Cultures of Kindness:
A Meta-Analysis of Trust Game Experiments

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Abstract

We collect data on trust and trustworthy behavior from eighty-four iterations of the Berg, Dickhaut, and McCabe Investment game (the "trust" game). We perform a meta-analysis of these games in order to identify the effect of experimental protocols and cross-country cultural differences on trust and trustworthiness. We find that approximately 40% of the variance in trust and 30% of the variance in trustworthiness is explained by changes to experimental protocols. We also find that cultural variables that are highly correlated with a country's stock of social capital, such as ethnic fractionalization and income inequality, are most closely related to trustworthiness rather than trust. We use these findings to show that the negative relationship between diversity and social capital disappears as competitive free markets become more prevalent in a country.

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1. Introduction

Trusting in others and reciprocating that trust with trustworthy actions are everyday aspects of life. In most neighborhoods, most of the time, unlocked doors remain unopened, lost wallets containing cash are returned, and the vast majority of contracts, thankfully, remain incomplete. This is fortunate, since all of this trust and trustworthiness is good for the economy. Trust within organizations increases efficiency by lower monitoring costs (e.g. Frank, 1988), lowering turnover (Dirks and Ferrin, 2002), and increasing uncompensated positive behavior from employees (Dirks and Ferrin, 2002; Konovsky and Pugh, 1994). On a higher level of aggregation, scholars have linked a shared willingness to engage in trusting or trustworthy behavior, often referred to as social capital, to better economic outcomes (Fukuyama, 1995; Arrow, 1972; Putnam, 1993). Knack and Keefer (1997) explicitly link social capital to the average willingness to trust in a country and use cross-country data to show a link between higher trust and higher GDP per capita. Higher levels of trust have been associated with more efficient judicial systems, higher quality government bureaucracies, lower corruption, and greater financial development (La Porta et al, 1997; Guiso et al, 2000).

The link between trusting and trustworthy actions between individuals, on the one hand, and social capital at the organizational or societal level, on the other, is fraught with difficulties. The experimental literature is concerned with measuring trust and trustworthy behavior at the microeconomic level. This literature defines trust as an individual's willingness to be vulnerable based on an expectation of cooperation (Rousseau et al, 1998; Mayer & Davis, 1995) while trustworthiness is the reciprocating intention and behavior of an individual along with some element of kindness that is not conditional on the behavior of others (Ashraf et al, 2006). By contrast, the social capital literature is concerned more broadly with aggregate societal resources

linked to networks of relations (Bourdieu, 1983). These networks are generally associated with members' willingness to engage in activities that are not strictly self-interested, though the exact nature of this other-regarding behavior is left somewhat vague. While the experimental literature has been very successful in identifying the microeconomic origins of trusting and trustworthy behavior, the social capital literature has shown important links between aggregate cultural and economic variables with broad proxies for "trust". But, how are these two literatures, with their different levels of measurement, related?

This question matters since there is evidence that people trust for different reasons than they are trustworthy and, thus, equating social capital with "trust" may be mistaken. Ashraf et. al. (2006), for example, find that trust is highly correlated with an *expectation* of reciprocity. We give because we expect to receive. Trustworthy behavior, on the other hand, they find is explained in part by a desire to reciprocate, but also by 'kind' behavior due to unconditional other-regarding preferences. When there is no possibility for reciprocation, people act as if it is better to give than to receive. At the microeconomic level, if social capital stems from trust, then policies that lower uncertainty concerning the types surrounding you (reciprocal types or non-reciprocal types) could affect social capital formation. If social capital stems from trustworthiness, then information asymmetry has less to do with the matter than do the presence of factors that motivate kindness (of which more will be said later).

Clarifying the relationship between trust, trustworthiness, and the factors that predict social capital may also improve our measurements of social capital. Most studies of cross country social capital rely on a single item measure of trust from the World Values Survey. The question is, "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" The more, "yes" answers, the greater is the stock of social

capital assumed for the country. There are several problems, however, with the construct validity of this single survey question as a measure of norms of trust and reciprocity. First, there is nothing at stake to ensure that respondents are carefully considering their expectations and willingness to be vulnerable. Second, to paraphrase Colin Camerer (2003), it is not clear what question people think they are being asked. Do respondents believe the "people" referred to in the question are strangers, or acquaintances? Do they repeat the interaction, or is this a one-shot encounter? Finally, and most conclusively, there is evidence that the World Values Survey doesn't measure *trust* at all, but rather reflects the average willingness of a society to engage in *trustworthy* behavior (Glaeser et al., 2000).

One alternative to measuring social capital using the World Values Survey Trust Question is to measure the willingness of people to engage in trusting and trustworthy behavior directly in a controlled laboratory setting, such as in the experimental trust game originally designed by Berg, Dickhaut and McCabe (1995).[1] The Berg, Dickhaut and McCabe two stage trust game offers a carefully designed measure of individual willingness to trust strangers and to reciprocate that trust with trustworthy behavior. It involves a sequential exchange in which there is no contract to enforce agreements. Subjects are anonymously paired and assigned to either the role of sender or receiver. They are each endowed with $10. At stage one of the game, the sender (player 1) may either pass nothing, or any portion x of the endowment ($0 < x \leq 10$) to the receiver (player 2). The sender then keeps $10-x$, and the remaining money is tripled by the experimenter so that $3x$ is passed on to the receiver. In stage two, the receiver (player 2) may either pass nothing, or pass any portion y of the money received ($0 < y \leq 3x$) back to the sender. The amount passed by the sender captures trust, "a willingness to bet that another person will reciprocate a risky

[1] This game was originally called the "investment game"

move (at a cost to themselves)," and the amount returned to the trustor by the trustee captures trustworthiness (Camerer, 2003, p. 85).

Experiments were initially conducted by Berg and colleagues and identified a considerable willingness to trust and reciprocate trust among subjects engaging in the one-time, anonymous, and controlled exchange setting – a result which deviated substantially from the game theoretic predictions. This finding prompted a series of replications of the trust game across numerous countries with widely varying cultures. We take advantage of this diversity to perform a meta-analysis of the trust game. Our data set covers 84 replications of the trust game across 29 countries. On average, there were 140 players in each of these replications for a total of 11,913 individuals. While we don't have data on the trust and trustworthiness for each of these individual players, we do have averages from each of the replications, thus, each observation in our data set consists of average amount sent and returned across all of the players in each replication.

We wish to answer three questions with our investigations. First, "To what extent do changes in experimental protocols affect measured trust and trustworthiness?" Replications of the original trust game were conducted to develop our understanding of trust, but many of these replications also introduced cost-cutting and simplifying procedural changes such as lowering the rate of return, having players play both roles, changing the stakes or not employing the original double-blind protocol. In most of these cases researchers assume that the methodological variations do not matter, even when others have found that they can introduce systematic biases into the results (e.g. Hoffman et. al., 1994; Güth et. al., 2001; Smith, 2003). We test the effects of these procedural differences and are able to reduce the impact of sampling error and improve estimates of trust behavior by combining multiple studies in a meta-analysis

(Cohen, 1994; Hunter, 1997).[2] We also put signs and sizes on these effects, and find that methodological variables explain about 40% of the variation in measured trust and 30% of trustworthiness across replications.

The second question we address is, "What is the link, if any, between trust, trustworthiness, and factors that predict social capital?" There is debate in the literature concerning which experimental measure best captures social capital. Glaeser et. al. (2000) find that trustworthiness is correlated with answers to the World Values Survey Trust Question whereas trust is not. On the other hand, Fehr et. al. (2003) argue that trust is correlated with similar survey questions, whereas trustworthiness is not. We compare our measures of trust and trustworthiness directly with the proposed determinants of social capital as identified by the broader literature. Using data as varied as Union Army desertion rates during the Civil War, the proclivity of Iowans during the early nineteenth century to cooperate in building schools, to standard cross country studies using the World Values Survey, researchers have consistently found correlations between lower stocks of social capital and ethnic heterogeneity, income inequality, participation in hierarchical religion, and more corrupt government (Alesina & La Ferrara, 2000; Goldin & Katz, 1999; Alesina et. al., 1999; Costa and Kahn, 2003b; La Porta et al, 1997; Knack and Keefer, 1997). We incorporate these measures for each country represented in our data set. We also follow Knack and Keefer (1997) in including controls for educational attainment and real incomes. We find that, holding constant methodological differences across experiments, the social capital variables are significantly related to trustworthiness, but not to trust. For example, a one standard deviation increase in either a country's ethnic heterogeneity or income inequality leads to about a one-third standard deviation decrease in average trustworthiness.

[2] For an early application of meta-analytic procedures to questions of this type for the Prisoners' Dilemma game see (Sally, 1995).

The final question we address in this paper concerns one of the paradoxes of the modern social capital literature, namely, "why is there an inverse relationship between a country's stock of social capital and its levels of ethnic fractionalization and income inequality?" The common finding that greater diversity is associated with lower social capital runs counter to popular views on what most economically successful nations should look like. We provide evidence that this paradox is resolved if one controls for the prevalence of competitive markets in a country. This relationship has been suggested by Ensminger (2001), among others, but a comprehensive test has proved elusive given the lack of variation in measures of market competition across participants in individual trust games. Our meta-analytic approach allows us to capture this effect.

3. Data and Methodology

Meta-analytic procedure

A meta-analysis is the statistical analysis of a collection of results aimed at integrating findings across studies (Glass, 1976). The basic purpose of a meta-analysis is to apply methodological rigor to a literature review through the use of statistical techniques (Stanley, 2001). Meta-analyses are most commonly used to conduct a quantitative literature review of a research finding or "effect" that has been identified under a variety of circumstances. The outcome variable is usually a measure of effect magnitude and is generally captured by a single summary statistic per data set in the form of a standardized mean difference or a correlation coefficient. In our case we have two effect measures from each replication of the trust game: average trust and average trustworthiness across participants.

Identification of studies

The explanatory power of a meta-analytic study depends heavily on the inclusion of all relevant publications. A systematic search strategy must be employed to identify publications, conference papers, pre-publications work and unpublished studies that have replicated the trust game since Berg, Dickhaut and McCabe first introduced it in their 1995 study (henceforth BDM). As a first step we used the Web of Science database search engine to identify all published articles that cited BDM. This produced a list of 262 papers which were then carefully reviewed to determine whether they replicated the BDM trust game. Twenty-eight studies were identified. The next step was to search the FirstSearch database which includes four important databases: WorldCat, ArticleFirst, ECO, and WorldCat Dissertations. WorldCat is a cooperative database of bibliographic records contributed by 53,548 libraries. ArticleFirst is an index of articles from the contents pages of journals containing more than 15 million entries beginning in 1990. ECO is another database of scholarly journals and World Cat Dissertations provides access to all the dissertations available in OCLC member libraries. We searched this comprehensive database for the keywords "trustgame" or "investment game". This produced a list of 87 cited books, articles and dissertations which were reviewed and 4 additional studies that replicated the BDM experiment and were not duplicates from the first step employed in this search.

The next two steps focused on limiting the "file drawer problem" (Rosenthal, 1979), a bias due to omissions of unpublished manuscripts in a meta-analytic review, by identifying working papers in the social sciences that have not been published. We used the Social Science Research Network (SSRN) e-library database, which catalogues over 100,000 searchable working papers

and forthcoming journal articles, to search for keywords "trust game" or "investment game" in the title or abstract. This produced a list of 140 papers, and 10 additional replications of the BDM game. Step four identified additional working papers by economists. We used EconPapers, a search engine that provides access to the largest collection of on-line economics working papers and book chapters, RePEc, and searched for "trust game" or "investment game". This produced a list of 534 sources. A careful review of these sources produced 15 additional unpublished papers that replicated the trust game.

As a final step we reviewed the reference lists of the papers identified so far for cited published or unpublished papers which were cited and had something to do with the trust game but had not yet been identified. This uncovered an additional 7 papers. Six of these were working papers that were found on a university website or conference website. One paper was a journal article that had cited BDM but was missing by the Web of Science search due to what may have been an error in the database.

Several studies that claimed to replicate the BDM trust game could not be included because they replicated a simplified version of the BDM trust game which offered subjects dichotomous choices to either trust and send a predetermined amount to the counterpart or not trust by choosing to send nothing. This version of the game does not allow for differences in the degree of trust to be identified, and as a result could not be included in this meta-analysis.

The search and criteria for selecting studies resulted in 64 papers in addition to BDM's original study (see Appendix 1 for an overview of our search results). While most of these papers were testing various extensions of the game or the effects of different conditions on the outcome, they also conducted the original game as a control against which to compare their extensions. Some papers include more than one result because they offer findings from more

than one country or group of independent subjects. As a result the 65 papers provided a sample of 84 observation on trust and 75 observations on trustworthiness.

Description of Variables and Summary Statistics

Our data are cross-sectional with each observation representing a replication of the trust game. The proportion of the endowment that subjects pass to their counterparts in each replicated study measures trust, and the amount returned to the sender as a proportion of money available to send measures trustworthiness (Camerer, 2003). Our two dependent variables are averages of these measures of trust and trustworthiness over each replication of the trust game. We follow Glaeser et. al. (2000) in measuring trustworthiness as the average amount returned by the receivers divided the average amount available to return. Average amount available to return in our study is equal to the average amount passed by the senders multiplied by the "rate of return," the factor (two or three) by which the experimenter chose to increase the amount sent. When measured this way, both trust and trustworthiness are proportions, falling between zero and one. In order to avoid inefficient coefficient estimates and an inappropriately specified model using OLS, we apply the logit transformation to both trust and trustworthy in order to map their values from [0,1] to the real line.[3]

To make interpretation easier, Table 1 shows the descriptive statistics for trust and trustworthiness both with and without the logit transformation. We call the variables before transformation "sentfraction" and "retavail". After the transformation they are referred to as "trust" and "trustworthy". Figures 1 and 2 provide histograms of the distributions of the untransformed variable sentfraction and retavail. Replications of the trust game have

[3] For a dependent variable, Y, the logit transformed variable is, $\hat{Y} = \ln\left(\frac{Y}{1-Y}\right)$.

consistently supported the finding that individuals are willing to engage in significantly more trusting and trustworthy behavior than predicted by game theory. However, the size of the trusting and trustworthy behavior found by researchers varies significantly. For example, one study (Gneezy et al., 2000) found senders passing an average of 31% of their initial endowment, while another had senders passing an average of 76% of their endowment (Koford, 1998). Our data are consistent with this wide range of findings. There is a significant amount of variation in both our trust measure and our trustworthiness measure. The coefficients of variation for the untransformed variables are both about a quarter of their means. This large variation in trust and trustworthy behavior across studies begs the question of how much is due to differences in experimental protocols (differences in methodological variables) versus differences in the underlying national cultures of the participants.

Methodological Variables – Predicting Trust Behavior

Trust is a willingness to be vulnerable to a counterpart based on a confident expectation of their behavior. We consider how methodological variations across trust game studies might influence a trustor's expectations or willingness to engage in risky behavior. Table 1 contains descriptive statistics for the variables we use to explain methodological differences across studies. Below we describe each of these variables.

Amount at Stake: BDM endowed their senders with $10 while other researchers have conducted their studies with smaller and larger stakes. A study conduced in rural Bangladesh provides some evidence that trust behavior falls as stakes increase (Johansson-Stenman et al., 2005). In addition, several experimental studies have examined the relationship between stakes and individual risk preferences, and have found that people become more risk averse when there

is more at stake (e.g. Binswanger, 1980; Holt and Laury, 2002). In a lottery choice experiment that measured risk aversion over a wide range of payoffs, Holt and Laury found that subjects became more risk averse as the stakes increased (2002). These findings suggest that the average subject playing the trust game with a larger endowment should be more risk averse and therefore less willing to assume the risk of engaging in trust behavior.

In our data we measure amount at stake as the size of the sender's endowment, represented by the variable "psendend". The variable is standardized by dividing the endowment in the original currency by a purchasing power parity (PPP) conversion factor developed by the World Bank and published as part of the organization's annual compilation of World Development Indicators. The PPP conversion factor allows currencies to be converted into a common unit of account that reflects equivalent purchasing power by using information from surveys of prices and expenditures across countries (Dornbusch and Fischer, 1994). The PPP conversion factor represents the number of units of a country's currency required to buy a set bundle of goods and services in the domestic market as a US dollar would buy in the US market. We use the PPP conversion factor for the year in which each study was conducted.

Receiver Endowment: In BDM's trust game both the sender and receiver were given equal endowments. The sender then decided whether to pass any of that endowment to the receiver. Many replications by other researchers chose not to endow the receiver in the trust game, presumably to lower the cost of administering the trust game. Models of behavior that incorporate other-regarding preference (or fairness) into players' utilities (e.g. Fehr & Schmidt, 1999) and theories of equity (Adams, 1965; Adams and Freedman, 1976) would lead us to predict behavioral differences when the endowments are unequal. Subjects have been randomly assigned to their roles, so unequal endowments mean there is an *inequity* which can produce

feelings of distress and guilt (Adams, 1965; Adams and Freedman, 1976). Only by passing more to the unendowed receiver can the sender eliminate the feeling of distress and restore equity. The variable "precendend" indicates whether or not the receiver is endowed by the experimenter. The variable is equal to 1 if the receiver was endowed and 0 if the receiver was not endowed.

Rate of Return: BDM argued that trust must produce a welfare gain in order to facilitate exchange – both parties must be better off when trust occurs. The BDM game therefore incorporated a positive rate of return on trust by tripling the money passed to the receiver. While many replications of the BDM trust game maintained the convention of tripling the quantity sent, other researchers doubled the quantity sent simply to lower the cost of running the study. But trust is a calculated gamble (Coleman, 1990), and the potential gains from trust, if the counterpart were to be trustworthy, may enter into this rational calculation of whether to trust. This view of trust suggests that a higher rate of return in the trust game should increase the likelihood that the sender would take a risk and trust the receiver, while the lower rate of return, in contrast, produces lower incentives for the sender to trust. We code the rate of return as "rateret". Rateret is a dummy variable because only two different rates of return have been employed in the BDM replications. A value of 1 indicates the amount sent was tripled and 0 indicates the amount sent was doubled by the experimenter.

Both Roles: Replications of the BDM study sometimes asked subjects to play both the role of the sender and the receiver with different partners. This approach offers the advantage of collecting more testable observations from fewer subjects, but it is frequently employed without reference to possible systematic effects it might have on trust behavior. Burks and colleagues (Burks et al., 2003) found that subjects who played both roles and who were aware of this before the experiment began, on average sent less money to their counterparts than those who only

played the sender role in the trust game. They argue that subjects feel less responsibility toward their counterpart since their earnings will depend on two separate interactions and as a result are willing to act more selfishly. The variable "bothroles" is coded 1 if they played both roles and 0 if they played only one role.

Real Players: Replications of the BDM sometimes included a computer simulated counterpart rather than an actual human being. In such replications, subjects are told that they are interacting with a real counterpart, and it was generally assumed that subjects believed this to be true. Many of these studies did not, however, report the results of a manipulation check to verify that subjects actually believed what they were told – that they were interacting with a real counterpart when in fact they were not. Research has shown that people make different decisions in exchange settings with real counterparts than when they know they are dealing with a computer (e.g. Bottom et al., 2006; Sanfey et al., 2003), suggesting that subjects may send less money in the trust game when interacting with a computer counterpart. The variable "realperson" is equal to 1 if the counterpart was another experimental subject and 0 if it was a computer or confederate.

Random Payments: While the subjects in the original BDM game played with real money which corresponded to their earnings, replications of the trust game experiment sometimes involved random rather than guaranteed payments to the subjects. This approach is also employed to reduce costs to the experimenter. For example, rather than pay each subject for the amount 'earned' by playing the trust game, sometimes subjects are told that one (or a few) will be randomly selected and awarded the amount earned in the study. While Bolle (1990) found that the use of random payments to subjects does not systematically affect behavior, Bottom's research (1998) suggests that it might by introducing additional risk to the game. The subject's

upside reward depends not only on whether the counterpart is trustworthy, but also on an unrelated lottery. This added risk would make the average sender less willing to pass money to their counterpart. We examine this variable in our study as "randompayment" where 1 indicates that subject behavior in the trust game is rewarded randomly according to some pre-specified rule of the experimented, and 0 indicates otherwise.

Strategy Method: Subjects in some replications of the BDM trust game are asked to state the amount that they would return for *each conceivable amount* passed by the sender. Trustees are asked to respond to every possible behavior from their counterpart, allowing the experimenter to collect more information about what the subjects might consider to be fair behavior (Bahry & Wilson, 2006). While some researchers have shown that eliciting such responses from subjects does not have a systematic effect on behavior (Brandts & Charness, 2000), others have indicated that the process of thinking through the behavioral implications of each possible outcome changes the subjects' perceptions of the game and leads them to process their decisions differently (Güth et al., 2001; Roth, 1995). The variable "Stratmeth" is equal to 1 if the receiver was subjected to the strategy method and 0 otherwise.

Student Subjects: The subjects in the original BDM study were students. While students are a convenient and frequently employed sample for behavioral laboratory experiments, the external validity of using student subjects has been criticized because it is not a representative sample of the general population. Students are on average younger than random samples of the population and some research, has found that relatively older subjects exhibit less trust behavior in the trust game than student participants (Bellemare and Kröger, 2003; Fehr et al., 2003). If the experimental subjects were students, then the variable "student" takes on a value of 1, and 0 otherwise.

Double-blind: BDM placed great emphasis on the importance of a double blind procedure in their experiment – a procedure to ensure that the experimenter, along with other subjects, cannot trace decisions back to the individuals who made them. This procedure helps to rule out the possibility that people are engaging in trust behavior because they want to build or protect their reputation with the experimenter as a generous and agreeable individual with whom future exchanges would be desirable. Conveying these characteristics to an experimenter may produce the perception of some probability of benefits in future exchanges with the experimenter, and as a result the future expected payoff from engaging in such exchanges could motivate the subject's behavior in addition to, or instead of, trust in the counterpart.

Hoffman and colleagues found significantly more self-interested behavior in experimental dictator games using a double-blind procedure (Hoffman et al., 1994). Nevertheless, replications of the BDM trust game usually do not employ the strict double blind procedure, suggesting that experimental researchers have conflicting views with respect to the effects this protocol has on behavior. The inconsistent use of strict double blind procedures may be artificially inflating proportions sent in the trust game due to an underlying desire of subjects assigned to the role of sender to protect their reputation or impress the experimenter. The variable "dbleblnd" is equal to 1 if the experimental protocol followed the strict double-blind procedure, and 0 if the procedure was not strictly double blind.

Methodological Variables – Predicting Trusting Actions (Trustworthiness)

Trustworthiness is motivated by conditional other-regarding preferences (reciprocity), as well as unconditional other-regarding preferences such as altruism and kindness (Cox, 2004; Ashraf et al, 2006). We expect that while the amount sent by the counterpart will be a major

predictor of the amount returned in the trust game, methodological variations to the trust game may also influence these components of trustworthiness. Below we describe the motivation behind how these variables might influence trustworthiness behavior.

Stakes, Receiver Endowed, Rate of Return. Each of the methodological variables influences the perceived 'wealth' of the receiver. Higher stakes, an endowment for the receiver, and a higher rate of return are all factors that on average increase the receiver's pot of funds in the trust game. Research on philanthropic behavior has identified income as the most important predictor of giving behavior, finding that higher income households donate more (e.g. Yen, 2002). As such, we might expect 'wealthier' receivers to exhibit more kindness by giving more money to their counterparts.

Random Payment, Strategy Method, Real Player, Both Roles. Each of these methodological variables influences the level of responsibility that trusted parties feel toward their counterpart, and therefore affects the amount of money they send back. When subjects play both the sender and receiver roles, Burks and colleagues (Burks et al., 2003) found that subjects passed less money to their counterparts. The strategy method forces subjects to imagine how they would respond to their counterpart's behavior by asking them to respond to hypothetical actions, which again removes a part of the interpersonal dynamic and responsibility felt for the counterpart (Roth, 1995; Güth et al., 2001). Random payments also mean that the 'kindness' and reciprocity exhibited by the receiver may never be experienced or realized by the counterpart, which may also translate into lower felt responsibility to the counterpart. Finally, if subjects believe the counterpart to be a computer simulation rather than a real person, we also expect them to reciprocate less and to show less kindness.

Student. Researchers have found that older people are more generous than younger people and that giving increases with age (e.g. Yen, 2002; Midlarsky & Hannah, 1989; Nichols, 1992). Since students represent a subset of the population that is younger than average, we might expect students to give less money back to their counterparts than older, non-student populations.

Double-blind. We expect the effect of a double-blind protocol on subject behavior to be the same for trustworthiness as we predict for trust. By eliminating any possible reputation effect, we expect trusted parties to reciprocate less and therefore send less in the trust game when there is a double-blind protocol in place.

Cultural Variables

Our dataset contains observation from 29 countries: 2 from North America; 10 from Western Europe; 6 from Asia; 6 from Sub-Saharan Africa; 4 from Latin America; and 1 from the Middle East. This substantial variation allows us to investigate how various national cultures affect trust and trustworthy behavior and, in particular, identify whether variables usually associated with greater social capital in a country are more associated with trusting or trustworthy behavior. Table 2 provides descriptive statistics on the cultural variables we include as covariates. We describe these cultural variables and explain why they are included below.

Ethnic Fractionalization: There is ample evidence that the degree of ethnic diversity in a group or country is negatively related to social capital formation. Alesina and La Ferrara (2000) find that participation in community groups is significantly lower in the United States the more ethnically fractionalized is a group. Knack and Keefer (1997) find a negative correlation between ethnic fractionalization and negative responses to the World Values Survey Trust Question across countries. Costa and Kahn (2003a) find that Union Army conscripts were less

likely to desert, the more ethnically homogenous was their company. Goldin and Katz (1999) find that in early twentieth century Iowa, community participation in the expansion of high school education was more prevalent in regions with greater ethnic homogeneity. Alesina et. al. (1999) find that greater ethnic divisions in Maryland communities lead to lower cooperation towards public goods provisioning.

We use the variable *ethnicfrac* to measure ethnic fractionalization. It is taken from Alesina et. al. (2003) and represents the probability that two randomly drawn individuals from the population will be from different ethnic groups. The closer the variable is to one, the more ethnic diversity in the country. It is based on data compiled in 1960 by a group of Soviet ethnographic researchers and has been widely used in the cross-country growth literature (Easterly and Levin, 1997; Mauro, 1995; Canning and Fay, 1993, Knack and Keefer, 1997).

Income Inequality: Many of the same sources that find ethnic fragmentation lowers social capital, also find that income equality has similar effects. Alesina and La Ferrara (2000), Knack and Keefer (1997), and Goldin and Katz (1999) all find that greater income inequality leads to lower social capital. We measure income inequality using the variable *gini* which is the gini coefficient (*CIA World Factbook*, 2007). The closer it is to 1, the less equitable is the distribution of income in a given country.

Hierarchical Religion: Putnam (1993) argued that part of the reason he found low amounts of social capital in Southern Italian regions was because the Catholic Church had for centuries been imposing a hierarchical structure which discouraged trust and civic participation (as opposed to in the North where independent city state were more prevalent). Presumably, hierarchical organization did not encourage church members to develop bonds of trust between themselves in the same manner as "flatter" organizations. La Porta et. al. (1997) define

hierarchical religion as the proportion of people in a country in either an Eastern Orthodox, Roman Catholic, or Muslim congregation. They find a significant negative correlation between participation in hierarchical religion and negative answers to the World Values Survey Trust Question. We include three variables for hierarchical religion in our study which measure, *relcath*, *relorth*, and *relmus* which measure, respectively, the probability that a randomly drawn person is a member of a catholic, orthodox, or muslim religion. In our regressions we test and report the joint probability that these three variables explain trust or trustworthiness.

Institutional Quality: The formal institutional structure of a country provides a framework for economic action (Nee and Ingram, 1998) and may thereby influence individual willingness to trust or be trustworthy (Hardin, 1992; Knack and Keefer, 1997). Reliable political institutions restrain arbitrary actions within the government and provide effective third-party enforcement of contracts. The presence of formal constraints of the state, of laws, and of property rights diminish the risks associated with anonymous exchange and encourage economic development and entrepreneurship (Knack and Keefer, 1997). Fair and effective formal institutions influence the norms governing exchange relationships and may strengthen general trust among citizens (Hardin, 1992).

Corrupt and ineffective government institutions, in contrast, may weaken general trust (Zak and Knack, 2001). A society where government officials cannot be relied upon and trusted may lead individuals to develop stronger social networks and trust within these networks (Yamagishi and Yamagishi, 1994). While the presence of strong ties means that there are high levels of trust within these communities, this does not translate to higher levels of general trust. Networks of committed relationships prevent defection through the development of mutual attraction and loyalty. An individual's reputation for being trustworthy influences the likelihood of future

membership within the network. Opportunities for exchange outside these secure relationships present greater social uncertainty and risk, leading to a lower willingness to trust others in general (Yamagishi et al., 1998). As a result, high levels of corruption in a society should be associated with less general trust in people outside the well-established social networks.

The variable "corrpi" measures the amount of corruption in a country using the Transparency International Corruption Perceptions Index, TICPI. This index is developed and published by the policy and research department of Transparency International, a global organization with the mission to stop corruption. The TICPI is an aggregation of surveys of citizens, businesspersons, and other experts who provided subjective ratings of the frequency with which public officials demand bribes, which are converted into scores ranging from 0 to 10 for more than 150 countries. The index has an inter-rater reliability for the expert assessments and opinions surveyed of 0.87, and it is available from 1995 through 2006. The variable TICPI reports this index and captures the level of corruption for each country where each trust game study was conducted.

Lastly, we follow Knack and Keefer (1997) in including real gross domestic product per person in 1995 (*ypop95*) and proportion of population enrolled in primary school in 1960 (*pren60*) as controls for our culture regressions. Both of these variables are from the Penn World Tables. We use values for these controls from before any of the studies were performed in order to minimize possible endogeneity bias.

Weaknesses of the Data

There are several shortcomings of our data. Numerous studies replicating the BDM trust games have examined the effect of gender on trust and trustworthy behavior. While some have

found that gender has no effect (e.g. Ashraf et al., 2003; Croson and Buchan, 1999), others have found a positive relationship (e.g. Eckel and Wilson, 2003) or a negative relationship (e.g. Buchan et al., 2003; Glaeser et al., 2000) between women and trust. In addition, some recent research suggests that gender effects may interact with regional differences (Price, 2006) and demographic variables (e.g. Buchan et al., 2003; Eckel and Wilson, 2003) to influence cooperation or trustworthiness. This meta-analysis would be an ideal opportunity to further investigate the effects of gender on trust behavior, but unfortunately only a few of the BDM replications reported information about the gender of the subjects, and we could not use these studies to systematically examine the effects gender effects on trust.

Another shortcoming is that, given the aggregate nature of our data, we cannot identify the effect of *individual*, or, *group* cultural characteristics versus *national* cultural characteristics. For example, one of our findings is that the more ethnically fractionalized the country in which an experiment is conducted, the lower is trustworthy behavior. We cannot formally identify the effect of a country's overall level of fractionalization versus the possibility that just the subjects in the experiment are from varied ethnicities, or, the possibility that the individual counterpart with whom the game is played is from a different ethnic group. If experimental subjects are a random sample of the overall population of a country, then our aggregate measures should be appropriate. However, if the subject pool is not random, then we may potentially get biased estimates of the effect of country level variables on the average behavior of the participants. For example, if a study uses only students at a prestigious university, they may be significantly less ethnically heterogeneous than the overall population. The coefficient on our ethnic fractionalization measure would then likely be biased towards zero. Alternatively, a significant

coefficient will be difficult to interpret since we can't say whether the effect is due to a process that operates at the national level, or, is restricted to a person's immediate environment.

3. Results

Explaining Trust and Trustworthiness with Methodological Variables

We begin by investigating the relationship between experimental protocols across replications and observed trust and trustworthy behavior. We begin by estimating the following specification using ordinary least squares,

$$(1) \qquad y_i = \alpha + \mathrm{B}'X_i + \frac{\varepsilon_i}{w_i}$$

Where y_i is either our logit transformed trust or trustworthy measure and X_i is a vector of methodological variables, and *i* represents a replication of the trust game.[4] Hedges and Olkin (1985) recommend that estimates and test statistics based on averaged data be calculated using weighted regression analysis in order to ensure that study results reflect the sample size in each study examined. As such, the error term, $\varepsilon_i \sim N(0,\sigma^2)$ is weighted by $\frac{1}{w_i}$, where $w_i = \frac{n_i}{\sum n_i}$ with n_i being the number of subjects in treatment *i* and $\sum n_i$ the sum of subjects across all treatments. In effect, the contribution of study *i* is given greater weight the larger the underlying sample from which mean trust and trustworthiness are calculated. We also cluster on country since there are often multiple observation on trust and trustworthy from the same nation.

Results for the OLS regression are reported in Table 3. Model one predicts trust and indicates that methodological variations in the rate of return, whether a student population was

[4] As a robustness check, we abandoned the logit transformation and ran specifications for trust and trustworthy using a Generalized Linear Model with a Bernoulli family function and a logistic linking function, as suggested by Papke and Wooldridge (1996) for proportional dependent variables. The results were no different than those reported, aside from an overall increase in the precision of the estimates (but not precise enough to even come close to reversing our findings that culture explains trustworthy but not trust in the next section).

used, the use of the double-blind protocol or strategy method, and whether the counterpart was a real person did not systematically influence the amount sent (trust) in the trust game. However, we do find that as predicted, higher stakes, an endowed receiver, and random payment are methodological variations that consistently lead to lower proportions of money sent in the trust game. The relative size of the endowment, adjusted for purchasing power parity in order to capture some of the differences in income levels across countries, was negatively related to trust behavior. We also find that subjects were less willing to pass money when the receiver was endowed, and when payments to subjects playing the trust game are based on an additional random element (random payment), then senders are also less willing to pass money to their counterparts.

Model three predicts trustworthiness, the proportion returned in the trust game. As predicted, we find that stakes, whether the receiver is endowed, and the rate of return lead to higher amounts passed back to the sender by the trustee. Each of these methodological variations was predicted to influence the subjects' perceptions of wealth, and as predicted the results suggest that subjects are more generous when they are better off. Students exhibit significantly lower levels of trustworthiness – possibly because they are systematically younger than 'non-student' populations and youth has been associated with lower levels of generosity and charitable giving. We find that methodological variations in double-blind protocol, when subjects play both roles, random payment to subjects, and the use of the strategy method do not have significant systematic effects on trustworthiness behavior across trust games. We are not able to test the effect of playing a real counterpart on trustworthiness because we only have one "realperson" observation when predicting the proportion returned.

It is possible that our coefficient estimates are biased due to unobserved country specific factors that are correlated both with the independent variable and the error term. For example, perhaps the significant negative coefficient on student in the trustworthy regression stems from "national culture" in some countries being different than in others. Since we have multiple observations for most of the countries in our data, we can partially control for this possible endogeneity by including country dummies. These will successfully control for any unobserved variable bias stemming from fixed factors within a country. We drop from the sample all countries with just a single observation and estimate the specification,

$$(2) \qquad y_{ij} = \alpha + \mathrm{B}'X_i + \gamma_j + \frac{\varepsilon_{ij}}{w_i}$$

where γ_j is a dummy for country j. After dropping single observation countries we are left with 75 observations on trust and 66 observations on trustworthy.[5]

Model 2 in Table 3 predicts trust behavior with an OLS regression including country dummies. After controlling for unobserved country-level fixed factors, random payment and whether the receiver is endowed are no longer significant in the trust regression. On the other hand, student becomes significant at the 1%. It has a positive sign, indicating that student populations send more than non-student populations. Model 4 predicts trustworthiness with an OLS regression including country dummies. Here we find that including country dummies simply increases the number of methodological variables that are significant predictors of trustworthiness. None of the variables that are significant when we don't include country dummies change sign or lose significance when the country controls are added. This is strong

[5] We report the Huber-White robust standard errors for the dummy variable specifications. This is necessary in order to ensure that the variance-covariance matrix is of sufficient rank to perform the F-tests that are reported. We ran the dummy variable regressions using clustered errors as well and, aside from not getting an F-statistic, standard errors and coefficient estmates were virtually identical. As a robustness check, we also ran specifications (1) and (3) using the same restricted sample as we use for specifications (2) and (4) and found no significant changes in the results.

support for the robust economic and statistical significance of sender endowment, receiver endowment, rate of return, and student population in their effects on trustworthiness. In addition, once country level unobserved variable bias is controlled for, both roles and strategy method both become significant at the 5% and 1% respectively and in the predicted directions.

The coefficients of determination for specifications (1) and (2) imply that about 44% and 68% of the variation in trust is explained respectively by methodological differences across experiments, or, both methodological differences and unobserved fixed factors associated with national culture. Specification (3) suggests that the corresponding number for trustworthy is around 50%. However, the amount sent to the receiver on average is not, by any definition, a methodological variable. It is, rather, an integral part of the game. As such, a more appropriate indicator of the importance of methodological variables in predicting trustworthy behavior is provided by running specifications (3) and (4) without including *sentfraction* as a covariate. This results in coefficients of determination of 0.320 and 0.750 respectively (the estimates are not reported in Table 3). No matter how we look at things, two results stand out. First, between a third and two-fifths of the variation in average trust and trustworthiness across iterations of the trust game are due to differences in experimental protocols. Second, there also seems to be a significant effect of national culture on trust and trustworthiness. The addition of country dummies to the trust specification explains close to an additional 25% of the variation in trust across iterations. For trustworthy, the component accounted for national culture is over 40%! In the next section, we attempt to identify more precisely what it is about culture that matters to trust and trustworthiness.

Explaining Trust and Trustworthiness with Cultural Variables

The results in the previous section suggest that unobserved fixed characteristics of a country can have both an economically and statistically significant effect on trust and trustworthy behavior. We are interested in this section in identifying if those country specific characteristics identified by the social capital literature have explanatory power with regards to trust or trustworthy behavior.

We begin by estimating the following specification,

$$(3) \qquad y_{ij} = \alpha + \beta culture_j + \mathrm{B}' X_i^M + \Lambda' X_j^C + \frac{\varepsilon_{ij}}{w_i}$$

There are only two difference between specification (1) above and (3). First, we include a variable *culture* which represents ethnic fractionalization, income inequality, corruption, or hierarchical religion, depending on the specification. Second, we include both the methodological variables as controls, $\mathrm{B}' X_i^M$, as well as a vector of country level controls, $\Lambda' X_j^C$. The country controls we use are real gross domestic product per person in 1995 and primary school enrollment rate in 1960. These are similar to the controls used by Keefer and Knack (1997) when attempting to explain the answers of the World Values Survey Trust Question with cross-country data. Once again we weight the regression since the dependent variables are averaged data. We also cluster on country.

Tables 4 and 5 report the results from our estimates of (3) on trust and trustworthy. We begin with the results on trust contained in Table 4. Specifications (1), (3), (5), and (7) look at the effect on trust of ethnic fractionalization, income inequality, corruption, and hierarchical religion respectively. For religion, we report the p-value for a joint test of significance for all three measures of hierarchical religion. The only coefficient significantly different from zero is for ethnic fractionalization, and it has the wrong sign. Specification (1) implies that, at the 10%

significance level, a one standard deviation increase in ethnic fractionalization results in about a fifth of standard deviation *increase* in trust. This is the opposite of what the social capital literature finds using measures like the WVS Trust question, group membership, or group loyalty measures. Similarly, the signs on *gini* and *corrpi* are also positive (though insignificant) strongly suggesting that social capital and trust stem from different sources.

It is well known that cross country growth regressions are highly sensitive to the conditioning information set (Levine and Renelt, 1992). In general, coefficient estimates based on cross sectional data are sensitive to both specification and violations of the OLS normality assumption by the underlying data. Our data are no different. Indeed, the distribution of the trust data fails a skewness-kurtosis test for non-normality at the 5% level. The trustworthy data passes the test, but only at the 15% level. The implication is that there are outliers in our data which may be significantly biasing the parameter estimates. In specifications (2), (4), (6), and (8) we use a robust estimation procedure in order to minimize the effect of outliers. The procedure is a form of iterated weighted least squares regression in which the weights are inversely related to the absolute residuals of an observation. The iteration process terminates when the maximum change in residuals drops below a specified tolerance limit (Hamilton, 1991).[6]

After controlling for extreme values, ethnic fractionalization is no longer significant in the trust regression. Otherwise, the results are largely the same as OLS. The general picture that emerges from Table 4 is that there is no relationship between the factors that are associated with social capital and trust as measured in the experimental trust game.

[6] This form of robust regression allows for neither sample weights of the type we used for averaged data, nor for the use of robust variance-covariance estimators such as Huber-White standard errors or Clustered standard errors. To check if this matters, we ran the OLS specifications without weights or robust standard errors, the results were very similar to those in specifications (1), (3), (5), and (7).

In contract to the regressions on trust, there appears to be a very strong effect of cultural variables on trustworthiness. These results are reported in Table 5. Again, specifications (1) (3), (5), and (7) look at the effects of ethnic fractionalization, income inequality, corruption, and hierarchical religion on trustworthiness using the OLS estimator. Ethnic fractionalization and income inequality both have negative signs, as predicted by the social capital literature, and are significant at the 5% level. The coefficient sizes on *ethnicfrac* and *gini* both suggest that a one standard deviation increase in the independent variable results in about a one-third standard deviation decrease in the average amount of money sent back by the receiver in the trust game. Recall that we are holding constant methodological variables, including the average amount sent, in all of our culture regressions. Thus, it is less likely that our coefficient estimates for trustworthiness are picking up reciprocity, than some form of "kindness" or "altruistic" behavior. We consider the results from specification (1) and (3) strong evidence that the factors that contribute to social capital are more closely related to trustworthy behavior than to trusting behavior.

Corruption has the wrong sign (positive) and is insignificantly different from zero. The joint test for the significance of hierarchical religion rejects the null of no effect at the 1% level. Looking more closely at the individual coefficient estimates for catholic, orthodox, and muslim (not reported in Table 5), it is clear that the finding is driven by catholic (coeff = .280, p-value=0.054) and muslim (coeff=1.472, p-value=0.001) countries: Particularly, Italy for catholic and Bangladesh for Muslim. Furthermore, the signs on both *relcath* and *relmus* are positive, which is the opposite of that predicted by Putnam (1993) and La Porta et. al. (1997).

As mentioned above, the distribution of trustworthy is closer to normal than trust (passes the skewness-kurtosis test at 15% level), nonetheless, we also report the robust estimation results

for the trustworthy regressions in columns (2), (4), (6), and (8). Ethnic fractionalization and income inequality retain their negative signs and continue to be significant at the 5% and 10% level respectively. Corruption continues to be positive and insignificant. Hierarchical religion still passes the Hausman test for joint significance at the 1% level, however, a closer look at the individual coefficients reveals that *relcath* is no longer significant (coeff=0.033, p-value=0.774). *Relmus*, however, retains its positive sign and is significant at the 1% level (coeff=1.366, p-value=0.000). It appears that the more muslim a country is, the greater is the proclivity towards trustworthiness. An important caveat is that this result is largely driven by an *asian* muslim country, rather than a *middle eastern* muslim country. However, Bohnet et al. (*QJE*, forthcoming) also find very high levels of trustworthy behavior in Saudia Arabia.

The general picture that emerges from Table 5 is that the variables that tend to explain social capital in wide variety of contexts also do a good job of predicting trustworthy behavior in the experimental trust game. Ethnic fractionalization and income inequality, in particular, have economically and statistically significant effects that agree with the findings of the broader social capital literature. The sizes of these effects, furthermore, are roughly consistent with those found by Keefer and Knack (1997) in their cross country investigation into what predicts affirmative answers to the WVS Trust Question. Our unique contribution is, of course, that we can say with virtual certainty that what Keefer and Knack actually measured was the effect of trustworthiness, rather than trust, on economic outcomes.

Our finding that hierarchical religion has a significant effect on trustworthiness, in the opposite direction as predicted by the social capital literature, is surprising. However, we note that the result for catholic countries appears to be driven by outliers since it disappears under robust regression. Furthermore, the top five muslim countries in our sample along with the

proportion of the population that follows Islam are: Bangladesh (0.656), Bulgaria (0.131), Tanzania (0.070), China (0.051), and Kenya (0.034). Obviously, Bangladesh seems to be driving this result.[7] This highlights the sensitivity of cross sectional regressions to extreme observations. It also highlights an Achilles heel of both the OLS and the robust estimators that we use. The robust estimator is good at picking up "wild errors", or outliers among the dependent variable. It does not do a good job with outliers among the independent variables, as Bangladesh seems to be. We note that this is not a problem with our other culture variables. The top five countries by ethnic fractionalization are Kenya (0.859), South Africa (0.752), Tanzania (0.735), Canada (0.712), and Peru (0.657). The top five by income inequality are Paraguay (58.4), South Africa (57.8), Zimbabwe (56.8), Brazil (56.7), and Columbia (53.8). In effect, ethnic fractionalization and income equality are not prone to extreme observations in the same way as relmus and relcath are (at least in our limited data set with only 29 countries). It seems appropriate, then, to note the interesting result on the muslim religion, but in what follows, to emphasize the statistically and economically robust effect of ethnic fractionalization and income inequality on trustworthiness across countries.

5. Is Diversity Good or Bad For Society?

The results from the previous section beg two questions. First, why are factors which predict social capital more closely related to trustworthiness than to trust? And, second, what can this fact tell us about the nature of social capital?

Recent research helps explain why trustworthiness may be more closely related to the factors that predict social capital than is trust. Economists have typically interpreted trust as purely based on an *expectation* of return from the person being trusted (Rotter, 1980;

[7] Furthermore, we have four observations/replications on Bangladesh, all from the same paper.

Williamson, 1993; Hardin, 2002). Trustworthiness, on the other hand, has been typically associated with *reciprocating* a trusting action (Camerer, 2003; Ostrom and Walker, 2003). Recently, these interpretations have been called into question by theories that trust and trustworthiness may stem in part from unconditional other-regarding preferences such as kindness (Ashraf et al.), feelings of altruism (Andreoni and Miller, 2002), inequity aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), quasi-maximum preferences (Charness and Rabin, 2002), or, psychological benefits due to a "warm glow" (Andreoni, 1990).

There has been relatively little empirical work on identifying the various motivations for engaging in trusting and trustworthy behavior. Cox (2004) tries to quantify the importance of unconditional other regarding preferences (altruism or kindness), conditional other-regarding preferences (reciprocity), and self-regarding preferences (expectations) in predicting trust game behavior. Subjects each play three games: the trust game, the dictator game, and then a dictator game where the amount sent is tripled. The dictator games eliminate any expectations of reciprocity. He finds evidence for other regarding and self regarding preferences in the behavior of both senders (trustors) and receivers (trustees). However, unconditional kindness was more prevalent in the decisions of receivers than senders. When the cost of sending a dollar in the dictator game was $0.33, 63% of senders passed money. When the cost of sending a dollar in the dictator game was $1.00, 41% of the receivers passed money.

Ashraf et. al. (2000) build on the work of Cox using a within subject design, where each player plays three games: (1) the trust game, (2) the "sender" dictator game, and (3) the "receiver" dictator game. Furthermore, they administer surveys which allow them to directly elicit the expectations of each player concerning reciprocity of receivers conditional on amount sent and their risk preference (potentially an important determinant of the sender's decision).

They find that both the expectation of reciprocity and unconditional kindness matter for trustors, however the expectation of reciprocity dominates. For receivers, the opposite is the case. A regression of amount returned by trustees in the trust game on amounts sent by the same individuals in the "receiver dictator game" (unconditional kindness), amount received in the trust game (reciprocity), and demographic controls reveals that unconditional kindness has about a one order of magnitude greater effect than reciprocity.

There is substantial evidence that trust is primarily motivated by an expectation of reciprocity, whereas trustworthiness is motivated by unconditional other regarding preferences, or kindness. How does this inform our thinking about social capital? If social capital is related to trustworthiness, and trustworthiness is related to norms concerning unconditional kindness, then how those norms are formed matters. Furthermore, social capital is likely strongest where shared norms of kindness are prevalent. So we should focus both on what those norms are and how they become shared by large groups. For example, the relationship we find between income inequality and lower trustworthiness makes sense in the context of inequity aversion models. Bicchierini and Xiao (2008) find that inequity aversion models explain why income inequality reduces trustworthiness in a variant of the trust game they run.

In another paper, Bicchierini and Xiao (2007) develop a model that suggests a link between ethnic fractionalization and the degree to which norms are shared. They argue that individuals base their actions on both empirical and normative norms of behavior. Empirical norms reflect how we think others would act in a similar situation to ours whereas normative norms reflect what we think others would think we should do in that situation. The example they provide is corruption. When I am confronted with the decision of whether to engage in a corrupt activity or not, I weigh how I think others believe I should act (don't be corrupt) against how I

actually observe them acting. Bicchierini and Xiao find that, when playing the dictator game and given information concerning how others believe you should act as opposed empirical data on how others actually act, individuals tend to behave how others behave. In other words, people do as others do, not as they say. Empirical norms trump normative norms.

Both normative and empirical norms matter, but when they are in conflict, people tend to do what they think others who are similar to themselves would do under similar circumstances. In ethnically fragmented societies (or in societies with high income inequality, for that matter) the set of people who are similar to you is significantly smaller than in less fragmented societies. As such, in anonymous exchange (like those simulated by the trust game) ethnic fractionalization and income inequality are likely to increase our uncertainty concerning what we think others think we should do and when we are more isolated from others, we also have less of a sense of what others would *actually* do in similar circumstances. This makes it less likely a social norm of kindness is shared and enforced.

Interestingly, both of these forms of uncertainty are likely reduced by increased participation in free markets. Ensminger (2001) notes that among the Orma of Kenya, whom she conducted dictator experiments on, increased experience with market transactions is highly correlated with higher offers. In other words, the Orma who were more involved with markets exhibited greater amounts of unconditional kindness. Ensminger suggested this was due to the markets "training" the Orma to be more fair minded. The work of Bicchirieni and Xiao implies that individuals involved with market transactions simply know better what the norm of kindness *is* and have a shared sense that people similar to themselves follow that norm.

We argue that in a society where impersonal market exchange dominates, a larger proportion of people both know what other's expect them do in a situation where trustworthiness

is called for *and* they have a more certain sense of what others *actually* do. Why? The greater is market integration in a country, the more its citizens come into contact with similar signals concerning how other people expect you to behave and actually behave in various situations. Among the characteristics of free market competition that contribute towards this tendency are: advertising, regulations set by the state, product homogenization, the necessity of communicating in a similar language, and the enforced tolerance of "non-market relevant differences" such as religious beliefs in order to maximize profits.

Our data is uniquely qualified to test whether competitive market economies really do contribute to a sense of shared norms. The evidence on trustworthiness from the trust game is collected under controlled laboratory conditions and, as such, simulates the sort of anonymous exchanges under which we would expect individuals in highly fractionalized societies to have difficulty forming expectations concerning other individuals' likely beliefs and actions. Furthermore, unlike Ensminger and her colleagues, we have data on trustworthy behavior from a relatively large cross section of countries in which the degree of market competition also varies significantly.

If our claim that greater free market competition in a society increases the likelihood that shared norms emerge, then this also offers an explanation for the "paradox of diversity" mentioned in the introduction. Namely, how do we rectify the observation that ethnic diversity and income inequality lead to lower social capital with relatively well functioning market economies that are also quite diverse? For example, Canada, Switzerland, and the United States are all among the top ten ethnically fragmented countries in our data. The United States has one of the top ten most inequitable income distributions. Do markets mitigate the effects of this fractionalization on trustworthiness?

Our measure of the importance of markets must be broad enough to cover all of the countries in our data. At the same time, we want it to be specific enough to capture the degree to which markets are competitive, as opposed to simply measuring economic activity (thus, GDP per capita would not capture what we are looking for). We choose to use the measure of regulatory quality developed by Kaufmann, Kraay, and Mastruzzi (2008). This measures the, "… ability of the government to formulate and implement sound policies and regulations *that permit and promote private sector development* (Kaufmann et. al., 2008, p. 10)." The index focuses on the extent to which a country's regulations are effective and promote free market competition. Looking at samples of the questions that constitute this survey measure verifies this interpretation. They generally concern the extent of price regulation (are prices set by the market), regulation of monopoly (are markets competitive), ease of opening a business (again, are markets competitive), the freedom of internal and external trade, and the prevalence of non-market labor costs (unions) (see Kaufmann et. al., 2008). The other components of the Kaufmann index do not seem as appropriate for measuring the role played by market competition in a country. For example "control of corruption" and "political instability and violence" obviously don't directly concern markets. The other two components are "government effectiveness" and "rule of law". Government effectiveness is about the provisioning of public goods as much as anything else. Rule of law is the most closely related to regulatory quality, but focuses on security of property rights and criminal activity.

We estimate the following equation,

$$(4) \qquad trustworthy_{ij} = \alpha + \beta culture_j + \gamma regqual_j + \delta\left(culture_j * regqual_j\right) + \mathrm{B}' X_i^M + \Lambda' X_j^C + \frac{\varepsilon_{ij}}{w_i}$$

where *culture* represents ethnic fractionalization or income inequality depending on the specification, *regqual* is the Kaufmann et. al. measure of regulatory quality and (*culture*regqual*) is the interaction term.

Table 6 reports our results on the effect of competitive markets on social capital, as measured by the trustworthiness of participants in the trust game. Specifications (1) and (2) look at how regulatory quality mitigates the impact of ethnic fractionalization on trustworthiness. As in our results from Table 5, the direct effect of ethnic fractionalization is economically and statistically very significant with a negative sign indicating that more ethnically fragmented societies posses lower social capital. Regulatory quality (*regqual95*) is insignificant, which is what we'd expect the direct effect of free market regulations on trustworthiness to be. However, the interaction between regulatory quality and ethnic fractionalization (*ethnicxregqual*) is positive and significant at the 1% level. The positive sign indicates that, holding constant the level of ethnic fragmentation, the more competitive a country's markets, the less negative effect ethnic fragmentation has on the stock of social capital (as measured by trustworthiness). Figure 3 illustrates the marginal effect of ethnic fractionalization on trustworthiness as regulatory quality increases using the estimates from column (1).[8] As regulatory quality increases, the negative effect of ethnic fractionalization on social capital is significantly reduced. We interpret this result as supporting our hypothesis that competitive markets mitigate the effect fractionalization on social capital by encouraging the formation of shared norms of behavior.

[8] Figure 3 plots the marginal effect of ethnic fractionalization on trustworthiness as regulatory quality changes, $\frac{\partial trustworthy}{\partial ethnic} = \beta + \delta(regqual)$, where the standard error is calculated as, $\hat{\sigma}_{\frac{\partial trustworthy}{\partial ethnic}} = \sqrt{\text{var}(\hat{\beta}) + (regqual)^2 \text{var}(\hat{\gamma}) + 2(regqual)\text{cov}(\hat{\beta}\hat{\gamma})}$.

In column (2) of Table 6 we report the results of interacting regulatory quality with ethnic fractionalization under robust estimation. We find that both ethnicfrac and the interaction term retain the correct signs and their significance. The results in (1) are not likely to be driven by extreme value of trustworthiness. In specifications (3) and (4) we investigate the effect of market competition on the role played by income inequality in determining the level of trustworthiness. We, again, find that stronger regulation encouraging competitive markets mitigates the negative effect of income inequality on trustworthiness. Under robust regression the coefficient on gini and the interaction term retain their correct signs, but become barely insignificant (p-value = 0.120 and 0.109 respectively).

6. Conclusion

This paper makes three important contributions to the experimental and social capital literatures. First, we demonstrate that variations across trust game replications in methodological protocols are potentially responsible for between a third and two-fifths of the variation in measured trust and trustworthiness. Furthermore, we find that the way in which these methodological variables matter is largely consistent with the predictions made by other researchers.

Our second contribution is to bridge the gap between the experimental literature and the social capital literature. It is common for authors writing about social capital to claim that their aggregate measures are capturing "trust" behavior in the sense that experimental economists use the term. We show that it is more likely that social capital measures are capturing trustworthiness. Furthermore, we provide justification for why this distinction matters.

Lastly, we argue that our empirical framework helps explains the paradox of diversity. Diversity can bring many benefits to an economy, from different sets of skills and points of view to simply being the outcome of an incentive structure that favors equality of opportunity over equality of outcomes. However, diversity can also bring low levels trustworthiness between individuals. When it is unlikely that you believe those you interact with share the same norms of behavior that you do, you are less likely to act according to those norms. We suggest that competitive markets can mitigate this problem and we find significant evidence to support this hypothesis.

Our meta-analysis hits an empirical "sweet spot" between the generality of cross country studies which use the World Values Survey Trust Question and experimental trust games which rarely collect data over more than one or two countries. We hope our findings help spur research into the micro foundations of social capital formation and, more specifically, the complex relationship between a racially and economically diverse population and shared norms of cooperative behavior.

Table 1: Descriptive Statistics for Methodological Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
sentfraction	84	.5087606	.1377334	.0941	.885
retavail	75	.3651079	.0942361	.1704545	.5573899
trust	85	0.042203	0.627176	-2.264571	2.040655
trustworthy	76	-0.6002675	0.4649107	-2.112964	0.2305758
psendend	85	15.57102	32.31494	0.3546099	199.3223
precenddummy	85	0.5647059	0.4987379	0	1
rateret	85	0.0705882	0.2576559	0	1
dbleblind	85	0.2705882	0.4469003	0	1
student	84	0.7857143	0.4127903	0	1
stratmeth	85	0.2117647	0.4109837	0	1
bothroles	85	0.1294118	0.3376472	0	1
randompayment	85	0.1529412	0.3620669	0	1
realperson	85	0.9176471	0.2765332	0	1

Table 2: Descriptive Statistics for Cross-Country Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
corrpi	85	6.032824	2.480237	0.4	9.3
ethnicfrac	85	0.3575823	0.2579408	0.001998	0.930175
gini	85	38.92353	9.42404	23	58.4
relcath	81	0.3420494	0.3601661	0	0.996
relmus	81	0.0508765	0.1680378	0	0.833
relorth	81	0.0127901	0.0573255	0	0.368
ypop95	85	17106.43	10002.94	467.1545	28408.86
pren60	81	0.911358	0.1898009	0.25	1
regqual95	84	0.9075565	0.8227902	-0.869273	1.821018

Table 3: Explaining Trust and Trustworthiness with Methodological Variables

	Trust		Trustworthy	
	(1) OLS	(2) OLS(FE)	(3) OLS	(4) OLS(FE)
psendend	-0.0089***	-0.0105***	0.0036***	0.0026**
	(0.0024)	(0.0035)	(0.0011)	(0.0012)
precenddummy	-0.3097**	-0.3268	0.3296**	0.5383***
	(0.1252)	(0.3024)	(0.1330)	(0.1019)
rateret	0.2580	0.5236	0.2965***	0.6619***
	(0.2718)	(0.5268)	(0.0783)	(0.1056)
dbleblind	0.2066	0.2192	0.0603	-0.0153
	(0.1357)	(0.1941)	(0.1609)	(0.1135)
student	0.2747	0.7526***	-0.4446***	-0.6047***
	(0.1940)	(0.2731)	(0.1353)	(0.1198)
bothroles	0.3731	-0.0914	-0.2188	-0.5333***
	(0.3366)	(0.3166)	(0.1967)	(0.1865)
randompayment	-0.2768**	-0.4091	0.0609	0.1712
	(0.1238)	(0.5217)	(0.1225)	(0.1672)
stratmeth	0.1943	0.2788	-0.0369	-0.2542**
	(0.2785)	(0.2589)	(0.1146)	(0.1032)
realperson	0.5043	0.2897		
	(0.3123)	(0.6058)		
sentfraction			0.3911***	0.1963**
			(0.1040)	(0.0765)
Observations	84	75	75	66
F-Stat	7.03	26.86	12.47	27.79
Adj. R-square	0.439	0.675	0.503	0.784

Huber-white robust standard errors are reported in parentheses. Errors are clustered by country for specifications (1) and (3). *** indicates the coefficient is significant at the 1% level, ** at the 5% level, and * at the 10% level respectively. The dependent variables are transformed using the logit transformation as described in the text. "realperson" is not included in the trustworthy regressions due to insufficient observations.

Table 4: Explaining Trust Using Cross Country Variables

	(1) OLS	(2) Robust	(3) OLS	(4) Robust	(5) OLS	(6) Robust	(7) OLS	(8) Robust
ypop95	0.0000	-0.0000	0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
pren60	0.3816	0.4889	-0.0966	0.3594	-0.0357	0.2802	0.4434	0.7217
	(0.5687)	(0.6117)	(0.6529)	(0.5990)	(0.6223)	(0.5991)	(0.6264)	(0.6599)
ethnicfrac	0.4650*	0.1046						
	(0.2401)	(0.2975)						
gini			0.0126	0.0053				
			(0.0077)	(0.0083)				
corrpi					0.0680	0.0406		
					(0.0809)	(0.0622)		
religion							[0.441]	[0.377]
Observations	80	80	80	80	80	80	80	80
R-squared	0.490		0.485		0.475		0.490	
F-Stat	21.13	1.32	12.45	1.36	19.89	1.21	17.07	1.37

Huber-white robust standard errors are reported in parentheses and errors are clustered by country for specifications (1), (3), (5), and (7). *** indicates the coefficient is significant at the 1% level, ** at the 5% level, and * at the 10% level respectively. The dependent variables are transformed using the logit transformation as described in the text. For religion we report p-values for the joint test of significance for *relcath, relorth,* and *relmus*.

Table 5: Explaining Trustworthiness Using Cross Country Variables

	(1) OLS	(2) Robust	(3) OLS	(4) Robust	(5) OLS	(6) Robust	(7) OLS	(8) Robust
ypop95	0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
pren60	-0.0440	-0.0029	0.6023	0.2850	0.1442	0.0002	0.8630	0.3700
	(0.3746)	(0.3496)	(0.4507)	(0.3489)	(0.4723)	(0.3497)	(0.3400)	(0.3345)
ethnicfrac	-0.6713**	-0.4207**						
	(0.3073)	(0.1805)						
gini			-0.0172**	-0.0085*				
			(0.0066)	(0.0049)				
corrpi					0.0252	0.0498		
					(0.0544)	(0.0377)		
religion							[0.000]***	[0.003]***
Observations	72	72	72	72	72	72	72	72
R-squared	0.619		0.595		0.541		0.756	
F-Stat	23.95	5.15	21.57	4.83	19.37	5.50	100.97	9.06

Huber-white robust standard errors are reported in parentheses and errors are clustered by country for specifications (1), (3), (5), and (7). *** indicates the coefficient is significant at the 1% level, ** at the 5% level, and * at the 10% level respectively. The dependent variables are transformed using the logit transformation as described in the text. For religion we report p-values for the joint test of significance for *relcath, relorth,* and *relmus*.

Table 6: Free Markets and Social Capital

	(1) OLS	(2) Robust	(3) OLS	(4) Robust
ypop95	-0.0000*	-0.0000**	-0.0000**	-0.0000**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
pren60	-0.3986	-0.3208	1.3312*	0.4228
	(0.3371)	(0.3311)	(0.7313)	(0.4493)
ethnicfrac	-0.9181***	-0.7148***		
	(0.2276)	(0.2078)		
gini			-0.0367**	-0.0147
			(0.0153)	(0.0090)
regqual95	0.1134	0.1487	-0.8610	-0.1913
	(0.1538)	(0.1474)	(0.5505)	(0.3382)
ethnicxregqual	0.7271***	0.5766***		
	(0.1684)	(0.2016)		
ginixregqual			0.0247**	0.0132
			(0.0115)	(0.0084)
Observations	72	72	72	72
R-squared	0.725		0.670	
F-Stat	59.67	6.40	17.44	4.62

Huber-white robust standard errors are reported in parentheses and errors are clustered by country for specifications (1) and (3). *** indicates the coefficient is significant at the 1% level, ** at the 5% level, and * at the 10% level respectively.

Figure 1: Distribution of Sentfraction

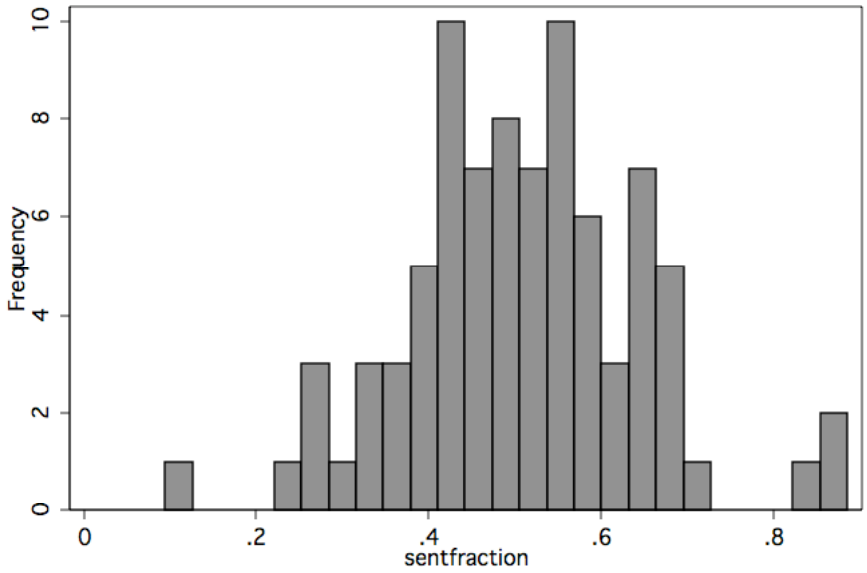


Figure 2: Distribution of Retavail

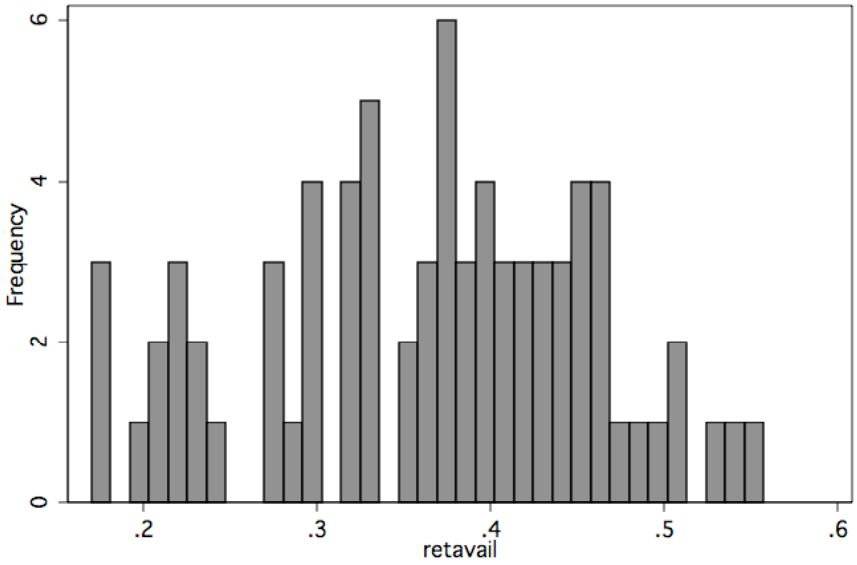
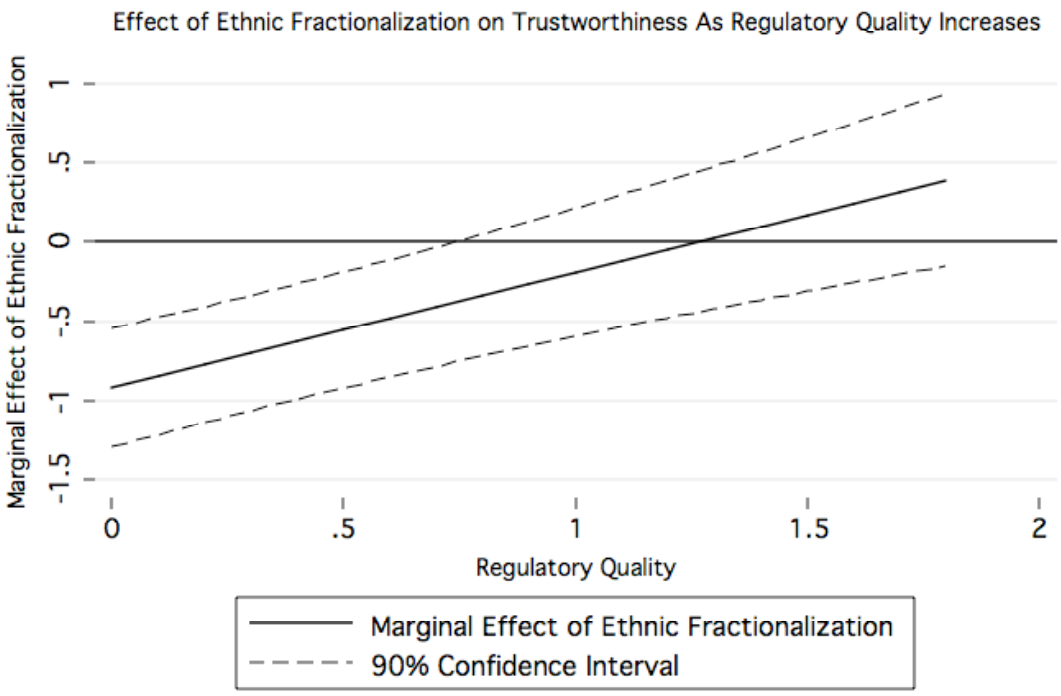


Figure 3


Effect of Ethnic Fractionalization on Trustworthiness As Regulatory Quality Increases
Marginal Effect of Ethnic Fractionalization
-1.5
-1
-.5
0
.5
1
0
.5
1
1.5
2
Regulatory Quality
Marginal Effect of Ethnic Fractionalization
90% Confidence Interval

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** Citation included in meta-analysis*

Appendix A: Search strategy overview for meta-analysis study[9]

Search Strategy		# of papers identified	Subset of papers which replicate BDM trust game experiment *(Duplicate occurrences are not recorded)*
Step 1:	Search Web of Science for all papers that cite BDM 1995.	**262**	**28**
Step 2:	Search FirstSearch database for keywords "trust game" or "trust game" ▪ WorldCat ▪ ArticleFirst ▪ ECO ▪ Dissertations *http://firstsearch.oclc.org*	**87** 50 19 17 6	**4**
Step 3:	Search "SSRN" database (title or abstract) for keywords "trust game" or "investment game" *www.ssrn.com*	**140**	**10**
Step 4:	Search EconPapers (search engine for Research Papers in Economics) working papers or book chapters for "trust game" or "investment game" *http://econpapers.repec.org/*	**534**	**15**
Step 5:	Search citations from articles found so far for additional working papers/ papers that may have been missed that replicate BDM experiment		**7**
TOTAL		1023	**64**

[9] Last updated 07-2008