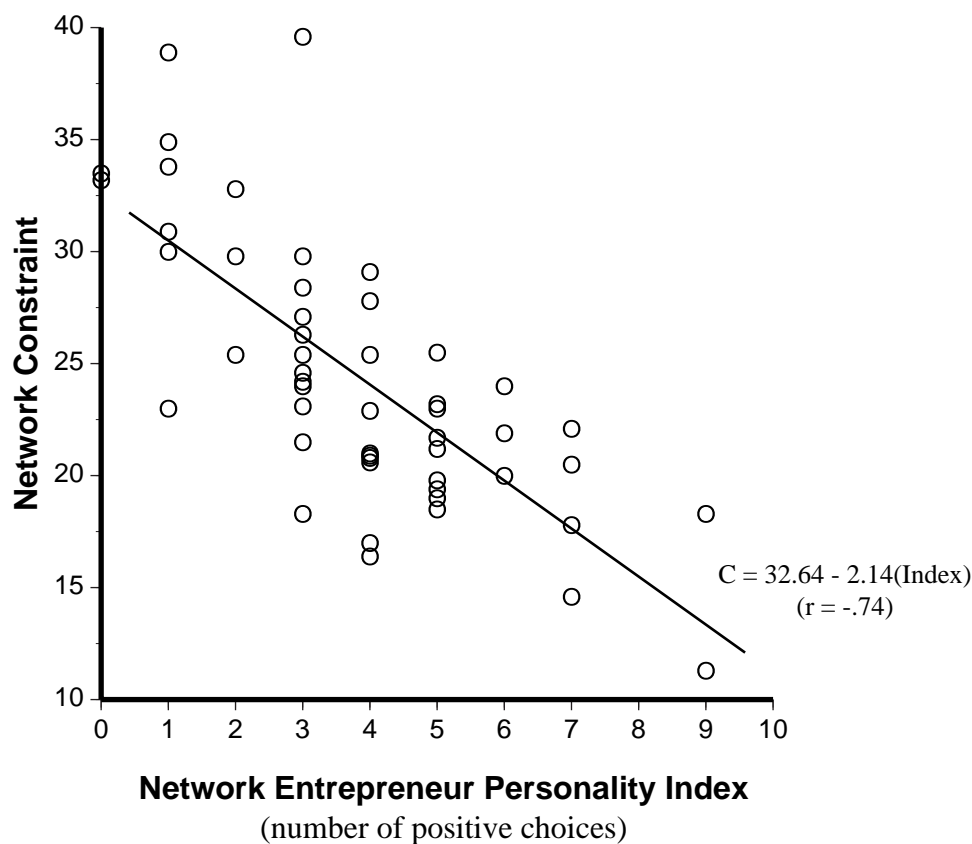
Correlations (N = 51)

1.00				Index (all 10 items)
0.85	1.00			Index (items 1, 2, 3, 4)
0.88	0.78	1.00		Index (odd-number items)
0.88	0.72	0.53	1.00	Index (even-number items)
-.74	-.75	-.64	-.66	Network Constraint

Figure 9.
Identifying Employees Who Have Entrepreneurial Networks

(S in logit equation is a dummy variable for middle and senior managers)

Clerical, Technical
and Junior Managers
(slope = .591)

Middle and Senior Managers
(slope = .004)

P(entrepreneurial network)

Network Entrepreneur Personality Index
(number of positive choices)
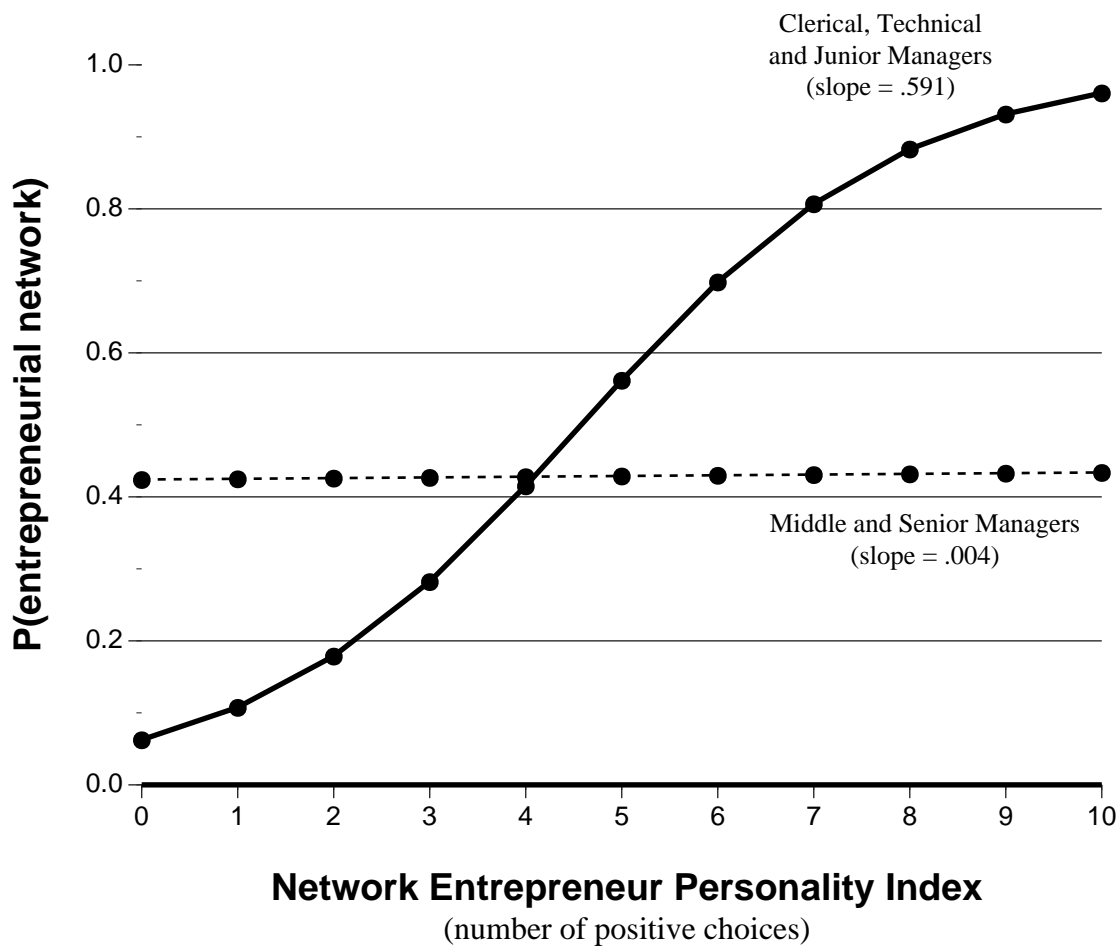
$$P(\text{entrepreneurial network}) = \frac{1}{1 + e^{-f}} \quad ; \quad f = -2.706 + 2.519S + (.591 - .587S)\text{INDEX}$$

(2.7)   (2.5)   (-2.4)

Table 1. Item-Cluster Correlations
with Network Structure

| Canonical Correlations | | | Header Phrase for Item Cluster |
First	Second	Chi-Square	
0.51	0.43	23.7	1. when evaluating opportunities, I am likely to look
0.55	0.33	23.4	2. my strength lies in the fact that I have a knack for
0.56	0.21	20.1	3. in discussions among peers, I am likely to be regarded as
0.55	0.13	18.3	4. in evaluating my aims in my career, I emphasize
0.48	0.30	17.1	5. I think people get into more trouble by
0.48	0.26	16.7	6. in a leadership role, my strength lies in the fact that I
0.43	0.34	15.1	7. if I were a member of a project team, I would
0.45	0.31	15.0	8. others are likely to notice that I
0.46	0.24	13.9	9. in an emergency, I
0.47	0.16	12.7	10. I look to the future with
0.41	0.27	12.3	11. if I had to admit it, people would probably see me as
0.38	0.28	12.2	12. others are likely to notice that I
0.44	0.18	11.8	13. my associates are likely to notice the fact that I
0.43	0.19	11.6	14. in my area, I insure that
0.38	0.21	9.8	15. an organization in which I am a member can count on me to
0.35	0.26	9.3	16. as a member of my group, my contribution comes from
0.34	0.27	9.3	17. I believe that the best way to get things done is to
0.40	0.15	9.0	18. people who meet me are likely to be impressed by my
0.37	0.17	8.3	19. organization problems would be less if people were more
0.32	0.22	7.7	20. when I set goals, I
0.28	0.13	4.9	80. I am a person who is generally willing to
0.27	0.14	4.5	81. when I ask people to do something really important, I
0.30	0.04	4.5	82. in taking a new job, I
0.18	0.10	1.9	83. in difficult situations, people notice my
0.14	0.12	1.6	84. when I am in trouble, I

NOTE — Each row is a canonical correlation model between the three items in the row cluster and three network variables (density, hierarchy, and constraint). Correlations are computed across the 51 respondents. The chi-square statistic has nine degrees of freedom, and tests the hypothesis of no correlation between the items and the network variables. A chi-square statistic larger than 17 gives the null hypothesis less than a .05 probability.

Table 2. Network Structure and
the Network Entrepreneur Personality Index

Network Entrepreneur Personality Index	Probability That Respondent Has an Entrepreneurial Network	Respondents with Clique Networks	Respondents with Hierarchical Networks	Respondents with Entrepreneurial Networks
0	.01	2	-	-
1	.03	2	4	-
2	.08	2	1	-
3	.17	2	7	3
4	.32	1	6	3
5	.52	-	5	4
6	.72	-	-	3
7	.86	-	1	3
8	.94	-	-	-
9	.97	-	-	2
10	.99	-	-	-

NOTE — The probability is of an entrepreneurial network is based on a logit function of the index predicting an entrepreneurial network versus a clique or hierarchical network (see footnote 15).

Table 3. Personality, Network Structure, and Job Evaluation

	Clerical & Technical Staff and Junior Managers (N = 102)		Middle Managers and Senior Managers (N = 115)	
Constant	-2.049	-2.176	-.140	.502
Network Entrepreneur Personality Index	.050 (0.4)	.158 (0.8)	-.361 (-2.6)	-.382 (-2.7)
Entrepreneurial Network	.690 (1.3)	——	1.343 (2.5)	——
Network Constraint	——	.009 (0.3)	——	-.090 (-2.1)
Male	.146 (0.2)	-.722 (-0.5)	.517 (0.8)	-.374 (-0.8)
Male*Entrepreneurial Net	-.076 (-0.1)	——	-2.065 (-2.1)	——
Male*Network Constraint	——	-.435 (-1.1)	——	.197 (2.6)
Chi-Square (4 d.f.)	2.39	3.13	14.51	15.33
Probability No Effects	P = .66	P = .54	P = .005	P = .004

NOTE — These are logit results predicting which employees received the highest job evaluations in their last annual review (evaluation of A versus B or C). Network entrepreneur personality index is the horizontal axis in Figure 9. Entrepreneurial network is a dummy variable (1 if employee has entrepreneurial network, Figure 9). Network constraint is measured relative to the average (C - mean C).