

ISSN 1471-0498



DEPARTMENT OF ECONOMICS

DISCUSSION PAPER SERIES

**CROWDING OUT TRUST: THE ADVERSE EFFECTS OF
VERIFICATION. AN EXPERIMENT**

Gerardo A. Guerra

Number 98

March 2002

Manor Road Building, Oxford OX1 3UQ

CROWDING OUT TRUST: THE ADVERSE EFFECTS OF VERIFICATION. AN EXPERIMENT

Gerardo A. Guerra

gerardo.guerra@wolfson.ox.ac.uk, gguerra@aya.yale.edu

May 7, 2002

Through an experiment, this study investigates the effects that verification has on honest traders. This paper demonstrates that by reducing the scope for trust verification can have a negative effect on the behaviour of honest individuals. Specifically, the analysis shows that trustworthy agents are willing to punish or seek compensation from those that deprive them of trust opportunities through the use of verification. Regulatory implications are discussed.

JEL Classification Numbers: C72; C78; C90; D18; D82; L86

Key Words: Verification; Trust; Ultimatum Bargaining; Experiments

Acknowledgements

I would like to thank Michael Bacharach, Diego Gambetta, Angelica Leroux and Daniel Zizzo for useful discussion and comments. I also thank participants of the “Experimental Economics Workshop” at the Department of Economics, University Oxford, and of the “Workshop in Economics, Philosophy and Cognition” at Nuffield College, University of Oxford. Funding by the George Webb Medley Fund and Wolfson College Senior Tutor’s Fund is gratefully acknowledged.

CROWDING OUT TRUST: THE ADVERSE EFFECTS OF VERIFICATION. AN EXPERIMENT

I. Introduction

Some years ago, when buying an electronic calculator in a Mexican market, I started bargaining with the seller to lower the price. After a long process he offered me the calculator for a price p that was less than 50% of his initial asked price p_0 and told me that that was the best price he could offer. As he would not lower the price further, I decided to look around the market for a similar calculator, armed with the knowledge that if I could not get a better price, I could always go back and buy it from said seller. As it were, I was unable to obtain a better price, and decided to return to the initial seller for the calculator. He told me that since I had gone shopping around for prices, he would only sell me the calculator for the initial price p_0 , more than double of the previously arranged price. I left the market with no calculator and puzzled. What had happened there? If he was willing to sell at a certain price 30 minutes before, economic rationality would certainly require him to be willing to sell at that same price later, but he was not. Friends and colleagues have told me they have had similar experiences. This paper proposes a trust explanation for this phenomenon, where verification crowds out trust, and presents experimental results confirming this behaviour.

II. Verification and Trust

A. *Verification*

Verification takes place when an uninformed agent checks the characteristics or claims of another agent. It removes uncertainty and provides valuable information to otherwise uninformed agents, improving market efficiency. Verification can be defined as perfect screening or perfect certification. It helps both buyers and sellers in an economy when there is uncertainty about the quality of suppliers or products [see Akerlof, 1970, Viscusi, 1978 and Guerra, 2001]. Verification helps unmask impostors, deceivers and cheaters, and can help honest agents to distinguish themselves from fraudsters by providing definite information to interested parties. It therefore seems to be a sheer positive act. However, if people actions are determined not only by reason, but also by attitudes, and if verification can have a negative impact on attitudes, it follows that verification can exercise a negative influence in people's acts. This study proposes that by reducing trust opportunities, verification can negatively impact agents'

attitudes, causing undesired reductions in market efficiency.

B. *Trust Defined*

Trust has been extensively studied in several disciplines; however, there is still no consensus about what it is meant by *trust*. Pettit [1995] distinguishes trust as an attribute from trust as a form of behaviour. Misztal [1996] separates trust in types according to their role (commercial, problem solving, informational, knowledge, and identity). Baron [1998] identifies trust as a good, a belief and a behaviour. The Oxford English Dictionary defines trust, in part, as “[...] a firm belief in the reliability or truth or strength etc. of a person or thing. [...] a confident expectation. [...] reliance on the truth of a statement etc. without examination.” With almost as many definitions of trust as studies exist, it is difficult to find a concept that satisfies all people.

The ultimate definition of trust is elusive; however, there is a common factor present in most definitions: uncertainty [e.g. Sobel, 1985; Gambetta, 1990; Kollock, 1994; Sako and Helper, 1998]. Without uncertainty there is no role for trust. If Alice and Bob can each perform two acts that affect both of their payoffs, and it is common knowledge that both strictly prefer one act (i.e. before choosing an action both Alice and Bob prefer to do what the other would like them to do), then a cooperative outcome from such a game will be given by its structure, rather than by the disposition of the participants. As both Alice and Bob would be acting under the firm belief that the other would perform the action that is preferred by them, then taking that action would involve no risk for them. In this case, when uncertainty is not present, there is no role for trust (or alternatively, it can be said that deciding to trust is not an issue, as there is perfect trust). However, if what is good for Alice is not necessarily good for Bob, she will be taking risks by interacting with him. This uncertainty creates trust concerns for Alice.

Uncertainty is then a necessary component of trust, but uncertainty does not necessarily imply trust. For example, let us consider an incomplete information situation, in which an agent is considering buying an *experience good* (a good whose quality can be determined only after it has been used) from a seller. The quality of the good can be high or low. Here the buyer faces uncertainty about the quality of the good, however, buying the good would not necessarily mean that she trusts the seller. If the price of the good is lower than her reservation price for the low quality good, the

act of buying would not constitute an act of trust, but rather a rational choice from her. We, then, need more than uncertainty to define trust and to fully characterise a trust situation.

This study will use the definition of the act of trust by Bacharach and Gambetta [2001]: “a person *trusts someone to do X* if she acts on the expectation that he will do X when both know that two conditions obtain: if he fails to do X she would have done better to act otherwise, and her acting in the way she does gives him a selfish reason not to do X”. Mutual knowledge of the two conditions restricts the set of trust games, and provides a refined description of trust. The first condition entails *exposure* from the trustor, while the second condition implies *temptation* for the trustee. Trusting then requires three conditions: uncertainty, exposure and temptation.

C. *The Need for Trust*

Arrow [1971] points out that even though it should be “rational economic behaviour” to cheat or disregard trust, agents exhibiting trust and confidence are an essential part of a successful economy and, as there is a potential gain from this type of behaviour, this should not be seen as “economic backwardness”. Arrow also recognises that, in order to improve efficiency, non-market controls are necessary. These non-market controls can be endogenous (such as trust-responsiveness) or exogenous (such as external verification) to the agents.

In our societies trust is often perceived as a good or a virtue, and therefore as a desirable goal. Academics and organisations talk about the maximisation of trust or the benefits of enhancing it [Pettit, 1995, Sako and Helper, 1998, European Commission, 1999]. It has been suggested that trust could be enhanced through controls, such as verification or certification. I would like to challenge this view and contend that verification does not enhance trust, but rather dispels it.

III. Basic Trust Games and Ultimatum Games

Let us define the notion of a trust situation through a two-player strategic-form non-cooperative game, called basic trust game (BTG). This description follows closely the definition of a BTG in Bacharach and Gambetta [2001], with minor changes. The game has two players, a trustor (R), and a trustee (E). Each player can follow two strategies: R’s are labelled T (for trust) and N (not trust), E’s are labelled H (honour

trust) and D (disregard trust). The material or *raw payoffs* of the game are shown in figure I (Bacharach and Gambetta differentiate payoffs motivated by self-interest as *raw payoffs*, from payoffs that include reactions, emotions, feelings, etc. called *all-in payoffs*). This game complies with the two conditions of Bacharach and Gambetta [2001], and is different from it in that theirs allows for values different from zero for R's payoffs in N, as long as (T,H) is preferred by R over (N,H), and (N,D) over (T,D). The game presented here could be taken as a particular form of their BTG. The zero payoff in the N row (not trust) illustrates the walk-out option in a trust situation by which if R decides not to trust E, she does not lose or win anything from her interaction with E, and E may not even be aware that he was in a trust game with R.

		E	
		H	D
R	T	w, x	-y, z
	N	0, 0	0, 0

s.t. $z > x$; $w, x, y, z > 0$

Figure I: A Basic Trust Game

This game can be better understood with an example: imagine that R is buying an experience good (as defined before) from E. A high quality good implies high costs for E and a low quality good implies low costs. E's material payoff will be greater from selling a low quality good than a high quality one, at any given price. E would then like R to buy from him, and R would like E to provide a high quality good. There is mutual knowledge between R and E of their available strategies and (raw) payoffs. There is an uncertainty problem for R from the fact that providing a high quality good is not incentive compatible for E, and therefore for R to buy she must trust E to have a different set of *all-in* payoffs that makes playing H incentive compatible for him.

With verification R acquires information about E's strategies or decisions before having to chose herself: by checking whether E's good is worth the asked price, R knows E's move in advance. This eliminates exposure for R, as she can decide to buy only when it is rational for her to do it. Verification then increases efficiency by improving R's information, however, it reduces trusting opportunities by eliminating exposure, a fundamental component of trust. Pettit [1995] suggests that intrusive regulation can be counterproductive if eradicates overtures of trust and drives out

opportunities for trust relationships. The introduction of checks or sanctions will motivate E to choose H, making H a rational choice for him, effectively dispelling trust. If E perceives trust as a good, having R performing checks on him will deprive E of this good, and may induce him to try to punish R or to seek compensation from her.

A. *Modelling market transactions with Ultimatum Games.*

Basic Trust Games like the one described in the previous section generally arise in the real world in sequential form: with either R or E moving first, and the other observing her choice and responding accordingly. The transaction example provided in the previous section has E moving first (by choosing price), being followed by R (choosing whether to buy or not); alternatively, R could move first by buying quantity (a pound of strawberries), and then E could honour the trust (by delivering the amount requested) or disregard it (by intentionally giving her less). This study will use ultimatum games to model transactions where E moves first. An ultimatum game is a two person game in which one player (the proposer) suggests a division of a resource between the two. The other player (the responder) can then accept or reject the offer. If the responder accepts, both get the allocation suggested by the proposer, and if he rejects, both get nothing. The sub-game perfect equilibrium predicts the proposer claiming all (or almost all) the resource, leaving zero (or an insignificant proportion) to the receiver, with the receiver accepting the proposed division. Ultimatum games have been studied extensively since the first systematic study of ultimatum games by Güth, Schmittberger and Schwarze [1982] [for surveys of the literature see Thaler, 1988, Güth and Tiez, 1990, and Roth, 1995]. Typical results show modal proposal of fifty-fifty split, with mean choices giving proposers higher proportions (between 60% and 70%).

Ultimatum games have been used to describe bargaining situations, but their use in modelling commercial transactions have often been neglected, even though they provide a powerful framework for the task [Croson, 1996 suggests ultimatum bargaining as a model for transactions]. To understand how a standard transaction can be reflected in an ultimatum game let us begin with the simplest transaction: a seller offering a good to a buyer. When the seller sets a price p for his good, he becomes a proposer. The buyer who must decide whether to buy or not is then put in the receiver place (a purchase will give the seller a profit π and the buyer will receive her utility u

from the good minus the disutility of the price p). One limitation of ultimatum games is the requirement of a fixed amount to be shared among two agents, and both of them getting nothing in the case of a disagreement. If there are gains from trade and/or the good provides a value for the seller, it would seem that an ultimatum game is ill prepared to model transactions. This is not the case, even in the case in which keeping the good provides value to the seller; it is always possible to analyse the transaction by normalising the gains over this value. Similarly, even in the case of gains from trade, as long as they do not enter the buyer's utility as a function of price, or the seller's as a function of acceptance of the offer, the game can and its strategic implications would still be reflected in an ultimatum game. In this case the cake to be divided would consist of the enhanced value if trade takes place, or nothing if not.

For the purposes of this paper, the ultimatum game will be enhanced with one side uncertainty and the possibility of negative payoffs, to reflect typical real life situations in which the seller is better informed about the attributes of the good than the buyer, and where the buyer may end up paying more than she would be willing to under perfect information.

B. One Side Uncertainty

Several experiments have used uncertainty in the form of one-sided private information in which the size of the cake is determined by nature: Forsythe, Keenan and Sopher [1991], Mitzkewitz and Nagel [1993], Straub and Murnighan [1995], Kagel, Kim and Moser [1996], Rapoport, Sundali and Seale [1996], Rapoport and Sundali [1996] and Croson [1996]. The typical model is that of Mitzkewitz and Nagel [1993] in which the proposer knows the pie size but the receiver knows only the probability distribution of the value of the pie (the pie size in this case varies from 1 to 6 according to the throw of a die). The paper distinguishes two types of games with asymmetric information, demand and offer games. In demand games the proposer announces the share of the pie he request for himself, while in offer games it informs of the possible share of the receiver. This study will use the demand game to model the simple buyer-seller situation: the seller sets a price (demands an amount for the buyer) and it is up to the buyer to accept or reject it. As a result of introducing one-sided uncertainty the notion of "fairness" becomes ambiguous, and makes difficult for the buyer to expect (or measure) equality. Mitzkewitz and Nagel [1993] find that by introducing this enhancement, proposers demanded higher shares on average than

proposers of typical ultimatum games (between 83% and 61%, depending on pie size).

C. *Negative Payoffs*

In ordinary ultimatum experiments proposers cannot extract money from receivers. This constraint can be lifted without affecting the structure of the game. The pie size can still be considered as fixed, as the appropriation by the seller is equal to the extraction from the buyer. Lifting this constraint extends the ecological validity of ultimatum games to model transactions, as in real life some buyers do receive products that are not perceived to be worth the price paid for them, yielding negative utility to buyers.

At this point it is convenient to define two measures: the first one, *Maximum Pie*, identifies the maximum possible pie in the setting (or alternatively, the maximum amount that a seller can receive at a given point). The second, *True Pie*, refers to the actual pie being divided (or the maximum value that a buyer could obtain at a given point). In Mitzkewitz and Nagel [1993] both measures were equal given the constraint of non-negative payoffs, i.e. a seller could receive at most the value indicated by the die. If we were to lift the non-negativity constraint in Mitzkewitz and Nagel's [1993] design, the maximum pie would be 6 (as the proposer could in theory ask for the maximum possible value and the responder could concede without necessarily breaking the individually rationality constraint, under a well defined set of beliefs). Clearly the maximum pie would differ from the true pie whenever the die outcome is not 6.

IV. Experimental Setting

A. *Design.*

This experiment tests the effect of verification in transactions with asymmetric information. In the transaction a seller posts a price p for a good of quality q known to him, but unknown for the buyer ($q \in [0..100]$). The buyer must then decide whether to accept the offer, reject it, or verify the quality of the good (verification is costless). If the buyer chooses to verify, the seller has the opportunity to change the price (raise it or lower it) or keep it, and the buyer then must decide whether to buy or not, given the second price decision of the seller. We face a similar situation when we enter a shop, observe a price and decide to delay our purchase in order to check prices. If we return to the store once we checked prices, the price of the good may have changed.

A possible explanation for a price increase after a delay is that the seller becomes knowledgeable about the market he is acting on. A customer returning after a delay could indicate that his price is lower than that of his competitors, and he may then decide to adjust the price upwards. To differentiate attitudinal price increases from competitive ones, this experiment uses two-person markets: a market composed by one buyer and one seller. In this environment a price increase cannot be due to competitive factors.

Two factors are analysed: verifiability and involvement. Involvement refers to a seller's connection to quality assignment. Two variants are considered: involved (*i*) and uninvolved (*u*). In the involved case, the seller chooses the quality level of his good, at a cost (higher quality being more costly). In the uninvolved case the quality of the seller is assigned by nature, drawn from a known distribution. Verifiability refers to the possibility of verification, under two treatments: verifiable (*v*) and non-verifiable (*n*). In the *v* treatment buyers are able to verify the quality of the seller, while in *n* they only can choose between buy or not. The two factors are combined in a 2x2 factorial design, run in 18 sessions. Each session consisted of 6 subjects, 3 for each role (randomly assigned). The experiment was computer assisted, and was run in the Experimental Laboratory of the Department of Economics, University of Oxford during the autumn of 2001. The experiment was a filler experiment for three different experiments in which subjects received a £3.00 participation fee on top of any money obtained from the experiment. The experiment was counterbalanced for order effects in two of the experiments, and was the initial experiment for the third one.

Subjects' payoffs were given in points. At the end of the experiment these points were paid at a rate of 2 pence (0.02 GBP) per point. When the experiment was conducted the exchange rate was 1.46 USD per GBP. The maximum a subject could make from the experiment (including participation fee) was £7.00; the minimum was £1.00.

The extensive form of the modified Demand Game is given below (see the appendix for a transcript of the instructions given to subjects). The steps that are to be included only in specific variants are preceded by the codes *i*, *u*, *v*, *n* in brackets for the variants *involved*, *uninvolved*, *verifiable*, and *non-verifiable* respectively.

B. Procedure

1. Each player is assigned a role: Buyer or Seller.
 - [u] 1.1. Nature assigns each seller a quality level $q \in [0..100]$, at a cost of
 - [i] $\pounds 2.00 \times q/2$ (the cost is a cost of producing, therefore if the buyer decides not to buy, the seller is not charged the quality cost)
 - 1.2. Seller chooses a quality level $q \in [0..100]$, at a cost of $\pounds 2.00 \times q/2$ (the cost is a cost of producing, therefore if the buyer decides not to buy, the seller is not charged the quality cost)
2. Each seller asked to set a price $p \in [0..100]$ (the *prior* price).
 - [v] 2.1. The buyer observes the price, and must choose between buy, not buy, or verify quality.
 - [v] 2.1.a. If the buyer chose to verify, he is informed of the true quality q of the seller
 - [v] 2.1.b. Once the buyer has been informed, the seller is given the opportunity to change his price (the *posterior* price).
 - [v] 2.1.c. The buyer is presented with the price and must decide whether to buy or not.
 - [n] 2.2. The buyer is asked whether she wants to buy or not from the seller.
3. The buyer observes the price and decides whether to buy the good or not.

The process is then repeated two more times from 2.1 onwards so that all three sellers are matched with all three buyers. To finish the game one of the matches is chosen at random. If the buyer chose to buy in that match the seller receives $\pounds 2 (p - q/2)$, and the buyer receives $\pounds 2 (2q - p)$. If she decides not to buy, both receive nothing.

Sellers used a horizontal linear dial calibrated in integers from 0 to 100 to choose price, and a vertical one to chose quality.

C. Expectations

In the *u* treatment the expected quality from any single seller is 50 units (expected value from a uniform distribution in $[0..100]$). As buyers receive $2q - p$ units from an encounter, and $p \in [0..100]$, all risk-neutral buyers in *nu* should buy at all times (individual rationality). In *vu* and *vi* buyers are better off by verifying first (at no cost) and buying only if $2q - p > 0$ (given that sellers should not increase their price after verification, as will be discussed later). In *ni* buyers should never buy. This is because quality is costly for sellers, and if a given seller assigns a positive probability to sell his good at a given price p , he maximises his expected profit by choosing a quality level of 0, saving on quality cost. Buyers knowing this should not buy, and the market unravels.

There are multiple equilibria for sellers in this games; however, all of them share a common feature: the prior price is greater or equal to the posterior price. If any seller has an expectation to sell his good at the posterior price, it should never offer the good at a cheaper price before. Using a trembling hand argument, if the buyer were to buy at the prior price (even though a buyer should always verify as discussed above), why should the seller forgo a potential profit by offering his good at a discount? This is true for all cases: the seller should never offer a discount in the prior price, as the buyer is locked with him for that transaction. The buyer cannot go shopping around from seller to seller: once she's paired with a seller she has to decide whether to buy from him or walk away. Given this, a discount in the prior price would signal that the seller has a positive attitude towards the buyer when the buyer is willing to forgo verification. The most plausible explanation for a discounted prior price would rely in attitudinal theories. Attitudinal theories (e.g. trust-responsiveness, kindness-reciprocity, etc.) make the choice of a player depend on how favourably he regards the others action. In the case of this experiment, a seller could regard the act of not verifying as an act of trust from the buyer. If trust is perceived as a good or provides benefits for the trusted agent [Pettit, 1995], not verifying may be perceived as a kind act, and could trigger kindness-reciprocity [Falk and Fischbacher, 2001]. Alternatively, the reduced prior price could be explained as a form of trust-responsiveness (a trust responsive agent displays a higher propensity to honour trust because he believes a trustee expects him to). For experimental evidence of trust-responsiveness and a discussion of attitudinal theories see Bacharach, Guerra and Zizzo [2001]. Fairness concerns or inequality-aversion fail to deliver an explanation, as an inequality-averse seller should display the same degree of inequality-aversion before and after the buyer chose to verify. Therefore, any difference in prior and posterior prices that makes the prior price less than the posterior price should have its root in an attitudinal response to being verified upon, with the increase in the posterior price being used as compensation or a punishment.

V. Results

A. Sellers

Table I shows some summary statistics of individual observations. For statistical analysis the data collected from each subject was averaged and considered as one observation, transforming 162 observations for each role (buyer or seller) into 54

observations. Subject's sex and age demographics were tested as covariates, and were kept whenever they were significant at 5% (both age and sex were kept when analysing buying rate for buyers; for sellers age and sex did not test significant as covariates). Contrary to expectations, there were no significant differences in product quality across treatments, i.e. sellers that were able to choose quality on average chose to do so, despite being costly for them. Furthermore, even when buyers were not able verify quality (*ni* variant) sellers' choice of quality was not significantly different from that imposed on sellers in the *nu* treatment (average quality for treatment *ni* was 45.89, and for treatment *nu* was 47.00, $F(1,16)=0.01$; $p=.932$).

Table I: Means and Standard Deviations of Observed Variables

	<i>v</i>	<i>n</i>	<i>i</i>	<i>u</i>	<i>all</i>
<i>Quality</i>	50.7 (25.74)	46.4 (25.82)	52.9 (23.61)	45.7 (27.44)	49.3 (25.77)
<i>Price</i>	52.3 (23.13)	57.5 (14.62)	60.8 (17.43)	47.2 (21.74)	54.0 (20.79)
<i>Offered Profit</i>	47.3 (29.81)	35.4 (39.68)	43.8 (33.64)	42.8 (34.11)	43.3 (33.77)
<i>Buy Rate</i>	0.77 (0.42)	0.65 (0.48)	0.70 (0.46)	0.75 (0.43)	0.73 (0.45)
<i>Verify*</i>	0.78 (0.42)		0.74 (0.44)	0.81 (0.39)	0.78 (0.42)

Sellers that were able to chose quality (*i* treatments) charged a significantly higher prior price than those that had quality imposed upon them (60.8 compared to 47.2; $F(1,50)=4.67$; $p = 0.036$). It seems that even though they were offering quality that was not different from that offered by sellers that had quality imposed upon them, sellers that chose quality felt they were entitled to a higher share given their involvement in the process of choosing quality. Table II shows the raw data for sellers and buyers.

Even though game theory does not predict a relationship between price and quality, sellers did choose their prices guided at least in part on their quality level. Figure II shows the price-quality relationship of seller's choices. A simple OLS regression gives a coefficient of 0.663 with an R^2 of 0.675. This relationship can indicate some form of fairness concern or inequality aversion on the part of the sellers, or alternatively some anchoring effect of quality on price (however the relation appears to be too strong to be explained solely by anchoring effects).

Table II: Sellers and Buyers' Raw data

Ses.	Subj	Var	Qual	Prior Price	Round 1 Encounter			Round 2 Encounter			Round 3 Encounter					
					Subj	Verify	Post. Price	Buy	Subj	Verify	Post. Price	Buy	Subj	Verify	Post. Price	Buy
1	S1	vi	74	80	B1	Y	80	Y	B2	Y	80	N	B3	Y	-	Y
	S2	vi	60	70	B2	Y	70	N	B3	Y	-	Y	B1	Y	70	Y
	S3	vi	15	15	B3	Y	15	Y	B1	Y	15	Y	B2	Y	10	Y
2	S4	vi	100	80	B4	Y	100	Y	B5	Y	100	N	B6	Y	100	N
	S5	vi	50	60	B5	N	-	Y	B6	N	-	Y	B4	N	60	Y
	S6	vi	55	50	B6	Y	55	Y	B4	Y	60	Y	B5	Y	60	N
3	S7	vi	25	37	B7	Y	37	Y	B8	Y	-	Y	B9	Y	37	Y
	S8	vi	75	70	B8	Y	70	N	B9	Y	75	Y	B7	Y	-	Y
	S9	vi	50	50	B9	Y	50	Y	B7	Y	-	Y	B8	Y	60	N
4	S10	vi	20	60	B10	N	-	Y	B11	N	30	N	B12	N	20	Y
	S11	vi	40	90	B11	Y	90	Y	B12	Y	80	N	B10	Y	80	N
	S12	vi	40	40	B12	Y	40	Y	B10	Y	-	Y	B11	Y	-	Y
5	S13	vi	80	70	B13	Y	70	Y	B14	Y	70	Y	B15	Y	80	N
	S14	vi	50	40	B14	Y	50	Y	B15	Y	-	Y	B13	Y	-	Y
	S15	vi	70	80	B15	Y	80	Y	B13	Y	75	N	B14	Y	80	Y
6	S16	vi	80	80	B16	Y	90	Y	B17	Y	90	Y	B18	Y	85	N
	S17	vi	70	60	B17	N	-	Y	B18	N	70	Y	B16	N	70	Y
	S18	vi	60	50	B18	N	-	Y	B16	N	60	Y	B17	N	60	N
7	S19	vu	46	40	B19	Y	47	Y	B20	Y	47	Y	B21	Y	-	Y
	S20	vu	55	51	B20	Y	55	Y	B21	Y	55	N	B19	Y	55	Y
	S21	vu	32	20	B21	N	-	Y	B19	N	30	Y	B20	N	30	Y
8	S22	vu	63	60	B22	Y	65	Y	B23	Y	65	Y	B24	Y	65	Y
	S23	vu	9	9	B23	Y	10	N	B24	Y	-	Y	B22	Y	-	Y
	S24	vu	94	90	B24	Y	95	Y	B22	Y	95	Y	B23	Y	95	Y
9	S25	vu	2	25	B25	N	-	Y	B26	N	20	N	B27	N	20	N
	S26	vu	33	30	B26	Y	35	N	B27	Y	-	Y	B25	Y	35	N
	S27	vu	73	65	B27	Y	70	Y	B25	Y	70	Y	B26	Y	75	Y
10	S28	vu	44	40	B28	Y	45	Y	B29	Y	-	Y	B30	Y	40	N
	S29	vu	87	90	B29	Y	90	Y	B30	Y	85	N	B28	Y	90	Y
	S30	vu	64	60	B30	Y	55	Y	B28	Y	65	Y	B29	Y	65	Y
11	S31	vu	25	30	B31	Y	25	Y	B32	Y	25	Y	B33	Y	25	Y
	S32	vu	79	75	B32	Y	80	Y	B33	Y	80	Y	B31	Y	80	Y
	S33	vu	5	15	B33	Y	10	N	B31	Y	-	Y	B32	Y	10	N
12	S34	vu	11	20	B34	N	-	Y	B35	N	-	Y	B36	N	10	Y
	S35	vu	34	30	B35	Y	40	N	B36	Y	35	Y	B34	Y	35	Y
	S36	vu	56	50	B36	Y	55	Y	B34	Y	55	Y	B35	Y	60	Y
13	S37	ni	70	80	B37	Y		N	B38	Y		Y	B39	Y		N
	S38	ni	30	50	B38	Y		Y	B39	Y		Y	B37	Y		Y
	S39	ni	50	60	B39	Y		N	B37	Y		N	B38	Y		Y
14	S40	ni	40	49	B40	Y		Y	B41	Y		N	B42	Y		Y
	S41	ni	90	90	B41	Y		N	B42	Y		N	B40	Y		Y
	S42	ni	28	56	B42	Y		Y	B40	Y		Y	B41	Y		N
15	S43	ni	60	65	B43	Y		Y	B44	Y		Y	B45	Y		Y
	S44	ni	0	50	B44	Y		Y	B45	Y		Y	B43	Y		Y
	S45	ni	45	60	B45	Y		Y	B43	Y		N	B44	Y		N
16	S46	un	52	50	B46	Y		Y	B47	Y		Y	B48	Y		N
	S47	un	6	30	B47	Y		N	B48	Y		Y	B46	Y		Y
	S48	un	18	35	B48	Y		Y	B46	Y		Y	B47	Y		Y
17	S49	un	73	65	B49	Y		Y	B50	Y		N	B51	Y		Y
	S50	un	91	75	B50	Y		N	B51	Y		N	B49	Y		Y
	S51	un	56	60	B51	Y		Y	B49	Y		Y	B50	Y		N
18	S52	un	37	45	B52	Y		Y	B53	Y		Y	B54	Y		Y
	S53	un	67	65	B53	Y		N	B54	Y		N	B52	Y		Y
	S54	un	23	50	B54	Y		Y	B52	Y		Y	B53	Y		N

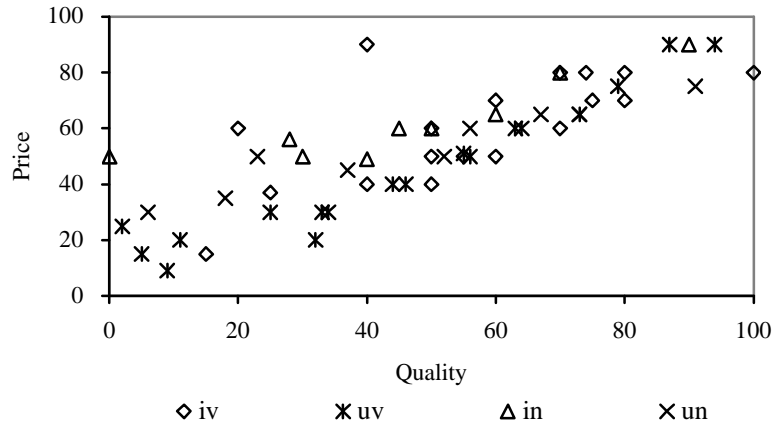


Figure II. Price Quality Relationship

Following Guerra [2002] this analysis uses the concept of percentage of total pie demanded as a proxy to test the pro-attitude of sellers to buyers. This pro-attitude encompasses several effects, such as honesty, inequality aversion, trust-responsiveness and fairness concerns. Percentage of total pie demanded assumes that the seller calculates a pie to be divided, and demands part of this pie through his posted price. In this experiment the pie size is given by $2 \times q$ (the amount a buyer would receive if the seller offered his good at a price of 0) minus $\frac{1}{2} q$ (the cost of producing the good). The size of the demand is given by the price offered (what the seller would receive from the transaction) minus $\frac{1}{2} q$ (the cost of producing the good). There were no significant differences across treatments in regards to this measure. Sellers demanding more than 100% of the pie were considered to be “deceivers”. There was a mildly significant reduction in the rate of deception when verification was available (mean deception in prior offers was 33.3% for the n treatments, and 13.9% for the v treatments; $F(1,50)=2.74$; $p=0.10$).

B. Buyers

Buyers were significantly more likely to buy when verification was available (buying rate 76.9% under v , and 64.8% under n ; $F(1,48)=4.22$; $p=0.046$). This result supports the argument in favour of the use of verification to promote efficiency, as it helps to realise potential gains from trade. Age and sex also affected significantly the buying rate (age: $F(1,48)=14.93$; $p=0.000$; sex: $F(1,48)=9.42$; $p=0.004$). The buying rate decreased with age, and was lower for women than for men (62.5% for females, 81.1% for males). This may reflect an increased degree of risk aversion for females and more mature participants.

Buyers did not always use verification (verification rate was 81.5% in *vu* and 74.1% in *vi*, not significantly different from one another, but significantly different from 100%). Given that verification was costless, and that the information was valuable, economic theory would suggest that all buyers would verify. There are two theories that can provide explanations for this result: regret theory and trust-responsiveness. Under regret theory, buyers would be aware that by verifying they may lose the opportunity to lock in a good price, and if price were to be increased, the regret cost would be greater than any expected benefits from verifying. Under a theory of trust-responsiveness, the buyer wants to signal that he trusts the seller by not verifying upon him, and if the seller is expecting to observe this type of behaviour, he will respond by behaving in a trustworthy manner [see Bacharach, Guerra and Zizzo, 2001].

C. Crowding Out Trust

As discussed above, game theory predicts that prior price should be greater or equal to the posterior price. An increase in posterior prices would therefore point towards an attitudinal explanation for this non-equilibrium behaviour. This study argues that, if observed, this phenomenon would suggest that verification is perceived to be reducing trust or another pro-attitude factor, as suggested by Pettit [1995]. An increase from prior price to posterior price could then be explained as a form of punishment or a compensation for reducing opportunities of trust (or displaying distrust). This will also be true for an increase in the percentage of the pie demanded from prior to posterior.

An initial comparison of prices for the *v* treatments show no significant difference from prior to posterior (mean prior price 52.28, mean posterior price 54.28, $F(1,34)=1.88$; $p=0.179$, with Huynh-Feldt correction). The difference in percentage of total pie prior against posterior is also insignificant. However, by analysing the behaviour of honest sellers only (those that chose a percentage of total pie prior of less than 100%), it is found that there is a significant increase in both prices and the proportion of the pie demanded. Mean prior price for honest sellers was 53.94, and mean posterior price 58.25, $F(1,29)=22.3$; $p=0.000$, with Huynh-Feldt correction. Average demand of total pie was also significantly increased from 31.2% prior to 34.9% posterior; $F(1,29)=12.81$; $p=0.001$, with Huynh-Feldt correction. The difference

in prices then show a significant increase from prior to posterior price for honest sellers. It is very interesting that honest sellers are the ones willing to punish buyers. This result strongly supports the theory of punishment or compensation for a reduction in trusting opportunities, as honest sellers are the only ones adversely affected in their “honour” by being verified upon.

In addition to the clear result in increased posterior price, a between-effects regression was conducted to explore which factors contributed to the change in proportion of pie demanded by honest sellers. The analysis began by estimating a catholic model with many explanatory variables. There was an iterated elimination of variables that failed to pass a significance test, under a significance level of 0.05, reintroducing eliminated variables to test for revivals of significance. Table III shows the results of the first, the second to last and the final iteration.. Percentage of total pie prior (the proxy for honesty), and a dummy variable for economics students were the survivors, with the dummy for involvement treatment in the second to last iteration being mildly significant ($p=0.129$). The model obtained from the final iteration has an overall R^2 of 0.65.

Table III: Change in % of Pie Demanded: Estimate of Catholic Model

<i>Variable</i>	<i>Initial Iteration</i>			<i>Second to Last Iteration</i>			<i>Final Iteration</i>		
	<i>Coef.</i>	<i>S.e.</i>	<i>P</i>	<i>Coef.</i>	<i>S.e.</i>	<i>p</i>	<i>Coef.</i>	<i>S.e.</i>	<i>p</i>
<i>Const</i>	0.2047	0.3498	0.565	0.2792	0.0294	0.000	0.2943	0.0290	0.000
<i>%TPprior</i>	-0.8325	0.1007	0.000	-0.8441	0.0787	0.000	-0.8399	0.0806	0.000
<i>Age</i>	0.0025	0.0072	0.736						
<i>Male</i>	-0.0013	0.0299	0.965						
<i>Invol</i>	0.0268	0.0297	0.377	0.0342	0.0219	0.129			
<i>Stud</i>	0.0442	0.2129	0.838						
<i>Grad</i>	-0.0329	0.0607	0.594						
<i>Econ</i>	0.0676	0.0445	0.145	0.0675	0.0305	0.035	0.0713	0.0312	0.030
<i>Socsci</i>	-0.0176	0.0627	0.782						
<i>Hum</i>	-0.0135	0.0633	0.833						
<i>Sci</i>	-0.0060	0.0607	0.923						

The behaviour of the resulting model is shown in figure III. In the case of economists the line shifts upwards (for any given level of honesty, economists change in pie demanded is greater than other subjects. It is important to notice that one of the surviving explanatory variables is the defined proxy for honesty (or rather dishonesty, as the higher the initial demand of pie, the less concern for others is exhibited). The

relationship obtained is the expected under the trust removal hypothesis, where the required compensation (or imposition of punishments) is greater the more honest (or trustworthy) the behaviour exhibited by the subject is.

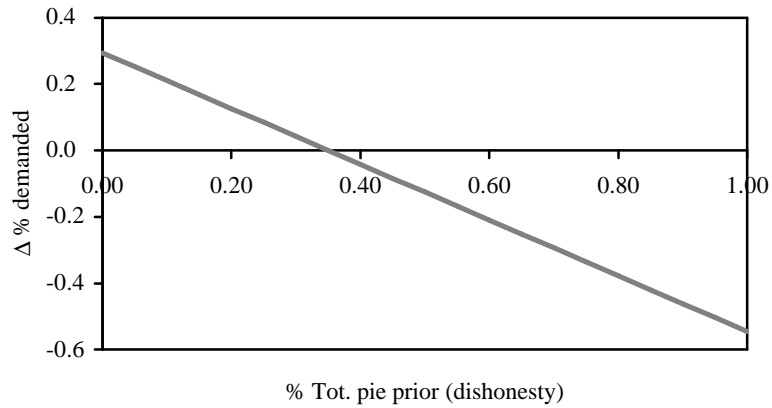


Figure III: Change in pie demand as a function of prior demand

VI. Conclusion

Trust is a fundamental part of our daily economic activities; it helps realise potential gains from trade and promotes growth. However, some agents abuse trust and cause harm to individuals a societies by deceiving and generally, violating trust. The use of verification, certification, screening, sanctions and other forms of market controls have been suggested and implemented to control this, and are generally viewed as perfect remedies against dishonest behaviour. By providing useful information to detect impersonators and deceivers, they are perceived as faultless aides. Even though they are useful to detect and deter dishonest characters, these controls can have harmful effects in honest individuals, by taking from them the opportunity to be trusted. This often ignored effect can in extreme cases dominate any possible benefit that the control provide.

Using an experiment, this study investigated the effect of verification in the behaviour and attitudes of individuals, and more specifically of honest individuals. Verification did produce an increase in realised transactions, proving that is can be a powerful tool to promote commerce. However, verification produced peculiar effects on honest sellers. They behaved in a penalising manner when subjected to it. This study corroborated what had only been conjectured in the past: that the reduction of opportunities to trust can have negative effects on individuals.

This analysis demonstrated that individuals are willing to punish or seek compensation from those that take trust opportunities from them. It also demonstrated that this effect is greater the higher the degree of trustworthiness that the trustee had exhibited.

These results raise important issues for regulators or decision makers in general that are planning to introduce verification or similar types of market control. An assessment of the possible negative impact of verification should be taken into consideration to ensure that the benefits are greater than the costs.

Appendix

The instructions were presented on screen and were also provided in paper to subjects. The instructions below have the treatment specific sections (three in total) marked with numbered brackets. To create the instructions as seen by subjects it is necessary to put the brackets for the desired treatment in the appropriate place.

INTRODUCTION

In this experiment there will be two roles for making decisions: BUYERS and SELLERS. The decisions will be rewarded with points. At the end of the experiment points will be exchanged for money, at the rate of 2 pence per point. You may earn money, but you may also in some circumstances lose part of your initial money.

SELLERS

Sellers will make a product with quality level between 0 and 100 units [1 *u* (Sellers will be assigned a fixed quality level by the computer, and will be charged 1/2 point per quality unit assigned, only if the product is sold).] Once a Seller knows his/her quality level, he/she will proceed to choose a price (between 0 and 100 points) at which to offer the product. The price will be shown, one at a time, to the buyers, who will then decide whether to buy the product or not.

BUYERS

Buyers will be shown the price chosen by the seller and will then decide whether to buy the product at that price, [2 *v* get a report (at no cost) about the quality of the product offered,] or walk away. If they choose to buy, they will be charged the price and will receive the product. [3 *v* If they choose to see a report, they will be told the quality level of the product, and the seller will have a chance to change the price (to increase it, decrease it or leave it unchanged), knowing that the buyer chose to see the report. The buyer will then decide whether to buy the product or not.] Each buyer will be paired with all sellers, one at a time, to make these decisions.

At the end of the experiment (only) one of the pairings will be chosen at random. If the buyer chose to buy the product from the seller in the chosen pairing, the buyer will receive 2 points for each quality unit of the product, otherwise he/she will receive nothing. Additionally, the buyer will have to pay the price of the product.

[1 *i* (Sellers will first choose a quality level, and will be charged 1/2 point per quality unit chosen, only if their product is sold).]

[2 *n*]

[3 *n*]

BREB Unit, Department of Economics, University of Oxford
Wolfson College, University of Oxford

References

- Akerlof, George A., "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism", *Quarterly Journal of Economics* LXXXIV (1970), 488-500
- Arrow, Kenneth J., *Essays in the Theory of Risk Bearing*, (Netherlands, North-Holland, 1971)
- Baron, Jonathan, "Trust: beliefs and morality", in A. Ben-Ner and L. Putterman, eds., *Economics, Values and Organization*, (UK, Cambridge University Press 1998), 408-418
- Bacharach, Michael O. L. and Gambetta, Diego, "Trust as Type Detection", in C. Castelfranchi and Y. H. Tan, eds., *Trust and Deception in Virtual Societies*, (Dordrecht, Kluwer Academic, 2001)
- _____, Guerra, Gerardo A., and Zizzo, Daniel J., "Is Trust Self-Fulfilling? An Experimental Study", University of Oxford, Department of Economics Discussion Paper 76, 2001
- Croson, Rachel T. A., "Information in Ultimatum Games: An Experimental Study", *Journal of Economic Behavior and Organization* XXX (1996), 197-212
- European Commission, *Trust enhancing initiatives in electronic commerce: A comparative analysis*, the European Commission, DG XXIII, 1999
- Falk, Armin and Fischbacher, Urs, "Distributional consequences and intentions in a model of reciprocity", *Annales d'économie et de statistique* LXIII (2001), 111-129
- Forsythe, Robert, Kenan, John, and Sopher, Barry, "An Experimental Analysis of Strikes in Bargaining Games with One-Sided Private Information", *The American Economic Review* LXXXI (1991), 253-278
- Gambetta, Diego, "Can We Trust Trust?", in D. Gambetta, ed., *Trust: Making and Breaking Cooperative Relations*, (Oxford, Basil Blackwell 1990), 213-237
- Guerra, Gerardo. A., "Certification Disclosure and Informational Efficiency: A Case for Ordered Ranking of Levels", University of Oxford, Department of Economics Discussion Paper 64, 2001
- _____, "Modelling Transactions With Ultimatum Games: An Experiment on Certification", University of Oxford, Department of Economics, Discussion Paper 87, 2002

- Güth, Werner., Schmittberger, Rolf, and Schwarze, Bernd, "An experimental Analysis of Ultimatum Bargaining", *Journal of Economic Behavior and Organization* III (1982), 367-388
- _____ and Tietz, Reinhard, "Ultimatum Bargaining Behaviour: A survey and comparison of experimental results", *Journal of Economic Psychology* XI (1990), 417-440
- Kagel, John H., Kim, Chung K. and Moser, Donald V., "Fairness in Ultimatum Games with Asymmetric Information and Asymmetric Payoffs", *Games and Economic Behavior* XIII (1996), 100-110
- Kollock, Peter, "The Emergence of Exchange Structures: An Experimental Study of Uncertainty, Commitment and Trust", *American Journal of Sociology* C (1994), 313-345
- Pettit, Philip, "The Cunning of Trust", *Philosophy and Public Affairs* XXIV (1995), 202-225
- Misztal, Barbara, *Trust in Modern Societies*, (MA, Polity Press 1996)
- Mitzkewitz, Michael and Nagel, Rosemarie, "Experimental Results on Ultimatum Games with Incomplete Information", *International Journal of Game Theory* XXII (1993), 171-198
- Rapoport, Amnon and Sundali, James A., "Ultimatums in Two-Person Bargaining with One-Sided Uncertainty: Offer Games", *International Journal of Game Theory* XXV (1996), 475-494
- _____, _____, and Seale, Darryl. A., "Ultimatums in Two-Person Bargaining with One-Sided Uncertainty: Demand Games", *Journal of Economic Behavior and Organization* XXX (1996), 173-196
- Roth, Alvin E., "Bargaining Experiments", in J. Kagel and A. E. Roth, eds., *Handbook of Experimental Economics*, (Princeton University Press 1995), 253-348
- Sako, Mari and Helper Susan R., "Determinants of trust in supplier relations: Evidence from the automotive industry in Japan and the United States", *Journal of Economic Behavior & Organization* XXXIV (1998), 387-417
- Sobel, Joel, "A Theory of Credibility", *Review of Economic Studies* LII (1985), 557-573
- Straub, Paul G. and Murnighan, J. Keith, "An Experimental Investigation of Ultimatum Games: Information, Fairness, Expectations, and Lowest Acceptable Offers", *Journal of Economic Behavior and Organization* XXVII (1995), 345-364
- Thaler, Richard H., "The Ultimatum Game", *Journal of Economic Perspectives* II (1988), 195-206
- Viscusi, W. Kip, "A note on 'lemons' markets with quality certification", *The Bell Journal of Economics* IX (1978), 277-279