

Measuring Trust and Trustworthiness

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I. Introduction

Social scientists have long held the view that trust has a significant influence on the economic prosperity of nations. But researchers have only recently started to find empirical support for this belief. Up to now this empirical research has relied on measures of trust derived from responses to a very simple survey question. These measures are subject to two criticisms. The first concerns the meaning of the responses upon which they are based – what aspects of trust do responses to this question reveal? The second concerns whether the question is interpreted in the same manner across individuals and, more to the point, across cultures.

In this chapter we propose that these problems are unavoidable – the term “trust” has different, though not necessarily mutually exclusive, connotations. Moreover, the motivations for exhibiting a behavior one might interpret as reflecting “trust” can differ depending on the context in which the behavior occurs. We propose that the different meanings given to and motivations underlying trust can be understood and unconfounded using different scenarios drawn from the literature on game theory. We then examine how best to go about measuring these different constructs for the purposes of

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understanding if and how they contribute to economic well-being. The paper is developed as follows:

First, we review common arguments as to why and how trust might contribute to economic prosperity as well as the literature indicating that trust, as measured by survey responses, does, indeed, have the expected effect.

Second, we review some of the concerns that have been expressed regarding the measures of trust used in these studies.

Third, we distinguish between two different usages of the word “trust”—as expectations regarding competence versus expectations regarding benevolence of others and, propose a tri-part distinction as to the motives individuals might have for behaving benevolently.

Fourth, we show how situations involving each of these constructs can be defined and understood in the context of a scenario drawn from game theory.

Finally, we discuss what the implications of each construct are for economic well being and how each might best be measured.

II. Trust and Economic Performance

Differences in the prosperity of nations or regions relative to others have proven difficult to explain in terms of differences in standard economic variables like quantities and qualities of labor or capital. During the 1990’s, a number of social theorists (e.g., Fukuyama (1995), Putman et al (1993), Putnam (1995 and 2000) argued that these differences could be explained by differences in what is called social capital. Social capital is a composite term reflecting attributes shared within groups that promote

cooperative behavior. Trust is one component of social capital. Civic-mindedness and participation in associational activities are others. Putman et al (1993) made the case for the importance of social capital based on an examination of the performance of governments in different regions of Italy all established in the 1970s and all sharing a similar structure. The similarities in structure notwithstanding, there were dramatic differences in the performance of these institutions going forward. Moreover, these differences in performance did not stem from “the usual suspects” – difference in political attitudes, differences in economic endowments, or idiosyncratic changes in demographics due to things like immigration or out-migration. Instead, performance differences resulted from differences in how civic-minded and trusting the different regional populations were as reflected in things like levels of membership in social and community organizations. In regions where civic-mindedness and trust were high (e.g., mostly in Northern Italy) governments performed well. In regions where levels of civic-mindedness and trust were low (e.g., Sicily and Calabria), performance was poor. Frances Fukuyama (1995) makes a very similar argument on an international level, suggesting that the superior performance (at least as of the date of the book) of Japan, West Germany and, with caveats, the US, relative to countries like France, Italy and South Korea was the result of the populations of the former countries being more trusting.^{2, 3}

² These conclusions are not universally embraced. Sobel (2002), for example, criticizes Putman’s thesis regarding the contribution of trust to growth as confusing correlation with causality.

³ Both Fukuyama (1995) and Putnam (1995, 2000) attribute a variety of the societal ills experienced by the US in recent decades to a decline in social capital.

Claims regarding the economic significance of social capital were initially met with skepticism by some people, particularly, economists. Nobel laureate Robert Solow (1995) for example, argued that it amounted to no more than a “buzzword” absent some means of measuring it...but means were developed. Knack and Keefer (1997) wrote a particularly influential article in this regard. In it, they examined the contribution of three aspects of social capital – trust, civic-mindedness, and associational activity – in explaining economic growth rates and investment rates across 29 countries with market economies. To measure trust in each of these countries, they used the percentage of each country’s respondents that answered affirmatively to the following question posed in the 1981 and 1990-1991 “World Values Survey (WVS).”⁴

“Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?”

Civic-mindedness and associational activity were measured as indices created from respondents’ answers to questions involving whether a person would engage in un-civic actions (e.g., avoiding a fare on public transportation, cheating on taxes if you had the chance) and whether the person belonged to various groups or organizations (e.g., religious or church groups, political parties), respectively.

Knack and Keefer then conducted regression analyses examining the impact of these measures on average annual growth in per capita income and investment rates for 1980 to 1992. They found that trust contributes significantly to economic growth, as did civic mindedness. Contrary to Putnam’s (1993) finding in Italy, associational intensity did not contribute to economic success.

⁴ For a discussion of the World Values Survey see <http://ssdc.ucsd.edu/ssdc/icp02790.html>

Knack and Keefer emphasize the role of trust in reducing the need for monitoring and writing of detailed contracts. Such cost reductions increase the profitability of existing trades and make otherwise infeasible trades feasible. These cost reductions may also promote productive efficiencies as they allow for greater specialization and may increase span of control, enabling firms to exploit economies of scale. Dakhli and De Clercq (2002) present evidence that countries with more trusting populations may be more likely to spawn innovation. Specifically, they find that country-level innovation as measured by the number of patent applications filed and the percentage of high-technology exports relatively to total manufactured exports in different countries are positively related to generalized trust and institutional trust. Huang et al (2003) find that trust promotes Internet adoption. To the extent this technology enhances productivity, the impact of trust on its adoption positively influences economic prospects.

To summarize, studies based on responses to the trust question contained in the WVS suggest that trust contributes to economic prosperity through a variety of mechanisms. In order to understand the true magnitude of the impact trust has on social outcomes (like economic growth) and, more importantly, to anticipate the effect changing the level of trust will have on such social outcomes, more refined measures of trust are needed. This, in turn, requires we ascertain what people have in mind when they answer the trust question and, as such, what their responses are reflecting – a problem to which we now turn.

III. What's Trust?

The terms trust is defined in a variety of ways both in common usage and in the academic literature on social capital. One definition of trust in the Cambridge University Dictionary (<http://dictionary.cambridge.org>) is, for example:

“To have belief or confidence in theskill or safety of (a person, organization or thing).

A second is:

“Believing that other people are good or honest and will not harm or deceive you.”

The first of these has to do with expectations regarding others' “skill or safety” – their competence. The fact that I trust a surgeon to perform an operation on me but do not trust my mother to do so results because I believe the surgeon is competent to perform such a task but my mother, however well-intentioned, is not. And, on a microeconomic level, having trusted surgeons as opposed to incompetent mothers performing surgery has positive economic effects. On a more serious level, Camerer and Knez (1995) argue that a variety of organizational failures result from inability to adequately signal competence to team members or others involved in joint production.

In common usage, the word trust concerns expectations that another person will behave in an honest and benevolent manner. People may, however, exhibit benevolent behavior for different reasons. It may be in a person's personal self-interest to do so. In this context, laws do a lot to create circumstances where honesty and benevolence (or at least not malevolence) is the best policy. So too does the prospect of future interaction.

Alternatively, a person might choose to be good and/or honest because he receives psychic utility from the benefits doing so bestows on others. Yet a third possibility is that people behave honestly and benevolently in the expectation that such behavior will be reciprocated. Responses to the WVS question do not allow us to discriminate between these different definitions nor motivations for trust. Doing so, instead, requires much more precise descriptions of the context in which behaviors and preferences will be revealed – descriptions we now consider.

III. Trust – Meaning, Motives and Games

As noted above, trust is commonly used in two ways, one of which concerns expectations regarding the competence of others. For the purposes of understanding when trust defined in this way is critical, consider the following situations discussed by Camerer and Knez (1995) involving two people, denoted Player 1 and Player 2. Imagine, to begin, that they are involved in a collaboration and that each has the option of exerting L(ow) or H(igh) effort. Suppose further that the rewards each receives as a function of their choices of effort level are as depicted in the following “matching” game.⁵

Figure 1:

		Player 2	
		Low	High
Player 1	Low	\$5, \$5	\$0, \$0
	High	\$0, \$0	\$10, \$10

Several things are important to note about the situation depicted here.

⁵ The logic of the argument presented here follows Camerer and Knez (1996).

First, note that if both players choose to supply Low effort or both choose to supply High Effort, there would be no incentive in either case for a player to unilateral change the amount of effort he or she supplies. Starting at payoffs associated with Low/Low, for example, switching to High on the part of Player 1 (or 2) would not make sense as a payoff received would drop from 5 to 0. Likewise, starting from 10, 10, neither player has an incentive to switch to low provision of effort as this would yield an inferior payoff of 0. Stated more formally, LL and HH are equilibria in this situation.

Second, note that of these two equilibria, both players will prefer HH to LL. Stated more formally, HH is an (a Pareto) efficient equilibrium while LL is a deficient one.⁶

Finally, note that in this type of collaborative environment, neither player needs to believe in the “honesty” or “goodness” of the other player. Instead, Player 1’s concerns are that Player 2 is:

- sufficiently well-informed about the payoffs associated with the activity,
- sufficiently astute to realize the superiority of HH over LL,
- competent to deliver H, and
- confident Player 1 is also sufficiently informed, astute and competent to recognize a, b and c as they pertain to Player 2.

Minimal competence and confidence is required for people to coordinate in situations like the one depicted in Figure 1. A more problematic situation arises in the following game.

⁶ An allocation or equilibrium is Pareto Efficient or Pareto Optimal if in the equilibrium no person can be made better off without another being made worse off.

Figure 2

		Player 2	
		Low	High
Player 1	Low	\$5, \$5	\$5, \$0
	High	\$0, \$5	\$10, \$10

In this “assurance” game, like the “matching” game, HH and LL are equilibria with the former being Pareto efficient and the latter being deficient. Prerequisites for players to coordinate on the High/High outcome in this game are the same as for the Matching game – players must understand the game they are playing, be astute enough to recognize the superiority of the HH outcome, competent enough to provide High effort and believe these things about the other player. However, in contrast to the matching game, choosing High effort here entails more risk than choosing Low effort -- Low effort guarantees a payoff of 5 whereas High effort involves a possible payoff of 10 but also one of 0. Players, not convinced of the competence of their collaborators and/or their collaborator’s confidence in them, may reason that it is better to be safe (choose Low effort and receive 5 irrespective of what the other player does) than sorry (choose H only to receive 0 because the other player fails to follow suit.)

In matching and assurance games, there are two equilibria and both players agree as to which is preferable. The difficulty in achieving that outcome results from lack of information regarding the competence of the other individual to execute and lack of information regarding the other player’s beliefs regarding one’s own competence. The following game presents a much different problem where, for reasons to become apparent in a moment, the actions available to players are denoted “Don’t Give” and “Give”.

Figure 3:

		Player 2	
		Don't Give	Give
Player 1	Don't Give	\$5, \$5	\$12, \$0
	Give	\$0, \$12	\$10, \$10

In this game, referred to as the “Prisoners’ Dilemma,” players face a knotty problem. To see why, note that for the two players jointly, the best possible outcome would be for both to “Give” as both would then receive a payoff of 10. However, this strategy pair is not an equilibrium, since starting from this point, each player would unilaterally prefer the “Don’t Give” option as their payoff would increase to 12. “Don’t Give” is a dominating strategy for each player in that it is the best option independent of the other player’s behavior or strategy. Unfortunately, if both players do so, they wind up at 5,5. This is the equilibrium outcome for the game in that once this outcome is achieved, neither player has an incentive to change strategies unilaterally. Unfortunately, it is socially “deficient” – both players would prefer if they could have achieved the outcomes associated with Give/Give.

The Prisoners’ Dilemma provides the basic framework for distinguishing between the different motivations people might have for exhibiting honest and/or benevolent behavior. To begin, note that there are, in essence, three ways to solve the Prisoners’ Dilemma. One, favored by Thomas Hobbes (1651) and much later by Hardin (1968) and many others, involves converting the dilemma into a non-dilemma through the use of side-payments and side-penalties. In this approach, it is the role of some central authority (e.g., the government) to convert the game – its authority to coerce having been mutually

agreed upon by the players. In the context of the game in Figure 3, the coercion might involve making Don't Give illegal and subject to a \$5 fine, the consequences of which are shown in Figure 4. Note that now it is a dominating strategy for both individuals to give – good or benevolent behavior comes about because it is in each player's self interest to pursue it.

Figure 4:

		Player 2	
		Don't Give	Give
Player 1	Don't Give	\$5- \$5 , \$5- \$5	\$12- \$5 , \$0
	Given	(\$0, \$0)	(\$7, \$0)
		Give	Give
		\$0, \$12- \$5	\$10, \$10
		(\$0, \$7)	(\$10, \$10)

An alternative way of converting the dilemma into a non-dilemma, proposed by Axelrod (1984), involves playing the game many times with the same partner. What Axelrod showed was that with repetition it might pay for purely egoistic players to cooperate with each other as the benefits accrued by doing so would exceed those that would result from defecting even if their partner initially cooperated. For this to occur the future has to be sufficiently important and the date of the last game uncertain: Otherwise the incentives to “not-give” in the last period would propagate back to imply not giving in the first game.

Mutual coercion, mutually agreed upon coercion and repetition solve the dilemma problem by converting the situation to a non-dilemma in payoffs. An alternative solution is to convert the matrix to a non-dilemma in player' satisfaction or utility. This can come about if people are altruists in that they receive satisfaction or utility from the well-being

of others. Alternatively, it may be that they receive satisfaction or utility – a “warm glow” to use Andreoni’s (1989) term -- from the act of behaving in a cooperative or altruistic manner. Such a “warm glow” might be taught through appeals to conscience or self-esteem. In either case, the result is the same – the matrix in Figure 3 although a dilemma in payoffs, is a non-dilemma in utilities and “Give” is the dominant strategy for both players.

The Prisoners’ Dilemma provides an ideal framework for representing situations in which individual incentives clash with those which would maximize the group outcome. It does not, however, lend itself to understanding the role of expectations of reciprocity in producing benevolent behavior to the extent that the players’ moves are simultaneous. Berg, Dickhaut and McCabe (1995) propose a sequential, one-sided version of the Prisoners’ Dilemma, termed a “trust game” which does allow us to examine expectations. In this game Player 1 is told that he and another person with whom he is matched (Player 2) have each been given \$100. He is now given an additional \$50. He may keep the entire \$50 or send some portion of it to the other person. The experimenter triples any amount he chooses to send so, for example, if Player 1 sends \$10, Player 2 receives \$30. Player 1 respondents are told that Player 2 will have the opportunity to send some portion of the money received back, although they are not required to do so. The Player 1 respondent is then asked how much he would send to Player 2 and, for that amount tripled, Player 2 is asked how much he would send back.

Economic theory predicts that a self-interested rational Player 1 will keep the entire amount of money for himself, and if Player 2 does receive any money he will not send any back. In actual play of this game, Player 1s send positive amounts and Player

2's reciprocate by sending money back. Amounts sent are commonly taken as measures of trust – indications that Player 1 expects Player 2 to reciprocate. Likewise, amounts sent back reflect trustworthiness – the extent to which money sent elicits an obligation to reciprocate on the part of Player 2.

IV. Trust in Its Various Connotations – Implications for Economic Performance and Methods of Measurement

Having now distinguished between trust as competence and trust as benevolence as well as and between the different motivations people might have for exhibiting the latter, we are in a position to identify how each of these different constructs might contribute or limit economic growth and define precise ways of measuring differences in each across cultures. To begin note that some of the constructs developed – trust as expectations regarding competency, benevolence resulting from the existence of effective formal and/or informal sanctioning authorities, and benevolence as a result of the expectation of repeat interaction are all characteristics of the economic milieu in which individuals interact. Information regarding trust motivated by such incentives should be gleaned through information at the economy level.

As indicated earlier, information about the competence of others involved in joint productive activities positively impacts economic growth by enabling participants to more effectively coordinate their activities. Such signaling of competence or quality can be expedited through “accrediting” institutions like business and professional associations. As such, measures of how common and how large such organizations are in a given economy may indicate how effective participants in that economy are at

coordinating joint activities. Counts of schools, universities and other educational credentialing bodies may also improve expectations regarding competence although the contribution of these organizations to economic prosperity may, to large extent, already be picked up and attributed to education variables.

Predictions regarding the impact of formal and informal sanctioning bodies on economic prosperity will depend on the nature of the body. Clearly governmental sanctioning bodies like the judiciary will promote growth to the extent that they protect property rights and enforce contracts. There are a variety of indices available to measure governmental quality in general and effectiveness of property rights enforcement in particular. Knack and Keefer (1995), for example, constructed an index exemplifying the latter based on commercially provided measures of political risk. They found that this index was significant in predicting differences in economic growth and investment across countries.

The implications on economic prosperity resulting from smaller-scale entities enforcing norms are ambiguous. These bodies will expedite exchanges within the relevant group by converting dilemma situations into non-dilemmas. This may produce net economic benefits to the extent that the transactions costs associated with the good or service would simply preclude its provision absent some sort of cartel or other form of repeat trade mechanism. The diamond trade – a trade historically dominated by Orthodox Jews and largely closed to entry by others – may illustrate this situation.⁷ If, on the other hand, limiting exchanges to a small circle of trading partners (implementing the Axelrod solution to dilemmas) exacts economic losses in terms of exchange opportunities foregone that exceed the benefits associated with existing exchanges occurring

successfully, the net effect of such groups will be negative Yamagichi and Yamagichi (1994) argue that the tendency of Japanese businessmen to solve dilemma problems through commitments to repeat play produce just this outcome. Taken together, these observations regarding small-scale or informal sanctioning bodies and networks of mutually committed transactors may explain why evidence regarding the contribution of associational affiliations to growth is so mixed.

Altruism and expectations regarding reciprocity are attributes of individuals and, as such, should be measured at the individual level. A number of recent studies have used the trust game described in the prior section to ascertain how trusting people are in terms of their expectations regarding other's reciprocity as well as how trustworthy those in the position to reciprocate really are. Glaser et al (2000) and Danielson and Holm (2002) have used the amounts sent and sent back by participants in experimental trust games to try and identify what responses to the WVS trust question are measuring. Not surprisingly given the arguments laid out in this paper, they find little correlation between money sent and answers to the trust question. Fehr et al (2003) are using games directly as part of a written-response survey to measure trust.

Cox (2000) points out the responses to the trust game alone cannot distinguish altruistic motives for sending and sending back money from ones based on expectations or perceived obligations regarding reciprocity. Following Cox (2000), Houser, Leland and Shachat (2003) have formulated questions that have been incorporated in telephone surveys conducted by Indiana University's *Survey Research Center* that allow this discrimination. To do so, they require survey respondents to decide how they would play two games. In the first, called a dictator game, the respondent is asked to imagine the he

or she is matched with another person they do not know and will never meet. The respondent is told that both players know:

- each has been given \$100,
- that the respondent has been given an additional \$50,
- that the respondent can choose to keep any portion of the \$50 and send the rest to the other player, and
- that the experimenter triples any amount sent.

The amount the respondent chooses to send is a measure of how altruistic he or she is.

The respondent is then asked to imagine a similar situation but one in which, for any amount the respondent sends, the recipient can decide to send some of the tripled amount back. The amount sent by the respondent in this standard trust game, less the amount sent in the dictator game, is a pure measure of trust. In similar fashion, we yolk a dictator game and a game in which the respondent plays the role of Player 2 in a trust game. The dictator game response is a measure of altruism while the trust game response net the amount sent in the dictator game is a measure of trustworthiness.

V. Conclusion

Trust as measured by survey responses has produced an intriguing array of econometric results regarding the impact of trust on economic prosperity. The faith we put in these results is, on the other hand, undermined by questions regarding what the measure of trust derived from survey responses is measuring. The primary message in this paper is that if we are precise and careful in defining which connotation of trust we have in mind, clear

hypothesis regarding implications for economic growth and crisp measurement approaches for exploring these hypotheses follow.

References

Alesina, A. and E. La Ferrara, "Who Trusts Who." Centre for Economic Policy Research, No. 2646, December, 2000.

Andreioni, J., "Giving With Impure Altruism: Applications to Charity and Richardian Equivalence," *Journal of Political Economy*. 1989, 97(6), 1447-1458.

Axelrod, R., The evolution of cooperation. New York: Basic Books. 1984.

Berg J., J. Dickhaut, K. McCabe. "Trust, Reciprocity and Social History." *Games and Economic Behavior*, 10, 1995, 122-142.

Camerer, C. and M. Knez. "Coordination in Organizations: A Game-theoretic Perspective." In Z. Shapira (Ed.), Organizational Decision Making, New York, NY: Cambridge University Press, 1996.

Cox, J. "Trust and Reciprocity: Implications of Game Triads and Social Context." University of Arizona, Department of Economics working paper, 2000.

Dakhli, M. and D. De Clercq, "Human Capital, Social Capital and Innovation: A Multi-country Study, Working Paper, Darla Moore School of Business, Management Department, University of South Carolina, 2002.

Danielson, A., and H. Holm. "Trust in the Tropic? Experimental Evidence from Tanzania." Lund University Dept. of Economics Working Paper, April, 2002.

Fehr, E., Urs Fischbacher, Bernhard von Rosenblatt, Jürgen Schupp and [Gert G. Wagner](#). “A Nation-Wide Laboratory: Examining Trust and Trustworthiness by Integrating Behavioral Experiments into Representative Surveys.” [IZA Discussion Papers](#) 715, Institute for the Study of Labor (IZA), 2003.

Fukuyama, F. Trust: The Social Virtues and the Creation of Prosperity. New York: New York Free Press, 1995.

Glaeser, E., D. Laibson, J. Scheinkman, and C. Soutter. “What is Social Capital? The Determinants of Trust and Trustworthiness,” *Quarterly Journal of Economics*, 65, August 2000, pp. 811-846.

Hofstede, G. H. Cultures and organizations: Software of the mind. New York: McGraw Hill, 1991.

Houser, D., J. Leland and J. Shachat. “Game Responses as Survey Instruments: Measuring the Constituents of Social Capital.” Research proposal to NSF sponsored Time-sharing Experiments for the Social Sciences (TESS) research project. 2003.

Huang, H., C. Keser, J. Leland, and J. Shachat. “Trust, the Internet and the Digital Divide.” *IBM Systems Journal*, Sept. 2003, pp. 507-518.

Knack, P., “Social Capital, Growth and Poverty: A Survey,” The World Bank, April 1999.

Knack, P. and S. Keefer, “Does Social Capital Have an Economic Payoff? A Cross-Country Investigation.” *The Quarterly Journal of Economics*, 1997, 112, 1251-1288.

Hardin, G., “The Tragedy of the Commons.” *Science*, 1968, #162, pp.1243-1248.

Hobbes, T., Leviathan, 1651.

Putnam, R. (with Robert Leonardi and Raffaella Y. Nanetti), Making Democracy Work. Princeton, NJ, Princeton University Press. 1993.

Putnam, R., "Bowling Alone: America's Declining Social Capital." *Journal of Democracy*, 6:1, Jan 1995, 65-78

Putnam, R., Bowling Alone: The Collapse and Revival of American Community. Simon and Schuster, 2000.

Richman, B., "Community Enforcement of Informal Contracts: Jewish Diamond Merchants in New York." Harvard Law and Economics Discussion Paper No. 384, September 2002.

Sobel, J., "Can We Trust Social Capital." *Journal of Economic Literature*, VI. XL, March, 2002. pp. 139-154.

Solow, R., "But Verify." *The New Republic*, September 11, 1995, pg. 36.

Yamagishi, R. and M. Yamagishi, "Trust and Commitment in the United States and Japan, Motivation and Emotion, 1994, 18 (2), 129-163.