

# Eight

## Bent Preferences

Driven by the evidence of local and personal processes in the preceding chapters, I speculate in this chapter on the role individual people play in the process by which network structure constitutes social capital. This is the question of agency: How much do individuals matter relative to the social structure around them? The question's neglect in contemporary network analysis has been noted from a variety of perspectives (e.g., Emirbayer and Goodwin, 1994; Baum and Rowley, 2008; Kilduff and Krackhardt, 2008). With some exceptions, much of the social capital research on performance and network structure reads as though performance springs directly from structure. The phrase "as though" warrants emphasis. Everyone knows that people are the source of action. Measured networks are only the residue of how people have spent time together up to the moment a network is measured. However, agency has often been put aside to focus on describing the performance association with network structure. Even in this book, with its emphasis on local and personal processes, I made it all the way to this final chapter without mentioning agency.

Networks certainly affect what people can do in the sense that certain people are advantaged while others are hindered. Such effects have been described in the preceding chapters. However, networks also affect what people want to do, what they see as valuable. How much of the performance association with networks is due to differences in network advantage versus network-induced differences in seeing or seizing network advantage? Action that seems worthwhile to one person can seem trivial, even status eroding, to another person. Are networks the performance factor to manage, or would it be more effective to manage incentives to act on network advantage? Network advantage is worthless until someone acts on it.

## AGENCY IN NETWORKS

I begin with the usual solutions. There is no agency in the preceding chapters. People were drawn by brokerage opportunities into enhanced performance. People were pushed by closure into collaborative alignment. The agency question has not been ignored in these analyses, but it has been put aside in the usual two ways: it has been assumed away, and it has been held constant.

### **Assume It Away**

Agency can be put aside if it is coincident with opportunity. This solution to the agency question has been used in formal models and empirical research. Formal models of network dynamics address intuitions about aspects of social capital such as contacts exercising monopoly power to erode the returns to brokerage (Reagans and Zuckerman, 2008), or everyone striving to bridge structural holes (Ryall and Sorenson, 2007; Buskins and van de Rijt, 2008). The agency question is resolved by assuming that ego develops every opportunity and is motivated to increase the opportunities available, subject to a budget constraint of limited time or resources. To know who acts on network advantage, you only need to know who has network advantage. Thus, agency is not a variable in the analysis; it can be put aside.

Clarity and generality are the attractions of assuming that agency is defined by opportunity, but desperately wrong is another feature to the assumption. Managers often fall below the performance potential of their network. The usual data display of residual performance across levels of network advantage has a triangular distribution (e.g., Burt, 1992:37, for suspicion; Burt, 2005:37 for illustrative data displays). High performance often occurs with high advantage, and rarely occurs with low advantage. However, low performance often occurs with both high and low advantage. In other words, many people in brokerage positions do not derive advantage from their position. A variety of explanations are possible, but whatever the reason, it is clear that people are not equal in benefiting from the opportunities provided by the network around them.

The assumption can seem less strident when embedded in data. Imagine that the network structure around a person indicates personal preference. People adapt to the

network around them. They also learn, editing the network to personal taste. There is evidence that even a little network training can produce substantial improvements in learning new networks as well as the usual performance metrics indicating network advantage (Janicik and Larrick, 2005; Burt and Ronchi, 2007). Whatever the etiology of the network around a person, the person is motivated to act on the advantage provided by the kind of network to which they have adapted and contributed. Motivation need not be measured directly because it is already measured by data on the network (Burt, 1992:34-36; 2005:47-50). The result is the same as assuming agency away; agency can be put aside to focus on performance associations with network structure.

### **Hold It Constant**

A more direct solution to the agency question is to measure individual differences to hold them constant when predicting performance. To a degree, this is generic in social capital research. People differ in their ability to act on network advantage. Some are better educated. Some have more experience. Some hold higher job rank, or work in a more prosperous region. Therefore, individual differences in capability are held constant when measuring performance relative to peers, as illustrated in Figure 2.4. A manager is well paid, for example, to the extent that his or her compensation is higher than managers with the same education and experience, in the same kind of work, job rank, organization, location, and so on.

Beyond individual differences in capability are differences in motivation. Two people equally able to act on network advantage can have distinct inclinations to act; one drawn to it, another repelled. Inclination to act on network advantage has been attributed to individual personality, and more broadly, to culture. A familiar culture story is Weber's (1905) thesis that Protestant beliefs encouraged capitalism by making entrepreneurial behavior righteous. If I had network data from the Reformation, I would infer from Weber's argument that people more Calvinist in their beliefs would be more likely to act on network advantage. In a related vein, Xiao and Tsui (2007) argue that network brokerage is inconsistent with Chinese social norms, and show a lack of returns to brokerage in the job ranks on which they have data. Burt, Hogarth, and Michaud (2000) compare senior managers in a pair of French and American engineering firms.

The French networks are based on long-standing friendships that rarely spanned the boundary of the firm, while the Americans build from work relations that often reached outside the firm. Differences in the etiology of network connections notwithstanding, performance in both firms is associated with networks that span structural holes.

A familiar personality story is McClelland's (1961) thesis that the early formation of a need to achieve is a personality factor significant for later entrepreneurial behavior. I infer from the argument and research evidence that people raised insecure in their childhood would have a need to achieve that would predispose them to act on network advantage, resulting in them having performance metrics higher than peers. In a related vein, Anderson (2008) shows that managers with what he terms a high "need for cognition" are more likely to take advantage of the information advantages of the network around them. Mehra, Kilduff, and Brass (2001) argue that managers high on a personality index of self-monitoring are more likely to act on network advantage. Self-monitoring is a tendency to match one's speech and behavior to the situation — the way I behave here would be inappropriate over there. Mehra, Kilduff, and Brass report scores in self-monitoring higher for people whose networks more often span structural holes (also Oh and Kilduff, 2008), and show that performance increases with both network brokerage and self-monitoring.

I expect to see much more research adding personality and culture variables to network predictions of performance because the predictions are often successful, the predictions typically do not pay attention to agency, and it is interesting to talk about kinds of people prone or averse to action. However, it will be difficult to produce general theory from the research. The issue is not quality. The research to date has been of good quality and the strategy of measuring individual differences is attractive for its burden of proof. The null hypothesis can be cleanly rejected. The problem is the many alternatives that could reject the null hypothesis. The requirement for empirical evidence that is the strategy's strength is also its weakness. Numerous measures of personality could be added to the performance prediction, barriers to entry for new measures are easily breached, and the organization-specific data typically used to estimate performance returns to network structure are prone to idiosyncratic correlations inconsistent across research projects. So many individual differences could

be held constant. Holding constant a particular favorite cannot provide a general solution to the agency question.

### **Endogenous Agency**

The "assume it away" and "hold it constant" solutions treat agency as exogenous in that individuals come to their current network with agency predetermined. The "assume it away" solution has people a priori motivated to act on whatever network advantage occurs, or motivated to act on whatever their network is configured to provide. The "hold it constant" solution measures the personality or cultural dispositions an individual brings to their network.

The lack of returns to secondhand brokerage implies endogenous agency. I concluded in Chapter 4 that brokerage seems not to be beneficial for the information it provides so much as it is beneficial as a forcing function for the cognitive and emotional skills required to manage communication between colleagues who do not agree in their opinion or behavior. The cognitive and emotional skills produced as a by-product of bridging structural holes are the proximate source of competitive advantage. This interpretation implies endogenous agency in that agency is in some part determined by network context.

The exogenous-endogenous distinction with respect to agency is analogous to the person-situation distinction that followed Walter Mischel's (1968) review of personality measurement (Mischel, 2004, is an efficient port into subsequent research). The gist of the review is that personality measures vary so much for a person across situations that it is difficult to believe that the person has a personality in the form of emotional and behavioral traits independent of situation. A person can be aggressive in some situations, passive in others. A person can be depressed in some situations, elated in others. As Mischel (1968: 146) put it: "With the possible exception of intelligence, highly generalized behavioral consistencies have not been demonstrated, and the concept of personality traits as broad predispositions is thus untenable."

One way to reassert that personality is exogenous to situations is to say that personality measures contain random error, so reliable measurement requires repeated measures. In a widely-cited article, for example, Epstein (1979) reports on college

students making daily records of their strong feelings and behaviors. There is low reliability between daily records (correlations under .3), but high reliability between measures averaged across multiple days (correlations over .7). People who feel happy today, for example, cannot be predicted to feel that way tomorrow (one-day reliabilities of -.03 and .22, Epstein, 1979:1107), but people who feel happy across several days are likely to feel that way across several other days (.92 reliability for average across 15 odd-number days with average across 15 even-number days, Epstein, 1979:1107).

Personality does not have to be exogenous to affect outcomes. Instead of averaging personality scores across situations, Mischel and Shoda (1995) propose contingency theories of personality in which the personality manifest in a situation depends in some part on the situation. At work, Susan is passive. At home, she is not. The "if this situation, then that personality" statements that result make sense in terms of capturing personality-situation interactions. Looking back on the search for consistency as evidence of personality, Mischel (2004:13) reflects: "In retrospect, the intuition of consistency turns out to be neither paradoxical nor illusory: It is linked to behavioral consistency but not the sort for which the field was searching for so many years, and it was found by incorporating the situation into the search for invariance rather than by removing it."

With respect to social capital research, however, "if situation, then personality" variables only deepen the empiricist weakness of the "hold it constant" solution to the agency question. There are a great many existing and possible personality measures, any of which can be proposed as a control in a social capital prediction. The range of legitimate control variables is the empiricist weakness discussed above in the "hold it constant" solution. Different studies can be expected to report different results for different measures in different organizations. Add situational adjectives, and those many personality measures become each cross-classified by the many distinctions that can be made between situations, increasing by a power the controls to consider in a social capital prediction.

I take a related, but distinct, approach. Rather than build situational variation into personality theory, I model people and situations separately, then let agency emerge from people reacting to situations. Assuming that ego is more likely to act on

opportunities that provide clear benefit, one way to answer the network agency question is to model how benefit is perceived in network context. I want a solution to the agency question that is close to the ground in the sense that it can guide and be subject to empirical research at the same time that the solution provides general description across populations and levels of analysis. I want a solution that can be productive at the intersection of economics, psychology, and sociology; something consistent with substantive research in psychology and sociology, while capable of being used as a primitive term in formal models exploring network applications of economic reasoning (e.g., Jackson, 2008). The course I have in mind is in the spirit of what Hedström (2005) describes as analytical sociology, with its emphasis on "the actual mechanism at work." I draw on all three faces of social psychology (House, 1977): I draw on psychology to model people in terms of a function from psychophysics that has been shown to describe the stimulation people feel in response to actual stimulation. I draw on sociology to model the situation as a social network. I draw on symbolic interaction to describe how people use others in the situation as a frame of reference.

The result is a model of the mechanism by which ego's preferences are bent by the surrounding network. Bent preferences are evaluations shaped by social comparisons. Ego evaluates what she has, or what is proposed, in comparison to what she already has and what people like her, her network peers, have. She feels happy, or drawn to act, depending on her evaluation. More specifically, bent preferences are in two ways a subset of possible results from social comparison. First, they have a specific functional form inferred from the functional form of intra-personal evaluations observed in psychophysics research. Second, they emerge within a reference group severely constrained by social network analysis defining the extent to which each of the individuals in the network around ego serves as a "like me" peer with respect to whom social comparisons are made.

With respect to the three reference disciplines, the bent preferences model would fall under the relative income hypothesis in economics, social comparison theory in psychology, and reference group theory and the concepts of relative advantage and deprivation in sociology. My training in sociology will be clear in the forthcoming pages, but here and in Appendix G, I make an effort to sketch links to work all three disciplines.

I can do no more than sketch links. Each link I made revealed to me three or four others next to be made in an expanding web of related work. I only know enough now to be sure that there are interesting links to be made into each of the three disciplines.

I refer to the bent preferences model as an exercise in social psychology because the model predicts a psychological state from the social context in which the state occurs. Thus, the model is social psychology of the classical kind in which the social is a causal factor in ego's psychological state, versus contemporary work in which the social is merely an object subject to intra-personal perception (Greenwood, 2004). At the same time, in keeping with contemporary social psychology, the model makes the social a causal factor without positing a transcendental group mind. Ego is merely assumed to make inter-personal comparisons just as she makes intra-personal comparisons. Without speculating about a group mind, and without assuming that ego knows the preferences of her peers, a variety of hypotheses are implied by the way ego makes social comparisons that give social context a causal role in her evaluations, thereby defining a social psychology of network agency.

Fair warning: Argument here is more formal than the arguments in the preceding chapters. The empirically verified precision with which psychophysics describes stimulus-response means that I can speak with more precision about agency than I could discuss performance in the earlier chapters. I take advantage of the available precision. The math involved is modest, but it is sure to irritate some readers I wish to reach. My only excuse is that when a little math accurately captures a key mechanism, it is worth extra effort to use the math to track down clear, testable implications to better understand the mechanism. I feel empowered by the available math closely tethered to familiar data, but I only retain key bits in the text, relying on footnotes for asides to the reader interested in more detail.

## PERCEPTION IN NETWORK CONTEXT

Consider ego evaluating alternative courses of action. Allow, for the sake of argument, that the resources relevant to ego's choice can be measured on a single dimension. Complex stimuli can be addressed after evaluation is linked to network context, but for



the moment allow a single dimension. The stimulation dimension could be money, people, time, or any other resource. Whatever the resource, ego's felt resources, what she feels she has, is a subjective evaluation of what she actually has. Evidence from psychophysics shows that physical stimulation,  $x$ , translates into felt stimulation,  $u$ , by a power function:

$$u = \kappa x^v, \tag{1}$$

where  $\kappa$  and  $v$  are parameters to be estimated (Greek letters will reference parameters). Stevens (1975) provides examples and a review of work leading to equation (1), with interim reviews available in journal archives (Stevens, 1957, 1970). Unless otherwise indicated, illustrative estimates for the exponent  $v$  are taken from Stevens (1957:166, 1970:1045, 1975:15).<sup>1</sup>

The association described by equation (1) is illustrated in Figure 8.1. One possibility is that ego's felt resources increase linearly with actual resources (e.g., the straight line in Figure 8.1 for  $v$  equal 1). For example, when the subject in a psychophysics experiment is presented with a line and asked to describe its length, there is a linear association between the length of the line displayed and the reported length of the line.

—— Figure 8.1 About Here ——

Felt resources are often assumed to increase more slowly than actual resources, which happens when the exponent  $v$  is a fraction between zero and one. An example from psychophysics research is the .3 to .7 exponent obtained for people evaluating the loudness of a sound. Low volumes are overestimated. Differences between high

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<sup>1</sup>The power function in equation (1) is widely cited as a benchmark, but also has its critics. Most relevant to the discussion here, Stevens' evidence for the function was obtained by individuals evaluating magnitudes with respect to a single reference point (so differences in the function at different reference points are ignored, see Steingrimsón and Luce, 2006:17-19, for illustration) and fitting the function to evaluations averaged across individuals, rather than fitting the function to individual responses directly (so Stevens' method did not provide a direct test of the power function). More sophisticated criticism of the power function with respect to ratio measurement and signal detection are beyond the scope of this chapter, though it is reassuring to read that Luce's (Luce, 2002:520) more sophisticated treatment "sharply limits the form of the psychophysics function to either a power function or something that for most of the range closely approximates a power function." Regardless, the precision of the psychophysics power function is well ahead of the precision with which network mechanisms are defined and measured. I begin with the simplicity of equation (1), in no way preempting future moves to more sophisticated psychophysics when and if significant substantive results emerge with the bent preferences model derived from equation (1).

volumes are underestimated. A fractional exponent corresponds to the familiar assumption of marginal decreasing utility; increasing stimulation yields decreasing effect. A thousand dollars is a lot of money for someone who has very little. It is less impressive for someone who has many thousands. Hamblin (1971:433) reports estimates of  $v$  for people evaluating the status associated with increasing levels of annual income. Hamblin's estimates are about .5, showing that the largest felt increases in status come from unit increases at low levels of income (e.g., the line in Figure 8.1 for  $v$  equal .5).

If the exponent is greater than one, then ego's felt resources increase faster than her actual resources. For example, the exponent is 3.5 for people evaluating the strength of an electric shock administered through their fingers. Small shocks are difficult to identify. Differences between strong shocks are overestimated. Educational status is a more familiar example: Hamblin (1971: 432) reports exponents of about two for the association between educational status and years of education (e.g., the line in Figure 8.1 for  $v$  equal 2). An additional year of education generates more status for a college graduate than it does for someone with an elementary school education. Ego is perceived to be better educated when she is familiar with that state-of-the-art business process, can discuss that recent article in the Wall Street Journal, or can explain how to do that much-abused new calculation.

### **Marginal Evaluation**

Equation (1) implies that evaluations are made at the margin of what ego currently has. The raise ego feels from an increase in her salary ( $du$ ), equals the salary increase ( $dx$ ) multiplied by the rate at which ego feels increase at her current salary ( $\partial u/\partial x$ ):

$$\begin{aligned} du &= (\partial u/\partial x) dx, \\ &= (v\kappa x^{(v-1)}) dx, \\ &= (vu/x) dx. \end{aligned}$$

The partial derivative in parentheses defines felt increase benchmarked against  $x$ , ego's current condition. Dashed lines in Figure 8.1 illustrate the calculation. For ego on the horizontal axis at resource level  $x$ , generating on the vertical axis a felt level of resource  $u$ , the increase  $dx$  increases ego's felt level of resource by  $du$  to a higher level  $u+du$ .

The idea that ego evaluates an increase in resource against what she currently has is the familiar idea of marginal evaluation. There is no absolute good or bad, high or low. Such adjectives are meaningful relative to a benchmark, which in psychophysics has been ego's current condition.

### **Marginal Interpersonal Evaluation**

Evidence for the power function in equation (1) comes from people making evaluations when they are alone in a psychophysics laboratory. Imagine another person in the lab, a person socially similar to ego such that ego views the other person as “like me” (Laumann, 1965). Based on the history of research on peer influence discussed in Appendix G, I expect ego to make evaluations that take into account the other person. More, with no other evidence to go on, I expect ego to use the other person as a frame of reference in the same way that she uses herself as a frame. According to equation (1), ego making an evaluation feels an increase in  $x$  as a function of her current level  $x_i$ , as described by the partial derivative displayed above in parentheses, here displayed in brackets with  $u$  referring to ego and  $x_i$  referring to ego's current level of  $x$ :

$$\left[ \frac{vu}{x_i} \right],$$

The analogy for interpersonal comparison is that ego brings person  $j$  into the evaluation by performing the same marginal calculation with respect to the other person, imagining how things would feel if ego were in the other person's situation:

$$\left[ \frac{vu}{x_j} \right], \tag{2}$$

which is a marginal evaluation for ego stated with respect to resources  $x_j$  held by the other person. There is no assumption in equation (2) that ego knows what the other person feels. Ego is not assumed able to look into her neighbor's soul to understand the neighbor's preferences, implicit or expressed. Ego is only assumed able to imagine what it would be like to have what her neighbor has, to have the neighbor's budget, to have the neighbor's subordinates, to have the neighbor's salary, to imagine herself in her neighbor's position.

The mechanism in equation (2) is not limited to neighbors with whom ego speaks. Communication is symbolic rather than behavioral. Symbolic communication is familiar from a school of sociology established in the early 1900s with the work of Cooley, Mead, and Thomas (e.g., Collins, 1994: Chap. 4). The interpersonal comparison in equation (2) has ego putting herself in the roles of other people, from which a generalized other emerges to guide ego in her own opinion and behavior (Mead, 1934:154-155). More significant for economic sociology, equation (2) is a way for interpersonal influence to reach wordlessly across the structural holes in a network. Equation (2) does not require that ego has direct, or indirect, or any contact with the person in whose position she puts herself. Ego only needs to be aware of the other person and have a sense, accurate or not, of the person's current resources. The critical element that enables and makes likely the interpersonal comparison is ego perceiving the other person to be “like me” such that the other person is a frame of reference for ego's own evaluations.

### **Bent Preferences**

Let  $w_{ij}$  be a proportional measure of the extent to which person  $j$  plays such a role in  $i$ 's evaluations ( $0 \leq w_{ij} \leq 1.0$ ,  $\sum_j w_{ij} = 1.0$ ). I use network structure to define the  $w_{ij}$  below, but for the moment, allow that  $w_{ij}$  is the extent to which person  $i$  sees person  $j$  as “like me” such that  $w_{ij}$  measures the proportional weight person  $j$  carries in  $i$ 's evaluation. In the absence of evidence requiring something more complicated, I model ego's marginal evaluation as a weighted average across the  $N$  people in the network around ego:

$$\frac{\partial U}{\partial x_i} = w_{i1} \left[ \frac{vU}{x_1} \right] + w_{i2} \left[ \frac{vU}{x_2} \right] + \dots + w_{ii} \left[ \frac{vU}{x_i} \right] + \dots + w_{iN} \left[ \frac{vU}{x_N} \right]. \quad (3)$$

I use upper-case  $U$  to distinguish this evaluation from the  $u$  in equation (1). Equation (3) simplifies to equation (1) if ego is alone with no peers ( $w_{ii}$  equals 1.0), or if ego and her peers are receiving the same level of stimulus ( $x_j = x_i$  for all  $j$  for whom  $w_{ij}$  is nonzero). The network evaluation in equation (3) contains an element for ego using herself as a frame of reference, and a sum of elements describing ego using each other person  $j$  as

a frame of reference. Integrating equation (3) provides a network model analogous to the psychophysics model of individuals making evaluations in isolation:

$$U = \left( w_{ii} + \sum_j \phi w_{ij} \left[ x_i/x_j \right] \right) \kappa x_i^\nu, \quad (4)$$

where ego  $i$  is excluded from the sum across peers ( $j \neq i$ ), I have ignored the integration constant, and  $\phi$  is a parameter that dampens resources felt relative to peers (parameter  $\phi$  is a fraction equal to  $\nu/(\nu+1)$ , that increases toward 1.0 as  $\nu$  increases).<sup>2</sup> Defined by equation (4), ego's felt level of resource increases with her actual resource ( $x_i$ ) and the ratio of that to whatever each peer has ( $x_i/x_j$ ). I will refer to  $U$  as a bent preference, and

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<sup>2</sup>I do not elaborate on the dampening parameter  $\phi$  in the text because I do not need it to reach the hypotheses to be presented. The parameter is created by my extrapolation from intrapersonal evaluation in equation (1) to interpersonal evaluation in equation (2). Holding network structure and peer  $j$ 's resources constant during ego's evaluation (i.e., constant  $w_{ij}$  and  $x_j$ ), the integral of equation (3) with respect to increasing ego resource,  $x_i$ , contains two kinds of elements summed in equation (4), one for ego's comparison to herself:

$$\kappa w_{ii} \int \left[ \frac{\nu x_i^\nu}{x_i} \right] = w_{ii} \kappa x_i^\nu,$$

and  $N-1$  elements in a network size  $N$  for ego's comparison to each other person  $j$ :

$$\kappa w_{ij} \int \left[ \frac{\nu x_i^\nu}{x_j} \right] = \kappa w_{ij} \int \left[ \frac{\nu x_i^{\nu+1}}{(\nu+1)x_j} \right] = \phi w_{ij} (x_i/x_j) \kappa x_i^\nu,$$

where peer  $j$  is each person other than ego  $i$ . Because I replaced ego resource,  $x_i$ , with peer  $j$ 's resource,  $x_j$ , in the denominator of equation (2), the interpersonal comparison does not simplify as cleanly as the intrapersonal comparison implicit in equation (1). I end up with a multiplier  $\nu/(\nu+1)$  in the interpersonal comparison, which I put aside as the dampening parameter  $\phi$ . I could have dropped  $\phi$  from equation (4) and worked backward to find a derivative that would imply a  $\phi$ -free version of equation (4). That would put the  $\phi$  complication in equation (3) instead of equation (4). I prefer, and it is no more than personal preference at this point, to leave the  $\phi$  complication in equation (4) for two reasons: First, to simplify the argument from intrapersonal evaluation (equation 1) to interpersonal evaluation (equations 2 and 3), and second, because my use of the integral in equation (4) is rudimentary at this stage of theory development. Having specified the dampening parameter  $\phi$ , however, it merits brief explanation for its potential substantive meaning beyond a mathematics place-keeper ignored in the hypotheses to be discussed in the text. The dampening parameter measures the extent to which ego with peers feels that she has less resource than she would if she were alone; her felt resources are dampened down from what they would be if she were alone. This is illustrated in Figure 8.3 by the solid lines lying below the dashed line in Figure 8.3A until ego exceeds her peers by more than a unit of resource. The point is illustrated in Figure 8.3B by the solid lines crossing the dashed line when ego's peers are still a unit of resource below what ego has. The ratio of  $\nu$  to  $(\nu+1)$  is larger when  $\nu$  is less than one, so dampening parameter  $\phi$  will most affect evaluations subject to marginally decreasing utility.

equation (4) as a bent preferences model. Equation (4) describes evaluation bent by the surrounding network in which it occurs.

Bent preferences preserve the psychology of marginal evaluation. Equation (4) is identical to equation (1) for evaluations made in isolation. For ego alone, all  $w_{ij}$  equal zero, except  $w_{ii}$  which equals one, so equation (4) reduces to  $U = \kappa x_i^\nu$ , which is the power-function psychophysics model in equation (1).

For evaluations made in a social context, bent preferences broaden motivation to include other people. Sherif's (1935) early experiments on peer pressure showed that people in isolation resort to their personal history as a frame of reference to guide them through difficult evaluations, but they use peers as a frame of reference when peers are available (more detail is in the first few pages of Appendix G). To what extent would implementing the new business practice put me ahead, or behind, people like me? The idea that people understand themselves through comparison to others is the concept of relative advantage and deprivation, discussed as reference group theory in sociology (Stouffer et al., 1949; Merton and Rossi, 1957; Merton, 1957; Stouffer, 1962), social comparison theory in psychology (Festinger, 1954), and the relative income hypothesis in economics (Duesenberry, 1949; Leibenstein, 1950).<sup>3</sup> The concept of relative deprivation emerged just after World War II from research conducted under Samuel Stouffer while he was a sociology professor at the University of Chicago, serving as Director of the Research Branch, Information and Education Division of the U.S. Army (more than 200 questionnaires used to interview more than half a million soldiers between December 8, 1941 and the end of the war). Stouffer was recruited to Harvard right after the war to run the Laboratory for Social Relations, where he and colleagues

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<sup>3</sup>Social comparison in psychology is similar in metaphor to reference group theory in sociology, which is not surprising because they developed together during a period of frequent cross-reference between sociology and psychology, the golden age for social psychology (House, 1977, 2008; Sewell, 1989; Greenwood, 2004; Pooley and Katz, 2008). More specifically, the person who created social comparison theory, Leon Festinger, led the earlier research (Festinger, Schachter, and Back, 1950) so warmly cited in the influential Columbia University research by Lazarsfeld, Katz, Coleman, and colleagues on opinion leaders and diffusion, which together with Stouffer's American Soldier, provided the foundation for Merton's theoretical work in sociology on reference groups — all of which is foundation for my treatment in this chapter of social context creating bent preferences. Kindred economic theory emerged at the same time on a separate track. The relative income hypothesis and its component effects have a great deal to say about population implications of social comparison when it occurs, but little to say about the situations in which social comparison is unlikely, so I draw few results from that work for this chapter (primarily from Frank, 1985, but see Appendix G, "Corresponding Developments in Economics").

produced a final report, The American Soldier, in which the concept of relative deprivation was a recurring theme. Stouffer et al. (1949:125, italics in original) describe wide differences in soldier attitudes as a preface to introducing the concept: "To help explain such variations in attitude, by education, age, and marital condition, a general concept would be useful. Such a concept may be that of relative deprivation . . . The idea is simple, almost obvious, but its utility comes in reconciling data, especially in later chapters, where its applicability is not at first too apparent. The idea would seem to have a kinship to and, in part, include such well-known sociological concepts as 'social frame of reference,' 'patterns of expectation,' or 'definition of the situation.' Becoming a soldier meant to many men a very real deprivation. But the felt sacrifice was greater for some than for others, depending on their standards of comparison." Research is now available on such as how comparisons are made, with whom, and toward what end (e.g., Hyman and Singer, 1968; Frank, 1985; Suls and Wheeler, 2000; Walker and Smith, 2002; Guimond, 2006; Buunk and Gibbons, 2007; Greenberg, Aston-James, and Ashkanasy, 2007). The model in equation (4) is consistent with evidence in The American Soldier (Burt, 1982:195-198), but the power of the model lies in a precise definition of relative advantage and deprivation in terms of network context. Before discussing how context defines peers, I illustrate the expected peer effect on ego.

### Relative Advantage

Figure 8.2 describes ego feeling relative advantage. The vertical axis describes how ego feels about her resources increasing while peer resources are fixed. For this illustration, I put measurement metrics aside by setting the stimulus-specific constant  $\kappa$  to one. In addition, assuming knowledge in organizations is analogous to education, I use the exponent of two that Hamblin (1971) reports for people evaluating the status associated with years of education. As a benchmark, the dashed line in Figure 8.2 describes ego alone. The dashed line in Figure 8.2 is identical to the upward-sloping line in the Figure 8.1 psychophysics results for an exponent  $v$  equal to two.

—— Figure 8.2 About Here ——

The heaviest solid line in Figure 8.2 describes the simplest social situation, ego and one peer such that ego and the other person have equal weight in one another's

evaluations. The line is defined by the following expression:  $.5 x_i^2 + .5 (.66) x_i^3$ , which is equation (4) with parameters and scores inserted for the example ( $\kappa = 1$ ,  $v = 2$ ,  $x_j = 1$ ,  $w_{ij} = .5$ ), and  $x_i$  is ego's resource level. The first term in the expression is from ego's evaluation with respect to her own resources. The second term is from ego putting herself in her peer's situation. The bold solid line rises faster than the dashed line, showing the extent to which ego feels satisfied with her resources because she has more than her peer. Whatever the intrinsic value of your resources, there is an element of satisfaction in having more than other people like you. You can feel like a big frog if you find a suitably small pond. The other solid lines in Figure 8.2 show what is to be expected in larger groups. The lines are higher than the bold solid line, but they do not increase ego's felt advantage in proportion to the number of peers exceeded. The largest increase in relative advantage happens when ego shifts from being alone to being with one other person, as when ego is pitted against a single competitor.

Returning to the initial research in The American Soldier, racial differences in soldier attitudes are often cited as an example of relative advantage. On average, African-American soldiers in 1943 were less satisfied than White soldiers with military life. Whites were more likely to say that the war was as much their personal responsibility as anybody's, the war was being fought for the right of free speech for everyone, everyone was being given a fair chance to participate in the war effort, or the military police treat soldiers fairly (Stouffer, et al., 1949:507ff.). However, African-American soldiers stationed in the South were more positive about military life, especially if they grew up in the South. Stouffer and his colleagues (1949:563) interpret this in terms of relative advantage: "Relative to most Negro civilians whom he saw in Southern towns, the Negro soldier had a position of comparative wealth and dignity. His income was high, at least by general Southern standards. Moreover, in spite of the Army carryover of many civilian practices of segregation, the Negro soldier received treatment more nearly on an equality with the white soldier than the treatment of the Negro civilian in the South as compared with the white civilian."



### Relative Deprivation Intensity

Figure 8.3 describes ego feeling relative deprivation. Dashed lines describe evaluations independent of peers (equation 1), and solid lines describe evaluations affected by their network context (equation 4).

—— Figure 8.3 About Here ——

The graph to the left, Figure 8.3A, shows ego catching up with peers. This is the same social situation as in Figure 8.2 except I increased the resources held by peers from one to three units. Solid lines below the dashed line in Figure 8.3A show that ego with less than her peers makes ego feel as though she has less resource that she would if she were alone (the dampening effect of peers, see footnote 2). There is a comparable interval of relative deprivation in Figure 8.2, but it is difficult to see because it is condensed into the interval between zero and one (note the dashed line slightly above the solid for ego resource less than one unit). Reversing the familiar colloquialism, this is a small frog in a big pond. A person with a good college education can feel intimidated in an office full of people with M.B.A. degrees and doctorates.

Figure 8.3B shows how ego feels as good things happen for peers. The dashed line is horizontal because ego in isolation is unaffected by what happens for peers. The solid lines describe ego's misery as peers who were below her, catch up, and surpass her. The heaviest solid line in the graph describes ego with one peer. The line is defined by the expression:  $4.50 + 8.91/x_j$ , which is equation (4) with scores and parameters for the example inserted ( $\kappa = 1$ ,  $\nu = 2$ ,  $x_i = 3$ ,  $w_{ij} = .5$ ), and  $x_j$  is the peer's resources.

Ego's feels intense loss as peers catch up. Ego suffers no actual loss, but she feels loss. She loses something she felt she had. The severity of the felt loss results from evaluation based on a ratio of ego to peer resources. Whatever ego has feels like a lot when her peer has very little ( $x_i$  feels big when divided in equation 2 by a very small  $x_j$ ). That inflated feeling of worth, bulging from comparison to a less-fortunate peer, evaporates quickly as good things happen for the peer (ratio  $x_i/x_j$  drops quickly as

$x_j$  increases from near-zero).<sup>4</sup> Highway driving provides a familiar example. You are driving on the highway and a car comes up out of nowhere to pass you. The approaching car makes you feel as though you have slowed. Academic life provides a specialized example. The first person in a cohort of sociology graduate students who publishes a paper in the American Journal of Sociology has an intense feeling of accomplishment. That feeling is eroded when a weak member of the cohort soon thereafter publishes a paper in the journal. The merit of the earlier publication is unchanged, but its felt significance is diminished.

Numerous instances of relative deprivation emerged in The American Soldier. An example close to contemporary life in organizations is education and promotion. It is not surprising to see that soldiers with more education were more likely to be promoted, or that soldiers who advanced more slowly relative to others of equal longevity were more critical of promotion opportunities (Stouffer et al., 1949:246ff). However, soldiers with more education were more negative about their opportunities for promotion. Why would the people who have more opportunity feel that they have less opportunity?

Table 8.1 contains illustrative data (Stouffer et al., 1949: 250-258).<sup>5</sup> The table summarizes sample noncommissioned officers, noncoms, expressing their opinion of

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<sup>4</sup>The partial derivative of what ego feels she has (equation 4) with respect to increasing peer resources ( $x_j$ ) is a negative ratio of ego's resources to peer resources:  $\partial U/\partial x_j = -\kappa \phi w_{ij} x_i^{(v+1)} x_j^{-2}$ , so ego's felt deprivation is more severe to the extent that the peer is similar to ego ( $w_{ij} > 0$ ), and increasing from below ego ( $x_j < x_i$ , which is the interval to the left in Figure 8.3B where the solid lines descend most steeply).

<sup>5</sup>I offer the illustrative data in Table 8.1, and the original text of Stouffer's explanation, because the original text can be difficult to obtain (Stouffer, 1962, is another source for key bits of relative deprivation evidence from the full study). Statistics reported in this and the next paragraph are based on loglinear models of frequencies computed from percentages and respondent numbers in a graph in The American Soldier based on opinions expressed by sample enlisted men numbering 628 noncommissioned officers (in Table 8.1) and 1,379 other enlisted men (privates and privates first class; Stouffer et al., 1949:252). I began with frequencies for the original four-way tabulation: opinion (four categories), by education (as in Table 8.1), by service branch (as in Table 8.1), by rank (noncom versus other enlisted). I ran a saturated loglinear model of the frequencies to identify strong interactions. The two opinion responses combined as negative in Table 8.1 were combined in the original study. The two responses combined as neutral in Table 8.1 had similarly negligible loglinear associations with the other three variables, so I combined them as a single category. Higher-order interactions with rank were also negligible, so I eliminated them from the model (11.13 chi-square statistic for all 2,007 sample men, 6 d.f.,  $P = .08$ ). This is the loglinear model providing the 5.45 and -9.62 z-score test statistics in the text for education and service-branch associations with noncom rank (so the association between rank and education is holding constant service branch and the association between rank and service branch is holding constant education). I only present the noncommissioned officers in Table 8.1 as illustrative data because relative deprivation was more apparent among the noncoms than the other enlisted men. The only statistically significant

promotion chances. Noncoms here are corporals and sergeants. Longevity is held constant by only considering soldiers who have been in the Army for one to two years. The soldiers in Table 8.1 most likely to be positive about their promotion chances were low-education Military Police (58% positive, 8% negative). The soldiers most likely to be negative were high-education men in the Air Corps (19% positive, 34% negative). Loglinear z-score test statistics in Table 8.1 show that the opinion associations with education and service branch are statistically significant beyond a .001 level of confidence.

———— Table 8.1 About Here ————

In contrast to soldier opinion, the truth about promotion opportunities can be seen in the extent to which enlisted soldiers held noncommissioned officer rank. Within the sample enlisted men from among whom the noncoms in Table 8.1 were drawn, 39.9% of high-education enlisted men were noncoms (versus 23.0% of low-education men; 5.45 loglinear z-score for the education association with noncom rank), and 25.6% of the sample enlisted men in the Military Police were noncoms (versus 52.6% in the Air Corps; -9.62 loglinear z-score for the lower odds of an MP noncom rank).

Educated enlisted men in the Air Corps had the best chances for promotion to noncom rank. Why were they the most likely to express negative opinions about their promotion chances? Stouffer and his colleagues (1949:251-253) answered the question in terms of exposure to relative deprivation. Begin with the promotion chances of a high-education enlisted man in the Military Police:

The chances of his being a noncom were 34 out of 100, based on the proportions of noncoms in the sample at this time. If he earned the rating, he was one of the top third among his fellows of equal educational status. If he failed to earn the rating, he was in the same boat with two thirds of his fellows with equal schooling. Contrast him with the Air Corps man of the same education and longevity. The chances of the latter's being a noncom were 56 in 100, based on the proportions in this sample at this time. If he had earned a rating, so had the majority of his fellows in the branch, and his achievement was relatively less conspicuous than in the MP's. If he had failed to earn a rating, while the majority had succeeded, he

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interactions were two-way, so I eliminated the three-way interactions among opinion, education, and service branch (4.03 likelihood ratio chi-square across the 628 noncoms, 2 d.f.,  $P = .13$ ). This is the loglinear model that provides the z-score test statistics in Table 8.1.

had more reason to feel a sense of personal frustration, which could be expressed as criticism of the promotion system, than if he were one of two thirds in the same boat, as among the MP's.

The process would work in the same way among the less educated. In both the Military Police Branch and the Air Corps, the promotion chances of the less educated were inferior to the chances of others. In the MP sample, only 17 per cent of the less educated were noncoms; in the Air Corps sample, the corresponding figure was 47 per cent. An MP who did not complete high school would feel unusually rewarded compared with others in his outfit in becoming a noncom; one who remained a private had so much company that he hardly could view discrimination against him as a reflection on his personal competence. In the Air Corps, those with ratings had almost as much company as those who remained privates — with less room for personal satisfaction over comparative achievement and more room for dissatisfaction over comparative failure to climb the status ladder.

The more-likely promotions for high-education men in the Air Corps meant that they were the men more exposed to feelings of relative deprivation when left behind by promoted colleagues (the steep segment to the Figure 8.3B bold line describing relative deprivation). More exposure meant more negative feelings, which were observed as more negative opinion of the promotion process.

An implication for organizations more generally is that some people would be willing to work for low pay and little opportunity for promotion to avoid the pain of relative deprivation. Here again is the big frog in a small pond phenomenon in which ego prefers to be central in a peripheral organization rather than peripheral in a central organization. Frank (1985: Chaps. 3-5) argues that many people are willing to exchange cash income for the status of deference from colleagues. His evidence on flattened pay schedules is relevant to Stouffer's analysis. Imagine a graph in which the vertical axis is pay (e.g., dollars per month an individual receives in compensation) and the horizontal axis is performance (dollars per month the individual produces). Plot by pay and performance employees doing the same kind of work in an organization. A regression line through the data describes a pay schedule for the work. If employees were paid for what they produce, the line would have a slope of one; the highest paid employee would be proportionally the highest performing employee, and so on. Observed pay schedules typically have slopes less than one; they are flatter than would

be expected in a perfectly competitive market. Flattened pay schedules can be explained in various ways. Frank focuses on people exchanging pay for status (Frank, 1984: Figure 2; 1985: Figure 3.3). In exchange for deference from colleagues, high performers are willing to receive less pay than would be appropriate to compensate their high performance. Low performers are willing to give deference to colleagues in return for receiving higher pay than would be appropriate for their low performance. Frank presents illustrative evidence on upstate New York car salesmen, Ithaca real estate brokers, and chemistry professors at Cornell University (respectively Frank, 1984: 556, 558, and 562; 1985: 63, 67, and 73). Such conditions can persist because they protect employees from the negative emotions displayed by Stouffer's Air Corps soldiers: Feelings of relative deprivation are less likely where pay differs less between employees doing the same work.

There is a positive note to relative deprivation: As a peer's good fortune erodes ego's felt fortune, peer misery creates relative advantage (Wills, 1981, on downward comparison, and Nachman, 1986; Portmann, 1999, on *schadenfreude*, referring to unanticipated delight in the suffering of another). From serious illness (e.g., Taylor, Wood, and Lichtman, 1983; Tennen, McKee, and Affleck, 2000), to personal attractiveness (e.g., Brown et al., 1992), to performance on exams (Friend and Gilbert, 1973), we all feel better when our position at the end of the line is changed by someone getting in line behind us.

### Relative Deprivation Duration

Beyond cross-sectional description, the bent preference model implies that feelings of relative deprivation are short-lived. The bold line in Figure 8.3B decreases quickly, then continues with much slower decrease once ego's peers have surpassed her.<sup>6</sup> A bubble of hubris from felt advantage is painfully burst by the success of a lesser peer followed by a rapid diminution of pain from good things continuing to happen for the peer. To

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<sup>6</sup>The second derivative of equation 4 with respect to increasing peer resources ( $x_j$ ) is positive,  $\partial^2 U / \partial x_j^2 = 2\kappa \phi w_{ij} x_i^{(v+1)} x_j^{-3}$ , so the partial derivative in the footnote 4 becomes less negative as  $j$ 's resources continue to increase, which means that ego's felt deprivation becomes less severe.

continue the highway analogy about being passed by another car, your felt speed is little affected by a passing car after the car is well into the pack ahead of you.

Grinblatt, Keloharju, and Ikäheimo (2008) present evidence that illustrates the brevity of relative deprivation. For residents in a densely populated area of Finland during 1999 through 2001, Grinblatt and his colleagues combine detailed data from tax records and car purchases. They construct measures of car purchases by ego's closest neighbors, and use those measures to predict ego's own car purchase. The research question: How does ego react to the relative deprivation of neighbors coming home in newly purchased cars? Neighbor purchases significantly increase the probability that ego will buy a car, but the effect has a strikingly short duration. The effect is strongest during the two days following neighbor purchases, with a weaker but still substantial effect for a week or two, and no effect thereafter (Grinblatt et al., 2008:744-745). In fact, Grinblatt and his colleagues (2008:750) do not believe that keeping-up-with-the-Joneses envy is a feasible interpretation of their neighbor effects because the effects are so transitory: "it is difficult to explain how quickly the social influence of those nearest neighbors decays. Envy is a more persistent emotion." On the contrary, envy is a bent preference of short duration (barring the possibility of ego and peer resources somehow held in painful balance for a period of time). The theoretical prediction illustrated in Figure 8.3B is that the relative deprivation of falling behind the Joneses is a discomfort intense but transitory. That prediction is consistent with the intense, short-lived neighbor effects reported by Grinblatt and his colleagues.

#### Relative Deprivation in Mix and Sequence

Evidence on the diffusion of opinion and behavior was an early justification cited for what I here discuss as bent preferences (Burt, 1982:198-2111; 1987): Ego failing to keep up with opinion and behavior adopted by peers experiences relative deprivation, which encourages ego's adoption. Felt deprivation was argued to be an emotional kick in the pants to get ego on board with her peers. Illustrative evidence is discussed in Appendix G.

The emotion driving adoption is more than deprivation alone. Ego's motivation to act is a shifting mix of the relative advantage and deprivation illustrated in Figures 8.2

and 8.3. Adoptions by ego's peers can be expected to create a feeling of relative deprivation. Each adoption by a peer is a deprivation shock to ego. Repeated shocks create a sense of falling behind one's peers. On the other hand, early adoption of what becomes a popular opinion or practice can trigger a feeling of relative advantage. People who adopt before their peers enjoy a resource not yet held by their peers — an effect beyond whatever felt benefits are expected from adoption. The tension for ego debating whether to adopt as a new opinion or behavior spreads is between diminishing opportunity for relative advantage, and increasing feeling of deprivation. If ego adopts early, she enjoys the advantage of having something her peers do not and she avoids the deprivation associated with delayed adoption. The risk is to look foolish if peers do not adopt later. If ego postpones her adoption to see how peers respond to it, adoption carries less risk, less relative advantage, and cumulating relative deprivation threatens ego with a sense of being left behind.

Now allow that multiple opinions and behaviors diffuse simultaneously where ego's status is a function of being up to date with opinion and behavior popular among peers. Emotions can be expected to cycle through a three-stage sequence: Ego causes relative deprivation in her peers by displaying a new opinion or behavior that gives her status among her peers (Figure 8.3). Ego experiences relative advantage over her peers as they defer to her expertise on the new opinion or behavior (Figure 8.2). Ego experiences relative deprivation when a peer displays some new opinion or behavior that increases the peer's status relative to ego (Figure 8.3). The third-stage pain of relative deprivation is ego's motivation to look for something new to display that re-establishes her status, thereby re-initiating the sequence.

The sequence characteristic of a group can be intense, or mild, depending on the magnitude of felt advantage and deprivation across the three stages, and the speed with which people move through the stages. The more quickly people move from one fashion to the next, then the more frenetic the search for new status-enhancing opinion and behavior to display. With respect to magnitude, ego accustomed to a certain level of positive stimulation can be expected to look for new opinion or behavior able to provide a feeling of relative advantage as strong as last time. For a person like me, is this new project significant, worthy, a reasonable way to spend time, or a status-eroding

waste of my time? Larger magnitudes of relative advantage and deprivation mean wider swings between manic and depressive. The greater the advantage in stage one, the more pain when it dissolves away in stage three.

Intense sequence is illustrated metaphorically by Veblen's (1899) concept of a leisure class — a group of people wasting resources on conspicuous consumption with the goal of attaining "the esteem and envy of one's fellow men."<sup>7</sup> In the sequence of advantage and deprivation just described, stage one provides envy, stage two provides esteem, and stage three is the emotional jolt that launches a new sequence. Such a sequence is not peculiar to the upper-middle class that so irritated Veblen. The same story could be told about a clique of indolent teenagers whose primary worry is looking cool, as they move from one pop song to another, from this cause to that, from that fashion to another. The story can be told equally well about fashion in business practice. Abrahamson (1996: 255) summarizes nicely: "Many management fashion setters — consulting firms, management gurus, business mass-media publications, and business schools — compete in a race to define which management techniques lead

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<sup>7</sup>I quote the "esteem and envy" phrase from Veblen's Chapter 2, on pecuniary emulation, in which he introduced the motivation responsible for leisure-class conspicuous consumption and leisure described in his Chapters 3 and 4. In credit to Veblen's imagery, I initially used the phrase "Veblen sequences" to refer to the sequenced feelings of relative deprivation and advantage described here. However, I found Veblen's text difficult; robust to point estimate of what he was trying to say. Fine (1994) offers a sociology of reactions to Veblen's text, quoting as one view (p. 467) satirist H. L. Mencken: "It is difficult to imagine worse English, within the limits of intelligible grammar." Uncertain about Veblen's exact meaning, I put in the text a bent-preferences version of the motive mix I thought was responsible for conspicuous consumption, and acknowledged Veblen in this footnote for inspiration. I am not the first to behave so. I was led back to Veblen by efforts within the relative income hypothesis to capture so-called "Veblen" effects. Leibenstein (1950) used the term to describe a nonfunctional demand response to a price decrease. More people are expected to be interested in buying a product when the product's price decreases. But if potential buyers are repulsed by an infusion of lower-price buyers, then a drop in price can trigger a drop in demand (Leibenstein, 1950:202). Such an event seemed to happen in the market for luxury goods in the early 1990s (Economist, 1992). Bagwell and Bernheim (1996:349-350) are certainly correct in saying that Veblen was not talking about consumer responses to price, as Leibenstein assumes. Veblen described people interested in a product to the extent that it confers status on people who own the product. Price is a secondary consideration; the status-conferring capacity of a product is eroded when too many people own the product, as can happen at lower prices. Bagwell and Bernheim (1996) work to capture their own version of Veblen effects defined by the increased price ego is willing to pay for a status-enhancing product versus a functionally equivalent product at lower cost. As I re-read Veblen's text, I found myself increasingly in sympathy with Leibenstein's decision to not try to capture what Veblen meant, focusing instead on a kindred phenomenon one can model. As Leibenstein (1950:202-203) so gently described his decision: "Although the theory of conspicuous consumption as developed by Veblen and others is quite a complex and subtle sociological construct we can, for our purposes, quite legitimately abstract from the psychological and sociological elements and address our attention exclusively to the effects that conspicuous consumption has on the demand function."



rational management progress. Fashion setters who do not participate successfully in this race, . . . will be perceived as lagging rather than leading management progress, as being peripheral in the business community, and as being undeserving of societal support.”

Nor need the sequence be played out in different groups with respect to the same status-enhancing opinion or behavior. The something that triggers advantage or deprivation — the resources  $x$  in equation (4) in terms of which the effects are defined — can come from any source. Origins do not matter. What matters is the effect with respect to ego's peers. In this group, ego trumps peers by wearing the latest fashion worn by celebrity entertainers. In the group over there, status is about familiarity with the new technology. In the next group over, status is about admiring words received from a wise colleague. In that other group, status is about driving an expensive car, putting in an expensive kitchen, or living in an expensive house. Whatever the relative advantage provided by displaying an opinion or behavior, the advantage disappears as others adopt the display. Local fads and fashions are to be expected. As peers catch up with what was new, ego hunts for the next something new that can again provide the buzz of relative advantage.

In sum, ego's preference on a question need not be permanently bent; it can bend this way and that in predictable sequences. Bent preferences therefore can be difficult to study directly without sequence data (such as the real-time car purchase data studied by Grinblatt, Keloharju, and Ikäheimo, 2008). It is not clear what an average survey response would mean on an opinion affected by sequenced relative advantage and deprivation since people respond from their unique, personal stages in the sequence. The recourse is to study bent preferences indirectly by comparing characteristics of social contexts in which sequences are likely to be more versus less intense (e.g., Stouffer's comparison of the Military Police versus the Air Corps).

### **Network Fear Hypothesis: New Frame on Feelings of Loss versus Gain**

In defining the frame of reference through which ego evaluates alternative actions, the surrounding network creates pressure on ego to take action. Ego is lured to action by the prospect of moving ahead, as illustrated in Figure 8.2. Ego is pushed to action by

fear of falling behind, as illustrated in Figure 8.3. Note from the shape of the graphs in Figures 8.2 and 8.3 how much steeper is the felt drop from falling behind relative to the gain from moving ahead. The felt gain provided by relative advantage is less intense than the felt loss induced by relative deprivation. In other words, network pressure on ego to act is less about the lure of gain, than the fear of loss. Figures 8.2 and 8.3 together illustrate the following hypothesis about the fear created by the social network around ego: The feelings of loss as peers overtake ego are more severe than the feelings of gain in overtaking peers, but the feelings of loss fade as peers continue to do well. The first part of the hypothesis is defined by the relative rates at which ego is affected by increases in her resources versus those of a peer, and is illustrated by the steep descent of the solid lines in Figure 8.3B as good things happening for a peer bring the peer's resources up toward ego's level. The second part of the hypothesis is defined by the decreasing negative effect on ego's felt resources with continued peer success (footnote 6), and is illustrated in Figure 8.3B by the solid lines decreasing more slowly after ego is surpassed by her peers.

Figure 8.4 illustrates the hypothesized effect in a situation used in Figure 8.3: the stimulus-specific constant is put aside by setting it to one ( $\kappa = 1$ ), ego has one peer ( $w_{ij} = .5$ ), and the resource being evaluated is analogous to educational status ( $v = 2$ ). The vertical axis is ego's felt change from a half-unit resource increase. The top solid line in Figure 8.4 shows ego's felt gain at different levels of ego resource on the horizontal axis when the peer's resources are fixed at three units.<sup>8</sup> Felt gains from an increase in resource are small when ego has little. Relative advantage is illustrated by the bold line expanding above the dashed line after ego surpasses her peer. The lower solid line in Figure 8.4 shows ego's felt loss at her peer's gain when ego's resources are fixed at

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<sup>8</sup>Ego's felt change,  $dU$ , from a change in her resources,  $dx_i$ , is defined in two terms by multiplying  $dx_i$  times the partial derivative in equation (3):  $dU = (\partial U / \partial x_i) dx_i = ([w_{ij} v \kappa x_i^v / x_i] + [w_{ij} v \kappa x_i^v / x_j]) dx_i$ . The first term describes ego's evaluation of the change using her own situation as a frame of reference. The term is the expression for  $du$  displayed just below equation (1) in the text, here weighted by  $w_{ij}$ . The second term describes how ego's evaluation is affected by the change in  $x_i$  changing ego's situation relative to the peer. If good things happen for ego such that a gain in  $x_i$  moves ego ahead of her peer, the second term enhances ego's felt increase in resources, as illustrated by the solid line lying above the dashed line at the top of Figure 8.4. The solid line is defined by substituting the example values into the above equation ( $dx_i = .5$ ,  $w_{ij} = .5$ ,  $v = 2$ ,  $\kappa = 1$ ,  $x_j = 3$ , with  $x_i$  increasing along the horizontal axis).

three units.<sup>9</sup> The bold line shows severe feelings of relative deprivation as good things begin to happen for the peer. A half-unit increase for the peer at one current unit of resource elicits a felt loss for ego of -4.52 units. As the peer continues to do well past ego, subsequent gains have little effect on ego. For example, a half-unit increase for the peer at five current units of resources (and ego is back at three units) elicits a felt loss for ego of only -.18 units.<sup>10</sup>

Turning to empirical evidence, the hypothesis is illustrated by car crashes in professional racing. Bothner, Kang, and Stuart (2007) analyze the probability that a NASCAR driver will experience a car crash during a race as a function of competitors crowding above and below the driver. Under the assumption that "a crash is more likely if a driver attempts risky maneuvers on the track," the incidence of car crashes is an indicator of the pressure a driver feels during a race (Bothner, Kang, and Stuart, 2007:211). That pressure can come from crowding ahead or behind the driver. Drivers earn points according to their finishing position in a race. The season champion is the driver with the most points from races run during the season. Bothner, Kang, and Stuart (2007:219) measure the crowding around a driver in a race by the number of competitors that the driver could surpass in the rankings if the driver did really well in the race (crowding above), and the number that could surpass the driver if they did really well in the race (crowding below). The potential gain from a race depends on crowding above the driver. If the competitors ahead of a driver are far ahead, there is no crowding above, and little potential gain for the driver from pushing hard in this race. But if there is a cluster of competitors just ahead of the driver (crowding above), he has

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<sup>9</sup>Ego's felt change,  $dU$ , from a change in the peer's resources,  $dx_j$ , is defined by multiplying  $dx_j$  times the partial derivative  $\partial U/\partial x_j$  in footnote 4. The line at the bottom of Figure 8.4 is defined by replacing parameters and variables with their example values ( $dx_j = .5$ ,  $w_{ij} = w_{ji} = .5$ ,  $v = 2$ ,  $\kappa = 1$ ,  $x_i = 3$ , with  $x_j$  increasing along the horizontal axis).

<sup>10</sup>The predicted difference between loss and gain increases with the exponent  $v$ . The exponent is set to two for Figure 8.4. At higher values, there is larger difference between the solid lines in Figure 8.4. With  $v$  set to three, for example, ego's felt gain at one unit of resource from a half-unit increase resource is 1.0 and ego's felt loss from her peer at one unit gaining a half unit is -15.19. The felt loss is more severe than the .67 versus -4.52 displayed in Figure 8.4 and mentioned in the text. Felt gain when the peer is ahead is dampened by  $\phi$  in equation (4). Fractional exponents  $v$  dampen the solid line at the top of Figure 8.4 to below the corresponding dashed line. Ego's felt loss from an overtaking peer remains negative when the peer is below ego, so the network fear hypothesis remains true, but with smaller difference expected between feelings of loss and gain.

an incentive to make that little bit of extra effort in this race to pass a couple of them, and move ahead in the rankings. The potential loss from a race depends on crowding below the driver. If the competitors behind the driver are way behind, it will be difficult for any of them to move ahead of the driver, whatever their performance in this race. On the other hand, if there is a cluster of competitors just behind the driver, he is at risk of one or more of them making that little bit of extra effort in this race to pass him, which could move him lower in the rankings. The research question is whether crowding around a driver increases the incidence of a car crash, and if yes, which kind of crowding is more associated with car crashes — crowding ahead of the driver, or crowding behind? Bothner, Kang, and Stuart (2007:225-228) show that crowding in the rankings around a driver before a race does increase the probability that the driver will crash his car during the race, and the effect is entirely from crowding below. Consistent with the network fear hypothesis, drivers are much more pushed to risky maneuvers by the possibility of being overtaken (loss), than they are drawn to risky maneuvers by the possibility of overtaking others (gain).

The network fear hypothesis is a bridge between the sociology of networks and the psychology of felt loss and gain. The prediction is that differences between felt loss and gain are contingent on the network structure around the perceiver. The hypothesis could be tested with psychophysics experiments in which ego's felt stimulation is monitored as ego and alter stimulation are manipulated. It would be interesting to test the hypothesis with the same experiments (extended to manipulate peer stimulus) used to document Kahneman and Tversky's prospect-theory finding that people are more sensitive to loss than gain (Kahneman, Slovic, and Tversky, 1982; Kahneman and Tversky, 1984). If the loss-felt-more-than-gain finding familiar from prospect theory turns out to be a bent preference as predicted by the fear hypothesis, then the finding is not a psychological feature of people so much as it is a feature of the social situation in which they find themselves. Such a re-framing of the finding could be a productive new bridge between economic sociology and behavioral economics. Expected variation within and between people generates my next hypothesis.

## NETWORK DEFINES PEERS

Bent preferences are not yet defined. Ego in equation (4) is motivated by the pull of relative advantage, and the push of relative deprivation, but relative to whom? Who is "like me" in a network? The question has been answered in the past by studying network conditions associated with two people, ego and a peer, expressing similar opinion and displaying similar behavior. Two criteria have emerged: connectivity and equivalence.<sup>11</sup>

Connectivity is the traditional criterion, and follows from the discussion of network closure in Chapter 6: A peer is someone strongly connected to ego, directly and through mutual friends. Such a pair of people would be high on the closure measures used in Chapter 6 (e.g., the horizontal axes in Figure 6.8). The argument for a connectivity criterion is that by talking to one another, ego and her peer shape one another's opinion of objects, people, and behaviors for which there is no one obvious interpretation. The stronger the connection between people, the more likely they trust one another, the more likely the socializing communication between them, and so the more likely they express similar opinion and display similar behavior.

Equivalence is traditional where competition has been discussed, but it was not widely used in network analysis until the 1970s. I begin with the most concrete form of

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<sup>11</sup>An argument can be made for leaving peers defined in a general, intuitive way. Interesting hypotheses can be derived without having to muck about in the empirical details of peer criteria. I needed no peer criterion to define bent preferences in equation (4), to numerically illustrate the feelings of relative advantage and relative deprivation that peers can elicit (Figures 8.2 and 8.3), or to define the network fear hypothesis. Component effects for the relative income hypothesis in economics are typically defined without specifying a peer criterion because the criterion is not needed to derive hypotheses about aggregate market behavior (see Appendix G, "Corresponding Developments in Economics"). Reasonable precedent notwithstanding, here are at least two reasons to move beyond an intuitive criterion for peers: First, we can do better. Network analysis makes it possible to define peers in a rigorous way grounded in theory and empirical research. Second, consequential empirical test requires it. Without a concrete definition of ego's peers, social comparison theory such as the bent preferences model in equation (4) is robust to empirical research. With peers only defined intuitively, empirical evidence failing to support the theory is easily attributed to an incorrect definition of peers. If the author had selected the appropriate reference group, he would have seen the evidence of social comparison. Robust to empirical research is twice a misery. Believers continue to endorse the theory as-is despite contradictory empirical evidence, and non-believers continue to ignore the theory despite corroborating evidence. No evidence can convince die-hard opposition, but there are always people whose curiosity can be sparked by compelling evidence. In short, social comparison theory such as the bent preferences model in equation (4) is as informed and empowered by empirical research as it is clear in defining the peers against whom social comparison is made. Fortunately, advances in network analysis provide clear alternative definitions of peers.

equivalence, structural equivalence. Two people are structurally equivalent to the extent that they have similar relations with other people. They need not be connected directly, but they seek out relations with the same other people and are sought out by the same other people. The argument for an equivalence criterion defining peers is competition: people engaged in relations with the same other people could replace one another in those relations. Equivalent people are expected to benchmark against one another for how to be more attractive in their relations. The more equivalent two people are, the more likely they benchmark against one another, and so the more likely they express similar opinion and display similar behavior.

### **Connectivity versus Structural Equivalence**

It will be convenient here and later to have a concrete example. The sociogram of a hypothetical organization is displayed in Figure 8.5. The organization contains managers and four functional groups. Lines indicate reporting relations and correspond to a one in the displayed adjacency matrix. As in earlier sociograms, physical distance in Figure 8.5 indicates strength of connection. People connected directly are next to one another. People connected indirectly through intermediaries are separated (e.g., the six-link indirect connection between persons 12 and 15 puts them on opposite sides of the space).

—— Figure 8.5 and Figure 8.6 About Here ——

Figure 8.6 is a multidimensional scaling of structural equivalence distances in the organization. Two people are close together in Figure 8.6 to the extent that they have identical relations with the same contacts. Structural equivalence between  $i$  and  $j$  is measured by a distance, call it  $d_{ij}$ , which increases as each person  $k$  in a population has different relations with  $i$  and  $j$ , for example:

$$d_{ij}^2 = \sum_k (z_{ik} - z_{jk})^2 + \sum_k (z_{ki} - z_{kj})^2, \quad i \neq k \neq j \quad (5)$$

where  $z_{jk}$  is the strength of connection from  $j$  to  $k$ . Distance  $d_{ij}$  is zero when  $i$  and  $j$  have identical relations with everyone else in the organization. There are subtleties to measuring structural equivalence, subtleties debated in the 1980s, but for the purposes

here, I discuss distance simply as the Euclidean distance in equation (5).<sup>12</sup> The distances used to generate Figure 8.6 are given in Table F3 in Appendix F.

### No Contest When the Criteria Agree

The spatial display of connections in Figure 8.5 is in many ways similar to the spatial display of equivalence distances in Figure 8.6. In both, there are clusters corresponding to the four functional groups, sales, marketing, production, and product development. Individual contributors are close together within their group. For example, the three individual contributors in marketing (persons 14, 15, and 16) are on top of one another in Figure 8.6 because they have identical relations to everyone in Figure 8.5 and identical relations from everyone. The senior leader is in the center of Figure 8.5 because she has the strongest connections on average to everyone else. She is at the center of Figure 8.6 because she is has a pattern of relations similarly distant from everyone else's. On either side of the senior leader are the division leaders, each on the side of the space with the people each division leader supervises. The division leader to the right in Figure 8.5, person 2, is on the right because his connections with people in marketing and sales are stronger than his connections to people in production and product development. Further removed are the group leaders, each close to the groups they supervise.

The only structurally equivalent people in the organization — the individual contributors in each functional group — are with one exception strongly connected directly and indirectly. Structurally equivalent people often have direct connections with one another. When they do, equivalence and connectivity define the same peers for

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<sup>12</sup>For this illustration, I traced indirect connections from the direct connections in Figure 8.5, used a simple fixed decay weighting to define the relational measures  $z_{jk}$ , and computed Euclidean distances using equation (5), excluding self-relations. The indirect connections are given in Table F1 of Appendix F. The derived  $z_{jk}$  are given in Table F2. Note that direct connections equal 1.0, two-step connections are .5, three-step connections are .5 squared, four-step connections are .5 cubed, and so on. Structural equivalence distances are given in Table F3. For details on measuring structural equivalence, see a general introduction to network analysis, such as Wasserman and Faust (1994: Chap. 9), or online Hanneman and Riddle (2005: Chaps. 12-13). Since relations are symmetric in Figure 8.5, either the row or column sums in equation (5) would be sufficient to capture relative distance between people. Including both terms in equation (5) doubles distance squared so it has no effect on the multidimensional scaling in Figure 8.6. I keep the row-column distinction in equation (5) because the distinction between relations sent (row) and received (column) can be substantively significant when relations are not symmetric as is the case in some of the empirical evidence presented in Appendix G.

ego, so there is no need to decide between the criteria. This is illustrated by three of the four functional groups in Figure 8.5, and can be seen in the Washington network of leading lobbyists during the early 1990s (Figure G3 in Appendix G).

### Deciding to Use the Equivalence Criterion

A choice has to be made when the two criteria contradict one another. Contradiction occurs in either of two situations. Two people who are strongly connected to each other can be structurally nonequivalent if they have very different relations with other people, ego connected into one group, and the other person connected into a different group. Such connections are the bridge relations essential to brokerage. Second, two people who do not speak with one another can be structurally equivalent if they have identical relations with everyone else. The salesmen in Figure 8.5 are an example. The salesmen have no connection to one another. They are only connected to the head of sales, person 4. By connectivity, each salesmen in Figure 8.5 talks exclusively with the head of sales so the head of sales would be their network peer under the connectivity criterion. By structural equivalence, the salesmen take one another as peers because they are similarly connected to the head of sales and disconnected from everyone else. Under the equivalence criterion, the salesmen would be expected to benchmark against one another.

The communication and competition justifications for connectivity and equivalence respectively can each be stretched to interpret the other criteria, but neither justification fits the other criterion so well as it fits its own. Competition is a rude interpretation of interpersonal influence between strongly connected people. Socializing discussion cannot account for interpersonal influence between structurally equivalent people who do not speak with one another.<sup>13</sup>

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<sup>13</sup>One could argue that structurally equivalent people not connected directly can influence one another indirectly through their mutual contacts. The argument is not compelling. Indirect connection is weaker than direct connection. If socializing communication through indirect connections is responsible for the similarity between structurally equivalent people not directly connected, then there should be evidence of even closer similarity between structurally equivalent people who do talk to one another directly. Instead, equivalent people are similar whether connected directly, indirectly, or not at all, and nonequivalent people are dissimilar regardless of connectivity (see footnote 10 in Appendix G).



Appendix G contains argument and evidence for my decision to use equivalence to define peers. The material is important to explain my choice, but it is not essential to understand the forthcoming two hypotheses derived from my choice, so I put the material in an appendix. The gist of the material is that I find more evidence of equivalence than connectivity. Equivalence was implicit in early research on interpersonal influence and peer pressure (see "Equivalence Implicit in Early Research" in Appendix G), structurally equivalent people display similar opinion and behavior regardless of their connectivity, and structurally nonequivalent people display dissimilar opinion and behavior regardless of their connectivity (see "Across the Populations" in Appendix G). Beyond supporting equivalence over connectivity, evidence supporting the equivalence criterion fits well with the interpersonal marginal evaluation process implicit in equation (2). Ego does not have to communicate directly with a peer to be in competition with the peer, and so affected by the peer's condition. Ego only has to be aware of the peer, and be able to imagine herself in the peer's situation.

**Intrepid broker Hypothesis:  
Brokers Escape the Threat of Relative Deprivation**

Let the  $w_{ij}$  network weights in equation (4) be defined by structural equivalence. I will give an exact definition shortly, but for the moment allow that ego  $i$ 's  $w_{ij}$  increase as  $d_{ij}$  decreases. The point I want to highlight is that people can differ greatly in the extent to which they have peers. Within the simple organization displayed in Figure 8.5, for example, structural equivalence clearly defines peers only for the individual contributors. With peers more clearly defined for certain people, relative deprivation is more clearly a threat for those people, which implies a contingency hypothesis that distinguishes people more subject to the network fear hypothesis.

Structurally Unique People

Figure G7 in Appendix G shows that structural equivalence is more obvious, so the pain of relative deprivation and fear of it is more severe, in populations of small, clearly differentiated groups. These groups can be closed-network groups like the individual contributors in marketing in Figure 8.5, or sets of people like the salesmen in Figure 8.5

who do not speak with one another but are structurally equivalent by dint of their similar relations with others.

Either way, brokers stand apart. The leaders in Figure 8.5 are all network brokers. They connect otherwise disconnected people and each leader's pattern of relations is unique such that none has a structurally equivalent peer. Leaders in the organization each have a unique pattern of relations that puts them alone in their own unique location in the Figure 8.6 spatial map of structural equivalence distances. They are not alone in terms of sensory deprivation. Such people have full calendars. They are alone in bearing unique responsibilities that give them no obvious peers — defined by structural equivalence — as a frame of reference for social comparison. The leader relation patterns in Figure 8.5 are not equally different in Figure 8.6, but they are each unique to an individual leader. The point is discussed in detail in Appendix G with respect to evidence of brokers being less likely to have structural-equivalence peers (Figure G7), and the link between network complexity and peer pressure: the more complex the network, the less clearly peers are defined by structural equivalence, and the weaker the competitive pressure of relative deprivation aligning peers.

### Hypothesis

A lack of structural-equivalence peers frees brokers from the competitive pressure of structural equivalence, so brokers are less subject to the pain of relative deprivation, and therefore more free to evaluate a new idea or practice for its merit. In other words, the dashed lines in Figures 8.2 and 8.3 describe network brokers and the solid lines describe people with network peers.

People who have no peers only experience their own resources. The flat dashed line in Figure 8.3 shows the lack of relative deprivation. That leaves the upward-sloping dashed line in Figure 8.2 as the only foundation for evaluating alternative actions. Such are the brokers.

People with peers experience their own resources, and evaluate what they have relative to the resources held by peers. Peers create the solid lines in Figures 8.2 and 8.3. Relative advantage is possible, but relative deprivation is a risk severe and painful. The risk of relative deprivation is concentrated in two kinds of people: People in groups

that correspond to closed networks (such as three groups of connected individual contributors in Figure 8.5), and people who have little to do with one another but have similar relations with other people (such as the salesmen in Figure 8.5, or more generally, people who are satellites to the same superior or more popular group).

If agency in networks is motivated by the interpersonal evaluations described by the bent preferences model, then fear of failure should motivate brokers less than it motivates people in closed networks (or anyone for whom peers are obviously defined by structural equivalence). I discuss the implication as a hypothesis about brokers appearing intrepid, a contingency variation on the network fear hypothesis: When evaluating a new idea or practice, network brokers are — relative to people with obvious peers — more motivated by the lure of gain and less troubled by a fear of failure.

The hypothesis does not distinguish kinds of people prone to social comparison. It is about kinds of situations that make social comparison difficult to avoid. It is natural to focus on kinds of people because that is where the hypothesized outcomes are manifest. For example, to illustrate his discussion of competition and emotional energy, Collins (2004:123) uses a photo of two women in a foot race, one passing the other. The woman passing is looking straight ahead. The woman passed is glancing over at the person passing her. The caption: "Winner focuses on the goal, loser focuses on the winner." The situation resembles the highway driving example discussed earlier in which ego is passed by a car speeding up from behind, or Bother, Kang and Stuart's (2007) results on NASCAR accidents associated with the threat of being overtaken. The situation does not predispose everyone equally to social comparison. The person in front would have to turn her head to make social comparisons. The person in second place has an obvious social comparison with the person passing her. I would like to see a photo of the racing women a minute earlier. Did the women passing ever glance over at the woman she was about to pass?

Gibbons and Buunk (1999) provide broader evidence. Consistent with Collins' photo caption, Gibbons and Buunk believe that individuals are not equally prone to social comparison: ". . . the need to compare oneself with others is phylogenetically very old, biological very powerful, and recognizable in many species. However, we believe that the extent to which people do so varies, perhaps considerably, from one individual

to the next. That belief led to the efforts described in this article to develop a scale assessing individual differences in comparison orientation (CO)." Gibbons and Buunk's index distinguishes people for the extent to which they make social comparisons.<sup>14</sup> Across thousands of people, Gibbons and Buunk (1999:133-134; Buunk and Gibbons, 2006:17-19) find that the individuals prone to social comparison have three qualities: They are more self-conscious, reflective about themselves in the presence of others. They are more empathetic, interested in the behavior and opinion of others. They are more likely to feel depressed and negative, about events and about themselves.

The three correlates are consistent with the intrepid broker hypothesis: people with obvious network peers have more difficulty avoiding social comparison with peers, so they are more self-conscious about themselves in public, more alert to how others feel, and more at risk of painful relative deprivation.

However, the hypothesis says that the correlates result from comparison; they are not predispositions to it. Instead of certain people being prone to social comparison, structural equivalence make comparison obvious for certain people, which increases the risk of relative deprivation for those people, which is a negative experience. Causation moves out of the individual, into the situation. If you change the situation, you can change the risk of relative deprivation, and so alleviate the negative feelings induced by relative deprivation. Measures of social comparison, such as Gibbons and Buunk's, will be interesting to study across kinds of networks.<sup>15</sup>

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<sup>14</sup>In the interest of replication with situational data, here are the six core items that Gibbons and Buunk (1999:137) say stand alone as an index that has .92 correlation with the full index (response is on a five-point scale from disagree strongly to agree strongly): (1) "I often compare how my loved ones (boy or girlfriend, family member, etc.) are doing with how others are doing." (2) "I always pay a lot of attention to how I do things compared with how others do things." (3) "If I want to find out how well I have done something, I compare what I have done with how others have done." (4) "I often compare how I am doing socially (e.g., social skills, popularity) with other people." (5) "I am not the type of person who compares often with others." (6) "I often compare myself with others with respect to what I have accomplished in life." The parenthetical expressions in items (1) and (4) are appropriate to the college students so often asked to complete the scale, but might be deleted or edited for organization research. Gibbons and Buunk (1999:142) use the following instructions: "Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with those of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with other people. To do that we would like to ask you to indicate how much you agree with each statement below, by using the following scale."

<sup>15</sup>Such study will require more subtlety than it might seem. The intrepid broker hypothesis does not say that brokers are less likely to make social comparisons; it says that structural equivalence provides

Meanwhile, the intrepid broker hypothesis is offered for future research. It has a felt reality from the situations in which people seem most concerned about looking foolish to their peers. Beyond face validity, I have two bits of research evidence that give me confidence in the hypothesis.<sup>16</sup>

### **Brokers Are Opinion Leaders**

First, network brokers show less evidence of the peer pressure associated with structural equivalence. On average, structurally equivalent people express similar opinions and display similar behavior, while nonequivalent people display dissimilar opinion and behavior. Summary evidence is given in Figure G6 in Appendix G. However, the same figure shows consistent evidence of ideas and behavior being contagious between connected people who are only weakly equivalent to another. Group and division leaders are examples in the Figure 8.5 organization. The salesmen to the east in Figure 8.6 are not structurally equivalent with their head of sales (person 4) or their division leader (person 2), but are more equivalent to both than they are to people in production or product development (the other side of Figure 8.6). The head of sales and division leader are not equivalent to the salesmen, but are somewhat equivalent. Such people are "near peers." Near peers are almost peers to ego, but not quite. They have relations in common with ego at the same time that they have relations different from ego's. Figures G5 and G6 show that contagion between near peers depends on connectivity: the stronger ego's connection with a near peer, the

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less obvious peers for brokers to compare themselves to. Measures of comparison orientation, such as the measure proposed by Gibbons and Buunk, will be high when a broker compares herself to others, whether those others are structurally equivalent peers or role equivalent peers (as predicted below by the network identity hypothesis).

<sup>16</sup>The intrepid broker hypothesis is only one of many that can be generated from the idea that structurally unique people are less exposed to the competitive pressure of peers. A familiar example is that peer pressure reduces the returns to network brokerage — the more peers working a job, the greater the competitive pressure on people in the job, so the lower the average returns to brokerage for people in the job (Burt, 1997, 2005:156-162). Baron and Pfeffer's (1994) article on the social psychology of organizations and inequality is interesting to read in parallel to this chapter. They too make use of social comparison for motivation, but do not limit the comparison process to a particular form (as is done in equations 2 and 4). They too discuss comparison within to a frame of reference, but do not limit the frame to a particular criterion other than by their examples in which job title is often the criterion (as is done with structural equivalence in equation 6; see Ingram and Yue, 2008: 276-280, for still broader criteria). By being less precise about how comparison works, and more general in its implications, Baron and Pfeffer cover a broader range of intuitions than is covered here. Those intuitions are each potentially fruitful to explore as bent preferences.

more likely that ego's opinion and behavior resembles the opinion or behavior of the near peer. The near peers through whom opinion and behavior spreads through connections turn out to be network brokers (Table G1), and correspond to the opinion leaders widely familiar from mass media research conducted in the 1950s at Columbia University by Elihu Katz, Paul Lazarsfeld, and Robert Merton (pages 31-34 in Appendix G). Information enters a group by connectivity through network brokers as opinion leaders, then spreads within the group by competitive pressure between structurally equivalent people. As long as brokers are a minority relative to the number of people in closed groups, structural equivalence on average predicts where ideas and behaviors are similar (as illustrated for managers in Figure G2, lobbyists in Figure G3, and doctors in Figure G4). However, for the few opinion leaders, those network brokers who connect across groups, connectivity is the key to contagious ideas and behaviors. In short, and as predicted by the intrepid broker hypothesis, brokers are less subject to the peer pressure otherwise evident between structurally equivalent people.

### **Brokers Display Emotion**

A second bit of evidence consistent with the intrepid broker hypothesis is the tendency for network brokers to display emotion in proposing ideas to senior management.

### Brokerage and Good Ideas

My evidence comes from the ideas proposed by the supply-chain managers in Chapter 3. The network story on good ideas is that network brokers are connected to more varied sources of information and are therefore at higher risk of detecting and developing good ideas — by moving best practice from one group to another unfamiliar with the practice, or by seeing new combinations across segregated groups. The story was illustrated in Chapter 3. Figure 3.8A showed that brokers enjoyed compensation higher than peers. Figure 3.8B showed that brokers were more likely to receive the highest performance evaluations. To the point here, Figure 3.8C showed that brokers were more likely to express good ideas, as judged by senior management.

Summarized in the original report (Burt, 2004:349): "people who stand near the holes in a social structure are at higher risk of having good ideas." More specifically (Burt, 2004: 388-389): "People with connections across structural holes have early access to

diverse, often contradictory, information and interpretations, which gives them a competitive advantage in seeing and developing good ideas. People connected to groups beyond their own can expect to find themselves delivering valuable ideas, seeming to be gifted with creativity. This is not creativity born of genius; it is creativity as an import-export business. . . . Across the clusters in an organization or market, creativity is a diffusion process of repeated discovery in which a good idea is carried across structural holes to be discovered in one cluster of people, rediscovered in another, then rediscovered in still others — and each discovery is no less an experience of creativity for people encountering the good idea." The brokerage-creativity link has been illustrated in a variety of ways (Burt, 2005:66-78, for review). Hargadon and Sutton (1997:716) provide an ethnographic account of the brokerage responsible for creativity in the leading American design firm, IDEO (cf. Obstfeld, 2005): "This firm exploits its network position, working for clients in at least 40 industries, to gain knowledge of existing technological solutions in various industries. It acts as a technology broker by introducing these solutions where they are not known and, in the process, creates new products that are original combinations of existing knowledge from disparate industries." Uzzi and Spiro (2005: 447) describe the success of Broadway musicals in terms of bridges across clusters of production teams, guided by the image, "that creativity is spurred when diverse ideas are united or when creative material in one domain inspires or forces fresh thinking in another." There is the early work on scientists in R&D labs showing that scientists more active in communicating across organizational boundaries were also more active in keeping up with professional journals (Allen and Cohen, 1969:17; see Tortoriello and Krackhardt, forthcoming, for network analysis), and recent work on brokerage and creativity inferred from the scope and detail of patent data such as Fleming, Mingo, and Chen's (2007) authoritative evidence on inventors with densely interconnected collaborators being less likely to file patents that are new combinations of patent categories (cf., Rosenkopf and Nerkar, 2001, at the organization level on boundary-spanning patents; Hsu and Lim, 2006, on knowledge bridging indexed by an organization filing patents that cite patents in other categories).

## Emotion and Good Ideas

There is reason to suspect that emotions play a role in the link between creativity and brokerage. There is a general case for emotion operating as a social lubricant. The argument is articulated in Turner and Stets' (2005) broad theoretical review, in Barsade and Gibson's (2007) and Eifgen's (2007) reviews of affect in organizations, and in Baron's (2008) discussion of affect in the entrepreneurship process. The argument is illustrated with examples such as flight attendants selected and socialized to maintain an upbeat tone with passengers (Hochschild, 1983), bill collectors socialized to convey a tone of urgency with "a hint of irritation" (Sutton, 1991), bank customers echoing back the emotions displayed by bank tellers (Pugh, 2001; cf. Barsade, 2002, for an experimental manipulation, with both Pugh and Barsade showing that positive emotion displayed in an encounter elicits more positive evaluations of the encounter), up to the extreme of flexible emotion manipulation techniques employed by actors and directors (Orzechowicz, 2008). Each of these roles — flight attendant, bill collector, bank teller, actor — involves brokerage in the sense that ego is an interface between groups. Brokerage roles, or brokerage components in otherwise non-brokerage roles, are a productive site for emotion research because tensions can run high when inconsistent or contradictory interests meet.

Given potential tension, it is sometimes a virtue to be seen as a neutral honest broker. Emotion is sometimes most apparent from the personal control required to conceal the emotion. Medical students have to learn to suppress feelings of desire or disgust during intimate exams. A way to maintain affective neutrality is to focus on the procedure, the sequence, the details (Smith and Kleinman, 1989). To avoid echoing back the anger of irate passengers, a flight attendant pretends "something traumatic has happened in their lives" (Hochschild, 1983:25).

On the other hand, emotion can facilitate brokerage in that people can be brought together through appeals to sentiments deeper than tactical coordination issues and positive emotion is associated with the recombinant kind of creativity that network analysts attribute to brokerage.

In a forerunner to work later discussed as the positive psychology movement (Fredrickson, 1998; Seligman and Csikszentmihalyi, 2000; Seligman et al., 2005), Isen,



Daubman and Nowicki (1987:1123) showed that even a modest amount of positive affect can enhance creativity (Amabile et al., 2005, offer field-research corroboration with daily emotion data recorded over an average 19-week period from 222 employees in 26 project teams from seven firms in three industries). Isen, Daubman and Nowicki assigned college students at random to teams in one of four treatments. In the baseline treatment, each team is seated at a table in front of a wall corkboard and given a box containing a candle, tacks, and matches. The team is given ten minutes to solve the following task (Isen, Daubman, and Nowicki, 1987:1123): “affix the candle to the corkboard in such a way that it will burn without dripping wax onto the table or the floor beneath.”

The required element of creativity is to make use of the box containing the candle, tacks, and matches: tack the box to the corkboard and use it as a platform for the candle. In the facilitated display treatment, the box is presented with candle, tacks, and matches outside the box, which makes the box more obviously a component in the task. In the positive film treatment, the task is preceded by having the students watch five minutes of a video containing humorous production errors edited out of two popular television shows. A quick paper-and-pencil test shows that the video created positive emotions in the students. After watching the film, students began the task as in the baseline. The same sequence happened in the neutral film treatment except the video was five minutes of a math film.

The task is not trivial. Students in the baseline condition are rarely successful (2 of 15 succeed, 13%). The simple hint of displaying the box as a component rather than a container, reverses the odds (19 of 23 succeed, 83%).

Almost as much success occurs when positive emotions are induced in the students before they begin the task (9 of 12 succeed, 75%). The success was not due to the video itself because students shown the neutral video were no more likely to succeed than the students in the baseline condition. Isen and colleagues show similar results in other studies with other creative tasks (e.g., making unique and varied word associations, Isen et al., 1985), and show that success is not due to aroused emotions because arousing negative emotions does not increase success (Isen, Daubman, and Nowicki, 1987). They (1987:1130) conclude: “the impact of positive affect on creative

problem solving is that good feelings increase the tendency to combine material in new ways and to see relatedness between divergent stimuli.”

### Emotion and Brokerage

The psychological image of recombinant creativity is strikingly similar to the sociological imagery used in network studies of creativity. Positive emotion might work together with brokerage. For example, positive emotion could give ego the energy to act on brokerage opportunities. Collins (2004: Chap. 3) has an image of ego accumulating "emotional energy" from repeated ritual interactions with other people (bring energy to an interaction ritual, ping it off the other people, the energy comes back amplified), which creates feelings of confidence and solidarity among colleagues, and those feelings can be essential to successful brokerage. As Cross and Thomas (2008:62) quote an executive: "You have to be energizing to get people to listen to your idea to begin with, and certainly energizing to get them to help you implement it or accept it."<sup>17</sup>

To see emotion and brokerage together as they are associated with good ideas, I coded the content of the texts in which the supply-chain managers described their best idea. Recall that each manager was asked to describe his or her best idea for improving the supply-chain organization, and could respond with up to 2000 characters.

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<sup>17</sup>There is evidence that brokers are a source of emotional energy (and see Csermely, 2008, for an intriguing analogy between network brokers as the active centers in proteins). Rob Cross kindly provided illustrative network data on energy and information ties in a small organization of 125 people. On a web network survey, people were asked to cite their sources of work information and cite colleagues who were energizing or de-energizing. On average, people cited 32 sources of information, 25 energizing people, and 7 de-energizing people. Here are correlations between the number of citations a person received and network constraint computed from the person's network of information contacts:

|                                    |      |      |      |      |
|------------------------------------|------|------|------|------|
| Cites for energizing colleagues    | 1.00 |      |      |      |
| Cites for de-energizing colleagues | -.14 | 1.00 |      |      |
| Cites for information              | .78  | .30  | 1.00 |      |
| Ln (network constraint)            | -.70 | -.24 | -.78 | 1.00 |

Strong negative correlations with network constraint show that brokers tended to be cited as sources of information and energy. If I divide network constraint at its median to distinguish brokers (bottom 50% of network constraint), the average broker was cited as energizing by 35.1 colleagues while non-brokers were cited by 15.9 colleagues. Brokers were cited as de-energizing by 7.5 colleagues on average, while non-brokers are cited by 5.9 colleagues. If I hold constant the fact that brokers were cited more often for all kinds of relations, the probability that a broker was cited for energy by someone citing the broker for any reason is .62 (versus .53 for non-brokers) and the probability of a contact citing the average broker as de-energizing is .13 (versus .20 for non-brokers). Measuring energy by the probability of energy between existing colleagues, non-brokers were more likely to be cited as de-energizing. Measuring energy in terms of the number of colleagues affected, brokers were disproportionately a source of energy.

There are obvious limits to the data. Emotions are more easily displayed in conversation than in written text, and there is very little text available here. Even limited text can be informative, however, given the known performance association with networks around the managers.

Figure 8.7 contains results. The graphs in Figure 8.7 correspond to the graphs in Figure 3.8: an outcome variable on the vertical axis, network constraint across the horizontal axis distinguishing networks that bridge structural holes (low constraint) from closed networks (high constraint), and data averaged within levels of network constraint to simplify the graph (statistics are based on the individual-level data).

A manager's idea is coded for its emotion content on the vertical axes in Figure 8.7. Content is measured with word counts. Word counts are a shallow form of content analysis, but attractive for clarity and reliability. In addition, correlations with significant psychological phenomena give an element of construct validity to the word counts produced by the software used here.<sup>18</sup> Pennebaker, Mehl, and Niederhoffer (2003) review research showing that the words we use reveal emotions and expressing them has therapeutic effect. Relative to people telling the truth, for example, liars are more likely to use negative words, less likely to use self-references, and less likely to use qualifiers such as but, except, or without (Newman et al., 2003). Recently unemployed professionals who write about their thoughts and emotions surrounding the job loss gain a sense of control over the traumatic event, and find new employment more quickly, relative to people who avoid emotional issues or do not write at all (Spera, Buhrfeind, and Pennebaker, 1994). The therapeutic effect of writing about emotional stress was consistent with an earlier study in which students who used more emotion words in writing for a period about traumatic events, later showed decreased blood pressure, fewer illness visits to the university health clinic, and improved blood-test measures of immune-system function (Pennebaker, Kiecolt-Glaser, and Glaser, 1988). The word-count software works from a dictionary of word characteristics. As a text is read, counts

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<sup>18</sup>I used output from the word-counting program, LIWC (for Linguistic Inquiry and Word Count). Kahn et al. (2007) present results on the validity of the program's word counts measuring positive and negative emotion. The program is available from the authors — James W. Pennebaker, Roger J. Booth and Martha E. Francis — for Windows and Macintosh operating systems. Enter LIWC in your browser, and you will see the home page from which the program can be downloaded.

are made of characteristics in the text. For example, the following sentence contains four positive words and no negative words: “The smiling manager walked happy in the bright, sunny day.” The output measures of positive and negative emotion would be 40% and 0% respectively. Here is the same sentence with negative words replacing the positive so the output measures of positive and negative emotion would be 0% and 40% respectively: “The sad manager walked depressed in the dull, gloomy day.”

———— Figure 8.7 About Here ————

Figure 8.7 shows a strong association between emotion and brokerage. Brokers offer longer descriptions of their best ideas (Figure 8.7A), and those words are more likely to express emotion (Figure 8.7B).

The emotion expressed is both positive and negative. Brokers are not prone to positive or negative emotions so much as are prone to both. Create two binary variables: a manager can use positive words in his or her idea proposal (yes, no), and can use negative words in the proposal (yes, no). Create a four-fold table by crosstabulating the two variables.

The white dots in Figure 8.7C show the managers in the positive-only cell of the four-fold table (yes positive, no negative). The dots form a horizontal band across the top of the graph: About half of the idea proposals contained only positive words. The proportion does not increase or decrease with network constraint. Brokers and people in closed networks were equally likely to offer positive-only descriptions.

White squares in Figure 8.7C show the managers in the negative-only cell of the four-fold table (no positive, yes negative). The squares form a horizontal band across the bottom of the graph. Only 5% of the managers proposed an idea using negative words without positive words. Again, the low frequencies of such proposals across network constraint in Figure 8.7C shows that both brokers and people in closed networks were equally unlikely to offer negative-only descriptions.

What distinguishes brokers from people in closed networks is the tendency for brokers to mix positive and negative words when proposing an idea (yes positive, yes

negative). The solid dots in Figure 8.7C show positive and negative emotions more likely in the idea proposals from network brokers.<sup>19</sup>

Whatever the reason for the mixed emotions in broker proposals, mixed emotions are not associated with value. Brokers in the supply-chain organization were more likely to propose what senior management deemed a good idea. The correlation is displayed in Figure 3.8C and statistically significant against alternative explanations in Table 3.2. I took the three emotion variables in Figure 8.7C (positive-only, mixed positive and negative, versus negative-only), and added them as predictors to the idea-value prediction in the last column of Table 3.2. None of the three improved the prediction. Idea value continues to be higher for network brokers (-4.12 t-test for network constraint, versus the -4.34 in Table 3.2). Idea value is independent of the proposal being positive-only (1.32 t-test), negative-only (-1.24 t-test), or a mix of positive and negative (0.49 t-test). I get the same lack of association between idea value and expressed emotion if I add to the prediction a binary distinction between any emotion words in a proposal versus none (0.77 t-test), any positive words versus none (1.84 t-test), any negative words versus none (-1.16 t-test), the proportion of words in the proposal that are emotion words (1.91 t-test), the proportion positive (1.75 t-test), or the proportion negative (-0.31 t-test).<sup>20</sup>

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<sup>19</sup>My efforts to replicate this result elsewhere emphasize to me that the intrepid broker hypothesis is not about brokers being emotional so much as it is about people being less likely to display emotion when they are at risk of looking foolish relative to clearly-defined peers. I have replicated the Figure 8.7 results in an electronic assembly company in which managers were asked to explain why a recent initiative failed. Brokers were more likely to display positive and negative emotions in their explanations. However, I did not see the same results among students in Chicago's executive M.B.A. program. The students are a couple decades past college and have typically done well in their careers. During the 2007/08 academic year, I ran a clinical workshop on social capital in which students in Chicago, London, and Singapore were asked as one of the workshop exercises to briefly describe their best idea for improving the value of their business (just as the supply-chain managers were asked for Figure 8.7). Everyone displayed positive and negative emotion in their description, leaving no association with network variables. My interpretation was that the workshop was an environment in which it had become safe to display emotion. The interpretation is self-serving, but consistent with the intrepid broker hypothesis. If there is no fear of looking foolish relative to network peers, non-brokers are no less likely than brokers to display emotion.

<sup>20</sup>Although not related to the value of an idea, mixing positive and negative emotions in broker proposals could be strategic. Preliminary ambiguity can improve the odds of successful action. Ego ambiguously signals interest, alter ambiguously signals acceptance, then ego and alter can move to concrete action with a lower risk of embarrassment. Leifer (1988) describes this action foreplay as "local action." A command can put ego in a powerful or an impotent role depending on whether or not the command is obeyed. It is wise to have a sense of how people will respond to the command before you issue it. Local action is a personal repertoire of ambiguous behaviors that can be taken to signal interest

With a wider range of emotions expressed by brokers, and those emotions irrelevant to the value of the idea proposed when the network around the speaker is held constant, I conclude that displayed emotion is style more than manipulation. Brokers are exposed to a wider diversity of opinion and practice, so they can see positive and negative aspects to any proposal, and they are not afraid to display those aspects as positive and negative. These results are consistent with psychological research reporting a correlation between good ideas and positive affect, but extend the research by showing that the correlation disappears when the network around ego is held constant. The results are consistent with sociological research reporting a correlation between good ideas and brokerage, but extend those results by showing that brokerage is accompanied by displays of emotion, both positive and negative.<sup>21</sup> Returning to the reason for presenting the results in this chapter, the results are

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in a role, or acceptance if another occupying a role, should events develop in that direction; otherwise the behaviors can equally well be taken as random social activity. Specifically, local action refers to behavior "that, ex ante, leaves open a range of roles and, ex post, does not prove inconsistent with any role that might be claimed later." (Leifer, 1988: 868). Padgett and Ansell (1993) provide a substantively rich illustration of local action in describing how Cosimo d'Medici rose to power by keeping his interests ambiguous, playing one family against another, so he could seize on advantages as they arose; a strategy that Padgett and Ansell (1993:1263-1265) term "robust action." Returning to the supply-chain managers proposing ideas, brokers could be engaging in local action when they mix positive and negative emotions in their proposals. Mixing positive and negative keeps their interests ambiguous until events take a clear direction. Such behavior is possible, though it seems too manipulatively clever for this population of relatively-open, middle-class folks. Also, ambiguity could be maintained by mixing positive and negative within sentences, but emotion content at the sentence level is not ambiguous. Emotion is clearly positive or negative within sentences, but rarely both. When I divide the texts into sentences, and predict emotions in a sentence, the association with mixed emotions disappears (logit test-statistic in Figure 8.7C changes from a significant -3.20 to a negligible 0.52). Brokers were unambiguously positive or negative within sentences. From this bit of evidence, and a sense of the kind of people the managers were, I infer that the more likely broker use of emotions reflects broader exposure to positive and negative possibilities with any idea and lower social inhibitions to displaying emotion.

<sup>21</sup>There is a further implication. Figure 8.7 describes people proposing ideas. The other side of the coin is seeking and acknowledging ideas from colleagues. Menon and Pfeffer (2003) argue that managers prefer to get advice from outsiders, rather than from colleagues within the company, because advice from a peer implies that the peer is superior, which is status eroding for the advice seeker. People who seek advice from inside the organization are seen as less attractive on a variety of dimensions including creativity and competence (Menon and Pfeffer, 2003:508; Menon, Thompson, and Choi, 2006:1136-1137). The status erosion associated with seeking advice internally is an example of relative deprivation, which is less likely for network brokers. Therefore, the intrepid broker hypothesis not only implies that network brokers will express more emotion when proposing ideas to senior management, they will be also more likely to seek and acknowledge ideas from colleagues.

consistent with the intrepid broker hypothesis: Network brokers are more likely to display emotion in proposing ideas to senior management.<sup>22</sup>

### **Aside on Motivation in Teams**

For this exploratory discussion, built on the lack of returns to secondhand brokerage in the initial chapters, I focus on brokers as less subject to relative deprivation. I could instead focus on the people more subject to relative deprivation, the people with peers clearly defined by structural equivalence. Viewed in terms of who is more subject to network fear, the hypothesis is about crowding. Ego crowded by numerous peers is at high risk of relative deprivation, so fear of relative deprivation is more likely among people crowded by peers. I used this imagery in discussing Bothner, Kang, and Stuart's (2007) NASCAR race results as support for the network fear hypothesis.<sup>23</sup> Ego can be

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<sup>22</sup>The qualification "in proposing ideas to senior management" picks up two variables likely to matter in future research testing the intrepid broker hypothesis. First, "proposing ideas" refers to a discussion topic sufficiently novel such that proper opinion on it is ambiguous. Such topics are most subject to peer pressure (see Appendix G), so they are the topics on which broker opinion will be most liberated from the peer pressure people with obvious peers, such as people in closed networks. I expect people in closed networks to display emotion after they understand what their group deems the proper emotion to display. Second, "to senior management" refers to an intimidating audience. I have elsewhere shown that gossip echoes within a closed network to amplify positive and negative opinions (Burt, 2005: Chap. 4). The echo can sustain within the closed network of a cult or clique strong opinion at odds with the outside world. Having a strong feeling, however, does not mean that the feeling gets expressed to outsiders. With respect to Figure 8.7, and continuing the point in footnote 19 about fear of looking foolish relative to peers, the survey request for a best idea put closed-network managers in a difficult situation: As managers, they should have an idea to express, but their lack of experience outside their closed network gave them grounds to be concerned about looking stupid or foolish relative to peers. The safe course was to say nothing, which was the most common response from closed-network managers (Burt, 2005:69).

<sup>23</sup>More than an alternative metaphor for the hypothesis, crowding offers an alternative network measure for the hypothesis. Numerous peers means many people engaged in relations with ego's contacts, so network weights  $w_{ij}$  would be high for peers  $j$ , leaving self-weight  $w_{ii}$  low. In other words,  $1-w_{ii}$  is a measure of crowding around ego, varying from zero to one with the extent to which ego  $i$  is crowded by numerous peers. The intrepid broker hypothesis can be stated as a hypothesis about crowding: When evaluating a new idea or practice, people more crowded by peers ( $1-w_{ii}$  closer to one) are more troubled by fear of failure. Crowding between structurally equivalent peers has precedent in ecological theory: McPherson (1983) on two organizations crowding one another to the extent that they draw membership from the same social categories, Hannan and Freeman (1989:103-104) on organizations crowding one another to the extent that they are dependent on the same resources (also used in structural hole theory, Burt, 1992:208-225), or Podolny, Stuart, and Hannan (1996) on two technologies crowding one another to the extent that they cite the same precedent patents. Unlike the ecological precedents, crowding here is a social psychological phenomenon. Crowding around ego is defined in the ecological precedents by measures of actual overlap between ego and peer relations. For example, Podolny, Stuart, and Hannan (1996:666) compute overlap coefficient  $\alpha_{ij}$  as the proportion of technology  $i$  precedent patents that are also cited by technology  $j$ , then measure crowding around technology  $i$  as the sum of  $\alpha_{ij}$  across other technologies  $j$ . In the bent preferences model, the network weights defining peers,

crowded in two ways by peers. The peers can be satellites structurally equivalent to ego by dint of their similar relations to outsiders and lack of relations with each other, or the peers can be group members structurally equivalent to ego by dint of their similar relations outside the group and strong relations with one another. The second form of crowding has special business relevance because crowding within a group corresponds to high-performance teams.

I mentioned in Chapter 1, and discussed in Chapter 6, how network closure provides advantage by creating a reputation cost for deviant opinion and behavior. As connections close the network, people are more informed about one another, and use one another as a frame of reference for social comparison. Reputations emerge. People wary of news reaching colleagues that might erode their reputation in the network are careful to behave well (which lowers the risk of trust within the network) and work to keep up with their colleagues (which lowers cost within the network by increasing the quality and quantity of work and decreasing the need for a supervisor to monitor individual behavior). Closure's advantage is manifest as enhanced collaboration, productivity, and stability that speed a group down its learning curve (see Burt, 2005:93-166, for review and diverse examples).

Reputation cost was left an intuition in the previous discussion. By common sense, the cost is a diminution of social standing, a loss of face, a feeling of letting people down, a feeling of not contributing your fair share. Reputation is a benchmark that floats with contributions from peers. They put in more, you have to put in more — or deal with your own and others' feeling that you are not contributing your share.

I can now be more specific about reputation cost. The motivation induced by fear of reputation cost is the motivation induced by fear of relative deprivation, and indexed by the downward-sloping curves in Figure 8.3B. People anticipate the pain of falling behind and avoid it. More, the labor and monitoring efficiencies associated with reputation-driven alignment are enhanced by such anticipation since people afraid are

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and so crowding, are based on social perceptions of overlap (discussed below and illustrated in Figure 8.8). The network around ego can give her a feeling of being crowded for one evaluation at the same time that she feels independent in another evaluation. The empirical question is whether reactions to crowding are better predicted by actual or perceived crowding. Judging from the empirical results discussed in Appendix G, the need to distinguish perceived from actual crowding will increase with the complexity of the network around ego.



drawn to others similarly afraid (Schachter, 1959). An engineer on a project team expressed the sentiment as follows: "Since Jim is killing himself; I mean he's here every night until three in the morning. I'd almost feel guilty if I wasn't working so hard." Guilt about not doing your part is reinforced by intense monitoring. Barker (1993) describes how monitoring changed when a small company shifted from a traditional chain of command to self-management within teams. Barker (1993: 418) asked employees how control practices in the new environment were different from practices in place before. One employee complained that (Barker, 1993: 408), "he felt more closely watched now than when he worked under the company's old bureaucratic system. He said that while his old supervisor might tolerate someone coming in a few minutes late, for example, his team had adopted a 'no tolerance' policy on tardiness and that members monitored their own behaviors carefully." As the employee summarized (Barker, 1993: 408): "Now the whole team is around me and the whole team is observing what I'm doing."

Analogy between relative deprivation and the reputation mechanism by which network closure provides advantage is useful in at least three ways. First, the analogy makes more precise how the reputation cost induced by closure is felt (the downward sloping curves in Figure 8.3B), and the conditions under which it is felt (clearly-defined network peers, as happens when the people in a team feel strongly connected with each other and special in some way that separates them from people outside the team).

Second, the analogy brings to mind alternative lines of research on the intrepid broker hypothesis. For example, Frank (1985) describes the flattened pay schedules that would result from people trading income for status among colleagues, which I cited earlier as an instance of people avoiding the pain of relative deprivation that afflicted Stouffer's Air Corps soldiers. In fact, Frank adumbrates the intrepid broker hypothesis when he links flattened pay schedules to dense networks (1984: 552, proposition 2; 1985: 51, Figure 3.4): "In firms in which co-workers perform their tasks independently of one another, one's rank among one's co-workers should matter less than it does in a firm in which interactions among co-workers are more extensive. . . . An important implication of the theory of markets for local status is that wage schedules will be flattest in those firms in which co-workers interact most intensively." The intrepid broker hypothesis says that people in closed networks are, relative to network brokers, more

motivated by fear of relative deprivation. One manifestation of that fear should be flattened pay schedules, with performance compensation extended beyond pay to include status symbols such as job titles, fringe benefits, and colleague deference (Frank, 1985: 91-94). In other words, if pay schedules are flatter in closed networks (where relative deprivation would otherwise be more severe), and reputation in a closed network is responsible for the greater productivity of high-performance teams, then high-performance teams should have flatter pay schedules.

Third, the analogy has practical significance for managing closed-network teams to generate advantage. Expressed in terms of the downward-sloping curves in Figure 8.3B, the pain of sliding down the curves is less motivating than the threat of sliding down the curves. The way the curves flatten out as good things continue to happen for peers that have left ego behind implies a resignation at having been left behind that I assume would result in ego becoming truculent, disinterested, and eventually withdrawing. To avoid the disinterest and withdrawal expected from being left behind (flat segments of the bold lines in Figure 8.3B), the pain of relative deprivation (steep segments of the bold lines) should be spread around so everyone gets a taste without experiencing a disproportionate share, and should be reversed quickly with praise or appreciation for previous contributions. In short, managing a closed network to generate its potential for collaboration and efficiency turns on maintaining a tension about pending relative deprivation. Brokerage is easier in that advantage turns on a constant search for productive variation. Relative to brokerage, managing closure is a balancing act that drives alignment by maintaining tension about who will next experience relative deprivation.<sup>24</sup>

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<sup>24</sup>The balancing act required to elicit the potential advantage of a closed network is another window on the strategic ambiguity that Leifer (1988) discusses as local action, and Padgett and Ansell (1993) discuss as robust action. See footnote 20. Balance also links back to Mayer-Schönberger's (2007) discussion of forgetting (see footnote 13 to Chapter 6). Relative deprivation is a brief, intense effect illustrated in Figure 8.3B by the bold line sharply decreasing as a peer overtakes ego then flattening out as good things continue to happen for the peer. The flattened segment of the bold line is ego forgetting the pain and getting on with her life. The pain cannot be forgotten if colleagues engage in schadenfreude gossip about the event, thereby ensuring a persistent pain for ego only alleviated by getting away from the colleagues. The closed network that defines a high-performance team increases the risk of painful relative deprivation at the same time that gossip within the team can neutralize the capacity team members would otherwise have to forget the pain.

## PERCEPTION DEFINES THE NETWORK

I have assumed that equivalence distance is like physical distance in that there is only one distance between two people. I relax the assumption in this section. Equivalence is an evaluation, and like other evaluations, equivalence as it is perceived is subject to bent preference distortion.

### Network Weights Defined

My assumptions in the previous section that brokers are relatively free from network peers, and that peers are defined by structural equivalence, was based on evidence reviewed in Appendix G of peer pressure between structurally equivalent people.

There is a complication I did not introduce in the previous section because it was not needed to state the intrepid broker hypothesis: To see the evidence of structural equivalence defining network peers, I had to distinguish structural equivalence as it exists from equivalence as it is felt. I do not mean that ego cannot see the similar relations with the same people measured by distance  $d_{ij}$  in equation (5). I mean that actual structural equivalence need not be relevant in the same way to all of ego's evaluations.

The shift from actual to felt equivalence is a straightforward application of the psychophysics model linking felt to actual stimulation. Begin with  $d_{ij}$  in equation (5) as the actual structural equivalence distance from ego  $i$  to some person  $j$ .<sup>25</sup> Let  $d_{max_i}$  be the maximum observed distance from ego. Then  $(d_{max_i} - d_{ij})$  measures the extent to which ego is more structurally equivalent to  $j$  than she is to others, and ego's felt equivalence to  $j$  can be measured by replacing stimulus  $x$  in the psychophysics model (equation 1) with the actual equivalence between ego and  $j$ :

$$\kappa(d_{max_i} - d_{ij})^v,$$

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<sup>25</sup>It is a leap to treat structural equivalence distance as if it were a concrete stimulus. People differ in their network skills and measured distance is subject to error. For example, distance is usually based on sociometric citations, which are subject to recall errors and social insecurities. Perhaps future work will define an epistemology distinguishing objective versus felt equivalence. Here, I treat the distance defined by network data as an objective reality subject to ego's interpretation. My motivation is empirical, not theoretical: Transforming objective equivalence  $d_{ij}$  into felt equivalence  $w_{ij}$ , generates evidence of peer pressure in Appendix G that is not visible without the transformation.

which, when converted to a proportion, is a measure of network weight  $w_{ij}$  for the bent preferences model in equation (4):

$$w_{ij} = \frac{(d_{\max_i} - d_{ij})^v}{\sum_j (d_{\max_i} - d_{ij})^v}, \quad (6)$$

The network weights defined by equation (6) are positive fractions that sum to one for ego  $i$  across everyone in the network ( $0 \leq w_{ij} \leq 1$ ,  $\sum_j w_{ij} = 1$ ). Weight  $w_{ij}$  equal to zero says that person  $j$  is irrelevant to ego's evaluation. Weight  $w_{ij}$  close to one says that ego's evaluation is greatly affected by how it would feel if ego were person  $j$ .

### Network Horizon

The  $(d_{\max_i} - d_{ij})$  metric in equation (6) says that differences are negligible between people at the horizon of the network around ego (that is to say at  $d_{\max_i}$  distance from ego). People on and past the horizon are irrelevant to ego's perception. Perceived equivalence varies between people close to ego. It would be equally reasonable to define perceived equivalence in terms of the  $d_{ij}$  directly, with zero distance defining peers and perceived distance differing at far removes from ego. I use a horizon as the fixed point of irrelevance because ego identically indifferent to distant contacts seems more likely than ego identically close to proximate contacts.<sup>26</sup>

My frame of reference for the horizon imagery here is the related work by Noah Friedkin and Diederik van Liere. Friedkin (1983) discusses interpersonal influence in terms of a horizon of observability referring to the length of indirect connection past which there is no social control from monitoring the other person's opinion and behavior. Friedkin (1983:65ff.) reports tight horizons around selected University of Chicago and Columbia University academics. Awareness extends to friends of friends, but it is much weaker than with direct contacts. Connections longer than friends of friends are irrelevant. In other words, the interpersonal control possible through closure can extend

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<sup>26</sup>A more Newtonian alternative to  $(d_{\max_i} - d_{ij})$  would be to express proximity as the reciprocal of distance, say as  $1 / (d_{ij} + 1)$ . This variable would equal one for ego and her structurally-equivalent peers, then fractions for everyone else. Another option would be to have proximity go fractional past a threshold of distance away from ego:  $D / (d_{ij} + 1)$  where  $D$  is a threshold distance beyond which ego pays little attention. Many alternatives satisfy the goal of having more discriminating perception distinguish levels of close equivalence to ego rather than levels of extreme nonequivalence. Equation (6) will do until there is evidence for an alternative.

to friends of friends (as reported in Chapter 6 for the analysts and investment bankers), but friends of friends define the horizon. Van Liere, Koppius, and Vervest (2008) report on a series of inventive laboratory experiments with middle managers and M.B.A. students showing that brokerage is contingent on a person's network horizon (see van Liere, 2007, for more detail and corroborating evidence). People able to see more of the forming and dissolving connections among others in the business simulation are more successful in building a brokerage network.

The primary difference to my use of the horizon imagery here is that I am not using horizon to refer to what ego can see, merely what ego deems relevant from what she can see. Van Liere, Koppius, and Vervest (2008:602) define the network horizon around a firm as "the number of firms and their relationships that the focal firm knows to exist in an interfirm network." In contrast, the gist of the story here is that exponent  $v$  in equation (6) tightens or expands the horizon for ego's frame of reference across the known surrounding network.

#### Exponent $v$ Shifts the Horizon

Like the focus on a microscope, exponent  $v$  can be increased to zoom in on a more narrow set of ego's peers as her frame of reference. Actual structural-equivalence distance from ego does not change. What changes is how ego feels about actual distance. A high value of the exponent makes finer the distinctions between people close to ego as it makes more coarse the distinctions between distant people. In the extreme, high values of the exponent can make everyone outside ego's closest peers reduce to a single broad category of "them." Recall the cartoon map on the cover of the New Yorker magazine (March 29, 1976) that represented fine-grain distinctions within Manhattan, a narrow band called Jersey on the other side of the Hudson, followed by the rest of the country packed into a small, desolate area between Mexico and Canada, followed by a condensed Pacific Ocean that ended on the horizon at China, Japan, Russia. A high exponent  $v$  underlay that caricatured New Yorker's frame of reference. Baron and Pfeffer (1996:195) offer more everyday illustration using the third edition of the U. S. Department of Labor's Dictionary of Occupational Titles. The classification categories were constructed by psychologists, resulting in a variety of occupation titles

within psychology and a great lumping-together of titles in other social sciences: 37 base and related occupation titles in psychology, 13 titles in economics, 9 in sociology, 7 in anthropology, and 2 in political science.

More specifically, Figure 8.8 illustrates the equation (6) link between actual and felt equivalence. Actual distance  $d_{ij}$  is on the horizontal axis. Felt equivalence  $w_{ij}$  is on the vertical axis. The graph to the left, Figure 8.8A, displays actual distance and felt equivalence for salesman 19 in the Figure 8.5 organization. Distances from salesman 19 to each person in the organization are given in the bottom row of Table F3. The three salesmen are separated by zero distance. They are completely equivalent. The next closest person is the head of sales, at a distance of 1.38, followed by division head 2 at a distance of 1.90, and so on. The people most nonequivalent to the salesmen are the group heads under the other division head (persons 6 and 7 at distance 3.23). With exponent  $\nu$  equal to one, the  $w_{ij}$  in equation (6) defining each person as a potential peer to salesman 19 are as follows: .06, .07, .01, .10, .04, .00, .00, .01, .01, .01, .01, .01, .01, .04, .04, .04, .17, .17, and .17. Salesman 19 takes the other two salesmen as peers (persons 17 and 18), followed to a lesser extent by the head of sales (person 4), followed by the division head of sales and marketing (person 2) and the senior leader (person 1). These scores are the white circles on the bold line in Figure 8.8A. Felt equivalence  $w_{ij}$  decreases linearly with increasing observed structural-equivalence distance  $d_{ij}$ .

The other lines in the graph show higher exponent values tightening ego's frame of reference. With the exponent set to one, the network weight between salesmen is .17, and for the head of sales is .10. Salesmen have 170% more weight than the head of sales. Increase the exponent to two, and more weight shifts from the head of sales to the other salesmen. Salesmen have 305% more weight. Increase the exponent to three, and the ratio increases to 500%. (Table F4 in Appendix F contains network weights for each person in the Figure 8.5 organization with exponent  $\nu$  set to three.) Increase the exponent to six, and almost no weight is given to the head of sales. Only salesmen define one another's frame of reference. For some evaluations — such as "Did I receive a good bonus?" — social comparison can be limited to a narrow circle of people exactly like me.

I was driven to distinguish felt equivalence from actual equivalence by empirical research on interpersonal influence in complex networks. In a network that is simple in the sense that it is composed of groups within which relations are symmetric and dense, and between which relations are rare, actual structural equivalence clearly defines network peers (e.g., the lobbyists in Figure G3 in Appendix G). In a network that is complex — in the sense that people are connected by long asymmetric indirect connections so group boundaries are difficult to distinguish, everyone is a little bit structurally equivalent to everyone else, so it is difficult to distinguish network peers from actual equivalence (e.g., the doctors in Figure G4 in Appendix G, some of whom are discussed in the next paragraph). The exponent  $v$  in equation (6) tightens the frame of reference around ego to focus on her one or two closest network peers, which then reveals the evidence of interpersonal influence between structurally equivalent peers.<sup>27</sup>

The graph to the right in Figure 8.8 illustrates the exponent  $v$  tightening a frame of reference in a complex network. The graph describes felt and actual structural equivalence for a doctor in a network of physician advice and discussion. The data were obtained in the early 1950s from physicians in Quincy, Illinois. Quincy was one of the four cities studied by Coleman, Katz, and Menzel (1966) in their Medical Innovation report on social factors affecting when doctors begin to prescribe a new antibiotic. The data are discussed in Appendix G (pages 22ff.). The point here is that the Quincy sociogram in Figure 8.8 is more complex than the organization in Figure 8.5. It is difficult to see group boundaries in the Quincy sociogram. The graph in Figure 8.8B shows actual and felt equivalence for doctor 3 (who can be found to the south in the sociogram). Doctors 29 and 38 are the most structurally equivalent to doctor 3, then there is a space after which other doctors follow in quick proximity to one another.

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<sup>27</sup>Operationally, when the average opinion of ego's structurally-equivalent peers is computed from network weights defined by actual structural equivalence in a complex network, there is a regression to the mean. Everyone is a little bit equivalent to everyone else, so everyone contributes to everyone else's frame of reference. Specifically,  $y^*$  in equation G1 in Appendix G has low variance relative to variance in observed individual opinion or behavior,  $y$ . The low variance in  $y^*$  created by putting too many people in ego's frame of reference obscures the correlation between  $y^*$  and  $y$ .

Higher values of the exponent  $\nu$  more clearly distinguish network peers 29 and 38 from the other doctors in Quincy.<sup>28</sup>

### **Network Identity Hypothesis: Brokers Rely on Abstract Images of Structure**

The distinction between felt and actual structural equivalence allows ego to expand or tighten her frame of reference as appropriate for a particular evaluation. That flexibility is necessary to see the evidence in complex networks of structurally equivalent people using one another as peers. As ego tightens her frame of reference to identify peers in a complex network, she risks losing her frame of reference. I'm different from Sheila for this reason. I'm different from Bob for that reason. Continue drawing finer and finer distinctions, and ego eventually becomes unique. The question of who is "like me" eventually gets answered "no one."

The dissolving frame of reference around ego is indexed by the self-weight,  $w_{ii}$ , defined by equation (6). For ego isolated from other people,  $w_{ii}$  equals one and all other  $w_{ij}$  for ego  $i$  equal zero, so the bent preference model in equation (4) simplifies to the model in equation (1) describing an individual alone in a psychophysics lab. For ego in a network that contains network peers structurally equivalent to ego, those peers provide a frame of reference for ego's evaluations,  $w_{ij}$  for peer  $j$  is nonzero and  $w_{ii}$  is less than one. As the exponent  $\nu$  in equation (6) increases to limit the frame of reference around ego's closest peers, more weight is given to ego's own situation. This is illustrated in Figure 8.8 by levels of felt equivalence over zero distance. Distance  $d_{ij}$  always equals zero. Using the equivalence metric in equation (6), increasing the

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<sup>28</sup>Distinguishing felt from actual structural equivalence also allows for broader frames of reference. When the exponent  $\nu$  in equation (6) is less than one, network differences are suppressed, so felt differences in equivalence are less than actual differences. An example would be the banding together of scientists from different disciplines in the 1980s to oppose Congressional budget cuts to basic research. Values of  $\nu$  larger than one exaggerate network differences so felt differences in equivalence are larger than actual differences. An example is the distinction between two scientists competing for the same senior professorship. In normal times, and by most observers, such competitors would be seen as similar in most respects. In trying to resolve a choice between the two professors as alternative candidates for a position, much ado is made of small differences between them. Exponents less than one can be expected among people pursuing collective goods of benefit across groups. I do not make much of fractional exponents here because I have not found a study population in which the exponent defining network peers was less than one.



exponent  $v$  tightens ego's frame of reference to people closer to ego, but especially heightens the weight given to ego herself and anyone completely equivalent to her.

Consider the three salesmen in the Figure 8.5 organization. With the exponent  $v$  equal to one, each salesman and his two colleague salesmen has a weight of .17. The bold line in Figure 8.8A crosses the vertical axis at .17. Increase the exponent to two, and the self-weight increases to .26 (solid thin line in Figure 8.8A), then to .30 for an exponent of three (dashed line), then to .33 for an exponent of six, at which point the three salesmen alone define 99% of one another's frame of reference (dotted line).

Compare the vertical axes for the two graphs in Figure 8.8. The self-weight for doctor 3 in the Quincy physician network increases much more than the self-weight increased for salesman 19 in the hypothetical organization. With the exponent  $v$  equal to three, doctor 3's self weight is .37, and it is off the chart when the exponent is set to six. The Quincy network is more complex, so no one is exactly equivalent to any one else, and a higher exponent that more clearly distinguishes a doctor's network peers simultaneously makes the doctor dramatically unique.

The distinction between felt and actual structural equivalence adds a new layer to the story about brokers being less subject to relative deprivation. The intrepid broker hypothesis is based on brokers having a unique pattern of connections in a network, so structural equivalence does not define an obvious set of network peers, which provides a freedom from the competitive pressure of relative deprivation. The distinction between felt and actual structural equivalence clarifies why the brokers in the physician networks are so much more unique than the brokers among the lobbyists and managers (Figure G7): the physician networks are more complex, so they require a higher exponent  $v$  to distinguish network peers, which makes everyone more unique (and the weak evidence of peer pressure is silent witness to the lack of clearly-defined peers for the physicians, Figure G4).

The distinction between felt and actual structural equivalence introduces a new question: How does ego manage the self-reliance foisted upon her when trying to identify suitable network peers by limiting her frame of reference to a narrow set of people? Network brokers are relatively free from the competitive pressure of structural equivalence because they are less likely to have peers obviously defined by structural

equivalence. That freedom can be an incentive for some people sometimes to be a broker, but everyone feels the need sometimes for a social frame of reference to make sense of ambiguous data and events. Is this a good idea? Do I look good? Is this job opportunity a good move for me? Answers to these questions are a matter of opinion, not fact. Certain answers come from evaluating data within a social frame of reference. When a structurally unique ego feels that an evaluation is too important to resolve within the limits of personal experience, ego looks around for a frame of reference, for a benchmark against which data can be evaluated. For brokers, the lack of an obvious frame of reference defined by structural equivalence means that a frame has to be found in more abstract images of social structure. Where the intrepid broker hypothesis describes correlates of the freedom provided brokers by their lack of structural peers, the following network identity hypothesis describes corrective moves expected from brokers when they feel the need for social comparison: The lack of an obvious frame of reference for brokers results in them being less guided by structural equivalence in identifying peers (including claims that they have no peer), and therefore more dependent on abstract images of social structure in which broker peers are more obvious. As with the intrepid broker hypothesis, I leave this third hypothesis to future research. However, a few comments on lines of attack would be useful to flesh out the hypothesis.

### **Brokers Break Frame**

I expect brokers to be less guided by structural equivalence in identifying peers, *ceteris paribus*, because structural equivalence provides brokers a less clear definition of network peers. Of course, brokers are connected beyond their local group, but many of those contacts beyond their local group are no more than contacts. Brokers are free to benchmark against peers inside a frame of reference broadly defined (other people in the same discipline) or narrowly defined (other people in the same discipline in this firm, in this office). The network identity hypothesis prediction is that brokers more often break out of the frame defined by structural equivalence.

One empirical test would be to run the usual contagion analysis of peer opinion affecting ego opinion to see whether the opinions of brokers are less well predicted by

structurally equivalent peers. That is the evidence in Figure G6 in Appendix G. Brokers are disproportionately involved in the near-peer relations in which connectivity rather than structural equivalence defines contagious opinion and behavior.

A second empirical test would be to ask people who they see as their competitors. Brokers should more often name competitors with whom they are not structurally equivalent. For example, Porac et al. (1995:214) surveyed heads of Scottish knitwear firms asking them to identify on a roster of the firms those firms that they considered to be competitors in the sense "that they were often considered during the past 18 months when setting prices, developing products, and marketing their knitwear." Porac and his colleagues predict competitor citations from market segments defined by product and company variables that lead people to see two firms as competitors. The more closely a firm fits into a market segment, the more often it was cited as a competitor within the segment.<sup>29</sup>

————— Figure 8.9 About Here —————

Figure 8.9 provides more concrete illustration of the network identity hypothesis using the citation data provided by Porac et al. (1995: 227). There are 89 people in the sociogram. An arrow goes from ego to the head of a firm cited as a competitor that ego considers in his own firm's pricing, products, and marketing. Six market segments distinguished by Porac et al. are indicated by color and shape in the sociogram. The table in Figure 8.9 shows that most managers only monitor other firms in their market segment (57 of 89, or 64%, only cite competitors within their own market segment). I computed network constraint scores from the citation data and divided the managers into below-average versus average-or-higher network constraint. Brokers in the Figure 8.9 table are managers with constraint scores below average. Brokers relative to non-brokers are twice as likely to benchmark against companies outside their own market segment (25 of 54 citations, 46%, versus 7 of 35 citations, 20%).<sup>30</sup>

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<sup>29</sup>The results are reported in Porac et al. (1995:219-221). The specific effect to which this sentence refers is the negative association between a company that fits poorly into a market category (AVGDIS) and the tendency for the company to be cited as a competitor by others in the category (RIVIN).

<sup>30</sup>This is only an illustration. The network data defining structural equivalence distance are the competitor citations used as a criterion variable. Ideally, network data on buying and selling would distinguish brokers and define market boundaries around structurally equivalent producers, both of which would be used to predict who cites whom as a competitor. Also, controls in the original report are not

### **Role Equivalence Provides Frame**

Coming at the network identity hypothesis from another direction, I expect brokers to make more use of abstract role analogies. In the absence of network peers clearly defined by structural equivalence, peers can be found by identifying with a role that allows comparisons across situations. "I see myself as a mother to this organization." "I see myself as the guard dog for this project." Identifying with a role allows for social comparison outside a situation that does not provide a clear frame of reference. As a mother to this organization, which of my current choice options would be the choice of a good mother? As a guard dog for this project, how do the obligations of that role guide my choice between current options?

Beyond colloquial labels, I expect brokers to make more use of role equivalence to define peers. Role equivalence is an abstract form of structural equivalence. People are structurally equivalent to the extent that they have similar relations with the same people. People are role equivalent to the extent that they have similar relations with people similarly involved in relations. Directors in two divisions supervise different people, so they cannot be structurally equivalent, however, they can be role equivalent.

A brief example will suffice to show role equivalence clearly defining network peers in situations where structural equivalence does not. Figure 8.10 is a spatial display of role equivalence in the hypothetical organization in Figure 8.5. Role equivalence distance is computed as described in Appendix G (see equation G2), and the distances for Figure 8.10 are given in Table F3 in Appendix F.

Compare the role-equivalence space in Figure 8.10 to the structural-equivalence space in Figure 8.6. The two division leaders are on opposite sides of the space in Figure 8.6 because they supervise entirely different people. However, the division leaders are similarly network brokers to identical organizations of people below them, so

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included here. There are nuances to consider in theory (Porac and Thomas, 1990; Hodgkinson, 2005). There are analogies to pursue. For example, Porac, Wade and Pollock (1999) show that CEO compensation is benchmarked primarily against compensation within a company's primary industry (which is consistent with common sense and the structural equivalence definition of industries), but there are conditions under which comparisons systematically occur beyond the industry frame of reference. Those frame-breaking comparisons are more likely from network brokers. These issues notwithstanding, Figure 8.9 illustrates the point that network brokers looking to benchmark against peers are more likely (than non-brokers) to break out of the frame of reference defined by structural equivalence.

the division leaders are role equivalent in Figure 8.10. In a situation where structural equivalence provides no peer, role equivalence provides an intuitively appropriate frame of reference — as a division leader, my natural peer for social comparison is the other division leader.

————— Figure 8.10 About Here —————

Group leaders are clustered together in the southwest corner of Figure 8.10. Group leaders 5, 6, and 7 are role equivalent. They are piled on top of one another in Figure 8.10 and separated by zero role-equivalence distance in Table F3. They each supervise a densely-connected group of individual contributors, and report up to a division leader. Because they supervise different individuals, the group leaders are separated into the four corners of the structural equivalence space in Figure 8.6. Because they supervise similar organizations and connect up similarly, they are role equivalent. Subtle differences in roles are also captured. The head of sales, group leader 4, is a little apart from the other group leaders because he supervises a disconnected group of individual contributors. The lack of connections between salesmen makes the head of sales a group-leader role different from the group-leader role in the other three functions. Here again, role equivalence provides the group leaders an intuitively appropriate frame of reference in a situation where structural equivalence does not.

Role equivalence does not provide a peer to the senior leader. Only one person in the organization plays the role of senior leader. Having come up through the roles of group and division leader, assume the senior leader has developed the cognitive skill required to define peers by role equivalence in lieu of structural equivalence. The senior leader can be expected to abstract his role in the organization so he can make social comparisons to senior leaders playing the same role in other organizations. Once network structure is abstracted into a role, it can be compared to similar roles anywhere.

Figure 8.10 also illustrates an important trade-off between the concrete conditions of structural equivalence and the abstract conditions of role equivalence. Individual contributors all have a frame of reference unambiguously defined by structural equivalence. Their network peers are the other individual contributors in their function.

The four structural-equivalence clusters of individual contributors in Figure 8.6 reduce to two role-equivalence clusters in Figure 8.10. The three salesmen are both structurally equivalent and role equivalent. They form a cluster to the east in Figure 8.10.

However, the three clusters of individual contributors in the other functions are clustered together as role equivalent to the northwest in Figure 8.10. The individual contributors in the other functions are role equivalent in that they all have strong relations with interconnected colleagues, and a strong relation with a group leader who is broker to the rest of the organization. However, the individual contributors outside sales do not have to use role equivalence to identify network peers. A perfectly clear frame of reference is provided by structural equivalence. More, the frame of reference provided by structural equivalence is simpler; it involves social comparisons within function. Role equivalence implies that comparisons across functions are as likely as comparisons within function.

The network identity hypothesis is conditional. Structural equivalence does not provide a social frame of reference for people who are brokers between groups. People in senior job ranks often play such a role, but more generally, structurally unique people include anyone who is the sole bridge from one group to another. Such people will not find a social frame of reference in structural equivalence. To the extent such a person wishes to have a social frame of reference for an evaluation, I expect them to rely on role equivalence more than structural equivalence.

Where structural equivalence does provide a clear definition of network peers, I expect people to rely on structural equivalence more than role equivalence because structural equivalence is more concrete and less demanding intellectually. It is less demanding because — as a special case of role equivalence — it requires social comparison with fewer people. Figure 8.10 shows that the individual contributors in marketing, production, and product development are role equivalent. That is a lot of people in different functions, many of whom will be unknown to ego, and none of whom counts very much toward ego's evaluation (even with the exponent set to three, each role-equivalent peer counts only 8% of ego's frame; see Table F5). Social comparison across many people, each counting a little, seems an unlikely mental calculation. I suspect that ego will select a subset of peers to make the task manageable. Structural

equivalence provides a manageable, less subjective, frame of reference by focusing on people who compete for the same relationships.

Empirical tests here are the same as the ones discussed above in the section on brokers breaking frame. One empirical test would be to run the usual contagion analysis with role equivalence defining network peers instead of the structural equivalence definitions discussed in Appendix G. Broker opinions predicted less well by the average opinion of structural-equivalence peers should be better predicted by the average opinion of role-equivalence peers. A second empirical test would be to follow the Porac et al. example in Figure 8.9 of asking ego she sees as her competitors. Where structural equivalence clearly defines network peers, those peers should be named as competitors. For brokers and other structurally unique people for whom structural equivalence does not clearly define peers, the named competitors should be predicted less well by structural equivalence and better predicted by role equivalence.

## SUMMARY

I have argued that perceptions are bent by feelings of relative advantage and relative deprivation defined by the network around the perceiver. The link between felt and actual stimulus was taken from psychophysics. Concepts of structural and role equivalence in sociology provided context. Together, they imply the bent preferences model in equation (4) from which I derived the three broad hypotheses around which I organized this chapter.

First, the motivation that networks create is disproportionately about fear, specifically, fear of falling behind peers. In defining the frame of reference through which ego evaluates alternative actions, the network around ego creates pressure to act. Ego is lured to action by the prospect of moving ahead and pushed to action by fear of falling behind. The bent preferences model predicts that the push is stronger than the pull; the network pressure on ego to act is less about the lure of gain, than the fear of loss. The following network fear hypothesis is implied: The feelings of loss as peers overtake ego are more severe than the feelings of gain in overtaking peers, but the feelings of loss fade as peers continue to do well.

Second, networks differ predictably in the intensity of fear they generate. The difference between felt loss and gain predicted by the first hypothesis is larger for people with more obvious peers. With peers defined by a network criterion of structural equivalence, more obvious structural equivalence makes falling behind peers more obvious, which ensures the pain, and so fear, of relative deprivation. Network brokers are relatively unique within their networks. There is often no one structurally equivalent to a broker. Brokers having no structurally equivalent peers are free from the competitive pressure of peers, so they are less subject to the pain of relative deprivation, and therefore more free to evaluate and espouse something new for its benefits. An intrepid broker hypothesis is implied as a contingency variation on the network fear hypothesis: When evaluating a new idea or practice, network brokers are more motivated by the lure of gain, and less troubled by a fear of failure.

Where the second hypothesis describes correlates of the freedom provided to brokers by their lack of peers, the third describes corrective moves expected when brokers feel the need for a social frame of reference. Freedom from the competitive pressure of structural equivalence is an incentive to be a broker, but everyone at one time or another needs a social frame of reference to make sense of ambiguous events. The question, "Who is like me?" sometimes needs to be answered, presupposing an answer to the identity question, "Who am I?" For brokers, the lack of obvious peers means that a social frame of reference has to be found in more abstract images of social structure, implying a network identity hypothesis: Brokers are less guided by structural equivalence in identifying peers (including claims that they have no peer), and are more likely to be guided by abstract images of social structure in which broker peers are more obvious.

This chapter is a break from the past in bringing agency to center stage in network theory. Consistent with the past, the focus on agency comes at the request of empirical research: The evidence in the preceding seven chapters implies that closure operates through local processes and brokerage operates through personal processes. There is no evidence of global processes. Social capital remains a phenomenon local and personal despite technological advance. How the local and personal operate, with what consequence, are questions that move now to center stage.



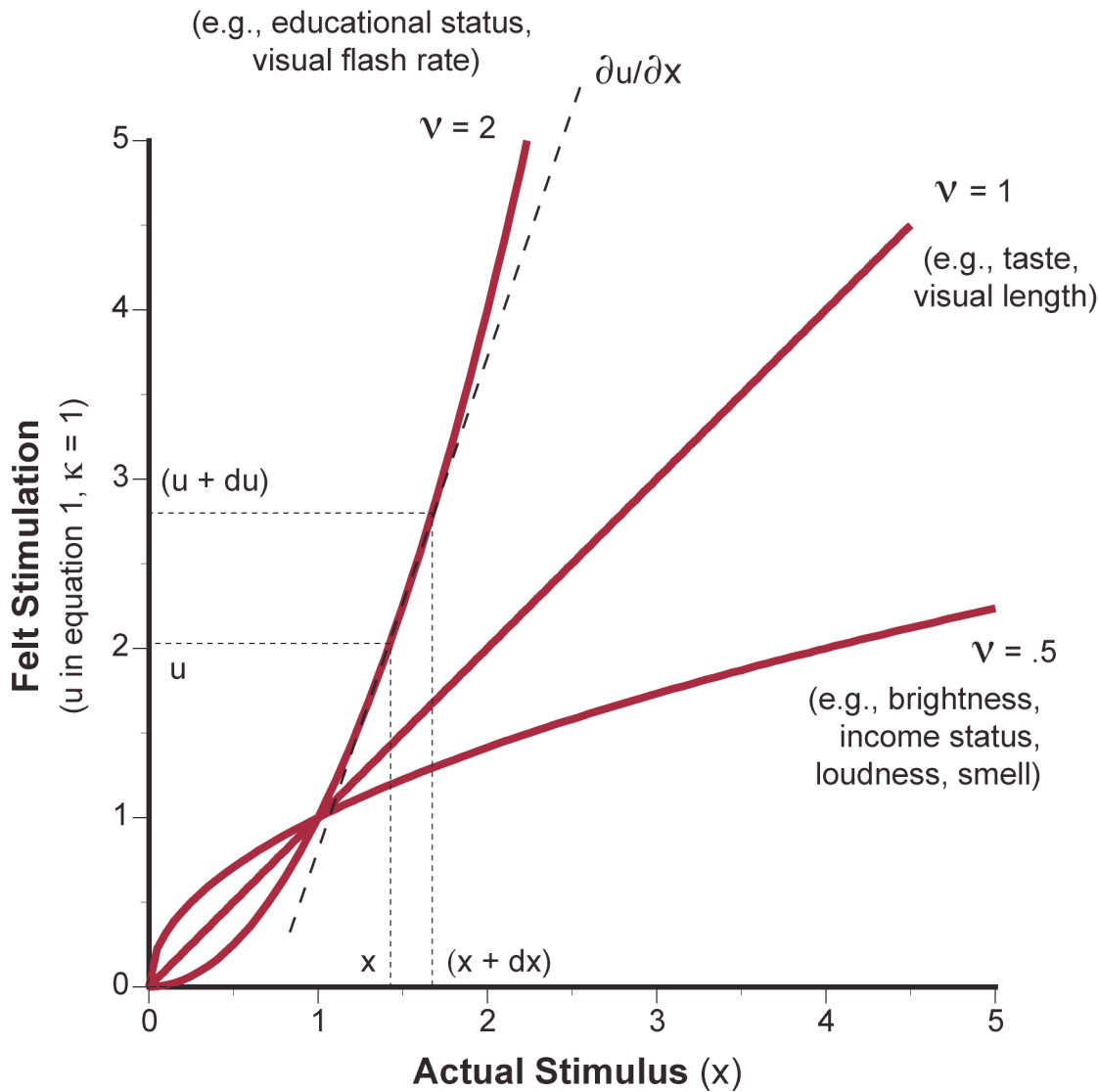


**Table 8.1**  
**People with the Better Chances of Promotion**  
**Are more Negative about Promotion**

| Opinion of Promotion Chances  | Military Police, High School or College<br>(n = 241) | Military Police with Less Education<br>(n = 165) | Air Corps, High School or College<br>(n = 152) | Air Corps with Less Education<br>(n = 70) | Loglinear Z-Score Opinion Link with |                 |
|-------------------------------|--|--|--|---|-------------------------------------|-----------------|
|                               |  |  |  |   | Education                           | Military Police |
| Positive                      | 27%  | 58%  | 19%  | 30%                                       | -5.93                               | 4.32            |
| Neutral                       | 53%  | 34%  | 47%  | 49%                                       | 1.43                                | 0.19            |
| Negative                      | 20%  | 8%   | 34%  | 21%                                       | 3.98                                | -3.87           |
| <b>Percent at Higher Rank</b> | 34%  | 19%  | 55%  | 47%                                       | —                                   | —               |

Note — These are American Soldier sample noncommissioned officers in the two services during 1944 who have been in the Army for one to two years answering the question, “Do you think a soldier with ability has a good chance for promotion in the Army?” Column percentages and log-linear z-score test statistics are given. Positive response is “A very good chance.” Negative responses are “Not much of a chance” or “No chance at all.” Neutral responses are “A fairly good chance” or “Undecided” (see footnote 5 for test statistics and explanation of combined responses). High education is high school graduate or some college. Low education is less than high school graduate.

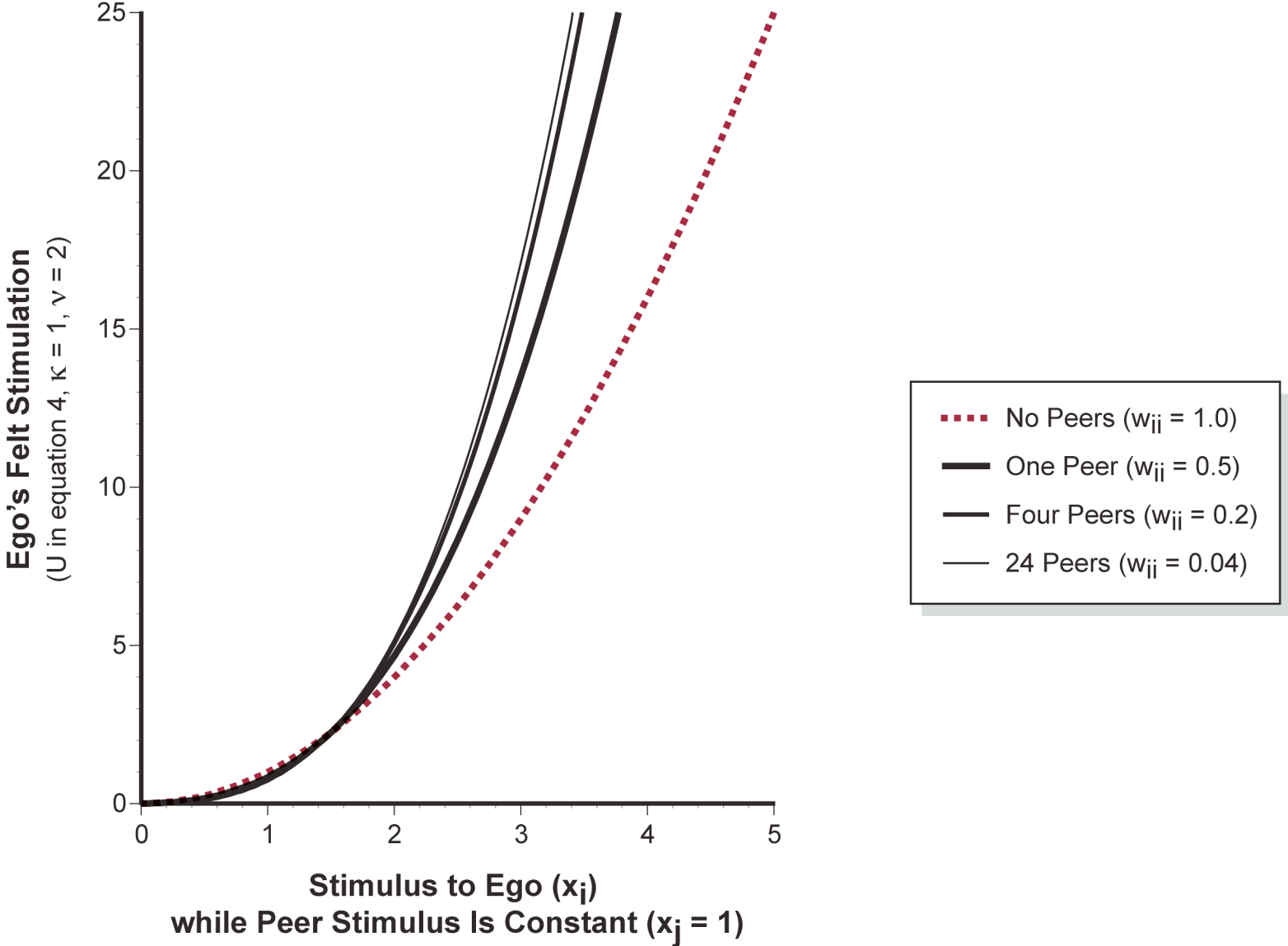
# Figure 8.1: Psychophysics of Marginal Evaluation: Translating Actual Stimulus into Felt Stimulation



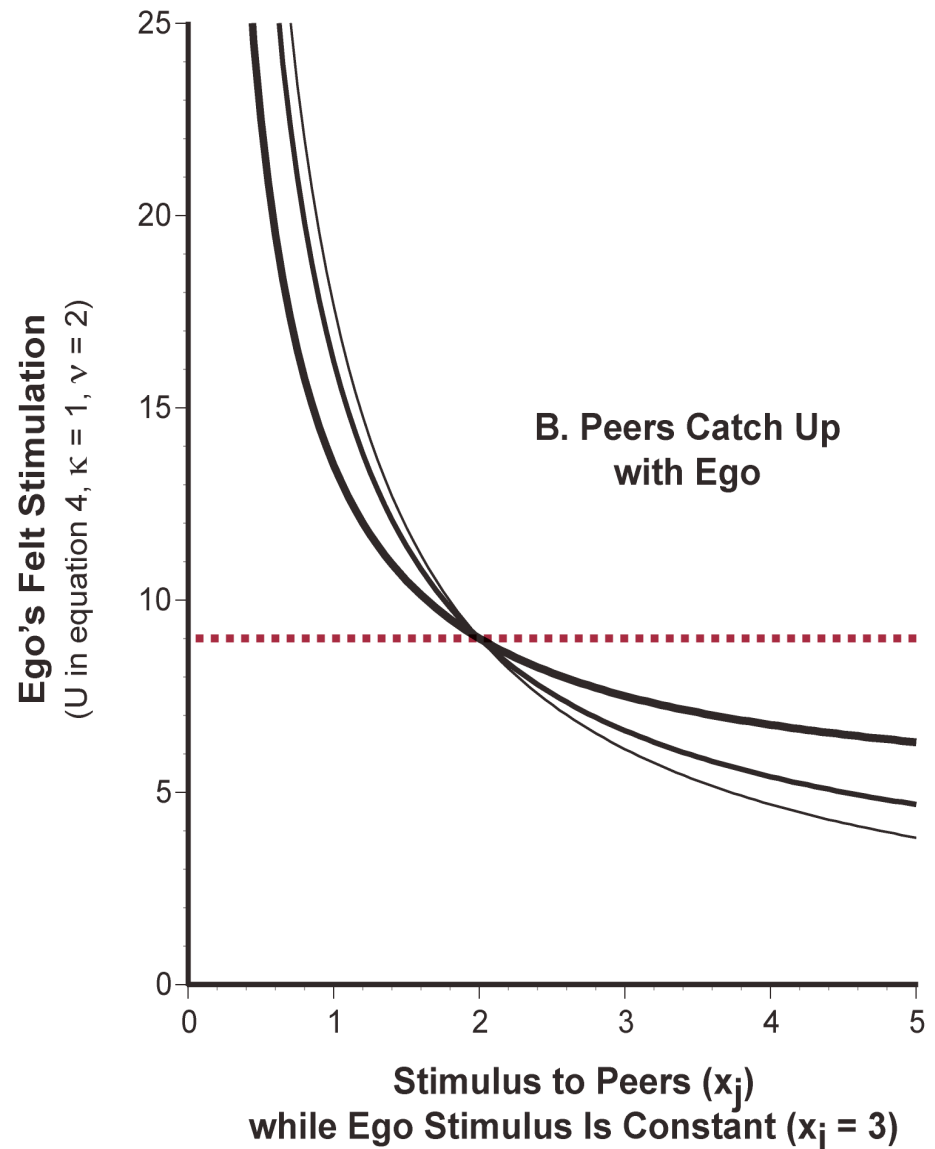
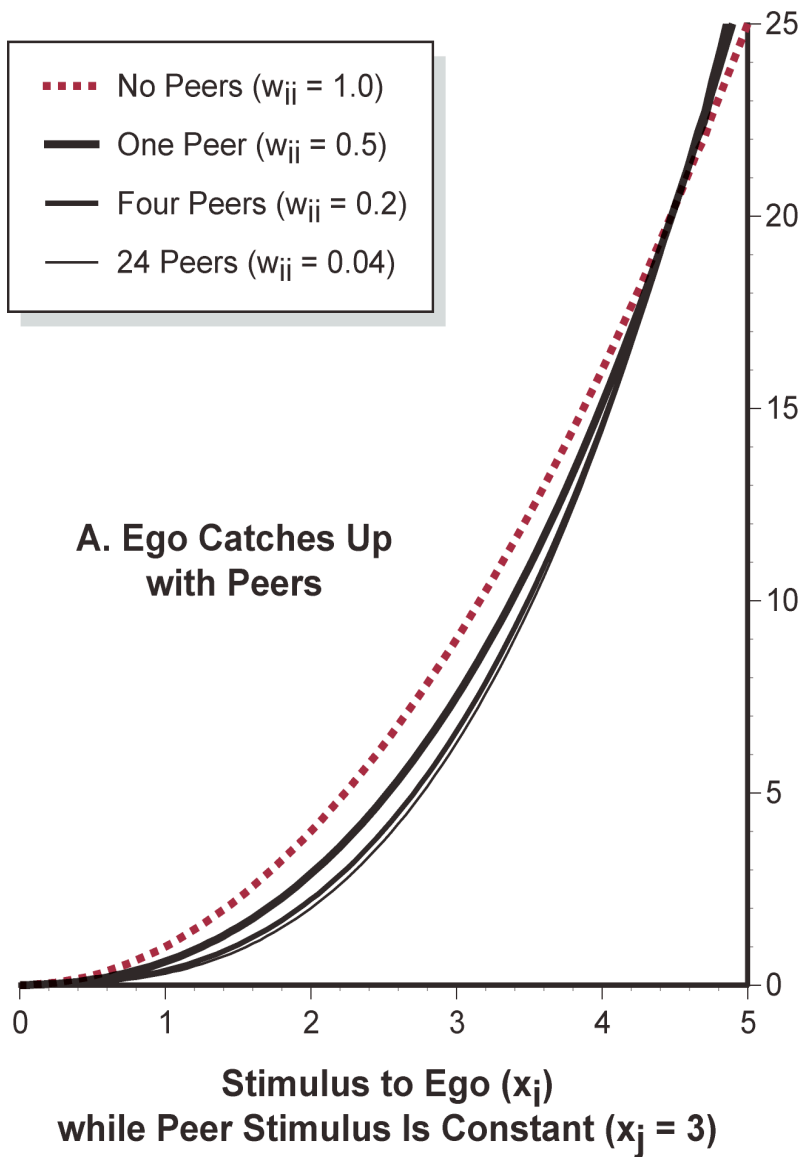
$$\begin{aligned} \text{felt stimulation} &= u \\ &= \kappa x^\nu \\ &= \kappa (\text{actual stimulus})^\nu \end{aligned}$$

$$\begin{aligned} \text{felt increase} &= du \\ &= [\partial u / \partial x] dx \\ &= [\nu \kappa x^{(\nu-1)}] dx \\ &= [\nu u / x] dx \end{aligned}$$

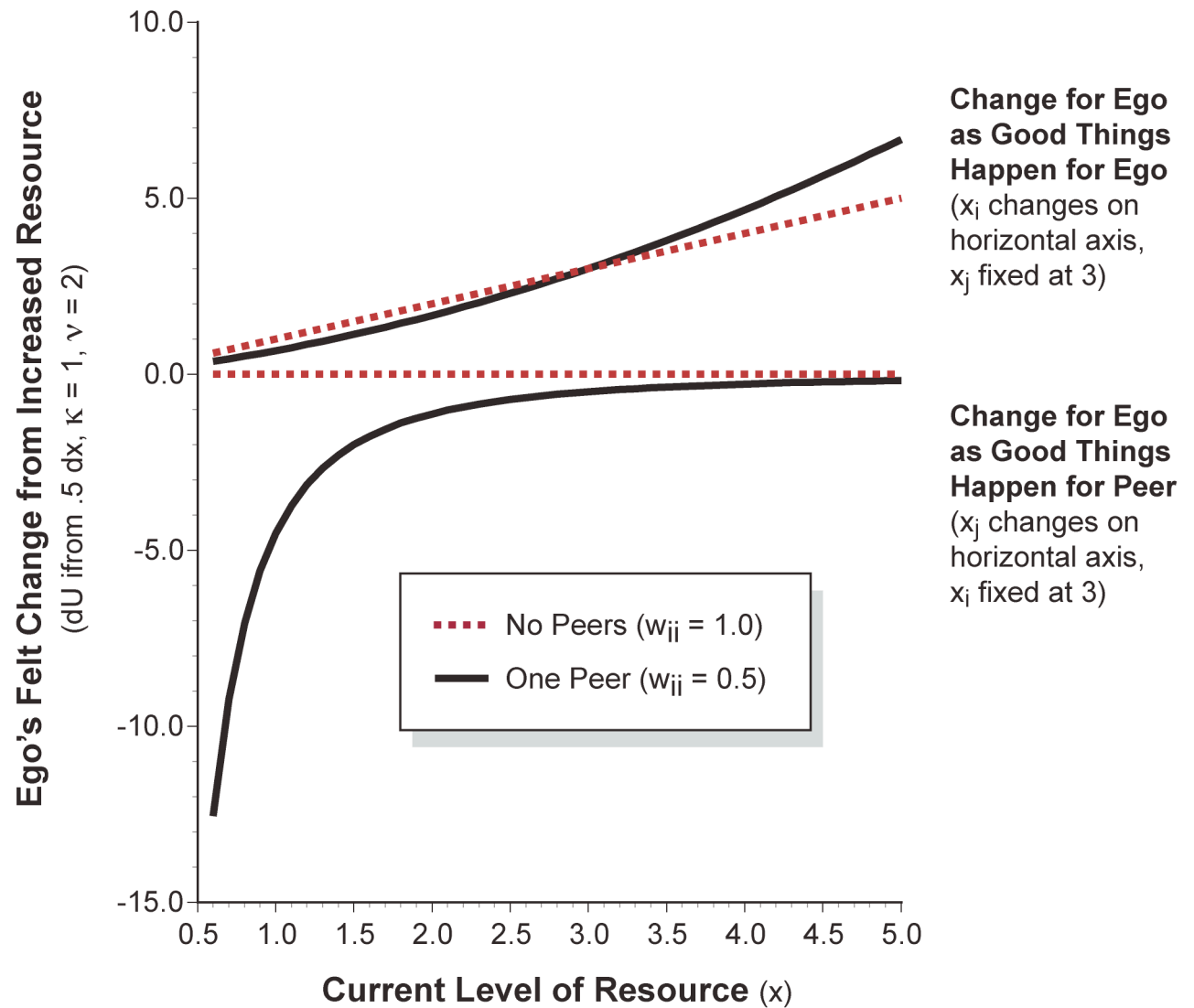
# Figure 8.2: Feeling Relative Advantage



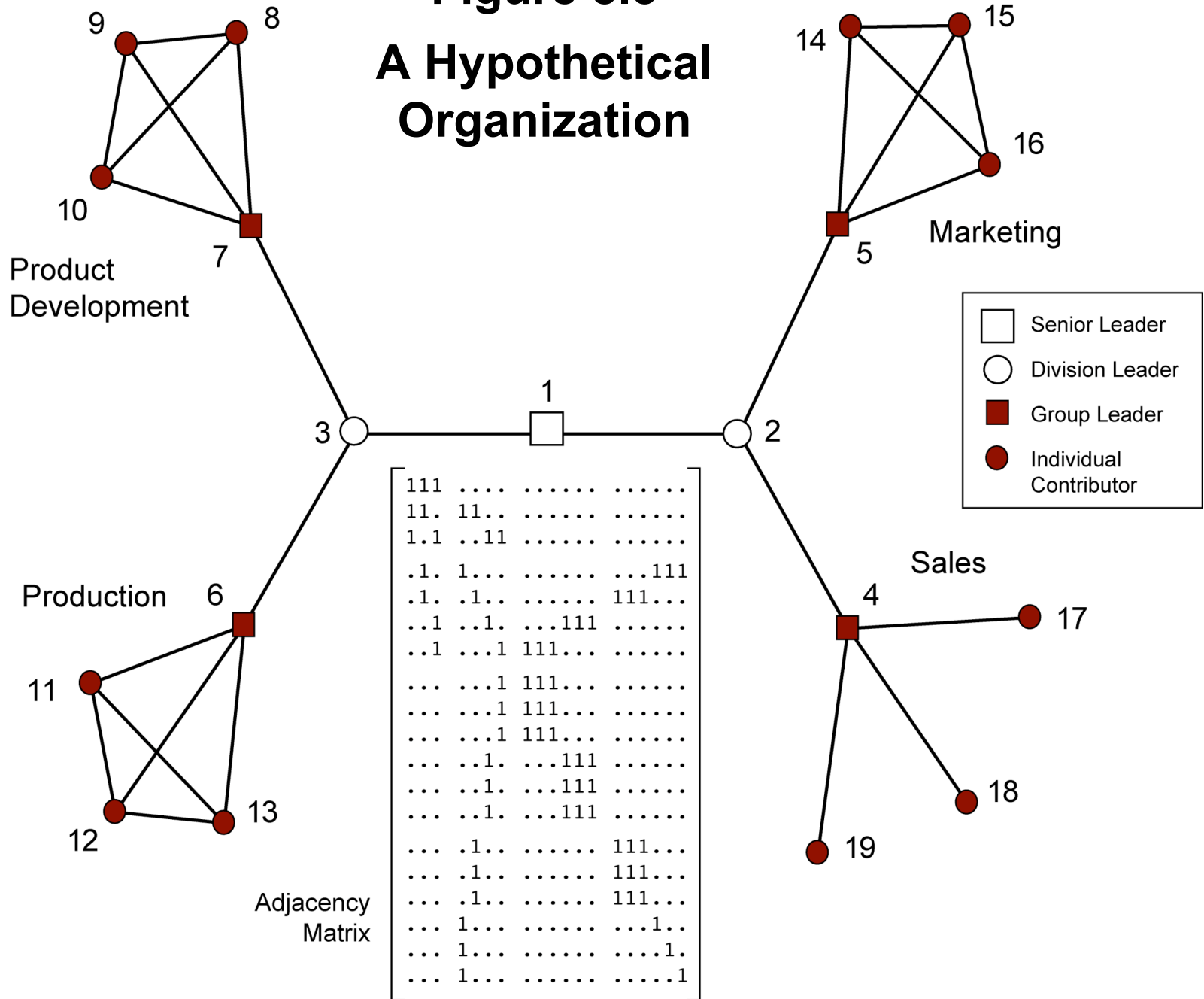
# Figure 8.3: Feeling Relative Deprivation



**Figure 8.4**  
**Illustration**  
**for the**  
**Network Fear**  
**Hypothesis**



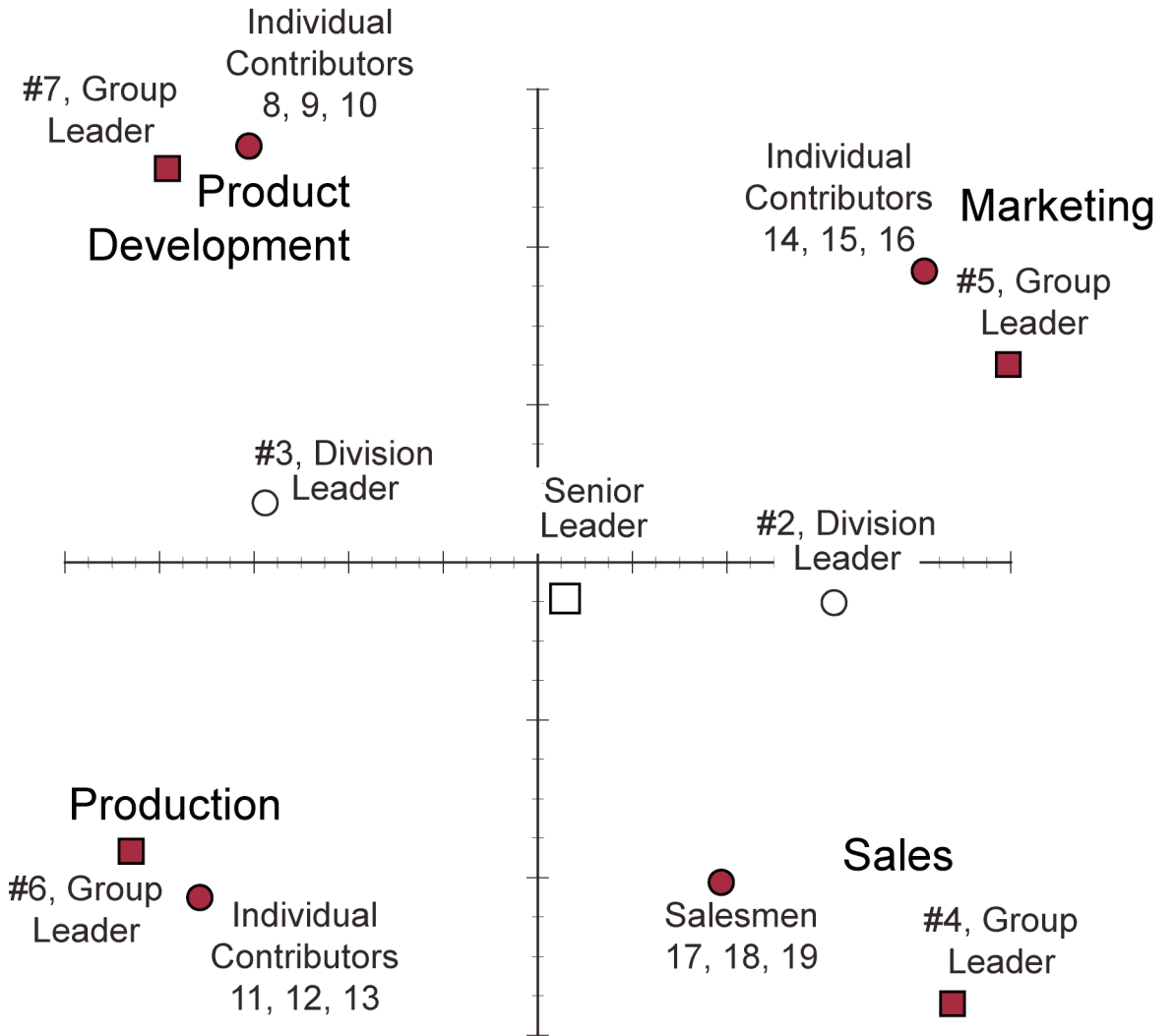
# Figure 8.5 A Hypothetical Organization



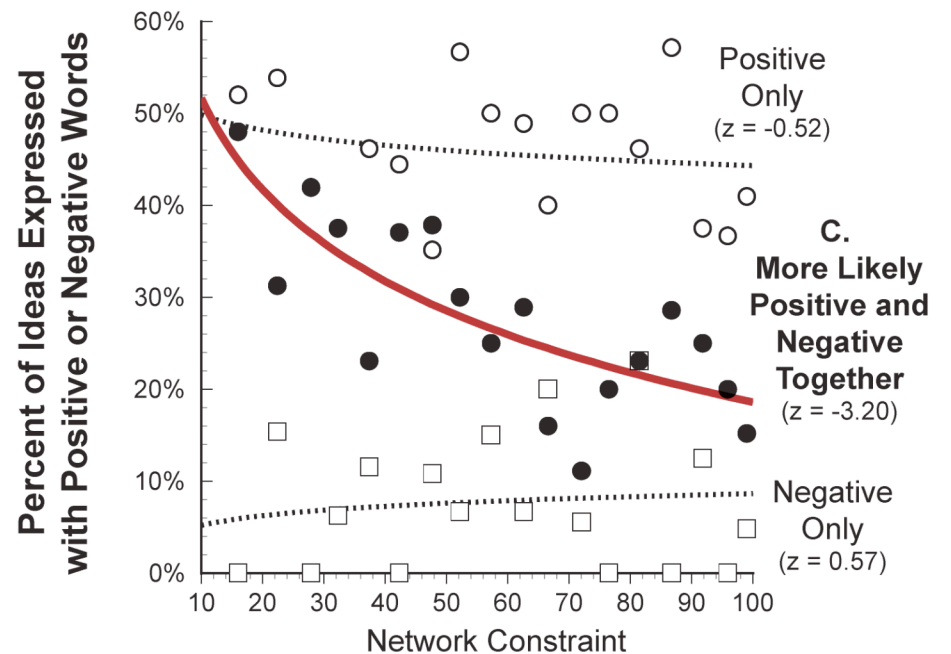
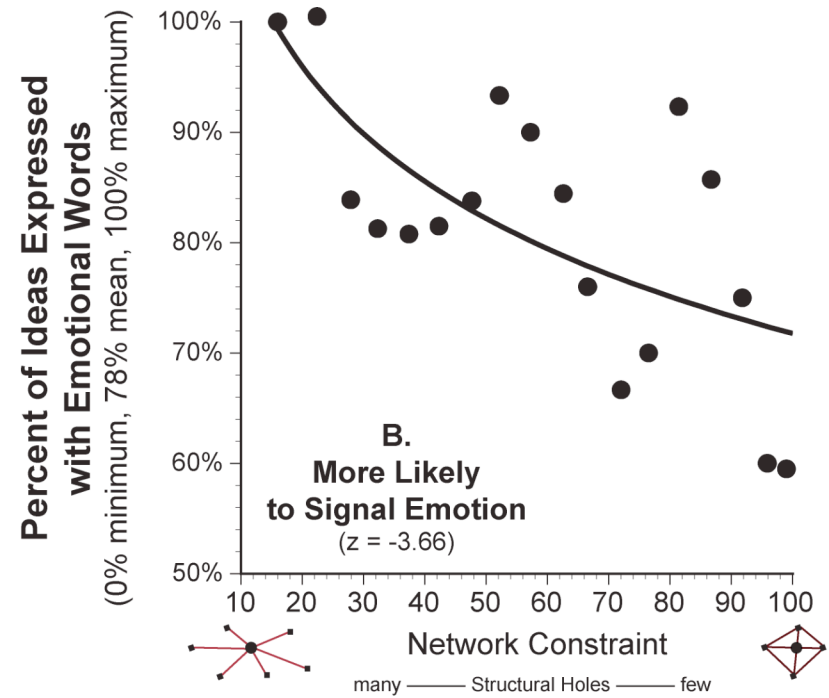
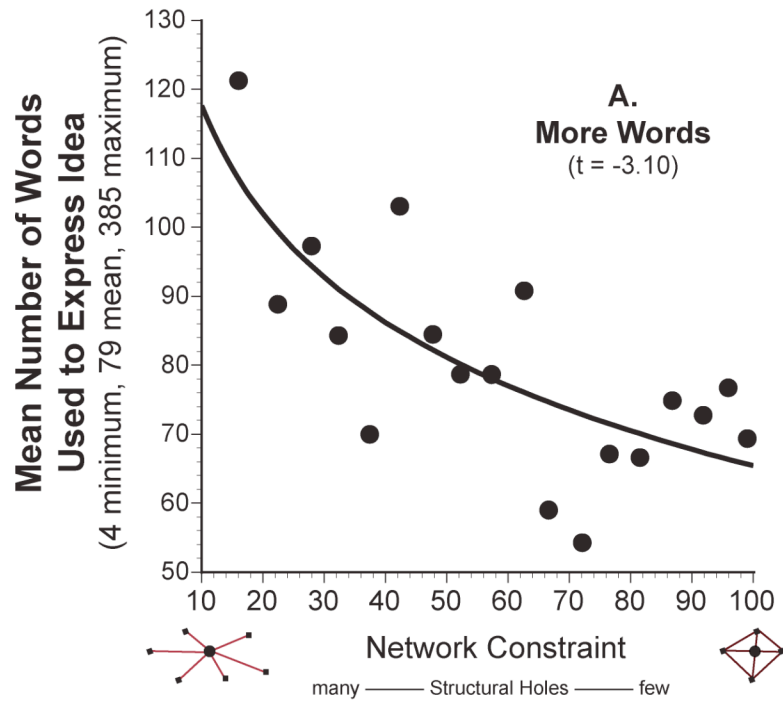
# Figure 8.6

## Spatial Map of Structurally Equivalent Peers in the Hypothetical Organization

This is a multidimensional scaling of the structural equivalence distances in Table F3 (Kruskal stress = .048)







## Figure 8.7

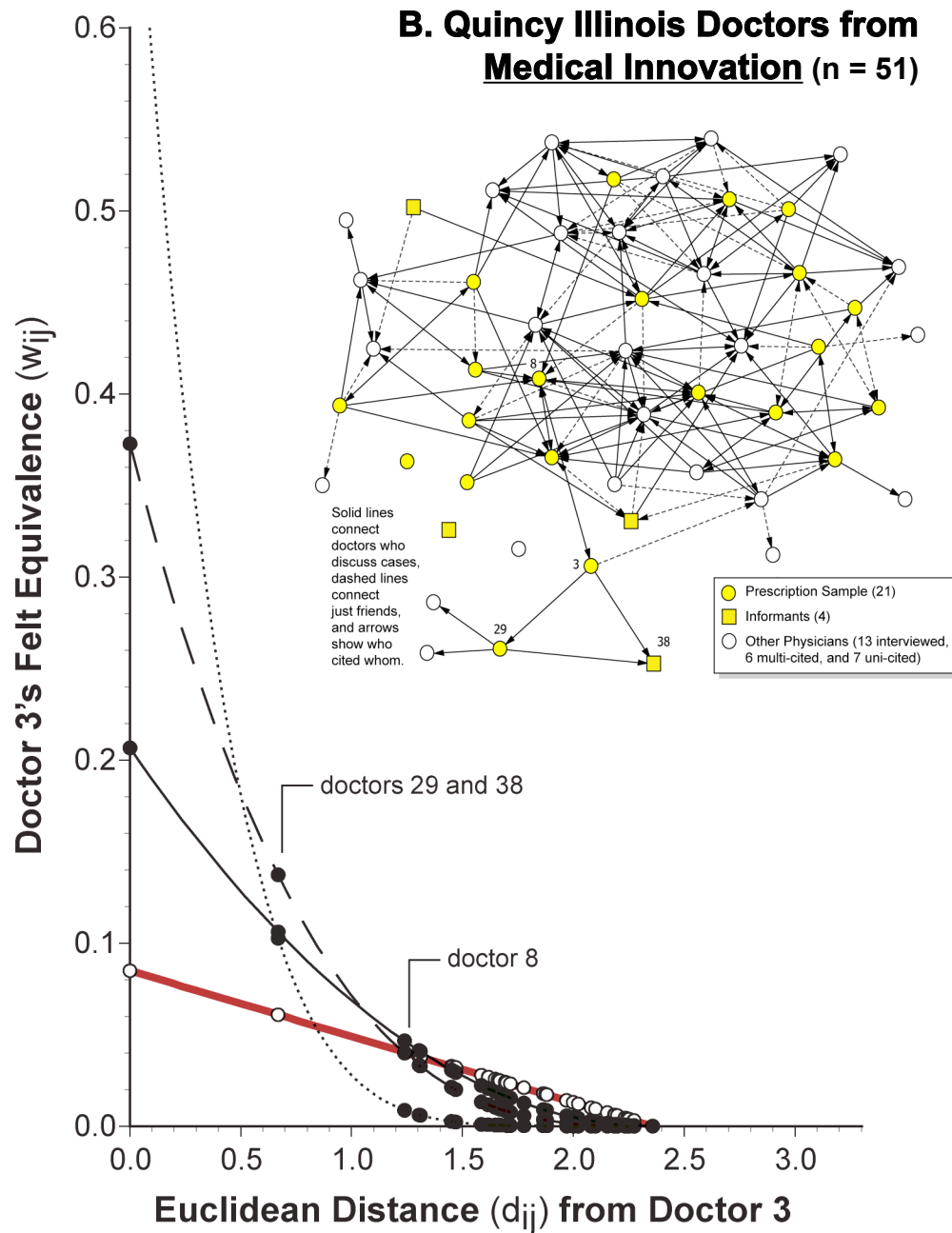
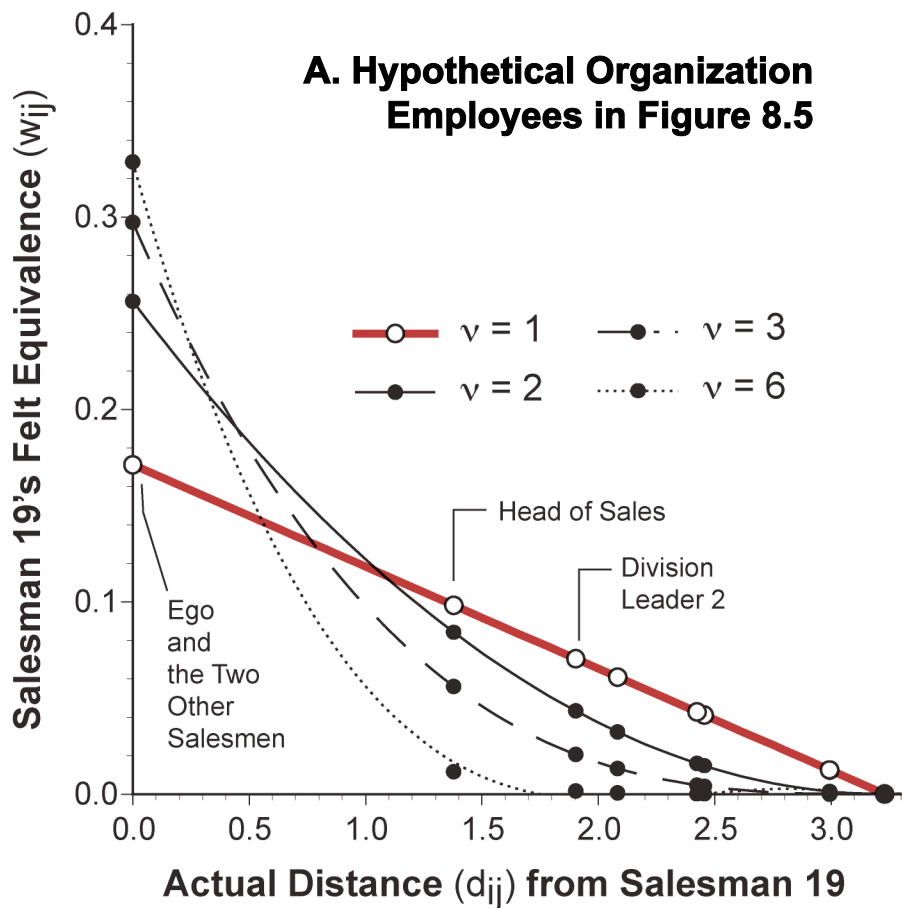
### Brokers Are More Expressive in Pitching Ideas.

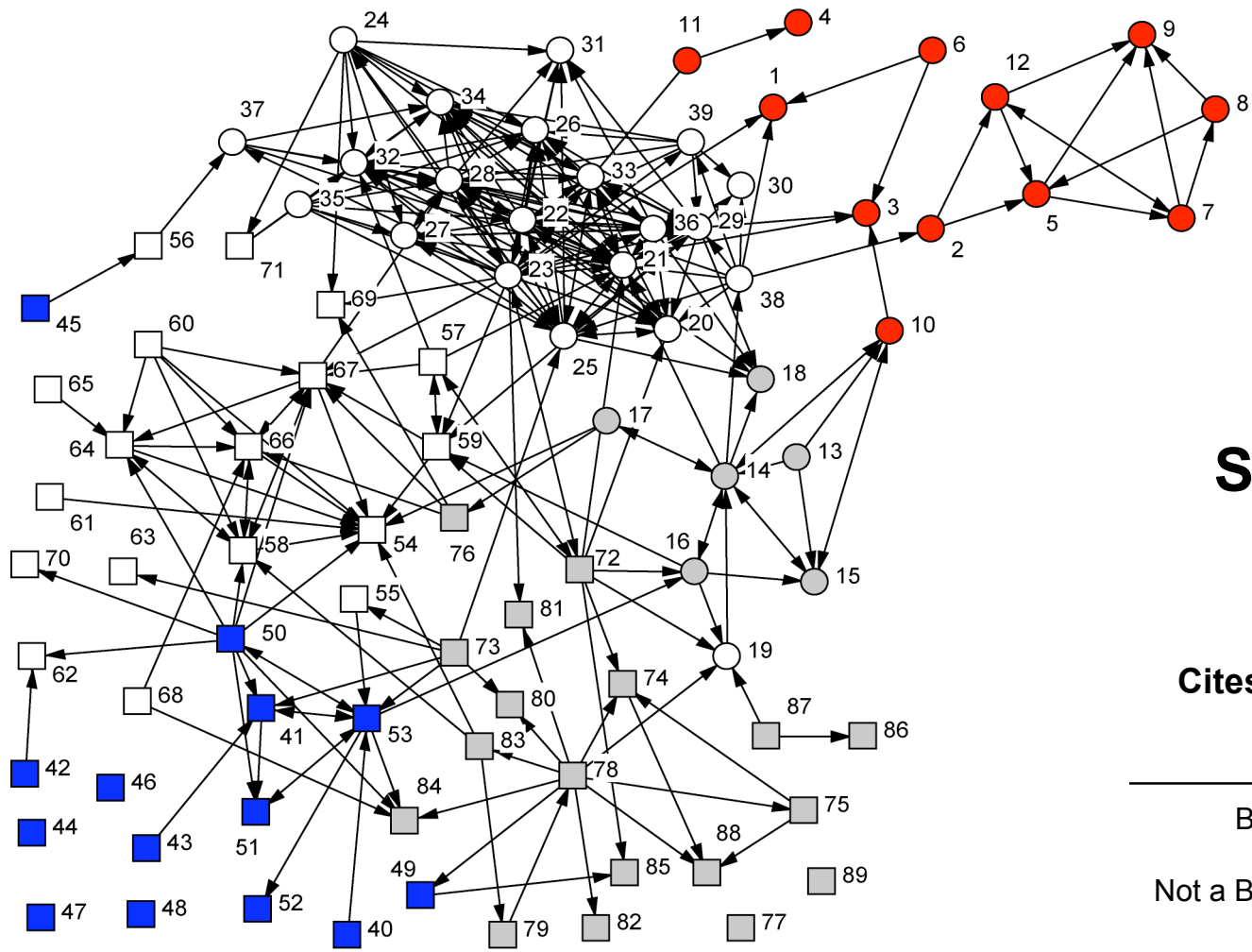
(Scores are averaged within 5-point intervals of network constraint. Logit z-score tests for association with network constraint are reported in parentheses)

# Figure 8.8

## Exponent $\nu$ Tightens Ego's Frame of Reference

$$w_{ij} = \frac{(d_{\max_i} - d_{ij})^\nu}{\sum_k (d_{\max_i} - d_{ik})^\nu}$$





**Figure 8.9**  
**Sociogram of**  
**Scottish Knitwear**  
**Competitors**

**Cites Outside Own Segment?**

|              | No        | Yes       | Total     |
|--------------|-----------|-----------|-----------|
| Broker       | 29        | 25        | 54        |
| Not a Broker | 28        | 7         | 35        |
| <b>Total</b> | <b>57</b> | <b>32</b> | <b>89</b> |

**Market Segments:**

- Up-Market
- Mid-Marketers
- Mass-Marketers
- High-Fashion Handframers
- Traditional Handframers
- Handknitters

Note — Data and market segments are from Porac et al. (1995: 227). Lines indicate ego citing other as taken into account in ego pricing and marketing. Brokers above have below-average network constraint. “Yes” means ego cited one or more companies in another market segment as a monitored competitor. Chi-square is 6.38 for table, and logit test statistic for log network constraint predicting external cite is -3.13 (P ~ .01).

# Figure 8.10

## Spatial Map of Role Equivalent Peers in the Hypothetical Organization

This is a multidimensional scaling of the role equivalence distances in Table F3 (Kruskal stress = .004)

