How Firms Can Build Trust When Products Have Hidden Characteristics

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Abstract
A potentially large problem in some markets is that low trust occurs between consumers and firms where product quality and the firm's time frame are difficult to discern. The paper employs a simple heuristic model that seeks to explain under what circumstances firms will seek to build a reputation for honesty—or "cut and run" with short-run profits. The contributions here are two: First, to expand on the idea that firms can build a reputation by confessing a defect (or otherwise sacrificing short-term profits) and two, to emphasize how the time frame of the firm plays a critical role in whether or not it will be honest. The paper explains how trust in these markets can be improved as the time frame lengthens.

I. Introduction

Firms sometimes have enticements to place short-term profits ahead of consumers' best interests in what has been called "opportunistic" behavior. This can occur in situations where the product's quality is difficult to assess or where firms have little at stake in the long run. But Gordon Tullock (1985) concluded that the problem of opportunistic behavior was actually dispensed with by Adam Smith himself, through what Tullock summarized as the "discipline of continuous dealings." Merchants will lose a valuable asset—their reputation—if they shortchange their customers.

However, Tullock neglects to mention another quote by Smith in his *Lectures on Jurisprudence:* "Where people seldom deal with one another, we find they are somewhat disposed to cheat, because they can gain more by a smart trick than they can lose by the injury which it does to their character" (cited in Shearmur and Klein, 1987, p. 33). Shearmur and Klein also note that the logic of repeat dealings was "limited in scope" as far as Smith was concerned, although they proposed other ways to ascertain whether firms are trustworthy, such as voluntary institutions and personal interactions (Shearmur and Klein, 1987, p. 33).

When product quality is difficult to discern at the point of purchase, firms may struggle with the decision of whether to disclose the truth about a product problem, particularly if that disclosure carries a high opportunity cost in lost profits. Consumers may not know the questions to ask, either. Both can lead to sharply lowered trust on the part of consumers when the firm hides the problem.

An example is whether or not car rental agencies should disclose to their customers that the car they are renting has been recalled over a manufacturing defect. Currently agencies may legally rent these vehicles as is, and it is up to them to decide when or if the vehicles should be fixed at the dealer (Jenson, 2011). Some, such as Enterprise, have a company policy not to rent recalled vehicles if they involve "the risk of sudden loss of control, safety-restraint failures or fire hazards," whereas other agencies have not publicly made known their policies but have recently been requested to do so by the National Highway Safety Administration (Jenson, 2011). Clearly, the agencies have wrestled with what information to disclose to their consumers because recall information (or discounts on those affected cars) is not offered to consumers as part of their renting experience.

A second everyday example is when a repairman fixes a complex household product and is in an excellent position to take advantage of his customer. Roofs, hot water tanks, circuit boxes, underground sprinkler systems, and household appliances are good examples of cases in which customers are often at the mercy of the repairman's honesty because of the product's location or complexity. Say a customer's dishwasher breaks and the hidden problem is an inexpensive switch. Upon inspection, the repairman is faced with an opportunity to lie and tell the customer that a motor is broken. By repairing both the motor and the switch to cover his tracks, he might earn hundreds of dollars more in labor and equipment charges. He

will have to decide if the extra money from the deception is worth the opportunity cost of a possible improvement in his reputation—which could eventually lead to more business. After all, we often trumpet to our friends the actions of a business that was in the position to take advantage of us and instead charged us a surprisingly nominal fee.

Building long-term trust between firms and consumers in these circumstances is an old problem, and previous literature has explored various mechanisms for solving it using warranties, advertising, and sunk costs, as will be discussed later in this paper. But the literature typically misses the firm's tension involved in these cost-benefit decisions because the time frame is generally assumed to be short (in which case regulation is the preferred fix) or long (in which case market self-regulation is preferred). A product with hidden characteristics presents two potential income streams for the firm: the first road builds income through investing in reputation, and the second road builds income through shortchanging the customer and then leaving the market. Which action is taken as a profit-maximizing strategy involves the time frame of the company as well as the perceived returns to their reputation upon fixing these defects.[1] In addition, the firm faces a difficult task of convincing a customer that it has taken the high road—investing in the long term—when the product is difficult to evaluate.

The focus of this paper is to hypothesize that firms selling products with hidden characteristics can publicly signal that they will *sacrifice* profits in the short run to *directly serve* their customers' (and the firms') long-term interests. In other words, when faced with a "win-lose" or a "lose-win" scenario vis-a-vis consumers (say, spending money on quality or repairing a hard to spot defect), I hypothesize that the firm can build its reputation and brand by absorbing the short-term loss as an investment, i.e., by choosing to "lose" in the short run, even as their customers "win." I argue that this more personal approach of firms directly benefiting customers at their own

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[1] If a firm hides defects, it must also build in expected losses to its reputation and company value upon being discovered, but this additional complication is not explicitly modeled in this paper and does not change its conclusions in any case. In addition, firms could conceivably fake a defect and then pretend to fix it. This too is laid aside for the purpose of this paper for simplicity and because in many cases the transaction costs of faking a fix would be very high.

expense is important for building trust between the company and the customer and will ultimately lead to "win-win" outcomes for both parties.

This notion seems to date back centuries. Stringham (2001, p. 336) reported that in 17th century Amsterdam, novice traders with little or no reputation in the world's first stock exchange were advised in a book by a stockbroker to trade in options until they earned a reputation for "generosity" as well as foresight with their customers. A more recent study indicated that companies that pre-emptively and voluntarily took blame for "negative events" affecting the company had significantly higher market capitalization a year later (Lee, et. al., 2004). But there appears to be no explicit explanation anywhere in the existing literature of how reputation is built when the firm's time frame is unknown to customers. This problem is especially apparent with brand-new firms selling goods with hidden characteristics. For example, lifetime warranties mean little to customers when a firm is only, say, six months old and they have not observed the firm making good on its promises.

This paper seeks to build a cost-benefit framework that illustrates the tension some firms face between maximizing short-term profits by shortchanging customers and investing in their long-run reputations and thus building long-term profits. Using this framework helps illustrate where firms might be more likely to deceive customers if their time frames are short. However, it also shows another dimension—how companies with a long-term horizon can provide credible information to customers that both of their interests are aligned. Other research has also shown that advertising, price premiums, and conspicuous sunk costs can build trust in these markets as well (Klein and Leffler, 1981; Shapiro, 1983).

Although regulation appears to be "the quick fix" to some, there are other reasons to be skeptical of its usefulness in markets with hidden product information. First, regulators rarely (if ever) anticipate the next problem; their actions occur in reaction to it. A good example is the 2010 BP Gulf oil spill. The typical pattern began with a media alert to a product design failure, followed by public anger and outrage at the company, and then Congressional calls for new regulations. Second, agencies such as the Food and Drug Administration (FDA) and the Securities and Exchange Commission (SEC) must then shoulder an enormous and complex job in designing and enforcing these regulations. During a "product quality

crisis," a government agency is often blamed for its lack of intensive anticipation, but this is frequently inevitable when there are tens of thousands of products to monitor. As Dudley (2011) notes, with hundreds of new regulations enacted each year, the job of enforcing them becomes increasingly expensive. Third, if we envision each regulation as a symbol of a new area of broken trust between the public, government, and business, then each one also symbolizes further erosion in social capital. Like a neighborhood that experiences a single break-in and then builds a security gate and hires armed guards, regulations create enormous opportunity costs in terms of resources that must be siphoned away from productive uses, such as investment and innovation, for monitoring and compliance. Various studies show a correlation between low social capital and relatively lower GDP growth rates, making this a growing concern (Fukuyama, 1996; Knack and Keefer, 1997; Berggren and Jordahl, 2006). Fourth, Congress is much better at passing new laws than enforcing them. For example, the 2010 Dodd-Frank Wall Street reform law established that the SEC should regulate complex derivatives and asset-backed securities. It requires 387 rules from 20 different agencies, some of which "pit regulator against regulator"—and the SEC says the resources are too limited for it to do its job competently (Riley, 2011).

This paper proceeds as follows. First, I provide a literature review of some of the more important articles written on the problems and remedies of asymmetric information while indicating some shortfalls in the existing literature. Second, I examine the 18th century viewpoint and insights of Adam Smith to more fully understand the importance of brands today. Third, I construct a cost-benefit model of reputation building, using an example of defective used cars to delve into the question of whether and when the used car seller should be honest about the defect, even though it will cost him money. I also explore an example using a company selling inferior medical devices. Last, I suggest some practical solutions to these problems using free market incentives in place of burdensome regulations.

II. A Long Run and a Short Run, but No Middle Run: A Brief Literature Review

George Akerlof's famous 1970 article on lemons in the used car market was intended to be an allegory about the problems inherent in

a market where consumers have difficulty assessing product quality and firms care little about their reputation. He surmised that under these conditions, sellers of good-quality used cars would withhold them from the market because they would not get their sought-after price. Akerlof's conclusion, using strong assumptions, was that under these conditions markets could fail to develop. He did acknowledge that in some cases brand names, licensing, and guarantees could help ameliorate the problem but suggested "markets could suffer" where those conditions were weak or did not exist (Akerlof, 1970, p. 500).

His paper is one of the most cited in all of economics, probably because of its unsettling conclusion: it seems to upend the notion of Adam Smith's invisible hand guiding self-interested buyers and sellers to mutual gains through trade. The paradoxical insight of the invisible hand depends on the free flow of information between the two parties—each knows what the other is offering in a market trade, and competition ensures that sellers please buyers. However, in Akerlof's world, when sellers know more than buyers about the product for sale, they may suddenly flip toward advancing their interests *at the expense of the buyer*. Now the seller can pass along defects, inferior design, or other flaws to the buyer and make even more money. The invisible hand seems to have been transformed into an invisible claw.

Free market advocates replied to Akerlof's article with many counter-arguments, particularly critiquing his lack of focus on the long run. Klein (2002) persuasively argued that markets with low trust create an opportunity for a new market dealing in information about product quality. This market consists of a "demand for assurance" and a "supply of assurance." Klein pointed out an exhaustive array of information mechanisms to fill the void of low trust, such as community word of mouth, public accolades, independent reviews, brands, and private certification firms, to name a few. Stringham (2002, 2003) further used evidence from stock markets in 17th century Amsterdam and 18th century London to demonstrate that traders in financial markets used their reputations to enforce contracts without state regulations.

Bernauer and Caduff (2006, p. 88) explored how brands help alleviate "trust deficits" by accomplishing two things: first, they shield firms from safety problems caused by other firms and may even increase market share because a brand raises the level of accountability across the market. Second, by adopting a brand, the company actually *increases its risk* if it moves from individual brand

products to an association with the entire firm as a brand (Bernauer and Caduff, 2006, p. 89). If there is a faulty product in just one product line, the entire brand risks damage and a corresponding stock devaluation. This risk supplies the product assurance that Klein refers to for the consumer and again overcomes trust deficits when consumers are faced with a wide array of unfamiliar products. For example, if Sara Lee puts its name on a new type of muffin, consumers are more apt to try it than an unknown brand.

Firms' use of brands also may lead them to adopt higher safety standards than are required by government-set standards. By adopting tougher standards, they gain trust with government regulators and even buy political legitimacy and goodwill. On the other hand, low trust-low value relationships are "doomed" according to Singh (2005, p. 41). O'Driscoll and Hoskins (2006) further suggested that firms risk harming their reputation—which is costly to acquire, easy to damage, and the source of long term profits. At stake is not only accumulated value from past dealings but also "the present discounted value of the gains from successive promise keeping" (O'Driscoll and Hoskins, 2006, p. 474). However, neither Singh nor O'Driscoll and Hoskins point out that what is also at stake is the present discounted value of the gains from *not* keeping promises, which is the approach of this paper. Richardson, Hall and Madjd-Sadjadi (2010) proposed using private health information bureaus (HIBs) akin to credit bureaus to provide universally compatible and trusted electronic medical records instead of creating a new government entity.

But what about firms with a short-term perspective? After all, take away the assumption of a long-term time frame, keep asymmetric information intact, and all these conclusions collapse because they depend upon a firm valuing (and even treasuring) the building of its reputation. Indeed, Posner (cited in Lynch et al., 1986, p. 8) points out two situations in which "misrepresentation" of a product is substantial: first, if the product is costly or infrequently purchased and has an important characteristic that is not easily inspected; second, if the product, regardless of cost, has an important characteristic that "may remain hidden to the consumer throughout a long period of use. This is what he refers to as a "well-hidden characteristic." Thus, both of these issues noted by Posner may result in market failure, e.g., misrepresentation, if the firm's time frame is shorter than the life of the product. Lynch (1986, p. 12)

acknowledges that products with hidden characteristics are "surely more important for consumer protection policy" but leaves these types of products aside in his analysis, choosing to study "experience goods," or goods with repeat purchases, in his study of how firms build reputation and value. But again, that assumes that firms always operate in the long run and ignores the impact that a firm's time frame has on its decision to invest in its reputation versus misrepresenting its products and making more short-term profits.

When the time frame changes, it induces markedly different behavior on the part of the firm, as has been explored at length in game theory applications. For example, in one-shot games the likely outcome is cheating, but as the time frame lengthens, cooperation and reciprocity become rational strategies (Hirschliefer, 1999; Kreps et al., 1982; Tullock 1985; Axelrod and Dion, 1988). However, the implications of *how and why* time frames could be changed is generally not discussed. In a collection of thirty-six economics articles about trust edited by Khalil (2003), none discuss the reasoning behind a firm's choice of time frame, and most ignore the question altogether. Rather than being fixed at "long run" or "short run," the firm's time frame likely depends on the individual entrepreneur's personality, age, personal discount rate, and cultural background, among other factors. Thus, the distribution of firms' time frames more likely resembles a bell curve of some kind.

III. A Heuristic Model for Reputation-Building

The simple cost-benefit framework developed in this paper assumes the firm has a defective (or inferior) product it plans to sell, and this defect is unknown to consumers. The critical question it faces is: Does it plan to reveal or not reveal the product defect as a business strategy? A key point here is that each path has its own marginal costs and benefits, and the path chosen is dependent upon how long the firm plans to stay in business.

On one hand, if the firm does not reveal defects as a profit maximizing strategy, then let us call the sales to consumers "*adversarial transactions.*" It is the land of "let the buyer beware" because buyers will find themselves with products that are inferior or not performing as advertised and regret the purchase when they discover this. If firms have a short-term time horizon, they have an incentive to deceive the customer and make profits by selling these kinds of products.

On the other hand, if the firm finds it profitable to reveal the product's true limitations, then let us call this a *mutually beneficial* transaction. This is the land of the "invisible hand" that Adam Smith envisioned. Here, I mean buyers and sellers walk away, pleased with the transaction. There is no buyer's remorse because all known defects or liabilities known to the seller were also made known to the buyer prior to the purchase. For a firm looking forward to the future, the net gains from each choice vary according to the time frame selected. This is what makes the time frame so critical to the analysis.

The model is based on a hypothesis: In a market where product quality is difficult to discern, when a dealer reveals a product defect (or makes some other publicly known financial sacrifice) he earns some trust and builds his reputation among future buyers. This is a way to communicate his commitment to the long term in the face of potentially skeptical buyers. The size of the short-term sacrifice (i.e., investment) indicates the level of long-term commitment and is directly correlated with reputation building and the strengthening of the brand. The reputation of a firm can thus be seen as a stock of value that grows with short-term investments on the part of the firm and that yields long-term returns. For the firm, the size of those reputational returns must be *balanced* against the losses of fixing the defect or improving the inferior product.

We might suppose that business ethics would also lead firms away from adversarial transactions. Adam Smith (1759) noted there were principles in human nature, such as pity, compassion, duty, and benevolence, that served as a check on opportunistic behavior. But various psychological studies have shown that people range in their sensitivity toward others' feelings. For example, Davis (1983) found in a study of 677 males and 667 females that empathy has multiple dimensions; he used an index to measure the ranges in sensitivity toward others. The point here is that evidence is strong that humans range from very high to very low levels of "fellow-feeling," as Smith (1759) called it. In other words, consumers shouldn't be surprised if some individuals take advantage of them despite the moral checks as posited by Smith. Indeed, this is the frequent characterization of businesspeople in films, where plots hinge on the firm making profits at the customer's expense. Ribstein (2005) argues that these films have a persuasive power that "tips the political balance towards regulation."

In the simple model developed below, I assume the caricature of a homo economicus who maximizes profits without a conscience. In addition, in another nod to assumptions made by market critics, I assume acquiring information on the product is difficult and/or extremely costly, but that like the Akerlof "lemons" model, the expected value of the product is known, which includes the possibility of purchasing a product with an unknown defect. I also assume high barriers to entry and that consumers do not relay information to each other about defective products. Lastly, the firm has no market value when the owner leaves it. In other words, the traditional disciplinary actions of market-informed consumers, owners with a "Smithian" sense of moral sympathy, strong competition, and transferable capital all have been eliminated.

These strong assumptions serve to darken the lines of the outer bounds of what might go wrong. *By assuming the worst, we can observe the worst possible outcome.* They also create clarity in the model by dispensing with the problem of how to measure the impact of business ethics in a firm's decision-making process. The following uses the case of used cars, which typically have some aspects of product quality that are difficult to evaluate. Like in Akerlof's model, the used car market is picked for its usefulness as a pedagogical example rather than its realism, but this time I focus on effect of changing the market's time frame as well as describing ways that trust is built in markets with hidden characteristics.

Used cars represent a step into the unknown for car buyers, who may not know the car's repair history or particulars of past ownership. As a result, buyers price this risk into their willingness to pay for used cars, which decreases the expected value, and therefore the selling price, for a given car. Let us call the buyer's expected value of the used car with potentially hidden defects $E(C_{Hide})$. Although used cars will have a distribution of potential undisclosed problems, let us suppose for purposes of illustration that a given firm sells one type of car per time period with a defect hidden from buyers that costs F dollars to fix. Its expected time frame to stay in business is equal to n time periods. I employ three perspectives to gather further insights: a) a simple mathematical treatment of the decision, b) an example using actual numbers in a table format, and c) a graph that illustrates the various outcomes.

A. The Role of the Discount Rate: A Simple Mathematical Approach

If the firm, say Flow Motors, has a company policy that preemptively and voluntarily fixes these defects (letting the customer know of this), then correspondingly its community-wide reputation for honesty increases over time, and the used car is more valuable to consumers as a result. Lower risk translates into higher expected value and higher market prices. Flow's reputation is expected to increase at a decreasing rate, in line with the law of diminishing returns. Put another way, risk will not drop to zero over time, but it will approach a new lower bound for firms with an excellent reputation. After all, there may be companies with sterling reputations, but no guarantee is 100 percent credible. A real-life example of this is the company CarMax, which has built a reputation for its rigorous inspection and reconditioning of used cars along with money-back guarantees. The company says it rejects nearly half of the cars brought as trade-ins for sale on its showroom floor. As a result, its prices tend to be higher than those of competing car dealerships (Glowicki, 2011).

But Flow may debate to itself whether or not to have an "honesty policy" because fixing the defects also lowers its short-term profits. If, for example, the owner has plans to sell the business in the next year, the future gains from reputation may not offset the current repair costs. Equation (1) illustrates Flow's choice as a decision at the margin, in terms of the total present discounted value of revealing defects minus the total present discounted value of hiding them. The issue for the firm is whether the change in profits will be negative or positive as a result of revealing defects. (I ignore the acquisition cost of the vehicle here for simplicity.)

Change in Profits = (profits from fixing defect) – (profits from hiding defect) =

$$\Delta\pi = \sum_{i=1}^{n} \frac{E(C_{Hide}) - F + REP_i(F)}{(1+r)^i} - \sum_{i=1}^{n} \frac{(C_{Hide})}{(1+r)^i} \quad (1)$$

Where:

$\Delta\pi$ = the present discounted value of the change in profits between revealing and not revealing defects after n periods,

$E(C_{Hide})$ = the expected selling price of a given used car, C_i, if a dealer does not reveal defects as a matter of firm policy, based on consumers' expected average cost of fixing a hidden defect after the sale,

r = the discount rate,

F = the dealer cost of fixing the automobile's defect (assumed to be the same in each time period),

$REP_i(F)$ = an investment function in which the reputational value of the dealer is added to a car's former price, $E(C_{Hide})$, boosting a customer's willingness to pay, and assuming it increases at a decreasing rate as both F and time increases; in addition, for simplicity, I assume no changes occur to reputation if defects are not revealed),

n = number of time periods a seller expects to stay in business, and

i = the ith time period.

Now set $E_i(C_{Reveal})$ equal to $E_i(C_{Hide}) - F + REP_i(F)$, the numerator in the first term above, where $E_i(C_{Reveal})$ = the expected revenue to the dealer after revealing defect in period i. This takes into account both the marginal cost of fixing the defect and the marginal revenue from the dealer's increased reputation (boosting the consumer's willingness to pay).

Equation (1) can be rewritten as (1′) below :

$$\Delta\pi = \sum_{i=1}^{n} \frac{E_i(C_{Reveal})}{(1+r)^i} - \frac{E_i(C_{Hide})}{(1+r)^i} \quad (1')$$

Alternatively, equation (1′) can be rewritten as below because both $E(C_{Hide})$ terms drop out upon simplification, which makes the marginal benefit-marginal cost decision to reveal defects more clear:

$$\Delta\pi = \sum_{i=1}^{n} \frac{REP_i(F) - F}{(1+r)^i} \quad (2)$$

Here the change in profits can be seen as a simple weighing of the two total discounted income streams: the first is from the building of reputation through fixing defects, and the second is from the opportunity cost of fixing the defect. When $\Delta\pi$ is < 0, the firm faces opportunity costs to revealing the truth equal to $(-)\Delta\pi$ and will

have an incentive to not reveal the defect, as company policy. (Unmeasured ethical or "sympathetic" tendencies on the part of the dealer may overcome this opportunity cost if it is low enough). As the time frame increases and n grows larger, the value of reputation increases (at a decreasing rate) and lowers the opportunity cost of telling the truth about the defect. In equation (1), when the first term equals the second, the firm is indifferent between revealing and not revealing defects. However, when the firm anticipates staying in business just a little longer, $\Delta\pi$ becomes > 0, and Flow's company policy *suddenly switches* to revealing defects on all its vehicles.

The equation also shows some other insights. As the cost of fixing the defect (F) grows, it implies that the firm may have fewer incentives to reveal defects because the net gains will get smaller or even become negative. Potentially, the benefits from reputation could never offset the cost of fixing the defect. In addition, an increased discount rate could shorten the time frame and lessen the payoff for fixing the defect because the long-term gains to reputation will shrink more rapidly, making the first term relatively smaller.

B. *Reputation and the Firm's Choices under Differing Time Horizons: An Illustration*

The previous equation highlights the importance of the discount rate in a firm's decision to cheat, but an example using actual numbers helps illustrate some of the more subtle decision points for the firm under different time horizons. Because the emphasis below is on examining the importance of time horizons on the switching point between revealing and not revealing defects, for expository reasons I assume the discount rate is zero and reputation builds at a steady rate until the 7th period. In Table 1 we can see a firm faces in each time period the "honest price" and the "dishonest price" and has a marginal return from being honest that can be either positive or negative in the last column on the top table. I assume that each time a firm reveals a defect and fixes it (here, set at F = $500), the firm's reputation for honesty grows. The value of the firm's reputation increases the "honest price" of the car, as consumers are willing to pay for lowered risk of product failure. Initially this somewhat offsets the firm's opportunity cost of being honest, as we can see in the first three time periods. By the 4th period/car, the honest price, due to the reputation premium, exceeds the dishonest price.

Table 1. The Decision to Reveal or Not to Reveal Defects

Cars (1 per time period)	Reveal defect			Don't reveal	Marginal loss/gain for being honest
	Revenue after fixing	Gains to firm reputation (t)	Honest price	Dishonest price	
1st	$4,500	$0	$4,500	$5,000	-$500
2nd	$4,500	$200	$4,700	$5,000	-$300
3rd	$4,500	$400	$4,900	$5,000	-$100
4th	$4,500	$600	$5,100	$5,000	$100
5th	$4,500	$800	$5,300	$5,000	$300
6th	$4,500	$1,000	$5,500	$5,000	$500
7th	$4,500	$1,000	$5,475	$5,000	$475
8th	$4,500	$1,000	$5,490	$5,000	$490
. . .	. . .	. . .	. . .	. . .	. . .
100th	$4,500	$1,000	$5,500	$5,000	$500

Cars (1 per time period)	Cumulative revenue or profit			Deceive?
	Honest dealer (reveal)	Dishonest dealer (don't reveal)	Net loss/profit from honesty	
1st	$4,500	$5,000	-$500	Yes
2nd	$9,200	$10,000	-$800	Yes
3rd	$14,100	$15,000	-$900	Yes
4th	$19,200	$20,000	-$800	Yes
5th	$24,500	$25,000	-$500	Yes
6th	$30,000	$30,000	$0	Maybe
7th	$35,475	$35,000	$475	No
8th	$40,965	$40,000	$965	No
. . .	. . .	. . .	. . .	. . .
100th	$546,965	$500,000	$46,965	No

Note: If firm's time frame is within the gray shaded area, defects are revealed on ALL cars because it begins building its reputation from the first time period onward.

But does the auto dealer reveal the defect at the 4th car if he plans on shutting down at that point (and not selling the business)? The answer is no. The reason is that the cumulative loss is still negative, at -$800 as seen in the lower table, column 4; in other words, the total losses from being honest with the previous three autos have not yet paid off. A time period = 4 means the owner will pursue a "cut and run" policy and not reveal the defect. Thus, importantly, the decision to reveal the defects is not made by comparing marginal returns but rather by comparing the future total income from both paths.

The "switch point" occurs at the 7th period. The firm's owner has now paid back his "investment" in revealing and paying for defects from all the previous cars at this point. Here the cumulative revenue is now $375, and the revenue past this time period will steadily increase. An interesting implication is that for any dealer planning to stay in business past the 6th period, *he will emulate an honest dealer by revealing defects from the first period, regardless of his personal ethical foundation.* In this way, the firm can immediately begin building profitable returns to investing in its reputation. The table illustrates how gains to a firm's reputation will increase over time, rising from $200 to eventually top out at $1,000 maximum. In this example, $1,000 is the highest premium a consumer would pay in the "market for assurance" as Klein (2002) puts it.

C. A Graphical Treatment

Figure 1 shows this concept of returns to reputation more generally, better illustrating the diminishing returns to reputation and the key decision point for the firm. As one can see, the decision to deceive the customer wholly depends upon whether or not the intersection point "X" is reached in terms of the firm's anticipated time frame. The vertical gap between TR (not reveal) and TR (reveal with reputational benefit) shows the cumulative opportunity costs the firm faces by revealing the product defect and is measured by distance "A(X)." The distance denoted "B" is the value added to the cars as the perceived reputational benefits of the seller grow. The intersection point "X" (where A = B) is the break-even point for revealing defects. (This is analogous to the earlier equation in which $\Delta\pi = 0$.) If a firm expects at time period zero to stay in business past the break-even point, even an ethically challenged firm will act *as if* it were ethical and reveal defects as firm policy from the beginning (at time = 0).
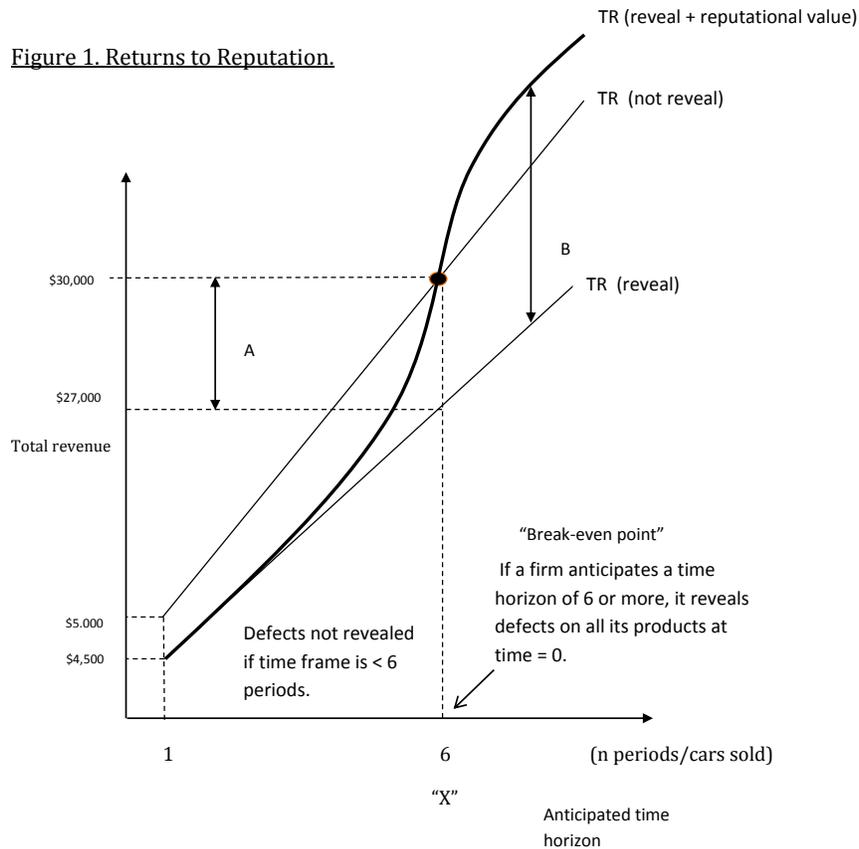
Figure 1. Returns to Reputation.

Figure 1: Returns to reputation.

At this point "X", the cost of fixing 6 cars × $500 = $3,000, so the firm makes only $27,000 in revenue instead of $30,000 if reputation were not considered. However, the growing value of the firm's reputation boosts the amount it can charge for each car (TR reveal with reputational benefit), so at X this total reputational value reaches $3,000, just offsetting the repair costs. Table 6 also shows this under the second column as the sum of the reputational values in periods 0 through 6; here, $200 + $400 + $600 + $800 + $1000 = $3,000. (Diminishing returns to reputation were ignored in the table for simplicity until the 7th period but displayed on the graph.)

Thus, a firm's willingness to bear and reveal large costs when defects are discovered reveals the time frame of the firm and its commitment to its customers. The size of the expense is a way the firm can "supply assurance" under the Klein framework, and the

amount of this assurance is correlated with the size of the expense. When the firm faces even higher opportunity costs for fixing defects, this means the TR (reveal with reputational benefit) shifts to the right. Necessarily the break-even point is thrust further into the future, which is a signal to consumers about the increasing length of the company's time frame and its devotion to making quality products. The actions of the firm in the face of these opportunity costs is a way to partly answer the question "How do firms build trust?" which is an empirical proposition that can be tested in future research.

D. Time Frames and Market Solutions

The time frame for a firm, n, is not a constant. It is a function of many factors, including the personal discount rate of the firm's owner and tax policies that affect the time frame of investment. Therefore, if a firm's time frame is less than X, as shown in Figure 1, its company policy will be to hide all defects for its units sold. But if government policies encourage the firm to expand its time frame to some period greater than X, that will cause the firm to reveal and fix defects. An alternative policy could focus on lowering the cost of fixing the defect, F, by, say, allowing more generous cost write-offs in these circumstances. Here, firms would need less regulation and become more likely to use their own resources to correct product defects in advance (although conceivably moral hazard problems could arise). In this case, the two TR curves would shift up by the same amount, bringing the break-even point X closer to the present. This would mean an increased probability of the firm revealing and fixing defects on its own rather than being forced to do so.

Market solutions could also cause positive upward changes in the TR (reveal with reputation) curve. A firm that "does the right thing" in revealing and fixing defects could be rated by a private agency using online customer reviews or paid reviewers, leading to an increase in the steepness of the curve. The reputation of the rating company would be developed in the same way as the auto dealership, by avoiding conflict of interest positions that might increase short term profits, such as being paid by the dealerships. Higher ratings would signify increased returns to the auto dealership for investment in reputation building. The firm's break-even point would come closer to the present and increase the probability of a given firm changing its company policy such that it reveals defects. As a result,

societal resources could be used for alternate and more highly valued uses than increased regulation of these markets.

As discussed in the literature review, Posner outlined special cases in which products with "hidden characteristics" might lead to market failure due to severe information asymmetry. Let us now take another concrete example that might entail a deeper threat to consumer safety and welfare. Suppose there is a case in which a heart pacemaker has been developed with a multimillion-dollar investment on the part of the firm, MedPace. After extensive testing, the firm's lab discovers the pacemaker's expected life is only 10 years. Yet it has obtained investor funding based on its former projections of an expected life of 15 years. Medical providers are lined up to buy the product. What does it do? Does it reveal the results of the testing and see a big loss for what it can charge? Or does it deal with the problem ten years down the road, when it may not even be in business? In these types of cases, it may be naïve to depend on the seller's ethics. For example, single-use medical devices are increasingly being used again to save costs, despite some evidence that patient health may suffer (Landro, 2008).

Let us assume MedPace is initially situated in the "adversarial zone," which is in a time period between 0 and "X" in Figure 1. With this time horizon, the revenues from not revealing the defect exceed the revenues from revealing it. This looks like a case for regulation or greater government oversight of this industry. Given its prospective time in the market, the firm's strategy would be to not reveal the defect in the medical device and harm consumers.

However, a less burdensome regulatory environment might make investment in the long term more profitable, moving the time horizon to the right—hopefully into the "mutually beneficial" zone past point X. In addition, tax policies that reward long-term investments will lower the probability that companies hide defects and instead think about burnishing their reputation with reputable products.

V. Conclusion and Policy Implications

This paper has shown that in some cases there is a tension within a firm between revealing and not revealing defects in hard-to-evaluate products. In those cases, some may see regulation as the vital corrective. However, as discussed in the beginning of the paper, the vast number of complicated goods—from medical devices to

financial products—makes it nearly impossible to monitor all products' safety. This model of reputation and brand building shows that firms can communicate their long-term commitment to consumers by sacrificing short-term profits in order to deliver high quality products. This short-term investment in reputation indicates by its size the likely length of time the firm plans to stay in business. Because over time nearly all products can be evaluated by consumers, a firm with a longer time frame is more likely to produce quality products. This is not to suggest that branding can in all places and times replace regulation but to show that potential trouble spots can be dampened or even solved through a market environment that encourages more firms to be invested in the long run.

Moreover, Higgs (1997) has hypothesized that "regime uncertainty" during the 1930s due to ever-changing government regulations led to a lack of investor confidence and a much longer recovery time from the Great Depression. This paper provides another and indeed complementary perspective to Higgs' analysis. Regime uncertainty could also lead to a fall in consumer trust as well as a tendency for firms to operate without regard to building reputation because their time frames are shortened. As a result, government regulations increase further, creating a downward spiral in social trust. Certainly this might also explain the sluggish recovery of the economy since the 2008 meltdown, with the enormous increase and uncertainty about regulatory burdens facing business, as noted by Dudley (2011).

It is also important to note that the model was created under a series of "worst-case assumptions" about market conditions to emulate the assumptions of a fierce market critic. When any of those assumptions are relaxed—entrepreneurs possess at least a dash of ethics, firms can be sold to others, market entry improves, or consumers get more information about the firm and its products— then problems regarding consumer trust and firm deception diminish substantially in these types of markets.

This paper has implications for tax policies and current or anticipated regulatory burdens, which currently incentivize firms toward short-term thinking. Lowering capital gains taxes will make long-term investments in building reputation relatively more attractive. Another idea could be to end accelerated depreciation of capital, which encourages a firm's short-term planning and may lead to more "cut and run" behaviors. By changing those types of policies

and lengthening firms' time frames, even so-called unethical entrepreneurs will find that in order to maximize profits, they will be far more likely to serve their customers in mutually beneficial ways, lessening the expenditures needed to both enact and enforce new regulations on business. Thus, there can be a "win-win-win" outcome for firms, consumers, and taxpayers in the long run.

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