

THE SPEED OF NEW IDEAS

TRUST, INSTITUTIONS AND THE DIFFUSION OF NEW PRODUCTS*

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Abstract

Trust in buyer-supplier relationships is sometimes regarded as a competitive advantage because trust can increase the gains from trade for firms and their suppliers. In this study, we document a particular type of competitive advantage conferred by trust. Using adoption rates of a new product as a case study, we show that trust protects current suppliers from competitors who offer innovative products. Buyers who trust their current suppliers are less likely to seek information about the new product and they express less interest in purchasing it. Once the product becomes available, they do in fact make fewer purchases. We also find that entrepreneurs from less-trusted groups – in this study, African-Americans – find it particularly difficult to overcome the barriers erected by trust. Trust, we conclude, confers competitive advantage by slowing down the diffusion of new ideas and products in the economy. As trust is built up over time, earning a buyer's trust confers a significant first-mover advantage.

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1. Trust and Competitive Advantage

Trust, understood as the mutual confidence that no party to a transaction will exploit the other's vulnerabilities, is sometimes seen as a competitive advantage (Sabel, 1993; Barney and Hansen, 1994, Davis et al., 2000; Jap and Anderson, 2003). Important examples for vulnerabilities in relationships between firms and their suppliers include adverse selection, moral hazard and holdup (Akerlof, 1970; Holmström, 1979; Klein, Crawford and Alchian, 1978). Buyers can protect themselves against such vulnerabilities with a wide variety of contractual and legal governance mechanisms, but doing so is costly (Williamson, 1985). If trust makes redundant the need for such protections, trusting relationships carry lower transaction costs and yield larger gains from exchange. As trust between suppliers and buyers is not ubiquitous, some scholars have argued that firms that know how to build trusting relationships enjoy a competitive advantage.

There is some empirical evidence to support this claim. For example, trusted automakers spend significantly less time contracting and haggling with their suppliers, an advantage that translates into reduced procurement cost (Dyer and Chu, 2003). Similarly, trust lowers the costs of negotiation and enhances supplier performance in electrical equipment manufacturing (Zaheer, McEvily and Perrone, 1998.) Trusting relationships within organizations can also confer advantages because they increase productivity (Kramer and Tyler, 1996; Levi, 2000; Dirks and Ferrin, 2002; Thoms, Dose and Scott, 2002) and raise the willingness of individuals to 'do good for the organization' (Ghoshal and Bartlett, 1994). Trust appears to be particularly

important for managers in societies with little social capital. Entrepreneurs in the former Soviet republics, for instance, consider trust a key criterion for business success (Neace, 1999.)¹

In this study, we ask if trust can act as a barrier to entry. Trust has the potential to protect suppliers from new competitors if buyers in a supply chain are reluctant to source new products and services outside existing relationships. However, theoretically, the effect of trust on the rate of adoption of new products is ambiguous. To see this, it is useful to distinguish two types of trust. *Generalized trust*, a universal confidence that suppliers will not exploit buyers, encourages the acceptance of new products and speeds up their diffusion (Murphy, 2002.) In contrast, *specific trust* in a particular supplier raises expectations of her performance and makes it more difficult for new suppliers to successfully enter the market.² Generalized and specific trust are linked because positive experiences in a specific relationship tend to spill over into generalized trust (Bohnet and Huck, 2003). If firms experience little vulnerability in dealing with their current suppliers, they may become more trusting toward suppliers in general. The net effect of specific trust on the rate of diffusion of new products is unclear because specific trust strengthens the position of incumbent suppliers and, possibly, the prospects of challengers.

We study the effect of specific trust on the diffusion of a new product in a field experiment that confronts companies in the plumbing industry with an innovative product. The new supplier

¹ Numerous studies have linked general levels of trust to macro-economic outcomes. For example, trust is positively related to economic growth (Knack and Keefer, 1997; Temple and Johnson, 1998; Zak and Knack, 2001), and it appears to lower corruption (La Porta et al., 1997). There is also a substantial experimental literature on trust which builds on the investment game by Berg, Dickhaut and McCabe (1995). In these experiments, trust increases the welfare of the participants and this effect is larger than reciprocal behavior or pure altruism alone would suggest (Cox, 2004). However, in multistage trust games, only a minority of players is trustworthy (Ho and Weigelt, 2005).

² The distinction between generalized trust, in the sense of prior expectations about the benefits of a new relationship, and specific trust goes by many names. Shapiro, Sheppard and Cherashkin (1992) refer to specific trust as “knowledge-based trust” because trust is built over time through repeated exchange. Platteau (1994:770) conceptualizes trust on the basis of limited-group and generalized morality. Limited-group morality and trust is “restricted to concrete people with whom one has close identification while generalized morality is morals applicable to abstract people (to whom one is not necessarily tied through personal, family, or ethnic links).”

is a little known manufacturer who tried to break into the market for floor drains. Our results show that trust in current suppliers is negatively related to various measures of interest in the new product. Plumbers who trust their current suppliers are less interested in receiving information or a free sample of the new product. They are also less likely to be interested in using the product, and they do in fact make fewer purchases once the product becomes available. We conclude that trust in current suppliers poses a significant barrier to entry.

The present study contributes to the literature by documenting how trust can confer competitive advantage. While the idea that trust allows firms to earn rents is not new, empirical work in this area is surprisingly sparse.³ The paper is also related to the literature on first-mover advantages (Spence, 1981; Ghemawat, 1985). Because trust takes time to develop (Levin, Whitener and Cross (2005), early movers enjoy reduced transaction costs which in turn discourage investments in new relationships.⁴ As in other models with buyer switching costs (Wernerfelt, 1985; Klemperer, 1995), buyers remain loyal to their current suppliers even if they know of other brands of equal quality selling at a lower price. In their reviews of the literature on first-mover advantages, Lieberman and Montgomery (1988, 1998) challenged researchers to focus more precisely on the mechanisms that generate advantage. Trusting relationships between suppliers and buyers constitute one such mechanism.

A final contribution of this study is methodological. To control for selection on observables in our field experiment, we develop a simple methodology, called *score assignment*, with which we assign our subjects to treatment and control groups. Experiments in the laboratory and in the

³ In addition to the papers cited above, the link between trust and competitive advantage is empirically explored in Dyer, 1995; Gulati, 1995; McAllister, 1995; Nooteboom et al., 1997; Mudambi and Helper, 1998; Valley and Thompson, 1998; Bouty, 2000; Balasubramanian et al., 2003; Carson et al., 2003; Stewart, 2003; Casadesus-Masanell, 2004; and Levine and Cross, 2004.

⁴ As Levin, Whitener and Cross (2005) show, the informational basis of trust shifts significantly over time.

field have become increasingly popular in management research (e.g., Dyer and Kagle, 1996; Godes and Mayzlin, 2004; Shearer, 2004; Bandiera et al., 2005; for a broad review, see Harrison and List, 2004.) In these experiments, researchers can decide who receives treatment and who remains in the control group. Typically, the assignment to treatment and control occurs randomly, but most experimental studies use a fairly small number of subjects and there is no guarantee that the law of large numbers applies. Score assignment takes into account observable characteristics of the experimental subjects, thereby reducing bias from selection on observables. For this reason, we believe that score assignment can have wide appeal in the experimental community.

The paper is organized as follows. In Section 2, we present a simple decision rule that links specific trust to the rate of adoption of new products. The design of the field experiment is described in Section 3. We report our empirical results in Section 4 and offer concluding remarks in Section 5.

2. Diffusion of New Products

Trust can influence the speed with which new ideas and products diffuse in the economy because many new ideas are generated by outsiders who are not part of current supplier networks (Acs and Audretsch, 1987, Christensen, 1997). While there is no generally accepted definition of trust, the expectation that a partner will not exploit a relationship in an opportunistic manner is at the core of most conceptions of trust.⁵ Trust matters because it changes the trusting person's calculation that she will be better off (Coleman, 1990:100). For the expected benefits of a supplier relationship, both specific trust in current suppliers and generalized trust in new

⁵ For an explanation of trust that is based on altruism, see Ashraf, Bohnet and Piankov, 2003.

suppliers are important. Consider a firm that faces a choice $C \in \{0, 1\}$ of continuing to use a current supplier i or switching to a competitor j . The firm stays with i ($C=1$) if i enjoys a competitive advantage A_i over j , that is $A_i \geq 0$, where

$$(1) \quad A_i = V_i(Q_i, T_i) - V_j(Q_j, T_{-i}(T_i)).$$

V_i (V_j) is the expected value of a firm entering into a relationship with supplier i (j). V_i (V_j) depends on a vector of product characteristics and prices, Q_i (Q_j), and levels of trust T_i (T_{-i}). Products of higher quality and lower price increase the value of doing business with a supplier. The same holds true for specific trust in the current supplier, $\partial V_i / \partial T_i > 0$, and for generalized trust, $\partial V_j / \partial T_{-i} > 0$. Because the firm has not conducted business with the new supplier, all new suppliers are assigned the same generalized trust score, T_{-i} .

Empirical evidence suggests that subjects who experience others as more trustworthy become more trusting in turn (Bohnet and Huck, 2003). Bouty (2000) describes this effect for research scientists working at competing firms. The scientists experience high levels of trust in relationships with other scientists they know and, as a result, tend to be fairly optimistic about the trustworthiness of scientists they have yet to meet. Similarly, Fisman and Khanna (1999) show that individuals who communicate more often with others become more trusting in general. If specific trust spills over into generalized trust, the value of doing business with a new supplier depends on specific trust as indicated in decision rule (1), with $dT_{-i} / dT_i > 0$. The theoretical effect of specific trust on competitive advantage is ambiguous because specific trust increases V_j and V_i , the latter indirectly via a positive effect on T_{-i} . In this study, we are interested in determining the sign of $\partial A / \partial T_i$ to understand if specific trust can act as a barrier to entry.

As part of our experiment, we also manipulate V_j , the expected value of entering into a relationship with a new supplier. We do this in two ways. First we study the difficulties of less-trusted groups to break up existing buyer-supplier relationships. In particular, we test if African-Americans find it especially difficult to overcome the barriers of specific trust. There are two reasons to believe that African-American entrepreneurs face greater hurdles. Recent empirical evidence indicates that Caucasians expect African-Americans to be less trustworthy (Alesina and La Ferrara, 2002; Eckel and Wilson, 2003; Glaeser, Laibson, Scheinkman and Soutter, 2000). If generalized trust enters the choice of suppliers as specified in decision rule (1), we should see that black entrepreneurs find it particularly difficult to displace current suppliers. A second reason is that plumbers might expect lower quality Q_j if they know that a product is offered by blacks (Bertrand and Mullainathan, 2004). Lower levels of generalized trust toward a specific group and diminished expectations of quality both reduce V_j , allowing us to study how specific trust influences adoption decisions when a less formidable competitor offers the new product.

In a second treatment that varies V_j , we investigate the role of information intermediaries. In many business contexts, the credible provision of information can overcome a lack of generalized trust. For example, Khanna and Palepu (2000) argue that arms-length transactions in markets require credible information or high levels of trust, and where these are lacking, managers are better off replacing market transactions with personal relationships by bringing more activities inside the firm. In our experiment, we test the effect of information intermediaries on competitive advantage by letting buyers know that the new product is certified to meet the standards of a national industry association. Boards of certification possibly represent a substitute for generalized trust. Rather than developing trust in a particular supplier, purchasing managers can develop trust in an institution and its process of certification. As with

our race treatment, certification can raise competitiveness by increasing trust or by raising expectations of quality.

3. Experimental Design

To study the link between levels of trust and the decision to adopt a new product we need variation in levels of specific trust in current suppliers and an unknown supplier whose performance is uncertain. The product we used in this study is a device called TrapGuard™. TrapGuard is a special kind of floor drain that is produced by a company located in Georgia. The device solves an old plumbing problem using a novel material. Trap water in rarely used drains evaporates over time, letting sewer gases stream into the home. TrapGuard prevents the intrusion of these gases. As shown in Figure 1, the lower half of the drain consists of an elastomeric material, which opens up when water flows down the drain. The innovation is that this material has a “memory.” Once the flow of water stops, the material “remembers” its original, curled position and closes the floor drain.

There are a number of features which recommended TrapGuard for our study. First, TrapGuard’s producer is a small firm that is unknown as a manufacturer of floor drains. At the time of the study, the company was about to introduce TrapGuard in a select number of markets and plumbers had no experience using the product. Second, trust is relevant in the decision to adopt TrapGuard because the new elastomeric material was unknown in the plumbing industry and buyers were likely to wonder about its long-term performance. Will TrapGuard really close for many years to come? Finally the plumbing industry is attractive for this study because innovation in the industry is not particularly rapid, making it more likely that we will observe the

variation in adoption decisions that is necessary to identify the effect of trust on competitive advantage.

The location for this field experiment is the city of Philadelphia. As most cities, Philadelphia requires plumbing firms to register with the city. At the time of the experiment, there were 596 individual plumbers and plumbing firms registered to do business in Philadelphia. In the first phase of this field experiment, all plumbers received a questionnaire. To measure specific trust in current suppliers T_i , we adapted a question from the World Values Survey (Institute for Social Research, 2002, question 25). This question is one of the most often used measures of trust in the literature. The responses to this question are predictive of trusting behavior in laboratory experiments with financial incentives (Lazzarini et al., 2004). The question read:

Generally speaking, would you say that you can trust your suppliers in the plumbing industry, or do you feel that you can't be too careful in dealing with them?

- Suppliers can be trusted
- Difficult to trust suppliers

Six weeks after the questionnaire was sent out, we mailed a TrapGuard product brochure to all plumbers in our sample. We implemented the race treatment by alternatively using the picture of a white or a black individual on an insert that we added to the brochure (see Figure 2). In the information treatment, we added a byline stating that TrapGuard was “listed by the International Plumbing Code,” a set of standards developed by the International Code Council (ICC). The ICC was established in 1994 as a nonprofit organization dedicated to developing a single set of national construction codes (International Code Council, 2004). ICC listings do not imply that products meet local building codes, but they are an endorsement from a well-known organization.

Four weeks after sending out the brochures, we called the 596 plumbers in Philadelphia to determine their level of interest in TrapGuard. In particular, we asked whether or not the plumbers had “heard of a product called TrapGuard,” if they were interested in “receiving a product brochure that describes TrapGuard in greater detail,” if they wanted “a free sample,” and whether or not they would consider “using this product in their own work.” A second sales call, placed 12 months after the brochures had been sent out, determined how many plumbers had actually bought the floor drain.

3.1 Score Assignment

We randomly assigned our subjects to control and treatment groups, taking particular precaution that our randomization procedure reduces the potential for selection bias. In relatively small samples such as ours, there is no guarantee that randomization balances subjects’ characteristics across treatment and control groups.⁶ One way to perfectly balance observations is to form pairs of subjects with the same observable characteristics, assigning one person to the control and the other to the treatment group. For instance, we could make sure that plumbers in the control group are of the same age, have the same business experience, and report identical trust scores as the plumbers in the treatment group. However, creating a perfectly balanced sample becomes increasingly difficult if there are many observables. Fortunately, Rosenbaum and Rubin (1983, 1984) developed a powerful way to reduce this dimensionality problem. Using our race treatment as an example, let $p(X_i)$ denote the conditional probability of seeing a brochure with a black person,

⁶ This problem has long been recognized in medical research where trials often involve a small number of patients (Pocock and Simon, 1975; Chalmers, 2001). This issue is also relevant in laboratory experiments where samples are typically small. For instance, the median sample size in studies published in the journal *Experimental Economics* during the past two years was only 80 persons.

$$(2) \quad p(X_i) = \Pr(\text{black} = 1) = \Phi(\beta_0 + X_i\beta_1).$$

Rosenbaum and Rubin (1983, 1984) show that if an experimental assignment ($\text{black} \in \{0, 1\}$) is not confounded conditional on subject characteristics X ,

$$(3) \quad C \perp \text{black} \mid X,$$

the assignment is also not confounded given the propensity score $p(X_i)$,

$$(4) \quad C \perp \text{black} \mid p(X).$$

This insight has been widely used in the literature (Heckman, Ichimura and Todd, 1998; Smith and Todd, 2001). Popular propensity score matching estimators include the nearest-neighbor estimator, which forms pairs of individuals with the nearest scores, and caliper matching, a method that matches subjects whose propensity score does not exceed a chosen threshold.

In contrast to classic propensity score matching, the plumbers in our study – and subjects in many experiments – are not previously assigned to treatment and control groups. Rather, we can choose who will see the brochure with the black person. We make this choice trying to match subjects with similar propensity scores. Score assignment proceeds in three simple steps: (i) We estimate (2) for a randomly chosen assignment of the plumbers in our sample. In our application, the X_i include the plumbers' race, years of work experience, trust in current suppliers, and their assessment of how easy it is to be successful as a plumber.⁷ (ii) For all

⁷ Even in our fairly small sample, there are too many possible assignments to evaluate all of them and truly minimize differences in scores. Generally, with n observations and one treatment, there are $n!/(n-n/2)!(n/2)!$ such assignments.

nearest neighbors i and j , we compute the difference in scores, $|p(X_i) - p(X_j)|$. (iii) We implement the assignment for which $\max[|p(X_i) - p(X_j)|] < \theta$, with θ set at 0.005.⁸

Score assignment produced a significant decrease in the maximum difference in scores. Had we chosen the worst random assignment, the mean difference in scores across the pairs in our sample would have been 0.0261. In the chosen assignment, this mean is only 0.0006. We achieved similar improvements in the tails of the distribution of the differences in scores. To provide a point of reference, a value of 0.05 or 0.01 is often used as a starting point in papers that implement caliper matching (Cochran & Rubin, 1973; Sianesi, 2001).

4. Empirical Specification

In our empirical work, we seek to explain the variation in the willingness to adopt TrapGuard. A baseline specification relates a latent index of interest in the product, $y^*(A_i)$, to customer characteristics X_i , the level of trust in current suppliers T_i , and the experimental treatments.

$$(5) \quad y_i^* = \alpha + X_i\beta + \delta T_i + \phi(\text{race}) + \lambda(\text{cert}) + u_i$$

We do not directly observe y^* or i 's competitive advantage A_i that determines y^* , but we know which firms expressed an interest in TrapGuard by requesting more information or ordering a sample. Given the binary nature of our dependent variables, we estimate probit models. In addition to estimates of δ , we are also interested in studying if trust exhibits disproportionate effects if a product is particularly competitive (e.g., the certified product) or

⁸ While we sought to reduce the mean distance between neighbors in this study, other moments of the difference in scores and additional restrictions could be used. For instance, one could classify assignments by the maximum of the difference in scores or by the number of observations that need to be excluded if a threshold distance is set.

likely to be seen as less attractive (e.g., offered by an African-American entrepreneur). To see these effects, we augment specification (1) by looking at the differences between trusting and non-trusting customers in their reaction to an experimental treatment.

$$(6) \quad y_i^* = \alpha + X_i\beta + \delta T_i + \phi(\text{race}) + \lambda(\text{cert}) + \phi(T_i \times \text{race}) + u_i.$$

This is a difference-in-difference specification in which ϕ measures

$[(y_{\text{trusting}}^* - y_{\text{non-trusting}}^* | \text{race} = 1) - (y_{\text{trusting}}^* - y_{\text{non-trusting}}^* | \text{race} = 0)]$. If trust in current suppliers constitutes a particularly effective barrier to entry for less promising products, we expect ϕ to be negative.

5. Results

Table 1 provides summary statistics for the variables used in our models and the wording of our questions. We contacted our subjects repeatedly if they were unavailable so that our final sample includes all 596 registered plumbers. In the post-survey sales call, almost 50% of all plumbers remembered the TrapGuard marketing material. 60% requested a brochure with additional information about the product, and 81% were interested in receiving a free sample. 37% said they would consider using the product. One year after we had sent out the original brochures, 10% of the plumbers in our sample had actually purchased a TrapGuard floor drain.

We first study the effect of the experimental treatments on plumbers' responses. As Table 2 shows, interest in the product is much smaller if the plumber received the insert with the photo of a black individual. For instance, 14% consider using TrapGuard if they received the picture of a white person, as opposed to 3% in the other group. Mann-Whitney tests reported at the bottom of Table 2 generally reject the null that the treatment samples are from populations with the same

distribution. Listing by the International Plumbing Code increases interest in TrapGuard considerably. With certification, 77% consider using TrapGuard if they received the picture of a white person, 56% say they would use it if the insert showed a black individual.

We next turn to probit estimates of the models in (5) and (6). Controlling for a plumber's race and years of work experience, we find that a picture of a black person in the product brochure reduces the likelihood of interest in the product (Table 3). Respondents who received this insert are also less likely to purchase the floor drain. The effects are economically significant. In specification (7), a plumber who received the brochure with the black person is 23 percentage points less likely to say he would consider using the product, and he is 8 percentage points less likely to purchase the product. Certification has a large positive impact on subjects' interest in TrapGuard: They are 60 percentage points more likely to consider using the product and 12 percentage points more likely to purchase the floor drain. We find some evidence for the idea that information intermediaries are particularly important when expectations for a new product are low.⁹ The interaction effects are positive and statistically significant in the models of the demand for brochures and samples, indicating that the gains from certification are particularly large if the plumber received the insert with the picture of a black person.¹⁰ However, these effects are not statistically significant for the "consider using" responses and for actual purchases. At a minimum, we conclude, the gains from information intermediaries are color blind in that they do not depend on the type of picture included in the product brochure. The race of the plumber bears no relationship to his interest in TrapGuard. There is some (weak)

⁹ Note that in nonlinear models of the type presented here, the interaction effect is not the marginal effect of the interaction term shown in Table 3. We follow Ai and Norton (2003) in computing interaction effects and standard errors.

¹⁰ The mean of marginal effects (standard error) for the interaction term is 0.25 (0.02) in the brochure model and 0.17 (0.07) in the sample model.

indication that plumbers who have worked in the Philadelphia market for a longer period of time are less interested in new products.

We test our main hypothesis in Table 4. In our sample, trust in current suppliers reduces the likelihood that plumbers request a brochure (-13%), order a free sample (-6%), consider using TrapGuard (-18%) or purchase the floor drain (-6%). These effects are economically and statistically significant. In these models, the picture of a black person continues to reduce the likelihood of interest in TrapGuard, while certification increases plumbers' interest. The even-numbered specifications in Table 4 test the idea, expressed in (6), that trust is particularly important in slowing the adoption of a new product if the product is associated with a less-trusted group. The interaction term [trust \times black picture] picks up differences in the importance of trust between the two groups that were assigned different pictures. These terms are negative in most specifications and significantly so in models (8) and (10).¹¹ We conclude that specific trust in current suppliers is a particularly important barrier to entry for less-trusted groups. In contrast, the interaction terms involving the certification variable are not statistically significant.

The market is often seen as a discipline device that forces firms to consider new products and technologies. In the survey, we asked plumbers about market pressures using the following question: "In your view, how easy is it to be successful as a plumber in Philadelphia?" Possible answers ranged from "1 = very easy" to "4 = very difficult." In Table 5, we add this measure to our models. There is some evidence that market pressures increase the plumbers' inclination to try new products. Plumbers who find it more difficult to be successful are more likely to order a sample and consider using the product. There is weaker evidence that this group is also more

¹¹ The mean of marginal effects (standard error) for the interaction term is -0.21 (0.09) in the "consider using" model and -0.22 (0.07) in the purchase model. As in Table 3, we compute the interaction effects and standard errors following Ai and Norton (2003).

likely to purchase TrapGuard. As before, trust in current suppliers decreases the plumbers' interest in TrapGuard.

Taken together, the models in Tables 3 through 5 provide considerable evidence that trust in current suppliers constitutes an economically significant barrier to entry for unknown firms and new products. If specific trust in current suppliers spills over into generalized trust at all, this effect is not large enough to make up for the competitive advantage conferred by specific trust. As trust is built up over time (Levin, Whitener and Cross, 2005), the sequence of market entry is important. Products that enter first can enjoy a first-mover advantage if their producers manage to build up trusting relationships with their customers.

An interesting question is whether or not buyers choose optimally between the benefits of trusting relationships and the advantages conferred by new products. Some of our results suggest that this may not be the case. For instance, trusting firms are less likely to acquire information about TrapGuard. This is surprising because the original brochure did not contain price information and one would expect that firms need to know the price of TrapGuard to properly assess its attractiveness. As it turns out TrapGuard is not more expensive than conventional two-inch floor drains.

6. Conclusions

Recent empirical studies and experiments document that trust is related to many positive economic outcomes. In this paper, we argue that trust can constitute a barrier to entry for new firms and products precisely because trust makes existing relationships more productive. In our

field experiment, we find that firms that trust their current suppliers are less likely to be interested in the new product. Trust in current suppliers is a particularly strong deterrent to entry if the product is associated with a less-trusted group. In contrast, information from an intermediary organization – a national industry association in this field experiment – is quite effective in neutralizing the negative impact of trust. Trust in institutions, we conclude, constitutes a valuable substitute for interpersonal trust.

Literature

- Acs, Zoltan J. and David B. Audretsch (1987). Innovation, Market Structure, and Firm Size. *Review of Economics and Statistics* 69(4): 567-74.
- Ai, Chunrong and Edward C. Norton (2003). Interaction terms in logit and probit models. *Economics Letters* 80: 123-129.
- Akerlof, George A. (1970). The Market for Lemons: Quality, Uncertainty and the Market Mechanism. *Quarterly Journal of Economics* 84(3): 488-500.
- Alesina, Alberto; La Ferrara, Eliana (2002). Who Trusts Others? *Journal of Public Economics* 85(2): 207-34.
- Ashraf, Nava, Iris Bohnet and Nikita Piankov (2003). Is Trust a Bad Investment? Working paper. Kennedy School of Government, Harvard University.
- Balasubramanian, Sridhar, Prabhudev Konana and Nirup M. Menon (2003). Customer Satisfaction in Virtual Environments: A Study of Online Investing. *Management Science* 49(7): 871-889.
- Bandiera, Oriana; Iwan Barankay and Imran Rasul (2005). Managerial Incentives in Hierarchies: Evidence from a Field Experiment. Working Paper, London School of Economics.
- Barney, Jay B. and Mark H. Hansen (1994). Trustworthiness as a Source of Competitive Advantage. *Strategic Management Journal* 15: 175-190.
- Berg, Joyce; John W. Dickhaut and Kevin A. McCabe (1995). Trust, Reciprocity, and Social History. *Games & Economic Behavior* 10(1): 122-42.
- Bertrand, Marianne and Mullainathan, Sendhil (2004). Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination. *American Economic Review* 94(4): 991-.
- Bohnet, Iris and Steffen Huck (2003). Repetition and Reputation: Implications for Trust and Trustworthiness When Institutions Change. *American Economic Review*, forthcoming.

- Bouty, Isabelle (2000). Interpersonal and Interaction Influences on Informal Resource Exchanges Between R&D Researchers Across Organizational Boundaries. *Academy of Management Journal* 43(1): 50-65.
- Carson, Stephen J., Anoop Madhok, Rohit Varman and George John (2003). Information Processing Moderators of the Effectiveness of Trust-Based Governance in Interfirm R&D Collaboration. *Organization Science* 14(1): 45-56.
- Casadesus-Masanell, Ramon (2004). Trust in Agency. *Journal of Economics & Management Strategy* 13(3): 375-404.
- Chalmers I. (2001). Comparing like with like: some historical milestones in the evolution of methods to create unbiased comparison groups in therapeutic experiments. *International Journal of Epidemiology* 30(5): 1156-64.
- Christensen, Clayton M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, Mass.: Harvard Business School Press.
- Cochran, William G. and Rubin, Donald B. (1973). Controlling Bias in Observational Studies. *Sankhya* 35: 417-446.
- Coleman, James S. (1990). *Foundations of Social Theory*. Cambridge, Mass.: Belknap.
- Cox, James C. (2004). How to Identify Trust and Reciprocity. *Games and Economic Behavior* 46: 260-281.
- Davis, James H., F. David Schoorman, Roger C. Mayer and Hwee Hoon Tan (2000). The Trusted General Manager and Business Unit Performance: Empirical Evidence of a Competitive Advantage. *Strategic Management Journal* 21(5): 563-.
- Dirks, Kurt T. and Donald L. Ferrin (2002). The Role of Trust in Organizational Settings. *Organization Science* 12(4): 450-467.
- Dyer, Douglas and John H. Kagel (1996). Bidding in Common Value Auctions: How the Commercial Construction Industry Corrects for the Winner's Curse. *Management Science* 42: 1463-1475.
- Dyer, Jeffrey H. (1995). Specialized Supplier Networks as a Source of Competitive Advantage: Evidence from the Auto Industry. *Strategic Management Journal* 11(3): 42-55.
- Dyer, Jeffrey H. and Wujin Chu (2003). The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea. *Organization Science* 14(1): 57-68.
- Eckel, Catherine C. and Rick K. Wilson (2003). Conditional Trust: Sex, Race and Facial Expressions in a Trust Game. Working paper. Virginia Tech.
- Fisman, Raymond and Tarun Khanna (1999). Is Trust A Historical Residue? Information Flows and Trust Levels. *Journal of Economic Behavior and Organization* 38: 79-92.
- Ghemawat, Pankaj (1985). Building Strategy on the Experience Curve. *Harvard Business Review* 63(2): 143-149.
- Ghoshal, Sumantra and Christopher A. Bartlett (1994). Linking Organizational Context and Managerial Action. The Dimensions of Quality of Management. *Strategic Management Journal* 15: 91-112.

- Glaeser, Edward L.; Laibson, David I.; Scheinkman, Jose A.; and Soutter, Christine L. (2000). Measuring Trust. *The Quarterly Journal of Economics* 115(3): 811-46.
- Godes, David, and Dina Mayzlin. "Firm-Created Word-of-Mouth Communication: A Field-Based Quasi-Experiment." Harvard Business School Working Paper, No. 05-023, 2004.
- Gulati, Ranjay (1995). Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *Academy of Management Journal* 38(1): 85-112.
- Harrison, Glenn W. and John A. List (2004). Field Experiments. *Journal of Economic Literature* 42(4): 1009-1055.
- Harvey S. Jr. (2002). The Trust Paradox: A Survey of Economic Inquiries into the Nature of Trust and Trustworthiness. *Journal of Economic Behavior & Organization* 47(3): 291-307.
- Heckman, James J.; Ichimura, Hidehiko and Petra Todd. Matching as an Econometric Evaluation Estimator. *Review of Economic Studies* 65(2): 265-294.
- Ho, Teck-Hua and Keith Weigelt (2005). Trust Building Among Strangers. *Management Science* 51(4): 519-530.
- Holmström, Bengt (1979). Moral Hazard and Observability. *The Bell Journal of Economics* 10(1): 74-91.
- International Code Council (2004). Setting the Standard for Building Safety. At <http://www.iccsafe.org/>
- Institute for Social Research (2002). *World Values Survey: Questionnaire*. At <http://wvs.isr.umich.edu/wvs-ques4.html>
- Jap, Sandy A. and Erin Anderson (2003). Safeguarding Interorganizational Performance and Continuity under Ex-Post Opportunism. *Management Science* 49(12): 1684-1701.
- Khanna, Tarun and Krishna Palepu (2000). Is Group Affiliation Profitable in Emerging Markets? An Analysis of Diversified Indian Business Groups. *Journal of Finance* 55(2): 867-91.
- Klein, Benjamin; Robert G. Crawford and Armen A. Alchian (1978). Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *Journal of Law and Economics* 21(2): 297-326.
- Klemperer, Paul (1995). Competition When Consumers Have Switching Costs: An Overview with Applications to Industrial Organization, Macroeconomics, and International Trade. *Review of Economic Studies* 62(4): 515-39.
- Knack, Stephen and Keefer, Philip (1997). Does Social Capital Have an Economic Payoff? A Cross-Country Investigation. *The Quarterly Journal of Economics* 112(4): 1251-88.
- Kramer, Roderick M. and Tyler, Tom R. (1996). *Trust in Organizations: Frontiers of Theory and Research*. Thousand Oaks: Sage.
- La Porta, Rafael et al. (1997). Trust in Large Organizations. *American Economic Review* 87(2): 333-38.
- Lazzarini, Sergio G., Regina Madalozzo, Rinaldo Artes, and Jose de Oliveira Siqueira (2004). Measuring Trust: An Experiment in Brazil. Working paper: Ibmec Business School.

- Levi, Margaret (2000). When Good Defenses Make Good Neighbors. In: Claude Menard (ed.), *Institutions, Contracts and Organizations: Perspectives from New Institutional Economics*. Chichester, U.K.: Elgar.
- Levin, Daniel Z. and Rob Cross (2004). The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer. *Management Science* 50(11): 1477-1490.
- Levin, Daniel Z., Ellen M. Whitener and Rob Cross (2005). Perceived Trustworthiness of Knowledge Sources: The Moderating Impact of Relationship Length. *Journal of Applied Psychology*, forthcoming.
- Lieberman, Marvin B. and David B. Montgomery (1988). First-Mover Advantages. *Strategic Management Journal* 9: 41-58.
- Lieberman, Marvin B. and David B. Montgomery (1998). First-Mover (Dis)Advantages: Retrospective and Link with the Resource-Based View. *Strategic Management Journal* 19: 1111-1125.
- McAllister, D.J. (1995). Affect and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations. *Academy of Management Journal* 38(1): 24-59.
- Mudambi, Ram and Susan Helper (1998). The 'Close but Adversarial' Model of Supplier Relations in the US Auto Industry. *Strategic Management Journal* 19: 775-792.
- Murphy, James T. (2002). Networks, Trust, and Innovation in Tanzania's Manufacturing Sector. *World Development* 30(4): 591-619.
- Neace, M B. (1999). Entrepreneurs in Emerging Economies: Creating Trust, Social Capital, and Civil Society. *Annals of the American Academy of Political & Social Science* 565(0): 148-61.
- Nooteboom, Bart; Hans Berger and Niels G. Noorderhaven (1997). Effects of Trust and Governance on Relational Risk. *Academy of Management Journal* 40(2): 308-339.
- Platteau, Jean-Pierre (1994). Behind the market stage where real societies exist—part II: the role of moral norms. *The Journal of Development Studies* 30(3): 753–817.
- Pocock, Stuart J. and Simon, Richard. (1975). Sequential Treatment Assignment with Balancing for Prognostic Factors in the Controlled Clinical Trial. *Biometrics* 31: 103-115.
- Rosenbaum, Paul R. and Rubin, Donald B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika* 70:41-55.
- Rosenbaum, Paul R. and Rubin, Donald B. (1984). Reducing Bias in Observational Studies using Subclassification on the Propensity Score. *Journal of the American Statistical Association* 79: 516-524.
- Sabel, C.F. (1993). Studied Trust: Building New Forms of Cooperation in a Volatile Economy. *Human Relations* 46(9): 1133-1170.
- Shapiro, D.L., B.H. Sheppard and L. Cheraskin (1992). In Theory: Business on a Handshake. *Negotiation Journal* 8: 365-377.
- Shearer, Bruce (2004). Piece Rates, Fixed Wages and Incentives: Evidence from a Field Experiment. *Review of Economic Studies* 71(2): 513-534.

- Sianesi, Barbara (2001). Implementing Propensity Score Matching Estimators with STATA. Paper prepared for the UK Stata Users Group VII Meeting, London, UK.
- Smith, Jeffrey A. and Petra Todd (2001). Reconciling Conflicting Evidence on the Performance of Propensity Score Matching Methods. *American Economic Review* 91(2): 112-118.
- Spence, A. Michael (1981). The Learning Curve and Competition. *Bell Journal of Economics* 12(1): 49-70.
- Stewart, Katherine J. (2003). Trust Transfer on the World Wide Web. *Organization Science* 14(1): 5-17.
- Temple, Jonathan; Johnson, Paul A. (1998). Social Capability and Economic Growth. *The Quarterly Journal of Economics* 113(3): 965-90.
- Thoms, Peg; Dose, Jennifer J; Scott, Kimberly S. (2002). Relationships between Accountability, Job Satisfaction and Trust. *Human Resource Development Quarterly* 13(3): 307-23.
- Valley, Kathleen and T.A. Thompson (1998). Sticky ties and bad attitudes: Relational and individual bases of resistance to change in organizational structure. In R.M. Kramer and M.A. Neale (eds.). *Power and influence in organizations*. Thousand Oaks: Sage, 39-66.
- Wernerfelt, Birger (1985). Brand Loyalty and User Skills. *Journal of Economic Behavior and Organization* 6(4): 381-85.
- Williamson, Oliver E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: The Free Press.
- Zaheer, Aks, William J. McEvily Jr. and V. Perrone (1998). Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance. *Organization Science* 9(2): 141-159.
- Zak, Paul J. and Knack, Stephen (2001). Trust and Growth. *Economic Journal* 111(470): 295-321.

Table 1: Summary Statistics

	mean	std. deviation	min	max
Heard of TrapGuard? “Have you heard of a product called the TrapGuard?”	0.49	0.50	0	1
Brochure “Are you interested in receiving a product brochure that describes TrapGuard in greater detail?”	0.60	0.49	0	1
Sample “Are you interested in receiving a free sample?”	0.81	0.39	0	1
Consider using “Would you consider using this product in your own work if the price were reasonable?”	0.37	0.48	0	1
Purchase Actual purchase of floor drain	0.10	0.30	0	1
Black person Subject received brochure showing black person	0.50	0.50	0	1
Certified Subject received brochure with byline “Listed by the International Plumbing Code”	0.50	0.50	0	1
Trusts suppliers “Generally speaking, would you say that you can trust your suppliers in the plumbing industry, or do you feel that you can’t be too careful in dealing with them?”	0.68	0.47	0	1
Business difficult “In your view, how easy is it to be successful as a plumber in Philadelphia?” “1 = very easy” to “4 = very difficult.”	2.34	0.80	1	4
Black respondent Respondent is black	0.08	0.27	0	1
Years work experience	21.32	11.33	1	55

Notes - The indicator variables take on a value of one if the answer is affirmative. The information about the race of our subjects comes from their plumbing license issued by the city of Philadelphia.

Table 2: Mean Responses by Treatment

	Heard of TrapGuard?	Brochure	Sample	Consider using	Purchase
White person no certification	0.127 (0.335)	0.517 (0.501)	0.805 (0.397)	0.141 (0.349)	0.067 (0.251)
Black person no certification	0.101 (0.302)	0.282 (0.451)	0.604 (0.491)	0.027 (0.162)	0.007 (0.082)
White person certification	0.758 (0.429)	0.839 (0.369)	0.879 (0.327)	0.772 (0.421)	0.221 (0.417)
Black person certification	0.986 (0.115)	0.778 (0.417)	0.946 (0.226)	0.557 (0.498)	0.114 (0.319)
H_0 : W=B no certification	0.4669	0.0000	0.0001	0.0004	0.0058
H_0 : W=B certification	0.0000	0.1857	0.0404	0.0001	0.0133
H_0 : no certification = certification	0.0000	0.0000	0.0000	0.0000	0.0000

N=149 for each cell. Standard deviations in parentheses. Test statistics in the last three rows are for the Mann-Whitney two-Sample statistic which tests the hypothesis that two independent samples are from populations with the same distribution. We report $\text{prob} > |z|$.

Table 3: Experimental Treatment Effects: Race and Institutions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Heard of TrapGuard ?	Heard of TrapGuard ?	Brochure	Brochure	Sample	Sample	Consider using	Consider using	Purchase	Purchase
Black person (DY=1)	0.527 (0.140)**	-0.132 (0.192)	-0.649 (0.134)**	-0.896 (0.180)**	-0.332 (0.141)*	-0.754 (0.178)**	-0.674 (0.129)**	-0.862 (0.251)**	-0.551 (0.155)**	-0.976 (0.390)*
Certified (DY=1)	2.428 (0.140)**	1.846 (0.173)**	1.623 (0.147)**	1.332 (0.198)**	1.085 (0.156)**	0.472 (0.208)*	1.922 (0.137)**	1.828 (0.171)**	0.870 (0.166)**	0.731 (0.195)**
Black person × certified		1.658 (0.355)**		0.563 (0.266)*		1.282 (0.315)**		0.263 (0.294)		0.538 (0.428)
Black respondent	0.076 (0.252)	0.080 (0.263)	-0.147 (0.236)	-0.144 (0.237)	0.121 (0.272)	0.142 (0.282)	-0.071 (0.239)	-0.074 (0.239)	-0.013 (0.280)	-0.009 (0.281)
Years work experience	-0.007 (0.006)	-0.007 (0.006)	-0.086 (0.007)**	-0.087 (0.008)**	-0.071 (0.007)**	-0.073 (0.008)**	0.007 (0.005)	0.007 (0.005)	0.001 (0.007)	0.001 (0.007)
Constant	-1.348 (0.176)**	-1.000 (0.184)**	1.804 (0.192)**	1.947 (0.208)**	2.353 (0.221)**	2.641 (0.241)**	-1.280 (0.171)**	-1.230 (0.179)**	-1.614 (0.208)**	-1.524 (0.216)**
Observations	596	596	596	596	596	596	596	596	596	596
Pseudo R2	0.4877	0.5210	0.3932	0.3988	0.2917	0.3217	0.3380	0.3390	0.1096	0.1142

Probit models. Standard errors in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4: Trust in Suppliers

	(1) Heard of TrapGuard ?	(2) Heard of TrapGuard ?	(3) Brochure	(4) Brochure	(5) Sample	(6) Sample	(7) Consider using	(8) Consider using	(9) Purchase	(10) Purchase
Trusts suppliers (DY=1)	-0.002 (0.148)	0.337 (0.296)	-0.385 (0.143)**	-0.379 (0.233)	-0.390 (0.162)*	-0.711 (0.274)**	-0.501 (0.137)**	0.170 (0.249)	-0.367 (0.154)*	-0.590 (0.304)+
Trusts suppliers × black person		-0.154 (0.327)		-0.144 (0.285)		-0.219 (0.323)		-0.828 (0.284)**		-0.614 (0.319)*
Trusts suppliers × certified		-0.537 (0.325)+		0.164 (0.288)		0.571 (0.334)+		-0.482 (0.292)+		0.373 (0.345)
Black person (DY=1)	0.527 (0.140)**	0.647 (0.283)*	-0.641 (0.134)**	-0.546 (0.237)*	-0.335 (0.142)*	-0.503 (0.278)+	-0.668 (0.130)**	-0.088 (0.236)	-0.557 (0.157)**	-0.486 (0.243)*
Certified (DY=1)	2.428 (0.140)**	2.817 (0.282)**	1.637 (0.148)**	1.526 (0.247)**	1.085 (0.157)**	0.675 (0.281)*	1.950 (0.139)**	2.282 (0.238)**	0.889 (0.169)**	0.683 (0.249)**
Black respondent	0.076 (0.252)	0.070 (0.254)	-0.150 (0.235)	-0.146 (0.236)	0.071 (0.270)	0.081 (0.272)	-0.080 (0.239)	-0.103 (0.242)	-0.005 (0.279)	-0.010 (0.280)
Years work experience	-0.007 (0.006)	-0.007 (0.006)	-0.087 (0.008)**	-0.087 (0.008)**	-0.072 (0.008)**	-0.072 (0.008)**	0.008 (0.006)	0.009 (0.006)	0.002 (0.007)	0.002 (0.007)
Constant	-1.347 (0.200)**	-1.596 (0.280)**	2.078 (0.222)**	2.074 (0.258)**	2.659 (0.263)**	2.925 (0.322)**	-0.990 (0.187)**	-1.444 (0.241)**	-1.417 (0.224)**	-1.310 (0.255)**
Observations	596	596	596	596	596	596	596	596	596	596
Pseudo R ²	0.4877	0.4911	0.4024	0.4031	0.3021	0.3078	0.3553	0.3722	0.1238	0.1270

Probit models. Standard errors in parentheses.

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 5: Markets as a Discipline Device

	(1) Heard of TrapGuard ?	(2) Brochure	(3) Sample	(4) Consider using	(5) Purchase
Business difficult? (scale 1-4)	0.145 (0.104)	0.103 (0.098)	0.449 (0.110)**	0.438 (0.102)**	0.217 (0.117)+
Trusts suppliers (DY=1)	-0.140 (0.178)	-0.480 (0.170)**	-0.015 (0.189)	-0.932 (0.173)**	-0.577 (0.194)**
Black person (DY=1)	0.527 (0.141)**	-0.641 (0.134)**	-0.357 (0.146)*	-0.688 (0.133)**	-0.573 (0.159)**
Certified (DY=1)	2.435 (0.141)**	1.639 (0.148)**	1.140 (0.161)**	2.006 (0.143)**	0.894 (0.171)**
Black respondent	0.097 (0.253)	-0.144 (0.236)	0.017 (0.272)	-0.066 (0.245)	-0.011 (0.283)
Years work experience	-0.008 (0.006)	-0.088 (0.008)**	-0.072 (0.008)**	0.004 (0.006)	-0.001 (0.007)
Constant	-1.571 (0.259)**	1.929 (0.262)**	3.533 (0.359)**	-1.679 (0.253)**	-1.732 (0.284)**
Observations	596	596	596	596	596
Pseudo R^2	0.4900	0.4038	0.3320	0.3797	0.1327

Probit models. Standard errors in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Figure 1: TrapGuard



Figure 2: Product Brochure Inserts – Race and Certification Treatments

A Plastic Material with a Memory?

Sounds like a sci-fi movie, right? Actually, it is a high-tech solution for a severe plumbing problem. How do you prevent sewer gas emissions from backing up into rooms once the trap water has evaporated? Trap Guard™ is the answer and takes the place of costly trap primers.



Made out of space-age elastomeric material, the Trap Guard™ sits watertight inside a floor drain but will open instantly to discharge wastewater down the drain. Once the flow stops, the material's built-in memory closes and prevents gas emissions and sewerage back-ups through the drain opening.

[Firm name] brings innovative solutions to the plumbing industry. To find out more about the Trap Guard™ floor drains, fill out the back of this card or call us directly at 1-800

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International Plumbing Code*

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