A Theory of Government Regulation and Self-Regulation with the Specter of Nonmarket Threats

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Abstract

We develop a game-theoretic model wherein a government establishes a mandate for product quality without possessing effective enforcement abilities, and a firm chooses whether to comply with the government standard for quality. After bringing a product to market, the firm faces the possibility of nonmarket reactions by interests such as trial attorneys and consumer activists, who might sue in the case of product-induced damages or reveal the firm's quality choice to consumers through investigatory and publicity activities. Equilibrium results identify conditions under which firms will engage in meaningful self-regulation, by either voluntarily selecting a high quality standard for their product independent of government mandate, or by complying with a government mandate for high quality even though government lacks enforcement power. Our results have direct implications for how political actors might choose to regulate certain industries based on the market value of different products, the danger associated with various products, and the nature of the nonmarket environment.

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A Theory of Government Regulation and Self-Regulation with the Specter of Nonmarket Threats

In any industry firms choose the quality of their products, which in turn affects their production costs, the final price, and the benefits and costs to society as a whole. Consider the market for chainsaws, as an example. In bringing a chainsaw to market, a tool company makes an explicit decision about what types of safety features to incorporate into its design. Potential chainsaw users would likely prefer that the chainsaw be as safe as possible at a reasonable price; and, given the wide range of injuries that might result from using an unsafe chainsaw, society as a whole also likely benefits when safer chainsaws are brought to market. Despite these market and social preferences to create safe chainsaws, each additional safety feature increases the price of production, affecting the firm's market share and profits. Hence, a manufacturer faces a crucial tradeoff in choosing what safety features to incorporate into its product, (i.e., what quality of product to bring to market), given the price and profit consequences that come with quality selection. If the objectives of producers, consumers, and society are not tightly aligned, the quality standard that the producer chooses will diverge from society's most-preferred standard.

This logic suggests a potential role for government regulation in these contexts. A benevolent social planner could set and enforce standards to balance consumer and producer interests to maximize the benefits and minimize the costs to society. In reality, however, no such planner exists, as government standards are set through political processes. Policymakers are influenced by interest groups and face pressures of reelection and reappointment. Their decisions are often made with inaccurate information, and their enforcement mechanisms are seldom ideally suited to the task at hand.

Thus we are left to wonder: what are the causes and consequences of government regulation in such a complex environment? In particular, what choices do firms make in the

absence of regulation? How are such choices influenced by the information about product quality available to consumers? How are firms' choices affected by the specter of nonmarket threats, such as lawsuits and boycotts launched by strategic activists? And finally, given the incentives of businesses, and given their market and nonmarket environments, what is the role of government regulators?

As a first step toward answering these questions, this paper offers a model of industry self-regulation given the implicit threat of nonmarket reactions. We allow the most minimal role for government regulation, one in which the government chooses a high or low quality standard for products, yet lacks effective enforcement power. Upon receiving the government-set mandate, a firm makes its quality choice, which has direct implications for the prices that it charges for its product (and for the subsequent profits that it reaps). Finally, after the product is brought to market, various nonmarket actors (in the form of courts or consumer activists) potentially intervene in the marketplace, providing information and penalizing firms that produce harmful products.

Building on this parsimonious foundation, we identify conditions of the activist environment, and regarding the scope of judicial penalties, that can induce a firm to produce a high quality product or service, both with and without strong government regulations. Our model is relevant for a wide array of markets in which product quality is not clearly observable by consumers or government regulators (e.g., the types of "credence goods" explored by Feddersen and Gilligan 2001), as well as where the government is ill-equipped to meaningfully enforce its chosen standards.

Our paper is organized to address these issues theoretically as well as with empirical examples. After exploring the relevant literature, we describe our baseline model of government

regulation and industry self-regulation. We then identify how judicial institutions and consumer activists can influence firms' production decisions, absent direct enforcement of government mandates. Finally, we conclude with a discussion of our results, an illustrative example, and ideas for future work to advance this research program.

Existing Literature and Research

In addressing the role of government regulation without subsequent enforcement, our model adds to the scholarly work not only on governmental regulation but also on self-regulation, on corporate social responsibility, and on private politics. Compared to the wide body of research on government regulation of industry, a less-developed literature explicitly engages the concept of industry self-regulation.[1] Indeed, in this early formative stage of research, the term "self-regulation" has come to mean several things ranging from the ways in which trade associations facilitate the establishment of industry-wide standards (e.g., Abolafia 1985), to the manner in which individual firms voluntarily provide environmentally "clean" products in the absence of (or anticipation of) government standards (e.g., Lyon and Maxwell 2002, 2004). Embracing a broad view of self-regulation, our approach speaks to several strands of the literature involving the voluntary provision of socially desirable goods and standard setting.

Empirical and theoretical advancements on self-regulation over the past decade have been considerable. The substantive focus of much of the self-regulation literature has been on

[1] The body of work that speaks to government regulation is voluminous, and any attempt to address it the current context would be inadequate. For discussions on the economics and politics of regulation see Baron (1989), Glaeser and Shleifer (2003), Noll and Owen (1983), and Wilson (1980).

environmental policy.[2] In this area, scholars have developed theories analyzing how the voluntary adoption of environmental standards can influence both markets and subsequent government regulations. Lutz, Lyon, and Maxwell (2000), for example, demonstrate that the voluntary adoption of relatively high standards can preemptively influence the coerciveness of government regulation. Similarly, Maxwell, Lyon, and Hackett (2000) demonstrate how the initial threat of government regulation can induce firms to voluntarily reduce their pollution efforts. Other scholars (e.g., Arora and Gangopadhyay 1995) have demonstrated how consumers' willingness-to-pay for goods produced by green firms can induce companies to incorporate environmentally-friendly technologies into their production processes, leading to firm differentiation based on their environmental practices. This notion of market segmentation is relevant to a rapidly developing literature on the market forces that influence corporate social responsibility, such as the work of Baron (2007, forthcoming), Besley and Ghatak (forthcoming), and Babnoli and Watts (2003).

Our model differs notably from these approaches both in the role for government that we offer and in the possibility of firms misrepresenting their product quality. By incorporating a government standard that is effectively not enforceable, we expand the definition of self-regulation to include meeting a government regulation even without a penalty imposed for violating that regulation. Moreover, we assume that firms can claim they are producing high quality (e.g., environmentally-friendly) products, while actually producing low quality (e.g., environmentally-harmful) goods. Hence, we tackle the hard case of when self-regulation might ensue even when firms are able to misrepresent their choices.

[2] King and Toffel (2007) provide an outstanding recent review of the various conceptions of self-regulation in the context of environmental policy.

We are thus contributing to the literature that explores whether proclamations of socially responsible management policies are actually carried out in practice. Along these lines, King and Lenox (2000) demonstrate that one of the more prominent self-regulatory institutions, the U.S. Chemical Manufacturer's Association Responsible Care Program, suffers from an adverse selection problem in that a disproportionately large number of poor performers join the program. Similarly, Rivera, de Leon, and Koerber (2006) demonstrate that ski areas participating in the Sustainable Slopes Program were no more environmentally sound than those areas outside the program. More broadly, Lenox and Nash (2003) demonstrate how viable sanction programs are crucial if self-regulatory trade associations hope to attract *good* performers and avoid otherwise pervasive adverse selection problems. Bringing the government back in, Short and Toffel (forthcoming) demonstrate how firms are more likely to engage in voluntary audits of their compliance with existing environmental regulations if they have been recently subjected to government enforcement measures. Consistent with this strand of the literature, we seek to explain when firms' actions match their statements, and how such good behavior is influenced by government regulations, by threats of lawsuits, and by activist involvement.

Our incorporation of the nonmarket forces of courts and activists speaks to an emerging literature on private politics. Recently, scholars have theoretically investigated the ways in which non-governmental actors might effectively serve to discipline firms so as to engage in meaningful self-regulation. Baron (2001, 2003) systematically addresses these topics by advancing the concept of "private politics": situations in which private interests attempt to influence collective actions by firms (and thus influence social order, generally speaking) without relying on public modes of order, such as lawmaking institutions. His theories, for example, demonstrate how nonmarket activists can successfully induce firms to engage in

socially responsible practices by threatening (and launching) boycotts, engaging in media campaigns, and undertaking other activities aimed at influencing market competition.[3] Building on Baron's work, Innes (2006) demonstrates how the potential for consumer boycotts can induce firms either to commit to producing environmentally friendly products prior to bringing a product to market or to change their production technologies as the result of a boycott, even in the absence of government regulation. Also related to these approaches, Feddersen and Gilligan (2001) demonstrate how consumer activists can influence firm production decisions by strategically providing information about their choices to a (relatively) uninformed market.

Our work adds to these literatures on government regulation, self-regulation, and private politics, while differing from previous models in several ways. First, while effectively deriving a private politics equilibrium (similar to Baron and to Innes), government is still an important actor in our model, as we seek to identify conditions under which a political actor would explicitly want to establish industry standards, rather than leave standard setting to the market (and nonmarket) environment. Second, while we also consider the role of activists in disciplining firms (similar to Feddersen and Gilligan), we assume that activist intervention is a costly activity. Hence, we can identify how activists can influence market conditions based on their potential benefit from action. More broadly speaking, by accounting for the possibility of product-liability lawsuits, of strategic activists, and of a government with limited enforcement capacity, we extend the existing literature in a way that we think more fully captures the market and nonmarket dynamics that underpin firms' decisions to self-regulate.

The Baseline Model

[3] These topics are advanced further by Baron and Diermeier (2007) who analyze ways in which firms might undermine their potential attractiveness as targets of activist non-governmental organizations.

In analyzing the relationships between government, firms, and other aspects of the market and nonmarket environment, one would like to develop a model that accounts for government decision making over regulatory standards, firm choices about product quality, and market and nonmarket responses to these decisions. To establish a baseline for comparison with models that include actors other than governments and firms, we begin our analysis considering a world in which the government makes a very coarse decision regarding a regulatory mandate. More explicitly, we assume that the government can either set a "high" or "low" standard for product quality. After establishing this mandate, a firm chooses whether to produce a high or low quality product, as well as whether to advertise that its product is of high or low quality. In our baseline model, we analyze scenarios in which the firm's quality decision is known with certainty, as well as when the firm is able to misrepresent its quality choice to consumers.

If one assumes that consumers value high quality products in their own right, as well as firm compliance with government mandates, a firm in our model will choose whatever quality standard and advertising choice maximizes its expected profit, given a particular government regulatory mandate. In the case where firm production choices are known with certainty, we find that firms will always produce high quality goods whenever the market places sufficiently great value on high quality products, regardless of the government standard. However, for lower innate valuations of quality, the market will only induce high-quality production when government regulations demand such quality. This is because consumers value the meeting of government standards. When firm choices are not publicly-observable, however, we find that firms will always choose to produce low-quality goods, yet claim that they are producing high-quality products, regardless of the government mandate. Because most markets are likely characterized by less-than-perfect information about firm choices, these baseline results suggest

the necessity of some sort of nonmarket reaction, subsequent to production choices, to induce firms to engage in meaningful self-regulation. Such extensions are characterized after the following formalization of the baseline model.

[Insert Figure 1 about here]

As illustrated in Figure 1, this baseline model involves a representative firm choosing a quality level ($s_f \in \{0, 1\}$) in response to a government standard ($s_g \in \{0, 1\}$). The firm also *announces* its quality ($s_{fa} \in \{0, 1\}$) and then reaps its profits in the marketplace, based on its quantity choice (q) in response to market demand. We leave to future work the strategic decisions of the government, focusing here instead on the subsequent market and nonmarket reactions to low ($s_g = 0$) and high ($s_g = 1$) government standards. We assume that the representative firm produces its product in a market where it faces the following inverse demand function:

$$p = \alpha - \beta q \quad (1)$$

where p is the price the firm charges for its product, and q is the quantity that the firm produces.

We assume that α captures the impact of a firm's quality choice on price, both in how it relates to the government standard, and in how it is valued by society on its own merits. More formally, we assume that:

$$\alpha = \alpha(s) = d - \gamma_1(s_g - s_{fm})^2 + \gamma_2 s_{fm} \quad (2)$$

where $d > 0$ captures the baseline price that a given firm can charge,[4] $s_g \in \{0, 1\}$ is the quality standard chosen by the government, and $s_{fm} \in \{0, 1\}$ is the quality standard of the firm as perceived in the marketplace. The parameters $\gamma_2 > \gamma_1 \geq 1$ capture the extent to which the market

[4] One could consider d to be the value of a firm's brand name in the marketplace, in that more well-regarded firms can charge higher prices for their goods.

values a certain quality level *ceteris paribus*, as well as how much the market values compliance with government standards. All else equal, the greatest price is attainable for high quality goods meeting high government standards, whereas the lowest price occurs when the marketplace perceives the firm as failing to meet high government standards. More moderate prices occur in the cases of low government standards, again with a somewhat higher price being paid for products perceived to be of higher quality.

Moreover, we assume that the firm faces a constant marginal cost of production for its products, *m*, which is a function of the per-unit cost of production and the quality level chosen. More specifically, we assume that:

$$m = c + s_f \qquad (3)$$

where $d > c > 0$, and $s_f \in \{0, 1\}$ is the *actual* quality standard chosen by the firm.

Combining the above expressions, the firm's profit can be expressed as:

$$\Pi = pq - mq = (\alpha(s) - \beta q)q - mq = (d - \gamma_1(s_g - s_{fm})^2 + \gamma_2 s_{fm} - \beta q - (c + s_f))q \qquad (4)$$

Market Clearance with Observable and Unobservable Firm Choices

We begin with the assumption that government and firm choices are perfectly observable, meaning that $s_{fm} = s_f$. In such a model, if the government mandates a high quality standard ($s_g = 1$), the firm could choose either to comply ($s_f = 1$) or to defy the mandate and produce lower-quality goods than mandated by the government ($s_f = 0$). Hence, the profit function described above in Equation 4 corresponds to $\Pi|_{s_g=1, s_{fm}=s_f=0} = (d - \gamma_1 - \beta q - c)q$ when $s_f = 0$, and $\Pi|_{s_g=1, s_{fm}=s_f=1} = (d + \gamma_2 - \beta q - c - 1)q$ when $s_f = 1$. In the market, the firm chooses its quantity of production to maximize these profits. Specifically, the equilibrium quantities

$q^*\big|_{s_g=1,s_{fm}=s_f=0} = \frac{d-\gamma_1-c}{2\beta}$ and $q^*\big|_{s_g=1,s_{fm}=s_f=1} = \frac{d+\gamma_2-c-1}{2\beta}$ are produced when the firm chooses a low and high quality standard, respectively, given $s_g = 1$. These quantities, in turn, yield equilibrium profits equal to: $\Pi^*|_{s_g=1,s_{fm}=s_f=0} = \frac{(d-\gamma_1-c)^2}{4\beta} < \frac{(d+\gamma_2-c-1)^2}{4\beta} = \Pi^*|_{s_g=1,s_{fm}=s_f=1}$. In other words, the firm accrues greater profits when producing a "high quality" good when the government has mandated a high quality standard than if it produces a low quality good.

Alternatively, suppose the government sets a low standard for quality ($s_g = 0$). Engaging in similar analysis, we see that the equilibrium quantities produced by the firm would be $q^*\big|_{s_g=0,s_{fm}=s_f=0} = \frac{d-c}{2\beta}$ and $q^*\big|_{s_g=0,s_{fm}=s_f=1} = \frac{d+\gamma_2-\gamma_1-c-1}{2\beta}$ when the firm produces a low or high quality product, respectively. These quantities yield profits equal to $\Pi^*|_{s_g=0,s_{fm}=s_f=0} = \frac{(d-c)^2}{4\beta}$ and $\Pi^*|_{s_g=0,s_{fm}=s_f=1} = \frac{(d+\gamma_2-\gamma_1-c-1)^2}{4\beta}$. Profits from the high-quality product could be greater than, or less than, the profits from choosing a low quality standard, depending on the magnitude of γ_2—the value that society places on high quality goods, independent of compliance with government mandates. For $\gamma_2 > \gamma_1 + 1$, the greater marginal costs of producing high quality goods is more than offset by the higher price the firm can charge for such goods in the marketplace. Taken together, these findings motivate the following proposition.

Proposition 1*: When government and firm choices are perfectly observable by the public, firms will always choose a high quality standard when it is mandated by the government, and will choose a high quality standard, independent of government mandate, when consumers place a sufficiently large value on high quality goods.*

Proof: Proofs of all propositions are given in the Appendix.

This proposition is illustrated in Figure 2, which identifies the conditions under which high quality goods are produced by the firm in the absence of binding government regulations. For $\gamma_2 \in (\gamma_1, \gamma_1+1]$, the firm chooses a quality standard that matches the government mandate. However, when $\gamma_2 > \gamma_1+1$, the value that society places on high quality goods is sufficiently large that, regardless of what standard the government chooses, high quality goods will be produced. In other words, the proliferation of high standards can occur via industry self-regulation when high quality goods are sufficiently important to consumers (and society, broadly construed). Interestingly, government standards here are only influential when the public places a relatively low value on buying high quality goods.

[Insert Figure 2 about here]

While this result is both relatively straightforward and normatively attractive (leading to high quality production), it relies on perfect information about firm choices of product quality. In reality, there are many products for which quality standards cannot be easily deduced, even after they have been purchased or consumed. For example, if one equates the quality levels modeled here with labor or product sourcing practices, it is unlikely that the average consumer can ascertain whether certain coffee beans are truly "fair trade," or certain athletic shoes were produced without relying on child labor. Given this inherent unobservability, it is worthwhile to explore how firms might choose to produce and advertise their products if their choices were unknown and there were no potential penalty from misrepresentation.

[Insert Figure 3 about here]

To analyze this scenario, consider the same model as above, but now suppose the firm's quality decision is unobservable, as presented in Figure 3. It is now possible that $s_{fm} \neq s_f$, with the market's view of the firm's quality choice deviating from its true choice. As before, the

government announces a standard $s_g \in \{0,1\}$, the firm announces $s_{fa} \in \{0,1\}$, and the firm chooses a quality level ($s_f \in \{0,1\}$). While the market is aware of s_{fa}, the choice of s_f is unknown during the market interactions. We assume that the consumers' sole information regarding product quality is based on the firm's announcements, and that therefore the market reacts such that $s_{fm} = s_{fa}$ in Equation 4 above. To an extent, this assumption relies on consumers behaving in a not completely rational manner. They do not, for example, glean knowledge about quality from the firm's quantity choice, nor do they believe that all firms lie to them. Thus we set aside some market undermining behaviors here (Akerlof 1970). Nevertheless, we believe that this fairly trusting public is plausible for most market transactions, especially when backed up by the nonmarket institutions introduced below.

Given this formalization, we know from the analysis above that if the government sets a high standard ($s_g = 1$) and the firm chooses $s_f = s_{fa} = 1$, then $\Pi^*\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=1} = \dfrac{(d+\gamma_2-c-1)^2}{4\beta}$.

However, suppose the firm announces $s_{fa} = 1$ (meaning that it claims it is producing a high quality product), but actually chooses $s_f = 0$ (meaning that it is producing a low quality product). Then the firm's profit is defined by:

$$\Pi\big|_{s_g=1,s_f=0,s_{fm}=s_{fa}=1} = (d-\gamma_1(1-1)^2+\gamma_2-\beta q-(c+0))q = (d+\gamma_2-\beta q-c)q \qquad (5)$$

In the market stage, the firm chooses its quantity to maximize profits. This yields $q^*\big|_{s_g=1,s_f=0,s_{fm}=s_{fa}=1} = \dfrac{d+\gamma_2-c}{2\beta}$ and profit equal to $\dfrac{(d+\gamma_2-c)^2}{4\beta}$. Note that this profit exceeds that from a high quality choice. Hence, the firm has a clear incentive to announce that it is producing a high quality good, yet *actually* produce a low quality good. Similar analysis reveals that if the government were to choose a low quality standard initially ($s_g = 0$), then the firm once

again would have a strict incentive to choose a low standard of quality ($s_f = 0$) for its production processes, yet still announce that it has chosen a high quality standard ($s_{fa} = 1$).[5] In other words, when the production processes of the firm are not observable, the firm will always choose a low quality standard, yet claim to have produced a high quality product. This analysis motivates the following proposition.[6]

Proposition 2: *Given a trusting public and unknown firm production processes, industry self-regulation cannot occur. All firms will claim they are producing goods of high quality, yet actually produce low-quality goods. Government regulations do not influence firm behavior.*

Having established a baseline for what occurs when the market possesses complete and perfect information versus incomplete information regarding firm production processes, we now turn to the extensions of identifying how *nonmarket* reactions, subsequent to production and advertising choices, might influence the propensity for firms to engage in meaningful self-regulation. For the purposes of analysis, one could focus on a variety of scenarios to consider the impact of nonmarket actors and reactions on firm decisions – ranging from consumer boycotts, to lawsuits, to public demonstrations intended to influence shareholder and consumer sentiment, and so forth. In the extensions that follow, we focus on two particular nonmarket reactions: the possibility of lawsuits and the role of information-providing activists.

Class Action Lawsuits and Self-Regulation

In many situations, a firm's quality choice directly affects the benefits that consumers experience. In other cases, the effects of such choices are revealed with less certainty. For

[5] This is because of our assumption that $\gamma_2 > \gamma_1$.
[6] This finding is consistent with several other models that analyze production choices under incomplete information, and most notably Feddersen and Gilligan's Proposition 3 (2001, p. 158), in their model of information-providing activists.

example, by opting in favor of a low quality good, firms might implicitly be choosing to manufacture a relatively unsafe product with a higher probability of consumer harm than if a high quality standard were chosen. In the event of a product-induced incident, a firm could plausibly be sued for the damages caused by its product. The potential to be a defendant in such lawsuits should influence the firm's initial product design decision—particularly if the likelihood of a disaster is affected by the firm's quality choice.

To capture such a possibility, we extend our baseline model to account for lawsuits that may be brought as a consequence of product quality choices. We assume that, after firms make their product choices and announcements as described in the incomplete information game above, a product-induced disaster occurs with a certain probability, which is influenced by whether the firm initially chose a high quality standard for its product. In the event of a disaster, a lawsuit ensues wherein the firm's quality choice is revealed (presumably through the discovery and testimony process), which influences the profits the firm can reap in the second period. Furthermore, a firm held liable for a disaster is subject to a court mandated penalty. Alternatively, if a disaster does not occur, the firm simply experiences another period of profits identical to those it obtained after the first period of market activity. In either case, the firm's second period profits are assumed to be subject to discounting.

Consistent with the intuition in the incomplete information case above, we find that in equilibrium the firm will always announce that it has produced a high quality product. Under certain conditions, however, the firm's high quality product announcement will coincide with a decision to *actually* produce a high quality product. That is, the potential of a product-induced lawsuit can induce a firm to engage in meaningful self-regulation. This is true when the size of the judicial penalty is large, when the firm cares significantly about the future, and when the

probability of a disaster is large absent high-quality production. Moreover, whether the firm produces a high-quality product depends crucially on the government standard, despite its lack of direct enforcement. Put simply, when low-quality products exhibit a high probability of disaster, government standard setting can induce good behavior, even by the types of firms that most benefit from deceiving the public. This is because consumers value the standard setting role of the government and thus reward firms that are subsequently revealed to have met the government's standard, while punishing those who have not.

We turn now to the formalization that yields these results. As presented in Figure 4, we now assume that, after the firm has made its quality announcement (s_{fa}) and chosen its unobserved level of quality (s_f), the market ensues, subject to the specifications described above. After the first period of market behavior, we assume that with probability $\rho > 0$ a "disaster" occurs ($D = 1$), and with probability $1-\rho$ no disaster occurs ($D = 0$). For the purposes of analysis, we assume that $\rho = \rho_0 - \rho_1 s_f$, where $1 \geq \rho_0 > \rho_1 \geq 0$. In other words, the probability of disaster involves a baseline probability of an adverse event occurring, in conjunction with the level of quality chosen by the firm. That is, if the firm chooses $s_f = 0$, the probability of disaster equals the baseline probability, ρ_0. High quality products reduce this probability by ρ_1.

[Insert Figure 4 about here]

If no disaster ensues, another iteration of market activity occurs (with the firm setting its quantity and consumers buying products as per the demand function). The firm experiences profits as derived above, which are subject to some discount factor $1 \geq \delta \geq 0$. If a disaster does occur, we assume that a trial takes place, wherein the firm's quality choice is revealed with certainty, a judgment is handed down, and another iteration of the market ensues. Following a trial, firm profits in the second period are a function of the information that has been revealed

about its quality choice ($s_{fm} = s_f$), its new quantity choice in light of this revelation, and the scope of the judgment, discounted by δ. More formally, second period profits in the case of an incident are defined as:

$$\Pi(Period\ 2)\big|_{D=1} = \delta[(d - \gamma_1(s_g - s_f)^2 + \gamma_2 s_f - \beta q - (c + s_f))q - J] \qquad (6)$$

where $J \geq 0$ is the penalty that is handed down by the court as the result of its judgment.

As in the baseline model, regardless of whether the government has chosen a high or low quality standard, firms face a choice of quality level and whether to truthfully reveal that information. The possibility of a lawsuit affects this choice in two ways: (a) the product quality choice affects the likelihood of a disaster, leading to an adverse judgment; and (b) given the lawsuit, a firm's true product quality is revealed to the market. Hence, firms base their quality decisions on the relative value of their first-period profits (when the market is wholly unaware of their actual quality choices) in comparison to their expected second-period profits given that the market may become aware of their actual quality decisions.

The model therefore features both the incentives to deceive consumers evident in Proposition 2 and the incentives for high quality as in Proposition 1. Many factors influence which of these choices prevails. Solving for the firm choices involves expected utility calculations for each of the four possibilities: (a) $s_f = 0$, $s_{fa} = 0$; (b) $s_f = 0$, $s_{fa} = 1$; (c) $s_f = 1$, $s_{fa} = 0$; and (d) $s_f = 1$, $s_{fa} = 1$. We make such calculations for both high government standards ($s_g = 1$) and low government standards ($s_g = 0$).

In comparing across these different cases, several points become evident. First, regardless of whether government has chosen a high or low standard for product quality, the firm will never prefer to choose a low standard and announce a low standard (i.e., $s_f = s_{fa} = 0$) in comparison to choosing and announcing a high quality standard (i.e., $s_f = s_{fa} = 1$). Moreover

(and perhaps unsurprisingly), the firm will always prefer to choose a high standard and announce that it has chosen a high standard ($s_f = s_{fa} = 1$) in comparison to choosing a high standard, yet claiming credit for a low standard ($s_f = 1$, $s_{fa} = 0$). The interesting comparison to consider, then, is under what conditions might the possibility of a lawsuit induce a firm to claim that it has selected a high quality standard and actually meet that standard, instead of misrepresenting its choice (by implementing a low standard, yet advertising a high standard)?

Comparing the expected utilities for these two options leads to conditions under which the firm would meet the high quality standard that it has announced. These conditions can be expressed in terms of a variety of parameters in the model. For our purposes, it is most straightforward to express these conditions in terms of the cutpoint J^*, above which the firm meets the high quality standard, in order to reduce the probability of having to pay such a large negative judgment. The exact cutpoints $J^*\big|_{s_g=0}$ and $J^*\big|_{s_g=1}$ are given in the Appendix, and can be analyzed using comparative statics techniques. Doing so yields the following proposition.

Proposition 3: *For both high and low government mandates for industry quality, there exists some crucial judicial penalty, J*. For $J \geq J^*$, firms will truthfully announce their selection of a high quality standard. For $J < J^*$, firms will announce that they have chosen a high quality standard, yet actually choose a low quality standard.*
Moreover, when the government mandates a high quality standard, $J^*\big|_{s_g=1}$ is:

a) decreasing in ρ_0, ρ_1, δ, and γ_1, and
b) increasing in d and γ_2 iff ρ_0 is relatively small.

When the government mandates a low quality standard, $J^*\big|_{s_g=0}$ is:

a) decreasing in ρ_0, ρ_1, and δ, and
b) *increasing in d and γ_2 and decreasing in γ_1 iff ρ_0 is relatively small*.

As discussed above, the firm will choose to actually adopt its announced high quality standards when the judgment following a disaster is sufficiently large (greater than J^*). Comparative statics over this J^* cutpoint, as presented in Proposition 3 thus characterize when

the range of high-quality good production increases (when J^* decreases) or when it decreases (for higher values of J^*). Interpreting the proposition, then, self-regulation is more likely to occur when the probability of a disaster occurring with a low-quality good is high (ρ_0 large) and when that probability is significantly cut by producing the high-quality good (ρ_1 large). This matches intuition, in that the firm can avoid a significant harm from an adverse judgment and revelation of its false claims by producing a high-quality product. Additionally, the firm's choice is influenced by how much it values the future (δ). A fly-by-night firm that does not expect to be around for the fallout from its product failures will be more likely to lie to its customers, whereas those with long-term views will be more likely to produce the high-quality goods that avoid disaster, lawsuits, and revelations of fraud.

The effects of the other main parameters of the model are more conditional, both on the government's regulation decision and on the probability of disaster. Where the baseline probability of disaster (ρ_0) is small, good behavior is hard to maintain; and this is especially true for firms with substantial brand names (d large) and where the market value of a high quality good is great (γ_2 large). Under such circumstances, firms can reap large profits in the first period from producing low-quality goods and announcing that they are of high quality. Since the probability of disaster and thus detection is low, this is a dominant strategy. However, for that probability being large, the reverse results hold – firms with substantial brand names and markets valuing high quality induce a greater degree of self-regulation, lest these firms take a major cut in their profits upon revelation in the second period.

Finally, Proposition 3 implies that the impact of the market value of government compliance (γ_1) can significantly influence the ability of a court to induce a firm's truthful revelation of its quality choice. If government has mandated a high quality standard ($s_g = 1$),

then the greater the public values government compliance, the greater are the firm's incentives to actually adopt the announced high quality, all else equal. Alternatively, if government has mandated a low standard, then if the probability of a disaster (and thus detection) is sufficiently large, the more the public values government compliance, the more likely it is that the firm will produce a low quality product. Essentially, this occurs because, while the firm fears the disaster and judgment of the second period, the cost from revelation of the low quality production is limited by the public reliance on the government's statement that low quality products are "good enough."

Besides identifying whether or not firms can be induced to truthfully announce (and provide) a high quality good, a more central question to our inquiry is how this self-regulation-inducing judgment varies as a result of the government's mandate. In other words, for example, are there conditions under which the high government standard, despite lack of enforcement, induces high-quality good production, which would not have occurred absent the government regulation? And, if so, what do those conditions look like? To isolate such conditions, we compare the equilibrium cutpoint for a low government standard ($J^*\big|_{s_g=0}$) to that for a high standard ($J^*\big|_{s_g=1}$). The results are given in the Appendix and are characterized in the following proposition.

Proposition 4: *When the baseline probability of disaster (ρ_0) is sufficiently large, industry self-regulation (meaning truthfully announcing a high standard of quality) can be sustained with a lower judicial fine when the government has chosen a high quality mandate than when the government has chosen a low quality mandate. The opposite is true when the probability of disaster is low.*

The intuition behind Proposition 4 is aided by consideration of Figure 5. Crucial to understanding this finding is seeing the difficult choice that a high government standard presents

to the firm. Being perceived as meeting that standard yields the highest possible market price, as consumers value both the higher quality itself and the attainment of the government standard. And getting that price while not paying to produce high quality goods is tempting. But being caught failing to meet the high government standard is the worst outcome, with the market price deflated on both grounds of violating the standard and having a low-quality product. If the probability of detection (via a product-induced disaster) is high, the firm eschews this gamble, with market incentives inducing the firm to meet the high standard even if only a moderate court-imposed judgment arises from the lawsuit. However, given a low probability of disaster, deceiving the public is a gamble worth considering. And it can only be prevented with a high court-imposed judgment – a judgment even higher than is needed to induce high quality were the government's low quality standard in place with its less-risky gamble.

[Insert Figure 5 about here]

In light of such considerations, the leftmost and rightmost sections of the figure are as expected – for a sufficiently low judgment, a firm's incentives to deceive consumers remain strong (as was found in Proposition 2). For a sufficiently high judgment, the firm works to avoid the judgment by producing a high quality good, which minimizes the likelihood of disaster. In the upper middle portion of the figure, the firm produces a product quality exactly in line with government standards. If the government sets a low standard, the firm produces a low quality good; and if the government sets a high standard, the firm responds in kind. The reason a higher judgment is essential to induce self-regulation in the case where the government sets a low standard is that the revelation of the low-quality good production is less costly here. The public is somewhat persuaded by the government statement that a low-quality product is sufficient. Given that a firm which chooses to produce a low quality good is effectively complying with the

government standard, it will not be penalized too greatly by the market in terms of expected profits. This is not true in the case of the high government standard, however, where the combined threat of a moderate judgment and the market reaction to violation of the government standard combine to induce the firm's good behavior.

Interestingly, in the lower middle portion of the figure, the firm is induced to do the *opposite* of what the government advises. This means that when the chance of disaster is relatively low and judgment sizes are moderate, the firm produces a low-quality product when the government standard is high, and a high-quality product when the government standard is low. The logic behind this perverse finding is based on the fact that the probability of detection is relatively low in this region. Thus firms largely think that they can get away with the deception of announcing a high quality good, when a low quality good is actually being produced. Importantly, the benefit (i.e., expected profit) from doing so is greater if the government has set a high standard than if the government had set a low standard, because a firm receives the market benefit of producing a high quality good, combined with the market reward from complying with a government mandate for high quality. To offset this greater benefit, a larger judgment must be imposed by the court in the case of a higher government standard to induce a firm to *actually* produce a high quality product. If the court sets the judgment size barely sufficient to bring about a high-quality product upon a low government standard, then that judgment will be insufficient to overcome the incentives to cheat induced by the high government standard.

Activists and Self-Regulation

Having identified how the possibility of lawsuits might induce self-regulation, we now consider how similar outcomes could possibly be obtained even without having to rely on any type of public forum, such as a judicial arena. To address this possibility, we return to our baseline model and assume that, after the firm makes its product choice and announcement, a concerned activist can choose a level of effort to exert with which to engage in investigatory activities that can influence the public's perception of the firm's choices. We assume that the more effort the activist expends the more likely she is to accurately inform the public about the firm's production choices, with the goal of inducing the market to reward high quality firms and punish those with low-quality goods.

Consistent with our earlier results, we find that a firm will always want to announce that it has produced a high quality product, regardless of its true quality choice. Moreover, we find that the firm's actual production choice is highly responsive to potential reward that the activist experiences from engaging in investigatory activities and publicizing her findings. When the potential rewards from her activism are large, the activist (unsurprisingly) will exert significant effort to inform the public. As a result, the firm will choose to produce a high-quality product. When the potential rewards from informing the public are small, however, the activist will not exert sufficient effort to reveal the firm's true production choice to the public; and hence, the firm will always choose to produce a low-quality product. Finally, when the activist's potential rewards are relatively moderate, we find that a firm will sometimes tell the truth and sometimes misrepresent its production choices, and the activist will exert just enough effort to ensure that the firm is indifferent between these options. Hence, our results identify how self-regulation can be obtained as the result of private politics, and how the possibility for viable self-regulation depends profoundly on the nature of the interest group environment.

This extension regarding activist behavior is relevant to many private sector activities. Often, a firm's quality choices might have little impact on whether a product-related disaster occurs, yet they could be of clear interest to consumers and to private activists who hold certain goals. For example, choosing to source from non-fair-trade coffee providers will likely not result in some cataclysmic coffee incident, but the decision to source from certain providers is clearly salient to labor and human rights activists who might seek to influence dominant market practices. As such, these interested parties have an incentive to invest effort in uncovering the true nature of the production processes undertaken by various firms, and to try to reveal this information to the marketplace for the purposes of rewarding firms with good practices and punishing others.

We formalize the actions of such an activist in our analytical framework by building upon our baseline model in the following way. As illustrated in Figure 6, following the first period of market clearance, an activist (A) chooses a level of effort (e) with which to investigate and report on the firm's choice of quality, so as to influence the firm's second-period profits. We assume that more effort produces more credible evidence, turning consumers away from their belief of quality based on the firm's announcement and toward a belief based on the activist's evidence. Moreover, higher activist effort is also more likely to uncover the true product quality.

[Insert Figure 6 about here]

Many functional forms are consistent with these assumptions. For simplicity, we assume that the following is true of consumers' second-period beliefs. With probability $\frac{1}{e}$ the firm's announcement is still believed to be true ($s_{fm} = s_{fa}$); with probability $\frac{1}{2e}$ the market believes what the activist reports, yet the activist is wrong (i.e., $s_{fm} = 1 - s_f$); and with probability $\frac{2e-3}{2e}$ the

market believes what the activist reports, and the activist is correct (i.e., $s_{fm} = s_f$). We also assume $e \geq 2$; at this lowest effort level, with probability ½ the firm's announcement is still believed, with probability ¼ the activist is believed but wrong, and ¼ of the time the activist is believed and correct. This last probability is increasing in effort while the other two are declining.

Regarding the activist's utility, we assume that the activist values rewarding high quality firms and punishing low quality firms.[7] Although the activist does not have the resources to punish and reward firms directly, the information revealed to consumers serves this role quite well.[8] However, it is costly to exert the effort needed to influence the market in this way. More formally, we assume that the activist's utility can be represented by the following form:

$$EU_A = IZ - e$$
$$\text{where } I = \begin{cases} 1 \text{ if } s_{fm} = s_f \\ 0 \text{ otherwise} \end{cases} \qquad (7)$$

In other words, if the market learns the firm's actual choice of product quality, the activist receives some positive reward Z (for simplicity, we assume Z is sufficiently large such that $e \geq 2$ in equilibrium), whereas the activist receives nothing when the market is deceived.[9] In either case, however, the activist still expends effort to engage in an investigation and a publicity campaign for the purpose of influencing the market. We assume that the activist, unlike the market, is fully rational. That is, the activist is fully informed about the firm's profit function, and hence understands the incentives that the firm faces in choosing a level of quality, and bringing a product to market. As such, the activist's choice of effort maximizes her expected

[7] Their motives for doing so may vary in reality. Expanding the market share of firms with similar values to their own may be sufficient; but uncovering egregious practices also may help with the fundraising needed to continue their activities into the future, for example.
[8] A model of activist-led boycotts could be advanced in a similar manner to what we offer here.

utility by affecting the information uncovered and revealed to the marketplace, and possibly by influencing the firm's *ex ante* product quality standards.

The first step in deriving the equilibrium involves finding the optimal level of effort for each possible case of firm quality and announcement and for both possible government standards. As with the baseline model and courts extension, the two firm strategies that are not strictly dominated for all parameter values are: setting a high standard and announcing it ($s_f = s_{fa} = 1$), and lying about meeting a high quality standard ($s_f = 0$, $s_{fa} = 1$). In the former case, the activist wishes to exert only a low level of effort relative to the reward (Z); specifically, in equilibrium $e^*\big|_{s_f=1,s_{fa}=1} = \frac{\sqrt{2}\sqrt{Z}}{2}$. This effort level is nonzero because the public is looking to the activist for an assessment of product quality and for supporting evidence. Without at least some minimal effort level, the activist cannot adequately establish a case in favor of the firm. In essence, the activist's role here is to offer a seal of approval. This case holds for sufficiently large Z (for $Z \geq Z^*_H$, as given in the Appendix). For Z below this value, the activist's low effort level is insufficient to induce the firm to choose to produce a high-quality product.

In the case where the firm misrepresents its quality, the activist has an incentive to exert more effort (relative to its reward Z), in order to produce convincing evidence that the public will find more persuasive than the firm's announcement. That equilibrium value is $e^*\big|_{s_f=0,s_{fa}=1} = \frac{\sqrt{6}\sqrt{Z}}{2}$. While higher than above, this effort level is insufficient to bring about a high quality choice by the firm. This is because this situation only arises (in equilibrium) for low values of Z (for $Z \leq Z^*_L$, as given in the Appendix). Here, the activist has insufficient resources

[9] Our assumptions that $e \geq 2$ and that Z is sufficiently large to ensure this effort level are made to rule out trivial cases, and are not crucial to deriving the equilibrium of the model.

or incentives to dedicate enough effort to alter firm behavior. The best the activist can hope for is to expose this firm's duplicity to the market.

[Insert Figure 7 about here]

In between Z^*_L and Z^*_H, as shown in Figure 7, the equilibrium involves mixed strategies, as is common in this sort of monitoring game. If the firm adopts a high standard, the activist wants to exert a low level of effort. But a low effort level gives the firm the incentive to actually select a low quality. This, in turn, induces a high level of effort, bringing about a high quality product choice by the firm. And so on, without an equilibrium in pure strategies. In the mixed strategy equilibrium, the activist chooses a level of effort e^*_{mix} (as defined in the appendix), which makes the firm indifferent between adopting a low or high product quality. The firm adopts a high standard with probability x^*, such that e^*_{mix} is the activist's optimal level of effort. The effort level e^*_{mix} decreases monotonically from $e^*\big|_{s_f=0,s_{fa}=1}$ to $e^*\big|_{s_f=1,s_{fa}=1}$ as Z increases from Z^*_L to Z^*_H.

This equilibrium as a whole is characterized as follows.

Proposition 5: *The equilibrium to the activist nonmarket reaction game involves a partition of the activist reward space into three intervals defined by two cutpoints, Z^*_L and Z^*_H, such that:*

a) *for $Z \le Z^*_L$, the firm announces that it has chosen a high standard ($s_{fa} = 1$), but actually chooses a low standard ($s_f = 0$), and the activist exerts effort level $e^*\big|_{s_f=0,s_{fa}=1} = \frac{\sqrt{6}\sqrt{Z}}{2}$;*

b) *for $Z \ge Z^*_H$, the firm chooses a high standard ($s_f = 1$) and truthfully announces that choice ($s_{fa} = 1$), and the activist exerts effort level $e^*\big|_{s_f=1,s_{fa}=1} = \frac{\sqrt{2}\sqrt{Z}}{2}$; and*

c) *for $Z \in (Z^*_L, Z^*_H)$, the firm always announces that it has chosen a high standard, and actually implements a high standard with probability x^* and implements a low standard with probability $1 - x^*$, and the activist exerts effort level e^*_{mix}.*

Proposition 5 does not note differences between the case of a high government standard ($s_g = 1$) and a low government standard ($s_g = 0$). Because the activists value truthful revelation of firm quality, rather than whether or not the firm meets the government standard, the equilibrium effort levels $e^*\big|_{s_f=1,s_{fa}=1}$ and $e^*\big|_{s_f=0,s_{fa}=1}$ do not depend on the government standard. Nevertheless, as in the baseline case and the courts extension, the government standard may influence the firm's behavior when there is some probability of detection. Specifically, the cutpoints Z^*_L and Z^*_H differ depending on the government standard. And, in the mixed strategy part of the equilibrium, e^*_{mix} also differs across these two cases. Proposition 6 notes the relative value of e^*_{mix} between the high and low government standard cases.

Proposition 6: *The level of effort that induces a firm to randomize between lying ($s_f = 0$, $s_{fa} = 1$) and telling the truth ($s_f = 1$, $s_{fa} = 1$), e^*_{mix}, is strictly lower when the government selects a high quality standard ($s_g = 1$) than when the government selects a low quality standard ($s_g = 0$).*

This proposition states that an activist is able to induce the firm's mixing behavior with a lower level of effort given a high government standard. Although the activist has no specific interest in the government standard, this finding shows the government and activist as serving complementary roles. The intuition behind this finding is that the relative loss in profit between lying and truthfully producing the high quality product is greater if the government has set a high standard than if the government has set a low standard. This is because the consumers value firms meeting the government standard. Revelation of not meeting the high standard is thus more costly to profits than revelation of only meeting (and not exceeding) the government's low standard. As such, the activist is able to make the firm indifferent between producing a high-quality product and producing a low-quality product with less effort (lower probability of being detected) when the government sets a high standard.

In addition to the ordering of these optimal effort levels across cases of high and low government standards, comparative statics over this level of effort differ somewhat depending on the government standard, as characterized in Proposition 7.

Proposition 7: *The crucial level of effort that induces the firm to randomize between a high and a low quality choice, e^*_{mix}, decreases as the future (δ) becomes more valuable to the firm. Moreover, when the government sets a high standard ($s_g = 1$), e^*_{mix} is decreasing in the value of the firm's brand name (d) and increasing in the firm's marginal cost of production (c). When the government sets a low standard ($s_g = 0$), e^*_{mix} is decreasing in d and increasing in c iff γ_2 is significantly larger than γ_1.*

The intuition behind this set of findings is as follows. First, the greater the value the firm places on the future, the more it is concerned about its low quality level being uncovered by the activist. Therefore, with even a modest level of effort, the activist can make the firm indifferent between a high- and a low-quality choice. Second, firms with substantial brand names are particularly hurt by activist revelations of low quality products, and therefore are induced to a high standard even with a lower level of effort. Third, the opposite is true for firms with high cost of production. These firms do not reap substantial profits if they need to also meet high standards. Therefore, they face strong incentives to cut costs, by producing low-quality goods. Even this type of firm can be induced to adopt a high standard, but only if the activist exerts a higher effort level, and thus reveals the truth with a greater probability.

These latter two findings hold in all cases for high government standards, but only under special conditions for low government standards. In particular, these two relationships are actually reversed when consumers value high quality products at about the same level as they value meeting the government's (low) standard. In such a case, little is lost upon the revelation that the firm has deceived the public, as consumers place little value on exceeding the government's low standard. Firms with more valuable brand names and lower production costs

therefore are less fearful of the activist's inquiries, and thus the activist must exert a higher effort level to bring these firms to indifference between producing low- and high-quality goods.

An Empirical Illustration

An empirical example is useful to illustrate not only the plausibility of the assumptions of our model but also the potential for tests of the model's predictions based on real-world behavior. We therefore consider here the policy debates that corresponded with the early growth in electronic commerce pertaining to online privacy. In the late 1990s, as consumer-oriented commercial websites were becoming commonplace, lawmakers and consumer activists voiced concerns that online firms were inadequately protecting their consumers' privacy and misusing consumers' personally identifiable information. Many online companies claimed they were meeting high standards of privacy protection, yet in practically all circumstances such claims were impossible to verify. At the same time, different branches of the U.S. government were struggling with whether or not to establish a federally-mandated baseline for online privacy protection, given the uncertainty regarding the technical feasibility of enforcement.

In July 1998, the United States Federal Trade Commission (FTC) issued a report to Congress wherein it claimed that industry self-regulation was potentially adequate to ensure that online firms would pervasively adopt socially adequate online privacy protection for consumers. While, on the one hand, speaking to the potential virtues of industry self-regulation in addressing this technically and socially complicated problem, the FTC noted that "unless industry can demonstrate that it has developed and implemented broad-based and effective self-regulatory programs by the end of [1998], additional governmental authority in this area would be

appropriate and necessary."[10] As might be expected, the FTC's report touched off a vibrant debate between members of industry, consumer activists, and other interested parties as to whether firms could meaningfully self-regulate to provide consumers with goods and services that were socially desirable in the absence of explicit "e-commerce" regulations.

After a series of studies and reports (including a 1999 report wherein the FTC again discouraged government regulations in favor of industry self-regulation), the FTC made its final report to Congress on internet privacy in May of 2000. Deviating significantly from its earlier position, a majority of the Commission argued that industry "self-regulation alone, without some legislation, is unlikely to provide online consumers with the level of protection they seek and deserve," and recommended that Congress create such legislation.[11] In stark contrast to the majority recommendation, the lone dissenter, Commissioner Orson Swindle, lambasted the majority's "embarrassingly flawed" report that abandoned "a self-regulatory approach in favor of extensive regulation, despite continued progress in self-regulation." The heart of Commissioner Swindle's 27-page critique focused on how the Commission had ostensibly failed to clearly demonstrate how industry self-regulation was insufficient to achieve socially desirable ends. Moreover, he argued that the Commission majority had failed to account for any of the likely costs of such wide-sweeping regulatory actions and how they related to the "asserted benefits of enhancing consumer confidence," in comparison to "alternative approaches that rely on market forces, industry efforts, and enforcement of existing laws."[12]

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[10] "FTC Tells House Subcommittee that Self-regulation is Preferred Method of Protecting Consumers' Online Privacy." U.S. Federal Trade Commission News Release. July 21, 1998. <http://www.ftc.gov/opa/1998/07/privacyh.shtm>

[11] "Statement of Chairman Pitofsky" in *Privacy Online: Fair Information Practices in the Electronic Marketplace*. May 22, 2000.

[12] "Dissenting Statement of Commissioner Orson Swindle" in *Privacy Online: Fair Information Practices in the Electronic Marketplace—A Report to Congress.* May 22, 2000 (pp. 1-2).

Central to these differing perspectives was the question of whether existing market arrangements and the actors that would naturally respond to the choices of e-commerce firms were sufficient to induce companies to make socially desirable choices, even when those choices might not be easily (or remotely) observable. Regarding internet privacy, the Clinton Administration ultimately rejected the FTC's recommendation in favor of a self-regulatory approach to address online consumer protections. While advocates of free markets clearly favored this outcome, the decision was made without a clear articulation of what institutions, if any, could effectively ensure that firms made the "right" choices, absent government oversight and enforcement activity. Similar to the actors in our model, government was deciding between setting a high standard (e.g., $s_g = 1$) or low standard ($s_g = 0$) for internet privacy protections, and firms were making (unobservable) choices regarding their level of privacy protection and making claims about these choices. While Proposition 1 suggests that if these choices were perfectly observable, all firms would choose the socially appropriate level of privacy protections, Proposition 2 points to the clear incentives that firms had to misrepresent their production choices, which was the precise concern that was voiced by a majority of the Commission.

In light of the Clinton's Administration not to push for further government regulations, one might expect all online forms to pervasively violate societal standards for consumers' privacy. The results of our model, however, suggest the possibility for firms to engage in meaningful self-regulation (i.e., choosing a socially appropriate level of privacy protection), even without explicit regulations that targeted online firms. Proposition 3, for example, suggests that online firms would likely provide appropriate privacy protections if the potential judicial penalty following from misuse of consumers' information were sufficiently high. Consistent with this argument, Commissioner Swindle explicitly claimed that existing consumer protection and anti-

fraud laws would be sufficient to induce self-regulation, as consumers would be able to file complaints against firms if incidents occurred as a result of misuse of their personally identifiable information (analogous to a product-induced disaster in the context of our model). On a more nuanced level, however, Proposition 3 also implies that the potential judicial penalty necessary to induce self regulation would likely have to be higher for firms with more well-established brand names (i.e., higher d). As such, one would expect that if consumer complaints were to emerge, they would likely involve the more prominent firms within the industry (given that the latent judicial penalty, J^*, was likely sufficient to induce compliance among lower-profile firms). Consistent with this argument, history demonstrates that much of the earliest litigation regarding consumer online privacy, did, indeed, involve the more prominent online firms, such as Microsoft, RealNetworks, and eBay.[13]

While disciplining high-profile firms via the judiciary might seem relatively difficult, Proposition 7 suggests how activists could possibly succeed where litigation fails. In the absence of explicit government regulation for online privacy ($s_g = 0$), the level of effort that induces a firm to mix between providing high- and low-quality goods decreases in the value of the firm's brand name (conditional on consumers placing a sufficiently high value on privacy protection). As such, our results suggest that activists should be more easily able to induce high-profile firms to voluntarily adopt high quality privacy protections than they could for low-profile firms. Consistent with this intuition, history demonstrates that over the last several years, the major industry players (e.g., Microsoft, Amazon, eBay, etc.) have been very quick to respond to the concerns of privacy advocacy groups such as the Electronic Privacy Information Center (EPIC),

[13] While the targeting of high profile firms is consistent with other theories of judicial politics (e.g., to send a signal to the industry regarding tolerance for various practices), it clearly comports with our model as well, and is worthy of more systematic exploration.

and the Center for Democracy and Technology (CDT), to ensure that they are not branded as irresponsible players in the e-commerce marketplace.

Conclusions and Future Directions

One significant role of government is to establish and enforce rules that influence how firms and individual consumers conduct their interactions. If endowed with perfect information and total control, a social welfare maximizing government would presumably establish industry rules that ensured that the products and services being brought to the marketplace were endowed with a socially optimal level of quality. When government is not all-knowing or all-powerful, questions emerge regarding how socially appropriate goods and services can emerge in a marketplace where firms have a clear incentive to misrepresent the quality of their products and foist them on an ignorant public.

We address these questions by analyzing conditions under which various nonmarket institutions induce firms to make the "right" production decisions. When the potential judicial penalty that follows from a product-induced disaster is sufficiently high, or when activists have a sufficiently high reward from investigating and publicizing company practices, firms will either voluntarily establish a higher standard than the government mandate, or alternatively will comply with a government mandate for high-quality goods even when the government has no enforcement ability. As such, we have demonstrated how nonmarket institutions can facilitate industry self-regulation when government regulation is either lacking, or toothless.

Building on this theoretical foundation, there are several theoretical and empirical extensions that we would like to investigate in future work to enhance our understanding of the relationships among governments, firms, and nonmarket institutions in facilitating meaningful

self-regulation. First, and most notable, we would like to bring government "back in" to the process by explicitly modeling the government as a strategic actor with its own preferences. Having currently derived the equilibria that will ensue if government establishes high industry standards in markets that are subject to the threat of lawsuits or activist interactions, we would like to identify what actions government is most likely to take if it is motivated by broad social welfare considerations, by more parochial constituency concerns, and by other factors. Building on this point, we would like to identify how various market and nonmarket actors can influence the government's regulatory standard decisions through lobbying, campaign contributions, or other nonmarket strategies, prior to the games that we have modeled here. By modeling firms, interest groups, and other parties affecting the government's initial regulatory decision, we can assess how firms' lobbying efforts interact with their propensities for self-regulation.

It might also be useful also to explore how government chooses to set regulatory standards when it possesses reasonably strong enforcement capacity. For a variety of industries it seems plausible that the government is better able to enforce its mandates than the way it is modeled here. As such, it would be worthwhile to identify the conditions under which government might seek to impose and enforce industry mandates, rather than effectively "outsourcing" regulation to the self-regulatory environment that we currently analyze. This extension is particularly worthwhile if one believes that firms, interest groups, and other parties are able to influence the government's initial regulatory standard, as suggested above.

Finally, our theory points to many directions for potential empirical exploration. A first step would be to analyze whether those industries that are subject to relatively high judicial penalties (i.e., through punitive damages) are most likely to engage in self-regulatory efforts. One could also analyze whether self-regulation is most common in industries that are

characterized by high levels of interest group activity, as such an environment would likely ensure that activists are readily able to provide valuable information to the market regarding firm production choices. Further empirical examinations would test whether the responses to such nonmarket pressures differ systematically across different types of firms and different government standards, as predicted in Propositions 3 and 7. Regardless of what directions are ultimately taken, this paper offers an initial glimpse at what promises to be a substantial research agenda on the market and nonmarket impacts of (and influences on) government and self-regulation.

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Figure 1: Regulation and Market Interactions with Perfect Information

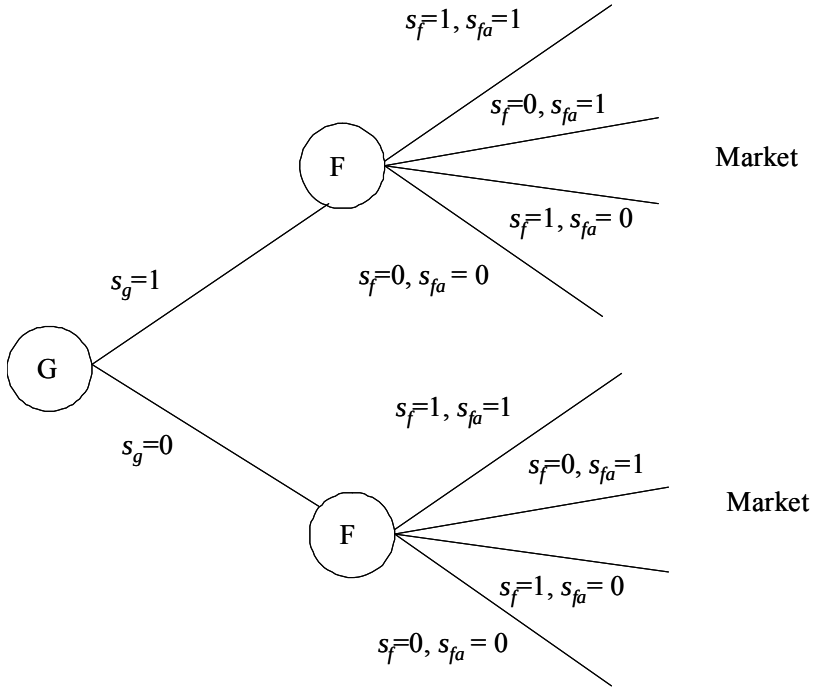


Figure 2: Conditions for Self-Regulation Given Perfect Information

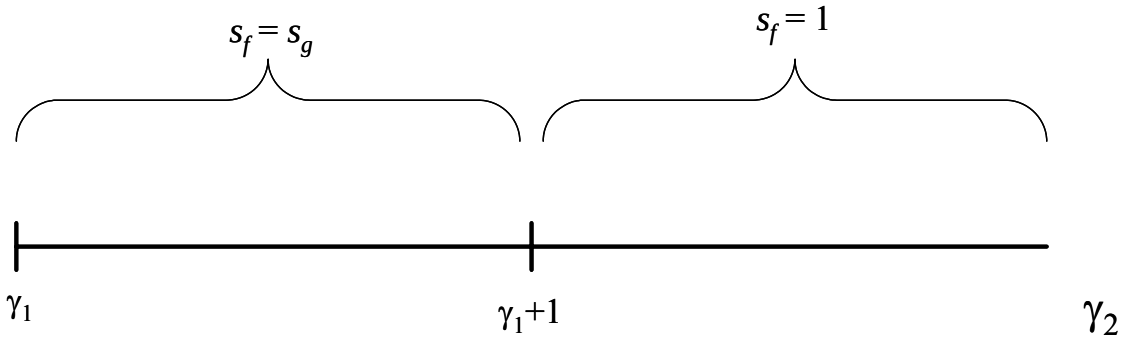


Figure 3: Regulation and Market Interactions with Incomplete Information

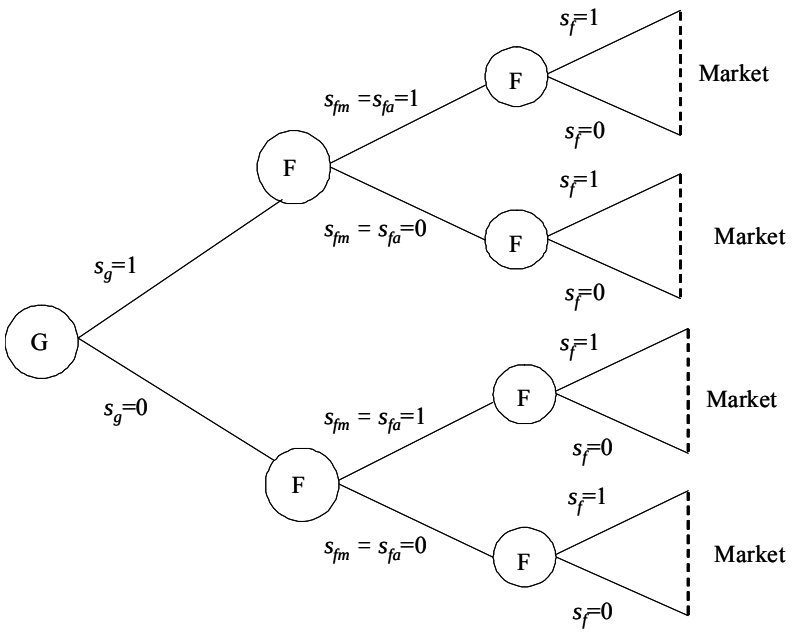


Figure 4: Regulation and Market Interactions with Judicial Institutions

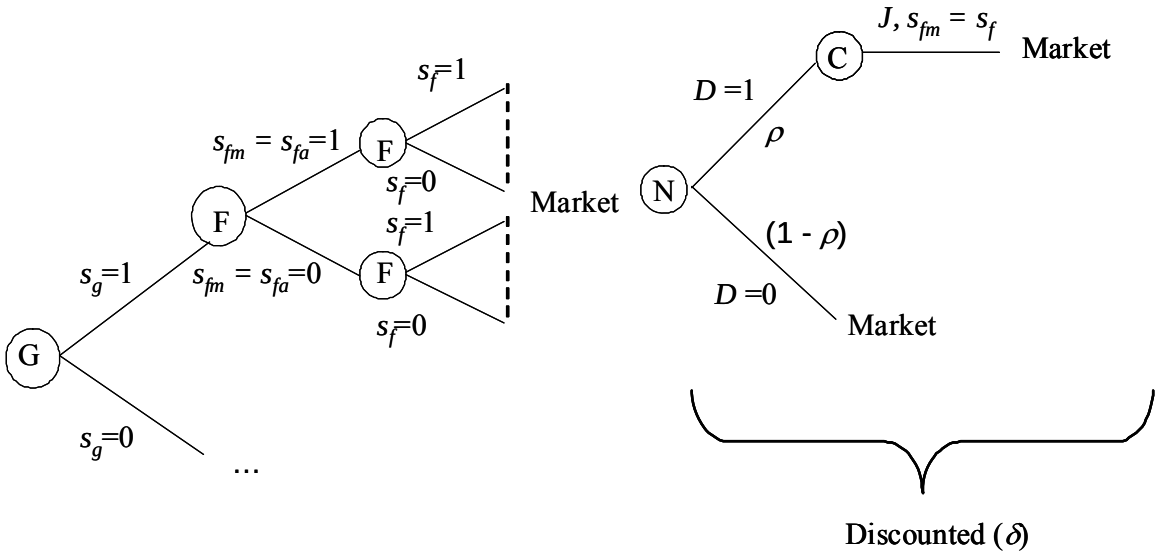


Figure 5: Self-Regulation Given Judgments and Government Standards

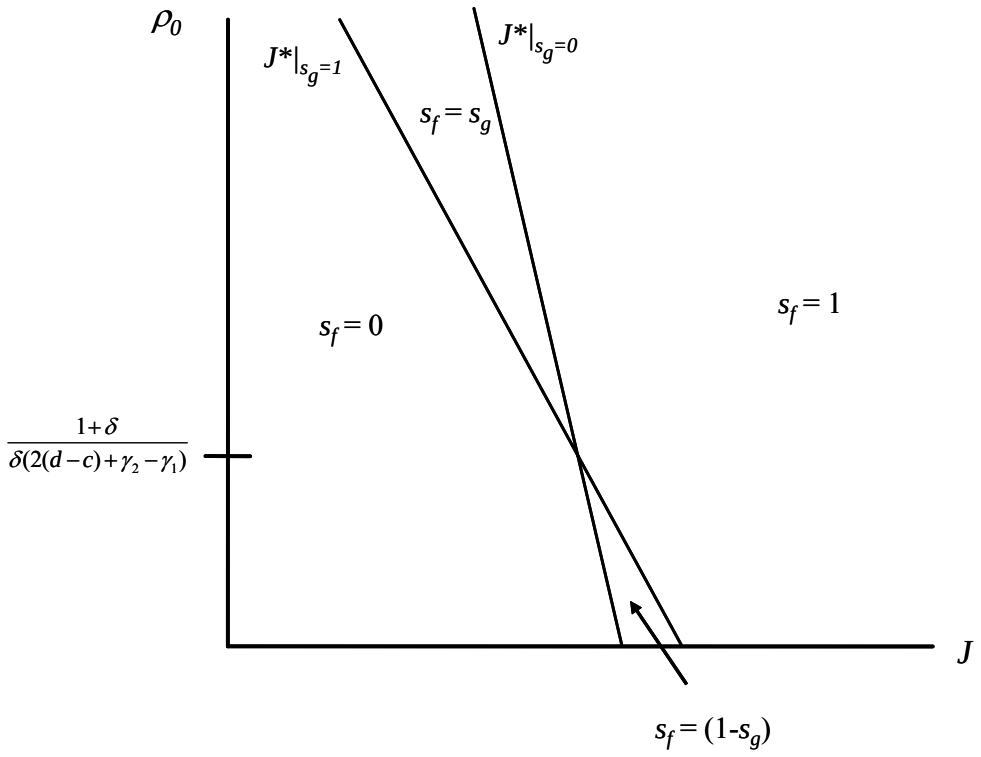


Figure 6: Regulation and Market Interactions in the Presence of Activists

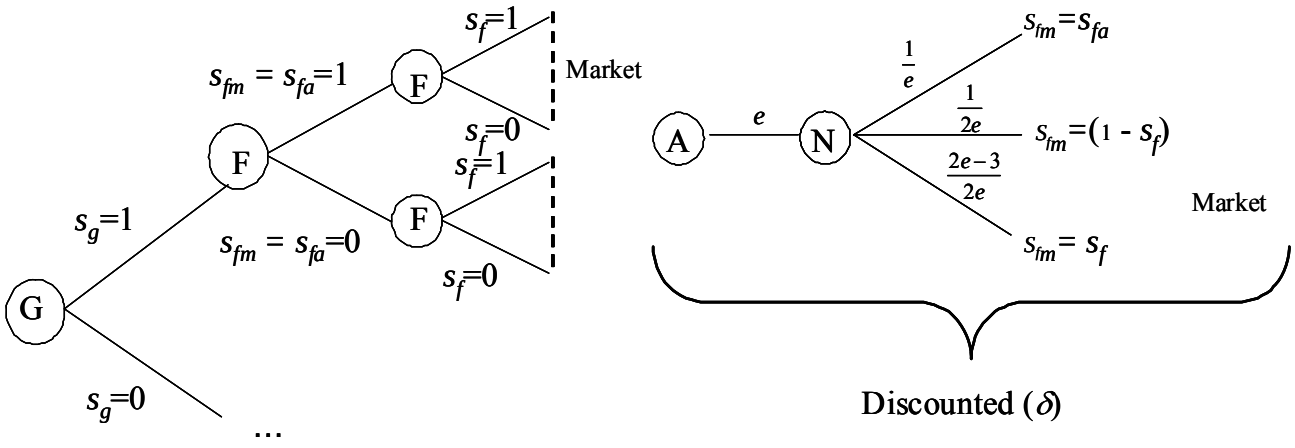
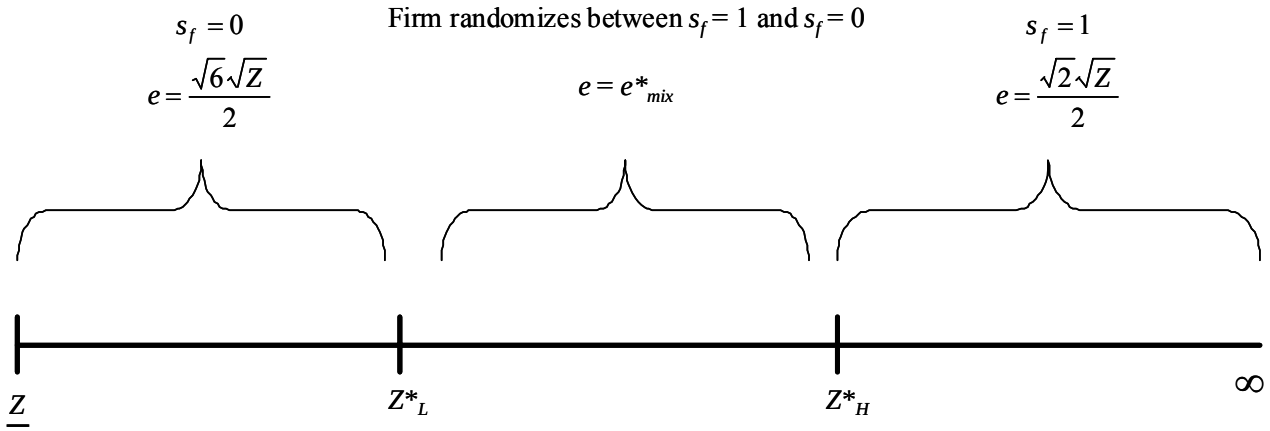


Figure 7: Equilibrium Self-Regulation Induced by Activists



Appendix

Proof of Proposition 1

Suppose government and firm choices are perfectly observable by the public, and government mandates a high quality standard ($s_g = 1$). As noted in the text, if $s_f = 1$, $\Pi|_{s_g=1, s_{fm}=s_f=1} = (d + \gamma_2 - \beta q - c - 1)q$. Differentiating this expression with respect to q yields:

$\frac{\partial \Pi|_{s_g=1, s_{fm}=s_f=1}}{\partial q} = -2\beta q + d + \gamma_2 - c - 1 \Rightarrow q^* = \frac{d + \gamma_2 - c - 1}{2\beta}$. Hence,

$\Pi^*|_{s_g=1, s_{fm}=s_f=1} = \frac{(d + \gamma_2 - c - 1)^2}{4\beta}$. Alternatively, if $s_f = 0$, as noted in the text,

$\Pi|_{s_g=1, s_{fm}=s_f=0} = (d - \gamma_1 - \beta q - c)q$. Differentiating this expression with respect to q yields:

$\frac{\partial \Pi|_{s_g=1, s_{fm}=s_f=0}}{\partial q} = -2\beta q + d - \gamma_1 - c \Rightarrow q^* = \frac{d - \gamma_1 - c}{2\beta}$. Hence, $\Pi^*|_{s_g=1, s_{fm}=s_f=0} = \frac{(d - \gamma_1 - c)^2}{4\beta}$.

Given that $d > c$ and $\gamma_2 > \gamma_1 \geq 1$ by assumption, it must be true that

$\Pi^*|_{s_g=1, s_{fm}=s_f=1} = \frac{(d + \gamma_2 - c - 1)^2}{4\beta} > \frac{(d - \gamma_1 - c)^2}{4\beta} = \Pi^*|_{s_g=1, s_{fm}=s_f=0}$. Hence, the firm will always choose a high quality standard when it is mandated by the government. Suppose, however, that government mandates a low quality standard ($s_g = 0$). Consistent with Equation (4) in the text, if $s_f = 1$, $\Pi|_{s_g=0, s_{fm}=s_f=1} = (d - \gamma_1 + \gamma_2 - \beta q - c - 1)q$. Differentiating this expression with respect to q yields: $\frac{\partial \Pi|_{s_g=0, s_{fm}=s_f=1}}{\partial q} = -2\beta q + d - \gamma_1 + \gamma_2 - c - 1 \Rightarrow q^* = \frac{d - \gamma_1 + \gamma_2 - c - 1}{2\beta}$. Hence,

$\Pi^*|_{s_g=0, s_{fm}=s_f=1} = \frac{(d - \gamma_1 + \gamma_2 - c - 1)^2}{4\beta}$. Alternatively, if $s_f = 0$, $\Pi|_{s_g=0, s_{fm}=s_f=0} = (d - \beta q - c)q$. Differentiating this expression with respect to q yields:

$\frac{\partial \Pi|_{s_g=0, s_{fm}=s_f=0}}{\partial q} = -2\beta q + d - c \Rightarrow q^* = \frac{d - c}{2\beta}$. Hence, $\Pi^*|_{s_g=0, s_{fm}=s_f=0} = \frac{(d - c)^2}{4\beta}$, and we see that $\Pi^*|_{s_g=0, s_{fm}=s_f=0} < \Pi^*|_{s_g=0, s_{fm}=s_f=1}$ iff $\gamma_2 > \gamma_1 + 1$, meaning that when the marketplace places a sufficiently large value on high quality goods, the firm will produce high quality goods even when the government has set a low standard for quality.

Proof of Proposition 2

Suppose government and firm choices are not perfectly observable by the public, and government mandates a high quality standard ($s_g = 1$). Building on the analysis above, if $s_f = s_{fa} = 1$, then $\Pi^*\Big|_{s_g=1, s_f=1, s_{fm}=s_{fa}=1} = \frac{(d + \gamma_2 - c - 1)^2}{4\beta}$. Alternatively, if the firm announces $s_{fa} = 1$ yet chooses $s_f = 0$, then the firm's profit is defined by: $\Pi\Big|_{s_g=1, s_f=0, s_{fm}=s_{fa}=1} = (d + \gamma_2 - \beta q - c)q$. Differentiating this expression with respect to q yields:

$\frac{\partial \Pi\big|_{s_g=1,s_f=0,s_{fm}=s_{fa}=1}}{\partial q} = -2\beta q + d + \gamma_2 - c \Rightarrow q^* = \frac{d+\gamma_2-c}{2\beta}$. Hence,

$\Pi^*\big|_{s_g=1,s_f=0,s_{fm}=s_{fa}=1} = \frac{(d+\gamma_2-c)^2}{4\beta}$, which is clearly greater than $\Pi^*\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=1}$, implying that whenever the government sets a high standard the firm will choose $s_f = 0$ yet announce $s_{fa} = 1$. In the event that the government sets a low standard ($s_g = 0$), if $s_f = s_{fa} = 0$, then as noted above, the firm's profit is $\Pi^*\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=0} = \frac{(d-c)^2}{4\beta}$. Alternatively, if the firm announces $s_{fa} = 1$ yet chooses $s_f = 0$, then the firm's profit is defined by:

$\Pi\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=1} = (d-\gamma_1+\gamma_2-\beta q-c)q$. Differentiating this expression with respect to q yields: $\frac{\partial \Pi\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=1}}{\partial q} = -2\beta q + d - \gamma_1 + \gamma_2 - c \Rightarrow q^* = \frac{d-\gamma_1+\gamma_2-c}{2\beta}$. Hence,

$\Pi^*\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=1} = \frac{(d-\gamma_1+\gamma_2-c)^2}{4\beta}$, which is clearly greater than $\Pi^*\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=0}$, given that $\gamma_2 > \gamma_1$ by assumption, implying that the firm has a clear incentive to claim that it is producing a high quality good, yet produce a low quality good even when the government mandates a low standard for quality. Finally, to demonstrate that the firm has no incentive to ever produce a high quality good ($s_f = 1$) yet announce that it has produced a low quality good ($s_{fa} = 0$), note that if $s_g = 0$, then $\Pi\big|_{s_g=0,s_f=1,s_{fm}=s_{fa}=0} = (d-\beta q-c-1)q$. Differentiating this expression with respect to q yields: $\frac{\partial \Pi\big|_{s_g=0,s_f=1,s_{fm}=s_{fa}=0}}{\partial q} = -2\beta q + d - c - 1 \Rightarrow q^* = \frac{d-c-1}{2\beta}$.

Hence, $\Pi^*\big|_{s_g=0,s_f=1,s_{fm}=s_{fa}=0} = \frac{(d-c-1)^2}{4\beta}$, which is clearly less than $\Pi^*\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=0}$ and (by transitivity) less than $\Pi^*\big|_{s_g=0,s_f=0,s_{fm}=s_{fa}=1}$. Analogously, suppose that $s_g = 1$, then $\Pi\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=0} = (d-\beta q-\gamma_1-c-1)q$. Differentiating this expression with respect to q yields: $\frac{\partial \Pi\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=0}}{\partial q} = -2\beta q + d - \gamma_1 - c - 1 \Rightarrow q^* = \frac{d-\gamma_1-c-1}{2\beta}$. Hence,

$\Pi^*\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=0} = \frac{(d-\gamma_1-c-1)^2}{4\beta}$, which is clearly less than $\Pi^*\big|_{s_g=1,s_f=1,s_{fm}=s_{fa}=1}$ and (by transitivity) less than $\Pi^*\big|_{s_g=1,s_f=0,s_{fm}=s_{fa}=1}$. Hence, regardless of what government standard is chosen, the firm will always choose $s_f = 0$ yet announce $s_{fa} = 1$.

Proof of Proposition 3

To prove the first part of Proposition 3 it is sufficient to compare the firm's expected utility that corresponds with each (s_f, s_{fa}) pair when $s_g = 1$ and when $s_g = 0$, to identify the crucial judgment

J^* such that the firm is indifferent between choosing a high standard ($s_f = 1$) and announcing a high standard ($s_{fa} = 1$) compared to choosing a low standard ($s_f = 0$) and announcing a high standard ($s_{fa} = 1$). To begin, suppose $s_g = 1$. If the firm chooses $s_f = s_{fa} = 1$, then, its expected profit given equilibrium quantity choices in each period equals:

$$E\Pi^*|_{s_g=1, s_{fa}=s_f=1} = \frac{(d+\gamma_2-c-1)^2}{4\beta}$$

$$+\delta[(\rho_0-\rho_1)(\frac{(d+\gamma_2-c-1)^2}{4\beta}-J)+(1-\rho_0+\rho_1)(\frac{(d+\gamma_2-c-1)^2}{4\beta})]$$

where the first term reflects the firm's first period profits, and the second term reflects the firm's second period profits where a disaster ensures with probability $\rho = \rho_0 - \rho_1$ leading to costly judgment J, and with probability $1-\rho = (1-\rho_0+\rho_1)$ no disaster ensues, all discounted by δ. Likewise, the firm's expected profits if $s_{fa} = 1$ and $s_f = 0$, $s_{fa} = s_f = 0$, and $s_{fa} = 0$ and $s_f = 1$ can be characterized as the following:

$$E\Pi^*|_{s_g=1, s_f=0, s_{fa}=1} = \frac{(d+\gamma_2-c)^2}{4\beta}$$

$$+\delta[(\rho_0)(\frac{(d-\gamma_1-c)^2}{4\beta}-J)+(1-\rho_0)(\frac{(d+\gamma_2-c)^2}{4\beta})]$$

$$E\Pi^*|_{s_g=1, s_{fa}=s_f=0} = \frac{(d-\gamma_1-c)^2}{4\beta}$$

$$+\delta[(\rho_0)(\frac{(d-\gamma_1-c)^2}{4\beta}-J)+(1-\rho_0)(\frac{(d-\gamma_1-c)^2}{4\beta})]$$

$$E\Pi^*|_{s_g=1, s_f=1, s_{fa}=0} = \frac{(d-\gamma_1-c-1)^2}{4\beta}$$

$$+\delta[(\rho_0-\rho_1)(\frac{(d+\gamma_2-c-1)^2}{4\beta}-J)+(1-\rho_0+\rho_1)(\frac{(d-\gamma_1-c-1)^2}{4\beta})]$$

Inspection reveals $E\Pi^*|_{s_g=1, s_{fa}=s_f=1} > E\Pi^*|_{s_g=1, s_{fa}=s_f=0}$ and $E\Pi^*|_{s_g=1, s_{fa}=s_f=1} > E\Pi^*|_{s_g=1, s_f=1, s_{fa}=0}$ $\forall\ J \geq 0$. That is, regardless of the judgment, J, the firm will always want to produce a high quality good and announce that it has produced a high quality good, compared to producing a low quality good and announcing that it has produced a low quality good, and/or producing a high quality good and announcing that it has produced a low quality good. That said,
$E\Pi^*|_{s_g=1, s_{fa}=s_f=1} \geq E\Pi^*|_{s_g=1, s_f=0, s_{fa}=1}$ when

$$J \geq \frac{(2d-2c-1+2\gamma_2)(1+\delta)+\delta\rho_0(\gamma_1+\gamma_2)[(2c-2d)+(\gamma_1-\gamma_2)]}{4\beta\delta\rho_1} = J^*|_{s_g=1}, \text{ and}$$

$E\Pi^*|_{s_g=1, s_{fa}=s_f=1} < E\Pi^*|_{s_g=1, s_f=0, s_{fa}=1}$ when $J < J^*_{s_g=1}$. This means that when $J \geq J^*|_{s_g=1}$ the firm will truthfully announce that it has produced a high quality good, and will misrepresent its production choice ($s_f = 0$, $s_{fa} = 1$), otherwise.
Likewise, when $s_g = 0$,

$$E\Pi^*|_{s_g=0,s_{fa}=s_f=1}=\frac{(d-\gamma_1+\gamma_2-c-1)^2}{4\beta}$$

$$+\delta[(\rho_0-\rho_1)(\frac{(d-\gamma_1+\gamma_2-c-1)^2}{4\beta}-J)+(1-\rho_0+\rho_1)(\frac{(d-\gamma_1+\gamma_2-c-1)^2}{4\beta})]$$

$$E\Pi^*|_{s_g=0,s_f=0,s_{fa}=1}=\frac{(d-\gamma_1+\gamma_2-c)^2}{4\beta}$$

$$+\delta[(\rho_0)(\frac{(d-c)^2}{4\beta}-J)+(1-\rho_0)(\frac{(d-\gamma_1+\gamma_2-c)^2}{4\beta})]$$

$$E\Pi^*|_{s_g=0,s_{fm}=s_f=0}=\frac{(d-c)^2}{4\beta}$$

$$+\delta[(\rho_0)(\frac{(d-c)^2}{4\beta}-J)+(1-\rho_0)(\frac{(d-c)^2}{4\beta})]$$

$$E\Pi^*|_{s_g=0,s_f=1,s_{fa}=0}=\frac{(d-c-1)^2}{4\beta}$$

$$+\delta[(\rho_0-\rho_1)(\frac{(d-\gamma_1+\gamma_2-c-1)^2}{4\beta}-J)+(1-\rho_0+\rho_1)(\frac{(d-c-1)^2}{4\beta})]$$

Similar to the analysis above, inspection reveals that $E\Pi^*|_{s_g=0,s_{fa}=s_f=1} > E\Pi^*|_{s_g=0,s_{fa}=s_f=0}$ and $E\Pi^*|_{s_g=0,s_{fa}=s_f=1} > E\Pi^*|_{s_g=0,s_f=1,s_{fa}=0}\ \forall\ J \geq 0$, yet $E\Pi^*|_{s_g=0,s_{fa}=s_f=1} \geq E\Pi^*|_{s_g=0,s_f=0,s_{fa}=1}$ for $J \geq \frac{(2d-2c-1+2\gamma_2-2\gamma_1)(1+\delta)+\delta\rho_0(\gamma_1-\gamma_2)[(2d-2c)-(\gamma_1-\gamma_2)]}{4\beta\delta\rho_1} = J^*|_{s_g=0}$ and $E\Pi^*|_{s_g=0,s_{fa}=s_f=1} < E\Pi^*|_{s_g=0,s_f=0,s_{fa}=1}$ when $J < J^*|_{s_g=0}$. This means that when $J \geq J^*|_{s_g=0}$ the firm will truthfully announce that it has produced a high quality good, and misrepresent its product choice ($s_f = 0$, $s_{fa} = 1$) otherwise.

To prove the second part of Proposition 3 it is sufficient to take comparative statics over $J^*|_{s_g=1}$ and $J^*|_{s_g=0}$ with respect to our variables of interest and identify whether the first derivatives are positively or negatively valued. For the case where government sets a high standard ($s_g = 1$), comparative statics analysis reveals that:

$$\frac{\partial J^*|_{s_g=1}}{\partial\rho_0}=\frac{(\gamma_1+\gamma_2)[(2c-2d)+(\gamma_1-\gamma_2)]}{4\beta\rho_1}<0,$$

$$\frac{\partial J^*|_{s_g=1}}{\partial\rho_1}=\frac{(2c-2d+1-2\gamma_2)(1+\delta)+\delta\rho_0(\gamma_1+\gamma_2)[(2d-2c)+(\gamma_2-\gamma_1)]}{4\beta\delta\rho_1^2}<0,$$

$$\frac{\partial J^*|_{s_g=1}}{\partial\delta}=\frac{2c-2d+1-2\gamma_2}{4\beta\delta^2\rho_1}<0, \text{ and}$$

$$\frac{\partial J^*|_{s_g=1}}{\partial\gamma_1}=\frac{\rho_0(\gamma_1-d+c)}{2\beta\rho_1}<0$$

given the underlying parametric assumptions of the model.

Moreover, we also see that

$$\frac{\partial J^*|_{s_g=1}}{\partial d} = \frac{1+\delta-\delta\rho_0(\gamma_1+\gamma_2)}{2\beta\delta\rho_1} > 0, \text{ iff } \rho_0 < \frac{1+\delta}{\delta(\gamma_1+\gamma_2)}, \text{ and}$$

$$\frac{\partial J^*|_{s_g=1}}{\partial \gamma_2} = \frac{1+\delta+\delta\rho_0(c-d-\gamma_2)}{2\beta\delta\rho_1} > 0, \text{ iff } \rho_0 < \frac{1+\delta}{\delta(d-c+\gamma_2)}.$$

Alternatively, for the case where government sets a low standard ($s_g = 0$), comparative statics are:

$$\frac{\partial J^*|_{s_g=0}}{\partial \rho_0} = \frac{(\gamma_1-\gamma_2)[(2d-2c)-(\gamma_1-\gamma_2)]}{4\beta\rho_1} < 0,$$

$$\frac{\partial J^*|_{s_g=0}}{\partial \rho_1} = \frac{(2c-2d+1-2\gamma_2+2\gamma_1)(1+\delta)+\delta\rho_0(\gamma_1-\gamma_2)[(\gamma_1-\gamma_2)-(2d-2c)]}{4\beta\delta\rho_1^2} < 0, \text{ and}$$

$$\frac{\partial J^*|_{s_g=0}}{\partial \delta} = \frac{2c-2d+1-2\gamma_2+2\gamma_1}{4\beta\delta^2\rho_1} < 0.$$

given the underlying parametric assumptions of the model.
Moreover, we also see that:

$$\frac{\partial J^*|_{s_g=0}}{\partial d} = \frac{1+\delta+\delta\rho_0(\gamma_1-\gamma_2)}{2\beta\delta\rho_1} > 0, \text{ if } \rho_0 < \frac{1+\delta}{\delta(\gamma_2-\gamma_1)},$$

$$\frac{\partial J^*|_{s_g=0}}{\partial \gamma_2} = \frac{1+\delta+\delta\rho_0(c-d+\gamma_1-\gamma_2)}{2\beta\delta\rho_1} > 0, \text{ if } \rho_0 < \frac{1+\delta}{\delta(d-c+\gamma_2-\gamma_1)}$$

$$\frac{\partial J^*|_{s_g=0}}{\partial \gamma_1} = \frac{\delta\rho_0(d-c-\gamma_1+\gamma_2)-(1+\delta)}{2\beta\delta\rho_1} < 0, \text{ if } \rho_0 < \frac{1+\delta}{\delta(d-c+\gamma_2-\gamma_1)}.$$

Proof of Proposition 4

To prove Proposition 4, it is sufficient to identify the value of ρ_0 such that $J^*|_{s_g=1} = J^*|_{s_g=0}$. To identify this value, note that $J^*|_{s_g=1} - J^*|_{s_g=0} = \frac{\gamma_1(1+\delta)+\delta\rho_0\gamma_1(\gamma_1-\gamma_2-2d+2c)}{2\beta\delta\rho_1}$, and this expression is greater than zero when $\rho_0 < \frac{1+\delta}{\delta(2(d-c)+\gamma_2-\gamma_1)}$. Hence, when $\rho_0 \le \frac{1+\delta}{\delta(2(d-c)+\gamma_2-\gamma_1)}$, $J^*|_{s_g=1} \ge J^*|_{s_g=0}$, and $J^*|_{s_g=1} < J^*|_{s_g=0}$ otherwise.

Proof of Proposition 5

To prove Proposition 5, we begin by identifying the optimal effort level (e^*) that the activist would exert if it knew the firm's quality choice with certainty. Suppose the government sets a high standard, and the firm chooses and announces a high standard (*i.e.*, $s_g = 1$, $s_f = 1$, $s_{fa} = 1$). In that scenario, the expected utility of the activist can be characterized as follows:

$$EU_A|_{s_g=1,s_{fa}=s_f=1} = Z(\frac{1}{e} + \frac{2e-3}{2e}) - e,$$

where *e* is the effort level exerted by the activist, and *Z* is the utility that she receives if the market realizes the firm's actual quality choice in the second period (where the firm's truthful announcement that it chose a high quality product is believed with probability $\frac{1}{e}$, and the activist's announcement is correct and believed by the market, with probability $\frac{2e-3}{2e}$). It should be noted that this expression is identical to the activist's expected utility when the firm chooses a low standard and truthfully announces a low standard (i.e., $EU_A|_{s_g=1,s_{fa}=s_f=1} = EU_A|_{s_g=0,s_{fa}=s_f=0}$). Differentiating this expression with respect to *e* yields:

$$\frac{\partial EU_A|_{s_g=1,s_{fa}=s_f=1}}{\partial e} = \frac{Z-2e^2}{2e^2} \Rightarrow e^*|_{s_g=1,s_{fa}=s_f=1} = \frac{\sqrt{2}\sqrt{Z}}{2}.$$

Alternatively, suppose that the firm chooses a low standard, yet announces a high standard (i.e., $s_g = 1$, $s_f = 0$, $s_{fa} = 1$). In this scenario, the expected utility of the activist from exerting effort can be characterized as:

$$EU_A|_{s_g=1,s_f=0,s_{fa}=1} = Z(\frac{2e-3}{2e}) - e.$$

Similar to above, it should be noted that this expression is identical to the activist's expected utility when the firm chooses a high standard, yet announces a low standard (i.e., $EU_A|_{s_g=1,s_f=0,s_{fa}=1} = EU_A|_{s_g=1,s_f=1,s_{fa}=0}$). Note that the expected utility to the activist is lower when the firm misrepresents its production choice ($\forall$ *Z*, $e > 0$), because if the firm is believed (with probability $\frac{1}{e}$), it will be misleading the public, which is counter to the activist's interests. Engaging in similar analysis to above, we see that $\frac{\partial EU_A|_{s_g=1,s_f=0,s_{fa}=1}}{\partial e} = \frac{3Z-2e^2}{2e^2} \Rightarrow e^*|_{s_g=1,s_f=0,s_{fa}=1} = \frac{\sqrt{6}\sqrt{Z}}{2}$, which implies that the activist would be willing to exert more effort if it knew that the firm were misrepresenting its production choices than when it tells the truth.

Given these optimal activist effort levels, we can calculate the firm's expected utility for choosing $s_f = 1$ and announcing $s_{fa} = 1$ as follows:

$$E\Pi^*|_{s_g=1,s_{fa}=s_f=1} = \frac{(d+\gamma_2-c-1)^2}{4\beta} + \delta[\frac{1}{e^*|_{s_g=1,s_{fa}=s_f=1}}(\frac{(d+\gamma_2-c-1)^2}{4\beta})$$

$$+ \frac{1}{2e^*|_{s_g=1,s_{fa}=s_f=1}}(\frac{(d-\gamma_1-c-1)^2}{4\beta}) + (\frac{2e^*|_{s_g=1,s_{fa}=s_f=1}-3}{2e^*|_{s_g=1,s_{fa}=s_f=1}})(\frac{(d+\gamma_2-c-1)^2}{4\beta})]$$

Where the first term represents the firm's first-period profit from announcing $s_{fa} = 1$, and the second (discounted) term represents the firm's expected second period profit, given that with probability ($\frac{1}{e^*|_{s_g=1,s_{fa}=s_f=1}}$) its announcement will be believed yielding profits equal to

$\Pi^*|_{s_g=1,s_{fm}=s_{fa}=s_f=1}$; with probability $(\frac{1}{2e^*|_{s_g=1,s_{fa}=s_f=1}})$ the activist will be believed, but will be incorrect, yielding firm profits equal to $\Pi^*|_{s_g=1,s_f=1,s_{fm}=0}$; and with probability $(\frac{2e^*|_{s_g=1,s_{fa}=s_f=1}-3}{2e^*|_{s_g=1,s_{fa}=s_f=1}})$ the activist will be believed, and will be correct, yielding firm profits equal to $\Pi^*|_{s_g=1,s_{fm}=s_{fa}=s_f=1}$. By the same logic, the firm's expected profits from choosing $s_f = 0$ and announcing $s_{fa} = 1$ as follows :

$$E\Pi^*|_{s_g=1,s_f=0s_{fa}=1}=\frac{(d+\gamma_2-c)^2}{4\beta}+\delta[\frac{1}{e^*|_{s_g=1,s_f=0,s_{fa}=1}}(\frac{(d+\gamma_2-c)^2}{4\beta})$$
$$+\frac{1}{2e^*|_{s_g=1,s_f=0,s_{fa}=1}}(\frac{(d+\gamma_2-c)^2}{4\beta})+(\frac{2e^*|_{s_g=1,s_f=0,s_{fa}=1}-3}{2e^*|_{s_g=1,s_f=0,s_{fa}=1}})(\frac{(d-\gamma_1-c)^2}{4\beta})],$$

In considering these quantities, the relevant question to ask is, for what value of *Z* (which supports an optimal *e**) would the firm choose to deviate from the assumed strategy? The first point to establish is whether the firm is content to choose $s_f = 0$, and $s_{fa} = 1$, given that the activist is exerting effort level $e^*|_{s_g=1,s_f=0,s_{fa}=1}=\frac{\sqrt{6}\sqrt{Z}}{2}$, or would it prefer to deviate to actually choosing $s_f = 1$ to correspond to its announcement of $s_{fa} = 1$. We can characterize the firm's expected profit if it deviates to $s_f = s_{fa} = 1$ from $s_f = 1$, $s_{fa} = 0$ as:

$$E\Pi^*|_{deviate(s_g=1,s_f=0,s_{fa}=1)}=\frac{(d+\gamma_2-c-1)^2}{4\beta}+\delta[\frac{1}{e^*|_{s_g=1,s_f=0,s_{fa}=1}}(\frac{(d+\gamma_2-c-1)^2}{4\beta})$$
$$+\frac{1}{2e^*|_{s_g=1,s_f=0,s_{fa}=1}}(\frac{(d-\gamma_1-c-1)^2}{4\beta})+(\frac{2e^*|_{s_g=1,s_f=0,s_{fa}=1}-3}{2e^*|_{s_g=1,s_f=0,s_{fa}=1}})(\frac{(d+\gamma_2-c-1)^2}{4\beta})].$$

Setting $E\Pi^*|_{s_g=1,s_f=0,s_{fa}=1}=E\Pi^*|_{deviate(s_g=1,s_f=0,s_{fa}=1)}$ allows us to obtain the $Z^*{}_L|_{s_g=1}$ such that the firm is indifferent between these two options, where

$$Z^*{}_L\Big|_{s_g=1}=\frac{2\delta^2[(4d-4c)(\gamma_2+\gamma_1)+2\gamma_2^2-2\gamma_1^2-\gamma_2-\gamma_1]^2}{3[(1+\delta)(1-2d+2c-2\gamma_2)+(\gamma_1+\gamma_2)(2\delta d-2\delta c+\delta(\gamma_2-\gamma_1)]^2}.$$

Similarly, we also seek to identify for what value of *Z* (which supports an optimal *e**) would the firm choose quality level $s_f = 1$ and announce $s_{fa} = 1$ rather than deviating to $s_f = 0$ and $s_{fa} = 1$, given that the activist is exerting effort level $e^*|_{s_g=1,s_f=1,s_{fa}=1}=\frac{\sqrt{2}\sqrt{Z}}{2}$. We can characterize the firm's expected profit if it engages in such a deviation as:

$$E\Pi^*|_{deviate(s_g=1,s_f=1,s_{fa}=1)}=\frac{(d+\gamma_2-c)^2}{4\beta}+\delta[\frac{1}{e^*|_{s_g=1,s_{fa}=s_f=1}}(\frac{(d+\gamma_2-c)^2}{4\beta})$$
$$+\frac{1}{2e^*|_{s_g=1,s_{fa}=s_f=1}}(\frac{(d+\gamma_2-c)^2}{4\beta})+(\frac{2e^*|_{s_g=1,s_{fa}=s_f=1}-3}{2e^*|_{s_g=1,s_{fa}=s_f=1}})(\frac{(d-\gamma_1-c)^2}{4\beta})]$$

Setting $E\Pi^*|_{s_g=1,s_f=1,s_{fa}=1} = E\Pi^*|_{deviate(s_g=1,s_f=1,s_{fa}=1)}$ allows us to obtain the $Z^*_H|_{s_g=1}$ such that the firm is indifferent between the two options, where

$$Z^*_H\Big|_{s_g=1} = \frac{2\delta^2[(4d-4c)(\gamma_2+\gamma_1)+2\gamma_2^2-2\gamma_1^2-\gamma_2-\gamma_1]^2}{[(1+\delta)(1-2d+2c-2\gamma_2)+(\gamma_1+\gamma_2)(2\delta d-2\delta c+\delta(\gamma_2-\gamma_1)]^2}.$$

Hence, we establish the partitions in the activist reward space such that for $Z \le Z^*_L|_{s_g=1}$, the firm chooses a low standard yet announces that it has chosen a high standard; for $Z \ge Z^*_H|_{s_g=1}$ the firm chooses a high standard and announces that it has chosen a high standard, and for $Z \in (Z^*_L\Big|_{s_g=1}, Z^*_H\Big|_{s_g=1})$, the firm always announces that it has chosen a high standard, yet mixes between actually choosing a high standard and choosing a low standard.

To identify the probability distribution that supports this mixed strategy equilibrium when $Z \in (Z^*_L\Big|_{s_g=1}, Z^*_H\Big|_{s_g=1})$, we begin by identifying the crucial level of effort that the activist must exert to make the firm indifferent between playing $s_f = 1$ and $s_f = 0$, given that $s_{fa} = 1$ in either case. That is, we are solving for $e^*_{mix}\Big|_{s_g=1}$ that satisfies the following equation:

$$E\Pi^*|_{s_g=1,s_f=1,s_{fa}=1,e^*_{mix}} = E\Pi^*|_{s_g=1,s_f=0,s_{fa}=1,e^*_{mix}}.$$

Upon identifying $e^*_{mix}\Big|_{s_g=1}$, we then identify the probability that the firm plays $s_f = s_{fa} = 1$ (*i.e.*, $x^*\Big|_{s_g=1}$) that supports this effort level. To do this, we begin by identifying the optimal effort level that the activist would exert if the firm were mixing with any generic probability, *x*. We can characterize the expected utility of the activist in this scenario as:

$$EU_A|_{s_g=1,mix} = x(Z(\frac{1}{e}+\frac{2e-3}{2e})-e)+(1-x)(\frac{Z(2e-3)}{2e}-e).$$

Differentiating this expression with respect to *e* yields the optimal effort level that the activist would exert for any generic probability, *x*: $e^*|_{s_g=1,x} = \frac{\sqrt{6Z-4xZ}}{2}$. Setting this quantity equal to the $e^*_{mix}\Big|_{s_g=1}$ that supports the firm's mixed strategy above yields the optimal probability distribution $x^*\Big|_{s_g=1}$ that supports the mixed strategy equilibrium when $Z \in (Z^*_L\Big|_{s_g=1}, Z^*_H\Big|_{s_g=1})$. Due to space considerations, these optimal closed-form $e^*_{mix}\Big|_{s_g=1}$ and $x^*\Big|_{s_g=1}$ equations are omitted.

Similar analysis is conducted to derive the equilibrium for the case where $s_g = 0$, which we omit from the text for space considerations (but which are available from the authors upon request).

Discussion of Propositions 6 and 7

To prove Proposition 6, one must compare the magnitude of $e^*_{mix}|_{s_g=1}$ and $e^*_{mix}|_{s_g=0}$. After taking the difference of these quantities, inspection reveals that $e^*_{mix}|_{s_g=1} < e^*_{mix}|_{s_g=0}$. We omit closed-form characterizations of these quantities due to space considerations, yet they are available from the authors upon request.

Similarly, to prove Proposition 7, one must differentiate $e^*_{mix}|_{s_g=1}$ and $e^*_{mix}|_{s_g=0}$ with respect to δ, c, and d, and identify whether the quantities are positive or negative signed. While these calculations are straightforward, they are quite cumbersome to present, and hence, are omitted for space considerations, yet are available from the authors upon request.