

THE SPEED OF NEW IDEAS

TRUST, INSTITUTIONS AND THE DIFFUSION OF NEW PRODUCTS

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Abstract

Trust in supplier-customer relationships is generally regarded as a competitive advantage. Empirical evidence indicates that trust reduces transaction costs and enhances supplier performance. In this study, we document a “dark side” of trusting relationships. Trust in current suppliers reduces the likelihood that firms are interested in and adopt novel products by new suppliers. Using adoption rates of a new product in the plumbing industry as a case study, we document that high levels of trust in current suppliers pose a significant barrier to entry. Firms which trust their current suppliers are less likely to seek information about the innovation, and they express less interest in purchasing the new product. Once the product becomes available, they do in fact make fewer purchases. We also find that generalized trust in the form of more optimistic expectations about the performance of new products does little to overcome the barriers to entry created by specific trust in current suppliers. In contrast, trust in institutions – the certification process of an industry association in the current study – is quite effective in fostering rates of adoption.

1. Trust and Economic Outcomes

Empirical studies document a strong relationship between levels of trust and positive economic outcomes. For example, trust is positively related to higher rates of economic growth (Knack and Keefer, 1997; Temple and Johnson, 1998; Zak and Knack, 2001), increased judicial efficiency and lower corruption (La Porta et al., 1997). In work environments characterized by incomplete contracts, trust between workers and employers reduces transaction costs and increases productivity (Kramer and Tyler, 1996; Levi, 2000; Thoms, Dose and Scott, 2002). Generalized trust appears to be particularly important for managers in societies with little social capital. Entrepreneurs in former Soviet republics for instance consider trust a key criterion for business success (Neace, 1999.)

In this paper, we study the relationship between trust and the diffusion of new products. Adopting a new product often requires trust, i.e. the *expectation* that a new product will benefit the adopter. As is typical for trust-based relationships, these expectations are grounded in an understanding that the trusted party has an interest in fulfilling the customer's trust (Hardin, 1993, 2002; Harvey, 2002). As Coleman (1990:100) has pointed out, trust matters because it changes the trusting person's calculations that she will be better off.

A simple view of trust holds that higher levels of trust encourage the acceptance of new products and speed up their diffusion, while a lack of trust makes it more difficult to innovate (Murphy, 2002.) However, in markets where new products compete with established goods, this effect is less than certain. Trust in existing suppliers raises expectations of their performance and makes it more difficult for new suppliers to successfully enter the market. The net effect of trust

on the rate of diffusion of new products is unclear because trust strengthens the position of incumbents and the prospects of challengers.

We study the effect of trust on the diffusion of a new product in a field experiment that confronts customers with an unknown and innovative product that is produced by a firm without a track record in the industry. We manipulate expectations of performance of the new product in two experimental treatments. The first treatment varies stereotypical information about the supplier. While the original product brochure shows a white person demonstrating the new product, a new brochure depicts a black person. Recent empirical evidence indicates that members of more similar groups trust one another more easily (Alesina and La Ferrara, 2002). Glaeser, Laibson, Scheinkman and Soutter (2000) report that greater heterogeneity in income and race reduces levels of trust and trustworthiness. As the majority of subjects in our study is white, we expect a reduced tendency to adopt the product if the marketing materials show a black person. In a second treatment, we mention that the new product is certified to meet the standards of a national industry association. Boards of certification and similar institutions represent perhaps a substitute for interpersonal trust. Rather than trusting a particular supplier, purchasing managers can develop trust in an institution and its process of certification. We expect institutional certification to raise levels of trust and increase the demand for the new product.

Our empirical results show that both treatments significantly influence the level of interest in the new product and the likelihood of adoption. In a baseline specification, firms are 23 percentage points less likely to be interested in purchasing the product if the marketing material shows a black person. Certification raises the likelihood of interest by 60 percentage points. We observe similar patterns of results for actual purchasing decisions, although the treatment effects are much smaller. Showing a black person decreases the probability of purchase by 8 percentage

points while certification raises the likelihood of adoption by 13 percentage points. Interestingly, increases in trust due to certification are colorblind: We find no evidence that the gains from certification depend on the race of the person shown in the product brochure.

Controlling for the experimental treatments, trust in current suppliers is negatively related to various measures of interest in the new product. Subjects who trust their suppliers are less interested in receiving additional information or a free sample of the new product. They are less likely to be interested in using the product and they do in fact make fewer purchases once the product becomes available. Trust in current suppliers is a significant barrier to entry. Its economic effect is about as large as the racial treatment effect.

The paper is organized as follows. In Section 2, we review the literature on product diffusion and the role of trust in supplier networks. 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

Building on early work by Griliches (1957), economic models of diffusion seek to identify the relative importance of raw technical progress and other economic forces in adoption processes. Ultimately, the pace of diffusion is determined by the interplay between technical opportunities and other economic forces like adoption costs, the locus of innovation (Bresnahan and Trajtenberg, 1995), the success of market distribution, the availability of complements (Bresnahan and Yin, 2004) as well as the existence of network externalities (Cabral, 1990.)

Trust is likely to influence the speed of new ideas and products because the gains from adoption of a new technology are typically uncertain. While there is no generally accepted definition of trust, the expectation that a partner will not exploit an exchange relationship in an opportunistic manner is at the core of most conceptions of trust (Coleman, 1990; Barney and Hansen, 1994.) Applied to the adoption of new products, high levels of trust lead the adopter to expect that entering into a relationship with a supplier will be beneficial. Trust is obviously linked to product quality but it is broader than quality. For instance, trusting customers expect to be notified if a supplier learns that his product is deficient.

Empirical evidence indicates that trust in supplier customer relationships is of considerable importance. In supplier – automaker relationships, for instance, higher levels of trust significantly reduce transaction costs (Dyer and Chu, 2003.) Reduced conflict, lowered costs of negotiation and enhanced supplier performance characterize trusting relationships in the electrical equipment manufacturing industry (Zaheer, McEvily and Perrone, 1998.) While empirical work in this area is sparse, most studies argue that personal and interorganizational trust can potentially be a source of competitive advantage (Barney and Hansen, 1994.)

The effect of trust on the rate of adoption of new products is uncertain precisely because trust lowers the transaction costs of ongoing relationships. *Specific trust in current supplier relationships* slows down adoption rates because incremental gains from adopting a new product are lower if the perceived benefit of current relationships is high. In contrast, *generalized trust towards new suppliers* speeds up rates of adoption because it increases the purchasing managers' estimate of the prior that a new relationship will be beneficial. In this paper, we seek to identify the effects of these types of trust on the likelihood that firms will be interested in a novel product.

3. Experimental Design

To study the relationship between levels of trust and adoption rates we need variation in trust levels between customers and their current suppliers and an unknown product whose performance is uncertain. The product used in this study is a device called TrapGuard™, which is produced by a small firm located in Georgia. TrapGuard is a special kind of floor drain. The device is an innovation that solves an old plumbing problem using a novel material. The trap water in rarely used drains evaporates over time and gases can stream into the room. TrapGuard prevents the intrusion

of sewer gases. The lower half of the drain consists of an elastomeric material, which opens up when water flows down the drain. The innovative aspect 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. This product is well-suited for the proposed study for a number of reasons. First, TrapGuard’s producer is a small firm that is unknown in the market. Second, not much is known about this new material. In particular, customers may wonder about its long-term performance. Will TrapGuard really close for many years to come? Third, innovation in the plumbing industry is not particularly rapid. Unlike other industries, where the adoption of new technologies and products is often a must, in this instance, plumbers do not face overwhelming pressure to adopt TrapGuard. This makes it more likely that there will be variation in adoption rates across plumbers.

We vary expected benefits from using TrapGuard by manipulating product and supplier information that is available to customers. Experimental evidence indicates that members of minority groups are less likely to be trusted, and African-Americans are least likely to be trusted (Eckel and Wilson, 2003; Glaeser et al. 2002; DeBruine, 2002.) We exploit this variation in trusting behavior by using a picture of a white and a black individual on an insert that was added to TrapGuard product brochures. We expect product brochures with the picture of a black person to lower adoption rates of the TrapGuard device. Figure 1 shows the two inserts. The picture at the bottom of the page shows the second experimental treatment, a reference to the fact that the product 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 comprehensive and coordinated 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. We are interested in the effects of ICC listings because trust in organizations such as the ICC is a potentially important substitute for trust between customers and suppliers. Khanna and Palepu (2000), for instance, argue that greater horizontal and vertical integration of firms in emerging markets reflect the lack of institutions and information intermediaries such as ICC. When trust is lacking, it makes sense to bring activities inside the firm because the firm’s reputation serves as a credible commitment device. In this paper, we test the idea that an unknown supplier without a track record can in fact overcome barriers to entry by relying on an information intermediary.

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. All plumbers

received a questionnaire in the spring of 2003. Questions included an item asking about current business conditions and trust in suppliers. To measure trust in suppliers, we adapted a question from the World Values Survey (Institute for Social Research, 2002, question 25) that has been used in many previous trust studies:

“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 brochure with one of four inserts to all plumbers in our sample. The four inserts correspond to the four experimental treatments. A follow-up telephone call determined the 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 your own work.” We describe the results of this experiments in the next section.

4. Results

Table 1 provides summary statistics for the variables used in our models. Almost 50% of all plumbers appeared to remember the TrapGuard marketing material. 60% requested a brochure and 81% were interested in receiving a free sample. 37% said they would consider using the product. In the 9 months since the introduction of TrapGuard in the Philadelphia market, 10% of plumbers actually purchased the floor drain.

We first study the effect of the four treatments on plumbers' responses. The results are reported in Table 2. 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 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 model the "adoption" decision as a binary choice which depends both on the expected performance of the product and the supplier as well as characteristics of the plumber. We estimate reduced-form probit models using the following specification

$$(1) \quad \Pr(\text{Adoption} = 1) = \Phi(X_i \mathbf{b} + \mathbf{d}(\text{race}) + \mathbf{f}(\text{certification}) + \mathbf{e}_i).$$

The vector of plumber characteristics includes a variable for their trust in their suppliers, a plumber's race and the number of years he has worked in the Philadelphia area. Plumbers who are new to a region may be more open to new suppliers.

The probit estimates in Table 3 are consistent with our hypotheses. Pictures of a black individual in the product brochure reduce the likelihood of interest in the product. Also, plumbers who received this insert are 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 trust is absent. The coefficients on interaction effects of the two treatments (black person \times certified) are generally positive, indicating that the gains from certification are particularly large if the plumber received the insert with the picture of a black person. However, the effect is 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) indication that plumbers who have worked in the Philadelphia market for a longer period of time are less interested in new products.

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%) (Table 4). 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 the plumbers’ interest. The even-numbered specifications in Table 4 test the idea 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. The signs on the interaction terms are negative in all specifications and significantly so in models (8) and (10). We conclude that specific trust in current suppliers is a particularly important barrier to entry for generally less trusted groups. In contrast, if the product is known

to be certified by ICC, specific trust in current suppliers no longer explains levels of interest in TrapGuard.

The market is often seen as a discipline device which forces firms to carefully 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 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 evidence that trust in current suppliers constitutes a barrier to entry for unknown firms and new products. An interesting question is if firms that trust their suppliers ought to be interested in TrapGuard. The answer is not obvious because trusting relationships are more productive leading us to expect that the profit-maximizing firm is less likely to enter new supplier relationships if it trusts its current suppliers. However, some of our results raise concerns whether or not firms are in fact choosing optimally between trusted and new suppliers. 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. (TrapGuard is not more expensive than conventional two-inch floor drains.) Similarly, if trust is an issue we would have expected trusting plumbers to be

very interested in receiving free samples from a producer they are not familiar with. Trusting firms, however, are less likely to order a free sample.

5. **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 tends to make existing relationships more productive. We conducted a field experiment in which we studied plumbers' interest in a new product in their industry. We find that firms which trust their current suppliers are less likely to be interested in the new product. Trusting firms are also less likely to purchase the novel floor drain. 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.

Table 1: Summary Statistics

	mean	std. deviation	min	max
Heard of TrapGuard?	0.49	0.50	0	1
Brochure	0.60	0.49	0	1
Sample	0.81	0.39	0	1
Consider using	0.37	0.48	0	1
Purchase	0.10	0.30	0	1
Black person	0.50	0.50	0	1
Certified	0.50	0.50	0	1
Trusts suppliers	0.68	0.47	0	1
Business difficult	2.34	0.80	1	4
Black respondent	0.08	0.27	0	1
Years work experience	21.32	11.33	1	55

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) 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
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 Disciplining 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: 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

*Listed by the
International Plumbing Code*

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