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Chapter 3

Social Networks and Trust in Cross-Cultural Economic Experiments

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IN THIS CHAPTER, we present two datasets from Africa, one rural and one urban, in which we examine the correlates of individual-level demographics and trusting and trustworthy behavior in economic experiments. We use a slightly modified version of the Joyce Berg, John Dickhaut, and Kevin McCabe investment game (1995). Our primary original contribution is to include in these demographics data on each individual's standing in their social network (compare Alesina and La Ferrara 2002; Anderson, Mellor, and Milyo 2005a, 2005b; Bouckaert and Dhaene 2003; Burns 2004; Chaudhury and Gangadharan 2003; Croson and Buchan 1999; DeBruine 2002; Eckel and Wilson 2003, 2004). We hypothesize that those who are pivotally and centrally located in social networks hold such positions because they have established and maintained reputations as successful social and political entrepreneurs, and that such positions are achieved in part by demonstrating trustworthiness. We define political entrepreneurs as those who strategically cultivate, create, and invest in social relationships to enhance their bargaining power and political brokerage abilities in areas such as conflict management and institutional change (compare Schneider and Teske 1992). This is a quality we believe is well identified by conventional measures of social network centrality (compare Christopoulos 2006). Further, we hypothesize that such entrepreneurs are risk takers by nature, and that this propels them to risk trusting to reap the rewards of cooperation that stem from such behavior. Inclinations to trust are further reinforced by the greater access to information, including

information concerning who is worthy of trust, that such pivotal positions in the social network afford.

Social networks are central to the concept of social capital as most people use the term, but studies of social capital have suffered from a lack of conceptual clarity. The metaphorical use of the concept and the looseness with which the term social capital has been operationalized, together with the power with which some have endowed an ill-defined version of the concept, has led to some discounting the entire concept. In this chapter, we seek to differentiate individual from group-level concepts of social capital and attempt to restore some clarity to the concept. We then take the individual component of social capital that exists as social or political entrepreneurship, and use social network analysis to provide precise measures of this individual-level trait. Finally, we derive specific predictions about the relationship between network position and the relative level of trust and trustworthiness exhibited by individuals within a given society.

Concepts of Social Capital

We are certainly not the first to attempt to make a link between social capital and trust and trustworthiness, nor are we the first to recognize the lack of consistency in providing a clear operational definition of social capital. Over the next few sections we take a brief look at the concept of social capital particularly as it relates to social networks and economic experimental games. There has been considerable discussion in the trust literature concerning the vagueness surrounding the various definitions, measures and applications of the concept of social capital (Durlauf 2002; Carpenter, Daniere, and Takahashi 2004). Further, and more important, is the general recognition of problems stemming from confusion surrounding the analytical levels at which social capital has been theoretically conceptualized. As others have noted, the important distinction among societal, organizational, group- and individual-level notions of social capital has often been either obscured or not well articulated (Cook, Hardin, and Levi 2005; Glaeser, Laibson, and Sacerdote 2002; Carpenter, Daniere, and Takahashi 2004; Guillén et al. 2002; Lin, Cook, and Burt 2001). Yet such a distinction is critical to gaining a more realistic understanding of the role of social capital in accounting for individual-level variation in trust and trustworthiness.

Group-Level Social Capital

Much of the work examining the relationship between trust and social capital has been at the community or aggregate level (Glaeser, Laibson, and Sacerdote 2002). One general use in the literature has to do with the degree to which an actor is embedded in a dense set of social relations—the denser an actor's relations, the higher their social capital (Coleman 1990; Portes

and Sensenbrenner 1993). This group-oriented conceptualization stands in stark contrast to the individual-level social capital. Here density provides security for individual group members in that it protects them from potentially negative outside influences (for example, outgroup conflicts) and promotes a more certain social environment (social norms are clear). In addition to protection, such dense, cohesive networks foster cooperation and provide members with a sense of belonging and identity (Portes and Sensenbrenner 1993)—that is, they have the potential to imbue actors with prosocial preferences. Some see this form of group-level social capital as both reflecting and creating the degree of trust in a given society (Putnam 1993, 2000). It comes at a cost, however. Such dense, redundant social relations often entail various social obligations and restrictive norms (Portes and Landolt 1996). In addition, this more macro-level conceptualization of social capital does not lend itself well to understanding individual-level factors accounting for intrasocietal variation in actors' game playing behavior. We focus in this chapter on the individual-level concept of social capital as captured by individual measures of one's network centrality.

Individual-Level Social Capital

Interest in the role of more individual-oriented forms of social capital in understanding trust is on the increase (Carpenter, Daniere, and Takahashi 2004). Edward Glaeser, David Laibson, and Bruce Sacerdote, for example, saw individual-level social capital in terms of the characteristics of actors with regard to such things as interpersonal skills, charm, and "the size of his Rolodex" (2002, 438). This more network-oriented view, depending on the type of relation or relations, can be thought of as a kind of "social or political entrepreneurship" that varies as a function of the degree to which an actor has the ability to bring together, bridge, or broker among a wide range of other actors who are themselves not connected (Burt 1992, 1997, 2001, 2005; Lin 1999, 2001; Lin, Cook, and Burt 2001). Referred to as bridging social capital by Joel Sobel (2002), such a structural position may allow an individual to influence the flow of information and control knowledge that can facilitate an individual's economic, political, or social advantage. It should be pointed out, however, that this does not necessarily predict more self-interested behavior, because it may not be possible to maintain such a position if one abuses it. It may predict strategic talents or acuity; however, as such actors need to be strategic not only to get where they are, but to stay there. Whatever their preferences, we may expect them to be more adept at calculation, have higher levels of social knowledge (Johnson and Orbach 2002), greater social shrewdness (Yamagishi 2001) or display an outsider orientation, seek authority, and thrive on advocacy and change (Burt, Jannotta, and Mahoney 1998). Such individuals may be both providing public goods through their organizational capacities, and steering

social norms and institutions toward their own ends (Ensminger and Knight 1997).

Trust and Social Networks

An important question concerns individual motivations for behaving in a trusting way across a variety of contexts. What underlies individual variation in an actor's capacity for trust (Cook and Cooper 2003)? What do actors bring with them into a given context that might account for both their motivations and capacity to trust, and, ultimately, their behavior? One important consideration relates to the benefits associated with the capacity for trust, and conversely the possible costs incurred by a lack of such capacity, or the possibility of being caught up in a vicious cycle of distrust (Yamagishi 2001).

Russell Hardin linked the capacity to trust and the ability to assess trustworthiness to a range of potential benefits (2002). More important, he recognized that an individual actor who lacks such capacity will be a "relative loser" (116). Critical to this is the idea that actors endowed with this capacity are by their very nature risk takers, given that it is only through the taking of risks that one can accrue greater gain. As Hardin noted, "Being an optimistic risk taker or cooperater opens up the opportunity for great loss and for great gain, neither of which might be possible without risking cooperation" (116).

The factors usually considered in understanding how individual actors develop the propensity to trust have primarily focused on a variety of sociological and psychological influences. These include such things as the way an actor was raised, an actor's social class background, an actor's religious training, and a variety of other life experiences. What has generally been missing is how an actor is embedded in a social network. Although a great deal of work has addressed how social networks are important for creating an environment of trust, little has looked at variations in the influences of network dynamics at the individual actor level in the development and maintenance of trust and trustworthiness. In individual-level approaches, the focus has been primarily on the impact of different community- or societal-level social capital on individuals as exemplified by the work of Robert Putnam, James Coleman, and Alejandro Portes. In society-level approaches, trust arises from the density of social relations, participation in civil society that engenders social connections, or the degree of network closure. These factors influence the extent of normative constraints, social obligations, and the capacity for social sanctions. In this case, the ties that bind foster trust and lower the risk associated with engaging in trustworthy behaviors because strong normative constraints tend to limit the potential for defection. However, the societal-level approaches have no mechanism to account for intra-societal variation in trust and trustworthiness. If all actors are embedded in a set of dense relations, then by def-

inition we should expect little individual variation in levels of trust and trustworthiness because all actors are constrained in similar ways. This kind of invariant notion may work at the macro level in terms of comparisons of trust across groups or societies, where some societies have denser networks than others and, therefore, may have higher levels of trust, as in Putnam's civil society. But it does little for helping us in understanding intragroup, intracultural, or intrasocietal variation in trust or trustworthiness, and, in particular, how individual differences, even in highly dense networks, shape an actor's approach to repeated social interactions.

Recently, Ronald Burt addressed aspects of this issue in attempting to account for the presence of brokerage within network closure or within highly redundant networks (2005). The two reigning views of social capital discussed earlier, that is, group-level social capital through dense networks, and individual social capital as social or political entrepreneurship (brokerage and bridging structural holes), have seemingly been at odds with one another, particularly with respect to aspects of trust. Clearly, trust is higher and trusting others is less risky when there is network closure (that is, high density and tie redundancy). Extracting value from such trust, however, falls within the realm of brokerage or the ability of an actor to connect people in the network not otherwise connected to one another. As Burt put it, "bridging a structural hole can create value, but delivering the value requires the closed network of a cohesive team around the bridge" (2005, 79). Thus the successful social entrepreneur requires closure of a kind to limit the risk inherent in trusting, yet needs to span structural holes to cash in on this trust, because coordination of bridging relations, though of significant value, is potentially riddled with risk. So it is within this context that we might find the underlying factors contributing to variations in the capacity or propensity to trust no matter the structural density of a given group or society. For nonbrokers, there is less to gain from risking trust because they are not structurally positioned to exploit and therefore benefit from structural opportunities that brokerage affords. For brokers better positioned structurally, on the other hand, risks have higher potential payoffs.

Evidence is clear that advantages do accrue to those who span such structural holes (Burt 2001, 2005; Guillén et al. 2002). These political entrepreneurs must recognize, build, and exploit structural holes to develop individual-level social capital. Further, they must engage in repeated activities that maintain their network position and reputation and hence sustain their social capital (Burt 2002). Both developing and maintaining social capital in this entrepreneurial form requires the repeated risk-taking that results from trusting in others. This process is enhanced, and risks somewhat reduced, if there is a social safety net in the form of network closure around the bridge. In addition, risks are further reduced by the tendency for actor's with entrepreneurial or bridging social capital to

have a better understanding of the social and political landscape (Johnson and Orbach 2002).

A significant contributor to maintaining social capital is the parallel development and maintenance of reputation. Reputation is essential for sustaining social capital, given that its very nature is future oriented (Burt 2005; Hardin 2002). A reputation for trustworthiness stems from a history of repeated interactions with others in which there is a clear perception on the part of others that one can be trusted (Kramer 1999). This has important implications with regard to both the perception of trust and trustworthiness by others and various aspects of individual self-perception at both a conscious and an unconscious level (Hartung 1988). As such, risk-taking in the form of trusting and being trusted are critical to fostering one's reputation. In addition, it becomes a behavior expected by others (Burt 2005). In other words, we would predict that those actors with bridging ties are also trustworthy.

An interesting query concerns the extent to which these expectations are internalized and translate into behaviors across a variety of contexts, including playing experimental games. That is, expectations become psychologically internalized, leading to the propensity for trusting and trustworthy behaviors, whether conscious or unconscious, in a variety of contexts, including economic experiments (for a discussion of this in understanding self-perceptions as adaptive mechanisms, see Johnson and Orbach 2002; Hartung 1988).

Networks and Social Capital

Although social networks have become an important concept in experimental research on the relationship between trust and social capital, they have been measured and operationalized in wildly different ways (Durlauf 2002). The more conventional measure has been indirect proxies, particularly with regard to group-level measures, whereby respondents are asked to report on such things as participation in community projects or membership in clubs and organizations (Carpenter, Daniere, and Takahashi 2004). Edward Glaeser and his colleagues used a decidedly network approach when they asked subjects paired in trust experiments to provide a count of the number of acquaintances they had in common (2000). This reflects a kind of personal network approach (McCarty 2002) for understanding overlap in individual's social networks and how this overlap might influence behavior in trust experiments. Virtually none of the experimental research looking at social capital and trust, however, has measured social capital directly using a whole or complete social network approach (Wasserman and Faust 1994). This is somewhat understandable given the difficulty and cost involved in collecting the entire network of a large social group and the boundary specification problems inherent in such data. However, under-

standing the way in which an actor is embedded in a social network or networks is crucial to understanding the ways in which an actor's greater social world influences their capacity to trust and be trustworthy.

Study Sites

This project was part of the second phase of a cross-cultural experimental project studying small-scale societies around the world that began in 1998 in collaboration with many anthropologists and economists. That project has yielded two volumes (Henrich et al. 2004; Henrich and Ensminger forthcoming) and a number of papers summarizing the group's data (see especially Henrich et al. 2005; Henrich et al. 2006).

In this chapter, we report on the coordinated effort of two researchers from this project to use similar methods to combine the Berg, Dickhaut, and McCabe (1995) investment game with data on social network analysis for the same populations. Ensminger conducted this research among a community of Orma pastoral livestock herders in Eastern Africa, and Barr did similar analyses among several communities of urban coworkers in Accra, Ghana. The two studies provide an opportunity to examine how the hypothesized effect of network position on trust and trustworthiness holds in two contrasting populations in Africa. One is a population of pastoralists in a more remote and less developed region and the other is a population of mostly migrants working in various small-scale production enterprises in an urban setting. Despite these considerable differences in populations, we find tentative support for the effect of individual level measures of social network centrality on trusting behavior.

Orma

The Orma are pastoral livestock herders living in the arid Tana River district of eastern Kenya (see Ensminger 1992). Although roughly one-third of the population is still nomadic, two-thirds are sedentary and heavily integrated into the market economy. The entire economy is closely tied to livestock, though most sedentary households now practice some opportunistic flood-plain agriculture and many individuals have casual labor jobs or engage in small-scale trading activities. The wealthiest households are those with civil service jobs or involved in cattle trading and retail shop-keeping. Despite this high level of market integration, the population lives almost entirely in grass houses, education is limited, and the area has no running water, no electricity, and only one seasonal and highly unreliable road. In short, the area is remote and undeveloped by Kenyan standards, but the population is quite market savvy and entrepreneurial.

Members of this community who display high network centrality are typically active political and economic entrepreneurs from sedentary rather

than nomadic households. They are also often senior male elders in the community who have central roles in dispute resolution and carry much influence in the community. Typically they are elders at the heads of large kinship groups and either are or have been successful livestock owners, livestock traders, shopkeepers, religious leaders, or headmen of the village. They command broad respect and are able to lobby others in the community to sway public opinion on a broad range of decision making and dispute resolution matters as diverse as domestic disputes, property rights conflicts, community development, and criminal complaints. These positions are not hereditary, however, and there is considerable fluidity in economic and political fortunes across generations and great variability among siblings in terms of their success in these roles. It is more accurate to characterize these individuals as self-made political brokers who are to some degree held accountable for their deeds. Those who score lowest in network centrality tend to be marginal community members, typically newcomers without strong kin connections in the area, women or young men who are not the sons of the power elite, and those with limited economic resources and who depend on the generosity of the top political and economic entrepreneurs.

Ghana

The Ghanaian sample was drawn from four enterprises, a bakery, a textiles and garment manufacturer, and two metal workshops, all in Accra, the capital city. The enterprises had fifteen, nine, twenty, and twenty-five employees respectively. The sample included fifty men and women. All were full-time employees and derived all of their personal income from their employment in these enterprises. Only one of the metal workshops could be described as a formal sector business, operating (roughly) in accordance with government regulations on taxation, trading, financial operations, and employment. The implication is that the individuals from the other three enterprises did not pay taxes and their employment was effectively unregulated by the government.

A key difference between the Orma and Ghanaian samples is that the Ghanaian social networks are both restricted to the workplace and far smaller and less dense than the Orma sample. Thus, though the Ghanaian network captures political dynamics within the firm, it does not capture all of the social and political dynamics of the Orma context.

Experimental Design

The measure of trust used in this chapter comes from experimental data collected in line with the investment game protocol designed by Berg, Dickhaut, and McCabe (1995; for the script, see the appendix). The game

has two players. At the start of the game, both players receive an equal initial cash endowment equivalent to roughly one day's wage among the Orma and two days' among the urban Ghanaian workers. The first player decides how much of her cash to pass to the second player. In these games, for the purpose of simplicity and understanding, we limited the options to offers of 0, 25, 50, 75, and 100 percent. The amount player 1 passes is tripled by the experimenter and then given to the second player. The second player then decides how much to pass back to the first player. The first player's final payoff is thus the amount not sent, plus anything that was returned by player 2. The second player's final payoff is their original endowment, plus the portion received from player 1 (including the tripling done by the experimenter), less anything which player 2 returned to player 1. Under the classical assumptions of selfish money maximization, the second player returns nothing and, expecting this, the first player sends nothing.

In both sites the protocol for the game was back-translated into the native language of the participants. This process requires two bilingual speakers. One person unfamiliar with the game translates the text from English to the local language and another uninformed bilingual speaker translates the new text back into English. Any discrepancies in translation are then sorted out to the satisfaction of all speakers. The players were randomly selected from the community or workplace pool and invited to participate in the experiment at a set time and place. Among the Ghanaian workers, this occurred after work hours in schools near the employees' places of work. Roughly twenty individuals at a time were called for the game and monitored for the duration to ensure that they did not have contact with outsiders and did not talk among themselves about the game. They were instructed in the game according to identical scripts at both sites that included examples that were played out on a game board showing the payoffs to both players for each offer and response.

The players were then called one at a time to play the game. For the Orma population, this was always Ensminger and a native-speaking research assistant and, for the Ghanaian population, a native-speaking research assistant sometimes alone and sometimes with Barr. In these interviews, the players were taught the game once more, were verbally tested on their understanding of the game, and then played. Finally, they were directed to wait in a second isolated location until everyone had played and they could receive their payoffs. Both the description of the game presented in the first instance and the one-on-one interviews were scripted. If subjects asked questions, the relevant part of the script was repeated. Monitors were posted to prevent players awaiting their turn to play talking after learning the game but before making their decisions. Both roles and pairs were randomly assigned. The first players (the trusters) played in random order. The second players (the trustees) then played, again in random order. Each player was informed that they were playing with one of their covillagers or

coworkers who had come for the game that day but none of the players knew the identity of their playing partner.

While subjects were waiting to play the game before the Ghanaian experiment, the sociodemographic data used in the analysis were collected. For the Orma, the income and wealth data were collected in a large-scale survey before the play, but other demographic data were collected at the time of the experiments. The interviews followed a structured questionnaire designed to elicit data on age, sex, education, income, and wealth. We used these data as controls in the regression analyses.

A word is in order on the use of experiments to capture trusting and trustworthy behavior among anonymous partners. We operate from the assumption that economic experiments often capture people playing out rules of thumb and behaving in ways consistent with their underlying experiences and social norms, even though such behaviors may not appear to make sense in an anonymous experiment (Ensminger 2004). For example, we posit that political entrepreneurs who have often taken the risk of trust in their daily lives and had such risk rewarded bring this experience into the game and invoke similar behavior more often than those who have not had the same experience. Similar principles apply to the role of trustworthy behavior in everyday life. People internalize societal norms and create habituated individual behaviors based on repeated experiences. When confronted with abstract games they often ask themselves, "What does this remind me of," and then use that analogy to guide their behavior in the experiment.

Network Data and Measures

Among both the Orma villagers and the Ghanaian workers, we used the same instrument to measure the social network. Among the Orma, twelve villages in one highly integrated market and political unit were surveyed and a closed network of 899 individuals was identified. All adult males and females in the area were asked the same question: "Who do you usually talk to about any kind of problem in this village?" Subjects listed as many individuals as they chose, within or outside their village. Because we bound the network in terms only of those interviewed, some who were mentioned but not interviewed were dropped from the network. This was a relatively small number, however, and usually did not include those named by anyone else, thus they were marginal with respect to this network.

Among the Orma, the network analysis was carried out two years after the trust experiments. Given the stability of kinship ties and network relationships in these communities, it is not expected that the centrality measures would have changed significantly over such a relatively short span. The results of these network measures are highly consistent with twenty-

five years of ethnographic knowledge of the population and longitudinal observations of the power brokers within the society. It is quite common for the same elders to command these positions for a generation or more.

In the Ghanaian sample, the network analysis was carried out for each work site separately on the day of but before the experiments were conducted. Four firms were surveyed and the method used was identical to that used for the Orma except for the variation on the question: "Who do you usually talk to about any kind of problem in this workplace?"

The type of network relation used here was the result of careful consideration of the applicability and meaning of network relations for a larger cross-cultural study (Henrich et al. 2006). The network relation for use across study sites had to be relatively meaningful for cultures that were radically different economically, politically, socially, and geographically. The social relation for the go-to person with respect to problems was the one deemed the most applicable and meaningful whether we were dealing with social organization at the band, village, or workplace level. It also reflected social relations with the potential to in turn reflect elements of power, control, and political or social activity and influence, all important for understanding aspects of political and social entrepreneurship.

The primary network measures of interest include indegree and betweenness centrality as indicators of social capital (Freeman 1979; Johnson and Parks 1998). Indegree centrality as measured here reflects the extent to which an actor is a political go-to person for discussing or solving problems in the villages or factories. It reflects those actors people see as important for addressing village or workplace political or social problems and likely captures some element of those who are trusted or are viewed as trustworthy within segments of the network. Betweenness centrality reflects an actor's bridging or brokering social capital or the extent to which an actor spans structural holes in these problem-oriented communication networks (Burt 1992, 2005). This measure captures the degree to which individuals hold strategic positions as bridges between otherwise weakly connected segments of the network.

The $n \times n$ binary matrices of social relations X_{ij} for each culture group is defined as

$$X_{ij} = \begin{cases} 1 & \text{if } i \text{ goes to } j \text{ to discuss village or workplace problems,} \\ 0 & \text{otherwise} \end{cases}$$

The equation for betweenness centrality follows Freeman (1979), where the betweenness centrality $C_b(k)$ of node k is

$$C_b(k) = 2 \left(\sum_{i=1}^n \sum_{j=1}^n \left[\frac{g_{ij}(k)}{g_{ij}} \right] \right)$$

Where for all unordered triples $i, j, k (i < j, \text{ and } i \neq j \neq k)$, n is the number of nodes in the network, g_{ij} is the number of geodesics or shortest paths between node i and j , and $g_{ij}(k)$ is the number of shortest paths from i to j that include k . Similarly, the equation for indegree C_{DI} follows Freeman (1979):

$$C_{DI}(i) = \sum_{j=1}^n a_{ji}$$

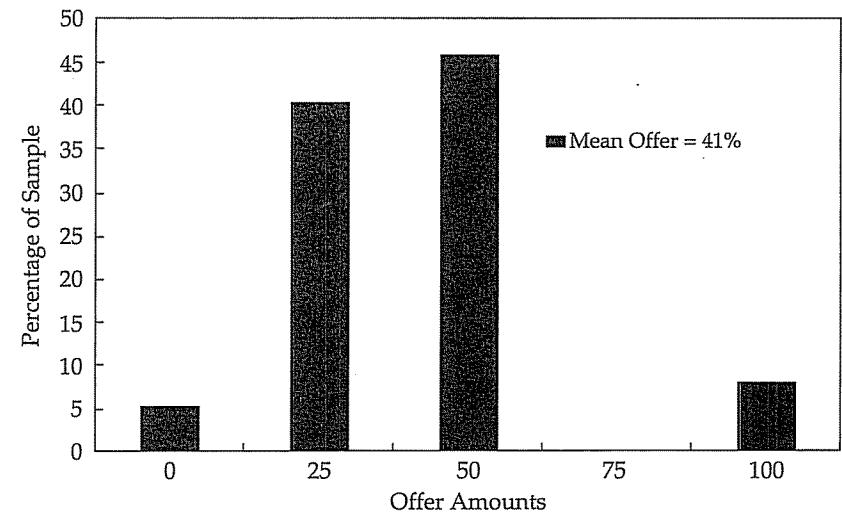
Where for node i , a_{ji} is 1 if there is an edge from node j to i , 0 otherwise. These are simply a count of the number of incoming ties to a given node.

We include both indegree and betweenness centrality for determining social capital in this context on the basis of the political nature of the network relation elicited. Newman noted that betweenness and indegree are often closely related (2005). In terms of the relationship between the two measures in our study, we find in the Orma case a 0.83 correlation between log transformed indegree and betweenness centralities, indicating that the two measures are picking up much the same phenomena. In the Ghanaian sample, the correlation is 0.47. Newman also noted, however, that despite these similarities in terms of correlations there are often important subtle structural differences between the two measures. We include both measures. Indegree centrality reflects the importance of an actor in terms of the sheer number of people who cite an individual. This says nothing, however, about the nature of the ties to which a central actor is connected. Such ties could be with actors within or not within close social proximity. Thus it is quite possible that all ties to an actor with high indegree are highly localized (for example, with members that all know one another). In contrast, betweenness centrality has the potential to capture elements of the network global properties of an individual actor. Actors with high betweenness centrality are more likely to be tied to actors who are themselves not tied to one another, thus spanning structural holes. We therefore examine the contribution of each centrality measure to our understanding of variations in game playing behaviors separately in the models.

Experimental Data

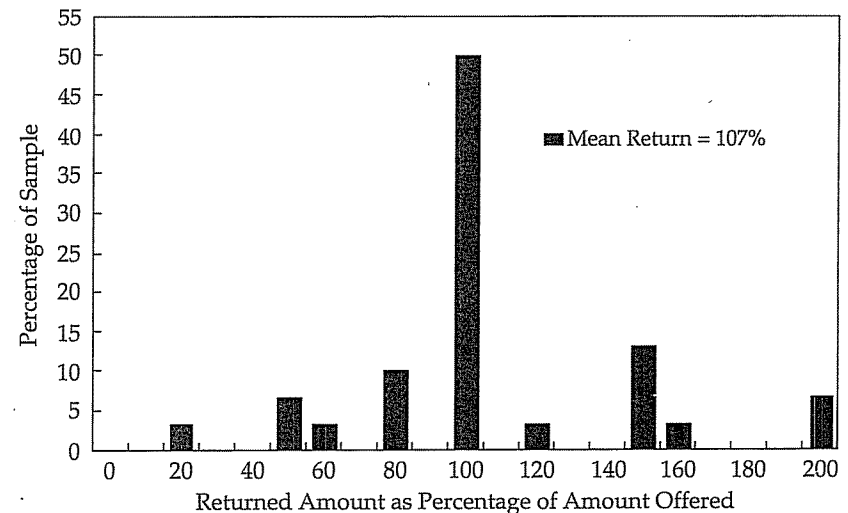
In figure 3.1 we see the histogram of player 1 offers for the trust experiment among the Orma. The population splits roughly between offers of 25 and 50 percent of their stake. The mean offer for the entire group is 41 percent. Figure 3.2 displays the returns by player 2 as a percentage of what was received after the amount given by player 1 was tripled by the experimenter. Among the Orma, we see that though they repaid the trust (returns average 107 percent), many in the player 2 group pocketed the entire surplus from the tripling effect. Fifty percent of the players returned what player 1 sent and kept the two-thirds surplus. Nevertheless, the sample

Figure 3.1 Orma Trust, $N = 37$

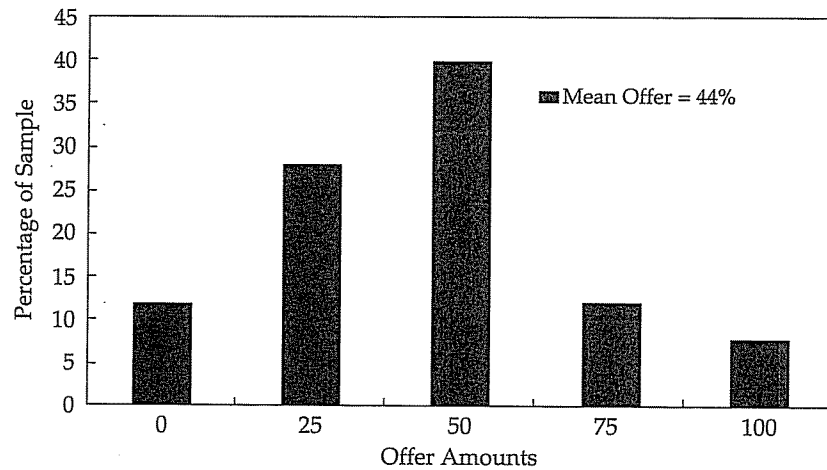


Source: Authors' calculations.
Note: Player 1 offers.

Figure 3.2 Orma Trustworthiness, $N = 30$



Source: Authors' calculations.
Note: Player 2 percentage return.

Figure 3.3 Ghana Trust, $N = 25$ 

Source: Authors' calculations.

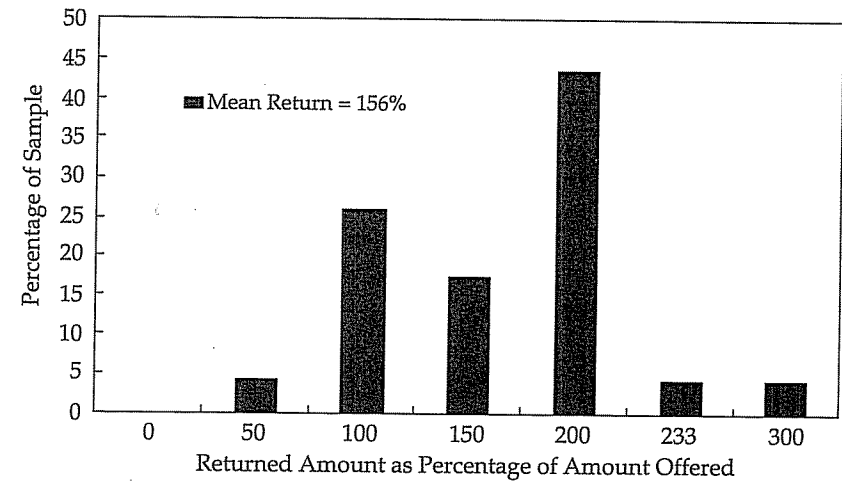
Note: Player 1 offers.

returns vary, from 20 percent to 200 percent, which is what results when all the money is split equitably between players 1 and 2.

In the Ghanaian sample, we see in figure 3.3 that the trust behavior of player 1s follows a pattern similar to that of the Orma, with a mean of 44 percent, but with somewhat more variation in behavior. However, they are significantly more trustworthy, as reflected in player 2 behavior in figure 3.4. Almost 45 percent returned the perfect equity amount of 200 percent, and 25 percent played more like the Orma and returned exactly the amount sent, but none of the surplus. Most of the remainder (about 25 percent) returned more than the amount sent, thereby providing their playing partners with a positive return on their trusting acts, while securing a higher final payoff for themselves.

In the regression tables (tables 3.1 through 3.5), we see the relative impact of demographic variables, including the players' social network positions. To counteract any nonnormality problems, network centrality measures have been log transformed. Gender has been dropped from the Orma regressions because it is inversely correlated with indegree -0.72 . Based on the correlation measures, multicollinearity does not appear to be a problem for other variables.

Both network centrality as measured by indegree (those consulted on other's problems) and betweenness (social and political brokers) are significant predictors of trust and trustworthiness in these analyses. However, the

Figure 3.4 Ghana Trustworthiness, $N = 25$ 

Source: Authors' calculations.

Note: Player 2 percentage return.

Table 3.1 Orma Trust and Network Centrality (Indegree), Player 1 Offers

| Variable Divided by SD | Model 1 | Model 2 |
|--|--------------------------------|----------------------|
| Age | -0.760 (3.296) | |
| Education | 15.650 [†] (8.090) | 15.401* (7.505) |
| Household wealth | 2.966 (3.952) | |
| Income | -6.851*** (1.831) | -6.193*** (1.620) |
| Centrality: In indegree Sign. = one-tailed test | 6.136 [†] (4.773) | 6.078* (3.066) |
| Constant | 35.265*** (7.856) | 33.697*** (4.378) |
| Observations | 37 | 37 |
| R ² | .372*** | .366*** |
| Model significance | .001 | .001 |

Source: Authors' calculations.

Note: Robust standard errors in parentheses.

*** $p = 0.001$, ** $p = 0.01$, * $p = 0.05$, [†] $p = 0.1$

Table 3.2 Orma Trust and Network Centrality (Betweenness), Player 1 Offers

| Variable Divided by SD | Model 1 | Model 2 |
|---|----------------------|---------------------|
| Age | 2.167 (2.106) | |
| Education | 18.589* (7.523) | 17.077* (7.275) |
| Household wealth | 3.555 (4.424) | |
| Income | -6.042*** (1.521) | -4.839** (1.792) |
| Centrality: In betweenness Sign. = one-tailed test | 1.103 (1.532) | 1.793* (1.400) |
| Constant | 26.217* (10.142) | 29.017** (9.294) |
| Observations | 37 | 37 |
| R ² | .341*** | .320** |
| Model significance | .001 | .004 |

Source: Authors' calculations.

Note: Robust standard errors in parentheses.

*** $p = 0.001$, ** $p = 0.01$, * $p = 0.05$, † $p = 0.1$

sample sizes in both studies are small, the statistical significance is sometimes marginal and not robust across both samples, and consequently these findings should be interpreted more as inspiration for future work rather than as definitive evidence of the effect we are highlighting. Among the Orma, we see evidence that network centrality, measured as both indegree (table 3.1) and betweenness (table 3.2) are marginally correlated with higher levels of trusting behavior. In table 3.3, we find that the same effect holds among the workers in Ghana when we measure betweenness (both logged and unlogged). Although the coefficient is positive for indegree in Ghana, it is not statistically significant, and we have not included these results.

We extend Burt's theory relating network spanning to social entrepreneurship to suggest that those who bridge structural holes (high betweenness individuals), should be more likely to engage in trusting behavior (2005). This relationship is suggested by our data in the direction predicted.

We turn now to the indices of trustworthiness, as measured by how much of the tripled offer player 2 chooses to return to player 1. We suggested that those who achieve positions of social and political entrepreneurship—that is, those who bridge structural holes (high betweenness) and those to whom others turn for advice (high indegree)—are likely to earn these positions in part by demonstrating that they are

Table 3.3 Ghana Trust and Network Centrality (Betweenness), Player 1 Offers

| Variable Divided by SD | Model 1 | Model 2 | Model 3 |
|--|---------------------|----------------------|----------------------|
| Age | 0.559 (6.015) | | |
| Female | -14.480 (11.496) | | |
| Education | 0.091 (3.112) | | |
| Household wealth | 5.018 (9.120) | | |
| Income | 3.673 (2.849) | | |
| Centrality: betweenness Sign. in one-tailed test | 2.066* (1.218) | 2.538** (0.791) | |
| Centrality: In betweenness Sign. in one-tailed test | | | 10.356* (5.403) |
| Constant | 35.285* (20.508) | 33.848*** (5.839) | 32.237*** (6.700) |
| Observations | 25 | 25 | 25 |
| R ² | .300** | .201** | .154* |
| Model significance | .002 | .004 | .068 |

Source: Author's calculations.

Note: Robust standard errors in parentheses.

*** $p = 0.001$, ** $p = 0.01$, * $p = 0.05$, † $p = 0.1$

trustworthy. Our Orma data support this hypothesis strongly, but our Ghanaian data do not. In table 3.4, we see that for the Orma indegree is a statistically significant correlate of trustworthiness. Similarly, in table 3.5 (also for the Orma), betweenness is also a statistically strong correlate of trustworthiness. Returning to the histograms of the trustworthiness offers, we see in figure 3.4 for the Ghanaian workers that their mean of 156 percent is pushing against the logical bound of 200 percent (pure equity return). It is possible that with our small sample sizes, the low level of variation in the Ghanaian data made it difficult to pick up a statistically significant effect. Alternatively, one should note that the Ghanaian firm sizes are very small (nine to twenty-five members), and it is possible that untrustworthy behavior in such small-scale environments just does not pay for anyone. Finally, as noted, the networks we capture in the Ghanaian workplaces are more circumscribed than those in the Orma villages. The Orma networks are large and dense and most likely subsume more dimensions than do those shared in the workplace. Among other things, they are more affected by kinship, which undoubtedly interacts with trust and trustworthiness.

Table 3.4 Orma Trustworthiness and Network Centrality (Indegree), Player 2 Returns

| Variable Divided by SD | Model 1 | Model 2 |
|--|----------------------|----------------------|
| Age | -5.011 (9.318) | |
| Education | -4.272 (9.039) | |
| Household wealth | 27.975 (18.300) | |
| Income | -7.702 (4.628) | -8.811** (3.033) |
| Centrality: In indegree Sign. = one-tailed test | 24.365** (9.017) | 21.461*** (6.268) |
| Constant | 86.028** (25.774) | 81.825*** (8.794) |
| Observations | 30 | 30 |
| R ² | .367** | .271** |
| Model significance | .012 | .006 |

Source: Authors' calculations.

Note: Robust standard errors in parentheses.

*** $p = 0.001$, ** $p = 0.01$, * $p = 0.05$, † $p = 0.10$

Table 3.5 Orma Trustworthiness and Network Centrality (Betweenness), Player 2 Returns

| Variable Divided by SD | Model 1 | Model 2 |
|---|--------------------|----------------------|
| Age | 4.314 (8.288) | |
| Education | -5.728 (9.083) | |
| Household wealth | 18.485 (17.007) | |
| Income | -2.611 (3.227) | -5.636† (2.906) |
| Centrality: In betweenness Sign. = one-tailed test | 9.561* (4.431) | 9.134*** (3.829) |
| Constant | 33.401 (28.137) | 53.526** (20.527) |
| Observations | 30 | 30 |
| R ² | .319* | .201† |
| Model significance | .015 | .068 |

Source: Authors' calculations.

Note: Robust standard errors in parentheses.

*** $p = 0.001$, ** $p = 0.01$, * $p = 0.05$, † $p = 0.10$

These differences may also explain some of the differences in the findings, which only more research can help tease out.

Conclusions

Much work has been published on the individual-level demographic correlates of trusting and trustworthy behavior, but this is—to the best of our knowledge—the first study to report on behavioral measures of trust together with complete social network data, although Jacob Goeree and his colleagues have done so for dictator games (forthcoming). We measure trust and trustworthiness with economic experimental data following closely the Berg, Dickhaut, and McCabe (1995) investment game. We draw two samples from Africa, one rural (the Orma of Kenya) and one urban (workers in Accra, Ghana). Controlling for age, education, income, and wealth, we find support for our theoretical argument that political entrepreneurs (as measured by two types of social network centrality) are more trusting, and in one of our studies (the Orma of Kenya), also more trustworthy.

Our sample sizes are small, and thus the power of our findings are not high, but they point clearly in the direction of the theoretical work of Ronald Burt, who has articulated the entrepreneurial role of actors who have maneuvered into pivotal social network positions (2005). We extend this work by positing that one of the ways in which political entrepreneurs achieve and maintain their positions of network centrality is by demonstrating trustworthiness. Second, we find support for Russell Hardin, who views trusting behavior as a necessary risk in pursuit of considerable rewards (2002). Social and political entrepreneurs are more trusting in both of our samples and more trustworthy in one of our samples (the Orma).

Future research is necessary to address some of the limitations of the work as reported here. In addition to increasing the number of study participants and the number and types of cases studied, there should be attempts to understand the extent to which other types of network relations (for example, friendship) or the multiplicity of relations affect study outcomes. The results of this study certainly suggest a relationship between variation in game playing behaviors and the characteristics of an actor's network structural position, just as Jacob Goeree and his colleagues found for the dictator game (forthcoming).

Appendix: The Trust Game Script

Note to researchers: Be sure to read the general instructions that you always read before a game (see below). Players 1 and 2 should be separated in two rooms/locations before you begin this game. The risk of collusion in the holding room is greater in this game due to the tripling effect and warrants the trade-off. First instruct the player 1s in a group, then take all of their offers. Ask them to wait while you play with the player 2s and then call back

the player 1s to pay them off. Remember that there is no show-up fee with the trust game because both sides are given the same initial endowment.

General Instructions

Thank you all for taking the time to come today. This game may take three to four hours, so if you think you will not be able to stay that long without leaving please let us know now. Before we begin, I want to make some general comments about what we are doing here today and explain some rules that we need to follow. We will be playing a game for real money that you will take home. You should understand that this is not [insert name of researcher]'s own money. It is money given to [him/her] by [his/her] university to use to do a research study. This is research—which will eventually be part of a book [optional: it is not part of a development project of any sort.] [Insert name of researcher] is working together with many other university professors who are carrying out the same kind of games all around the world.

Before we proceed any further, let me stress something that is very important. Many of you were invited here without understanding very much about what we are planning to do today. If at any time you find that this is something that you do not wish to participate in for any reason, you are of course free to leave regardless of whether we have started the game.

If you have heard about a game that has been played here in the past you should try to forget everything that you have been told. This is a completely different game. We are about to begin the game. It is important that you listen as carefully as possible, because only people who understand the game will actually be able to play it. [Insert name of researcher] will run through some examples here while we are all together [if you are doing this]. You cannot ask questions or talk about the game while we are here together. This is very important and please be sure that you obey this rule, because it is possible for one person to spoil the game for everyone, in which case we would not be able to play the game today. Do not worry if you do not completely understand the game as we go through the examples here in the group. Each of you will have a chance to ask questions in private with [insert name of researcher] to be sure that you understand how to play.

Trust Game Instructions

This game is played by pairs of individuals. Each pair is made up of a player 1 and a player 2. Each of you will play this game with someone from your own village. However, none of you will know exactly with whom you are playing. Only [insert name of researcher] knows who is to play with whom and [he/she] will never tell anyone else.

[Insert name of researcher] will give \$4 to each player 1 and another \$4 to each player 2. Player 1 then has the opportunity to give a portion of their \$4 to player 2. They could give \$4, or \$3, or \$2, or \$1, or nothing. [Note: It is important to allow only five options for dividing the money—this is to sim-

plify the game and to create the same focal points across sites.] Whatever amount player 1 decides to give to player 2 will be tripled by the researcher before it is passed on to player 2. Player 2 then has the option of returning any portion of this tripled amount to player 1.

Then the game is over.

Player 1 goes home with whatever he or she kept from their original \$4, plus anything returned to them by Player 2. Player 2 goes home with their original \$4, plus whatever was given to them by Player 1 and then tripled by [insert name of researcher], minus whatever they returned to Player 1.

Here are some examples [Note: you should work through these examples by having all the possibilities laid out in front of people, with player 1's options from \$4 to \$0 and a second column showing the effects of the tripling. As you go through each example demonstrate visually what happens to the final outcomes for each player. Be careful to remind people that player 2 always also has the original \$4.]:

1. Imagine that player 1 gives \$4 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$12 (three times \$4 equals \$12) over and above their initial \$4. At this point, player 1 has nothing and player 2 has \$16. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$3 to player 1. At the end of the game, player 1 will go home with \$3 and player 2 will go home with \$13.
2. Now let's try another example. Imagine that player 1 gives \$3 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$9 (three times \$3 equals \$9) over and above their initial \$4. At this point, player 1 has \$1 and player 2 has \$13. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$0 to player 1. At the end of the game, player 1 will go home with \$1 and player 2 will go home with \$13.
3. Now let's try another example. Imagine that player 1 gives \$2 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$6 (three times \$2 equals \$6) over and above their initial \$4. At this point, player 1 has \$2 and player 2 has \$10. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$3 to player 1. At the end of the game, player 1 will go home with \$5 and player 2 will go home with \$7.
4. Now let's try another example. Imagine that player 1 gives \$1 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$3 (three times \$1 equals \$3) over and above their initial \$4. At this point, player 1 has \$3 and player 2 has \$7. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$2 to player 1. At the end of the game, player 1 will go home with \$5 and player 2 will go home with \$5.

5. Now let's try another example. Imagine that Player 1 gives nothing to player 2. There is nothing for [insert name of researcher] to triple. Player 2 has nothing to give back and the game ends here. Player 1 goes home with \$4 and player 2 goes home with \$4.

Note that the larger the amount that player 1 gives to player 2, the greater the amount that can be taken away by the two players together. However, it is entirely up to player 2 to decide what to give back to player 1. The first player could end up with more than \$4 or less than \$4 as a result.

We will go through more examples with each of you individually when you come to play the game. In the mean time, do not talk to anyone about the game. Even if you are not sure that you understand the game, do not talk to anyone about it. This is important. If you talk to anyone about the game while you are waiting to play, we must disqualify you from playing.

[Bring in each player 1 one by one. Use as many of the examples below as necessary.]

6. Imagine that player 1 gives \$4 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$12 (three times \$4 equals \$12) over and above their initial \$4. At this point, player 1 has nothing and player 2 has \$16. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$6 to player 1. At the end of the game, player 1 will go home with \$6 and player 2 will go home with \$10.
7. Now let's try another example. Imagine that player 1 gives \$3 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$9 (three times \$3 equals \$9) over and above their initial \$4. At this point, player 1 has \$1 and player 2 has \$13. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$11 to player 1. At the end of the game, player 1 will go home with \$12 and player 2 will go home with \$2.
8. Now let's try another example. Imagine that player 1 gives \$2 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$6 (three times \$2 equals \$6) over and above their initial \$4. At this point, player 1 has \$2 and player 2 has \$10. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$0 to player 1. At the end of the game, player 1 will go home with \$2 and player 2 will go home with \$10.
9. Now let's try another example. Imagine that player 1 gives \$1 to player 2. [Insert name of researcher] triples this amount, so player 2 gets \$3 (three times \$1 equals \$3) over and above their initial \$4. At this point, player 1 has \$3 and player 2 has \$7. Then player 2 has to decide whether they wish to give anything back to player 1, and if so, how much. Suppose player 2 decides to return \$2 to player 1. At the end of the game player 1 will go home with \$5 and player 2 will go home with \$5.

10. Now let's try another example. Imagine that player 1 gives nothing to player 2. There is nothing for [insert name of researcher] to triple. Player 2 has nothing to give back and the game ends here. Player 1 goes home with \$4 and player 2 goes home with \$4.

Now, can you work through these examples for me:

11. Imagine that player 1 gives \$3 to player 2. So, player 2 gets \$9 (3 times \$3 equals \$9) over and above their initial \$4. At this point, player 1 has \$1 and player 2 has \$13. Suppose player 2 decides to return \$5 to player 1. At the end of the game player 1 will have how much? [The initial \$4 - \$3 (given to player 2) = \$1 + return from player 2 of \$5 = \$6. If they are finding it difficult, talk through the math with them and be sure to use demonstration with the actual money.] And player 2 will have how much? [Their original \$4 + \$9 (after the tripling of the \$3 sent by player 1) - \$5 they return to player 1 = \$8, if they are finding it difficult, talk through the math with them.]
12. Imagine that player 1 gives \$1 to player 2. So player 2 gets \$3 (3 times \$1 equals \$3) over and above their initial \$4. Then, suppose that player 2 decides to give \$1 back to Player 1. At the end of the game player 1 will have how much? [The initial \$4 - \$1 (given to player 2) = \$3 + return from player 2 of \$1 = \$4. If they are finding it difficult, talk through the math with them and be sure to use demonstration with the actual money.] And player 2 will have how much? [Their original \$4 + \$6 (after the tripling of the \$3 sent by player 1) - \$1 they return to player 1 = \$6, if they are finding it difficult, talk through the math with them.]

First player: You are player 1. Here is your \$4. [At this point \$4 is placed on the table in front of the player.] While I [RA] am turned away, you must hand [insert researcher's name] the amount of money you want to be tripled and passed on to player 2. You can give player 2 nothing, \$1, \$2, \$3, or \$4. Player 2 will receive this amount tripled by me plus their own initial \$4. Remember the more you give to player 2 the greater the amount of money at his or her disposal. While player 2 is under no obligation to give anything back, we will pass onto you whatever he or she decides to return. [Now the player hands back whatever he or she wants to have tripled and passed to player 2.]

[Note to researcher: Finish all player 1s and send them to a third holding location—they must not return to the group of player 1s who have not played and they must not join the player 2s. Once all player 1s have played you can begin to call player 2s. Player 2s can be paid off immediately after they play and sent home.]

Second player: You are player 2. First, here is your \$4. [Put the \$4 in front of player 2.] Let's put that to one side. [Move the \$4 to one side but leave it on the table.] This pile represents player 1's initial \$4. [Put this \$4 in front of the researcher.] Now [insert name of researcher] will show you how much

player 1 decided to give to you. It will be tripled. Then you must hand back the amount that you want returned to player 1. [Take player 1's offer out of the pile representing player 1's stake and put it down in front of player 2, near but not on top of player 2's \$4. Then add to player 1's offer to get the tripled amount. Receive back player 2's response.] Remember, you can choose to give something back or not. Do what you wish. While I [RA] am turned away, you must hand [insert researcher's name] the amount of money you want to send back to player 1. [The player hands back his return for player 1.] You are now free to go home, but do not visit with any of the waiting players.

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Chapter 4

Trust and Reciprocity as Foundations for Cooperation

JAMES WALKER AND ELINOR OSTROM

NUMEROUS EXPERIMENTAL STUDIES conducted over the past several decades have demonstrated that individuals' decisions, in a variety of social dilemma situations, reflect complex and diverse motivations beyond simple self-income maximization (see research summarized in Camerer 2003; Camerer and Fehr 2006; Ostrom and Walker 2003). This research, replicated across multiple cultures, has led to a wide variety of models designed to reflect rich and complex social preferences. Central to many of them, and the primary focus of this chapter, is the interaction between trust and reciprocity as necessary foundations for the evolution of cooperative solutions to social dilemmas (chapter 1, this volume). We continue to use the concept of trust as we defined it in our conclusion to our earlier Russell Sage volume: "as the willingness to take some risk in relation to other individuals on the expectation that the others will reciprocate" (Ostrom and Walker 2003, 382).

In addition, an ongoing discussion among social scientists undertaking research in the field and the laboratory has focused on the extent to which clear behavioral differences in social dilemma settings can be attributed to the context in which decision makers interact—including institutional rules, incentives, and time horizons. Using results reported from the experimental laboratory and the field, the primary goal of this chapter is to provide a set of illustrative examples of many of the core findings from this research. These examples, which are based in large part on research in which we have been extensively involved with collaborators, are not meant to provide a complete overview of this extensive literature but