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The more the merrier? Disciplinary actions against malpractice

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Abstract
In a world of experience goods, two costly ex-post disciplinary actions can be used against malpractice of firms: consumer lawsuits and government investigation. We distinguish between government effectiveness in detecting 'bad behavior' vs. 'good behavior' of firms—both play a key role in the model. Our results suggest that while an effective government eliminates malpractice completely, the intervention of an ineffective government may backfire, failing to protect the product safety. The reason is that on top of its ineffectiveness, the government may deter consumers from pursuing lawsuits (crowding-out), augmenting the malpractice of firms compared to an equilibrium without government intervention. Additionally, an improvement in government ability to detect 'bad behavior' should be complemented by a reduction of lawsuit cost or an improvement in the ability to detect 'good behavior' in order to restore consumer incentive to pursue lawsuits.

Keywords Experience goods · Product safety · Malpractice · Tort law · Government inspection · Government effectiveness

JEL Classification K13 · L15

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1 Introduction

In a world with rapidly changing products and technologies, assuring the safety of products is one of the highly intricate challenges of policy-makers.[1] In order to reduce potential risks to consumers, it is important to design policies that deter firms (providers or producers) from malpractice behavior. In the presence of experience goods, we focus on the co-existence of consumers' lawsuits and government intervention. The government intervention takes the form of ex-post malpractice investigation (or inspection) by a government agency (also called 'inspector') such as the Food and Drug Administration in the United States (FDA) or the Ministry of Health in other countries.

We analyze the impact of government intervention and highlight a puzzle: more government intervention is not always merrier and may encourage malpractice of firms in the equilibrium. A key factor somewhat disregarded in the literature is the interaction between the government and the consumers, and specifically how the government intervention affects the decision of consumers to pursue a malpractice lawsuit. A well-intended policy may potentially backfire depending on government effectiveness level in detecting 'malpractice' and its effectiveness in detecting 'good behavior' of firms. The main message of the paper is that much caution is needed in the pursuit of public health, taking into account the effect of government intervention on consumers' incentive to pursue a lawsuit, and consequently on the product safety in the equilibrium.

We introduce a game where the government agency interacts with firms and consumers. For simplicity of the analysis, the agency is exogenous to the model and not a strategic player. Firms choose their level of effort, or due care, invested in their goods (or services), where malpractice (no effort) increases the chance that the good is harmful (damaged, impaired, or unsafe). We focus on types of products where consumers learn their quality through experience, after purchase, but are not sure whether the cause of defect is the firm (malpractice) or nature (bad luck). For example, dairy products, meat and chicken may lose their freshness and even spoil (and consequently smell and taste bad), had the producer not strictly apply certain temperature and storage conditions. Another example is outburst of allergies when producers or restaurants do not adhere to their guarantee that the process of production is clean of allergens. Additionally, patients undergoing supposedly health improving medical procedures may wake up in a worse condition than before.

The role of the government in the setting is as follows. Given that the product is damaged, the government agency automatically investigates the reason. Our assumption that inspection is mandatory is plausible when the potential damage is sufficiently severe, e.g., in the case of sensitive food. The government investigation may yield three types of findings about the firm, depending on its effectiveness. The first type is negative findings. That is, the inspector may detect malpractice, which qualifies

[1] In one of the recent examples, the U.S. Attorney's office, the FBI, and the FDA announced in March 9th, 2023, that a former CEO of a medical device company is indicted for selling a fake nonfunctional device that was implanted into patients suffering from chronic pain. The health care fraud led to patients undergoing unnecessary implanting procedures that put their health at significant risk, using them for financial enrichment. See https://www.justice.gov/usao-sdny/pr/former-ceo-medical-device-company-indicted-creating-and-selling-fake-medical-component.

the consumer for a compensation.[2] Second, the government's investigation may yield positive findings. That is, the firm 'well-behaved' and the damage was caused entirely by nature (or 'bad luck'). Positive or negative findings are published in a public report which ends the game.

Alternatively, the investigation may not yield clear-cut information on the firm's behavior. In this case of 'no findings' (or no clear-cut findings), consumers decide whether to pursue a costly malpractice lawsuit. At this stage, they can assess their chance of winning a lawsuit based on the government effectiveness.

Our results suggest that the government effectiveness (or ability) to detect malpractice of producers is a key to product safety. While high effectiveness is sufficient to eliminate malpractice completely, in the presence of low effectiveness malpractice thrives to some extent and may even be larger than without government intervention. When the government effectiveness in detecting malpractice is relatively small, consumer engagement in lawsuits becomes crucial to maintain 'good behavior' of the firms. Consumers decide whether to apply to court based on the composition of cases left for lawsuits. Specifically, consumers are more induced to pursue lawsuits when the pool comprises of a relatively small share of 'well-behaved' firms, increasing their chance to win a lawsuit and receive a compensation.

In contrast, when the government effectiveness in detecting malpractice (relative to good behavior) is sufficiently large, then a large share of 'well-behaved' firms is left in the pool, reducing the chance of consumers to win a lawsuit. As a result, pursuing a lawsuit becomes less attractive for consumers. Consequently, in these circumstances consumers are less involved in lawsuits, which augments the malpractice behavior of firms and harms the product safety relative to an equilibrium without government intervention.

Considering the interest of policy-makers in public health, we search for the levels of government effectiveness that incentivize good behavior of firms. Our main results can be summarized as follows:

1. A sufficiently efficient inspector deters malpractice completely on its own, thus consumers never pursue lawsuits in the equilibrium.
2. When the inspector's effectiveness in detecting malpractice is relatively low, then consumers endogenously choose to step in and pursue lawsuits. However, despite the engagement of both consumers and the government in disciplinary actions, they cannot deter malpractice completely.
3. If additionally the inspector's effectiveness in detecting good behavior relative to malpractice of firms is relatively low, then government intervention, by crowding-out consumer lawsuits, is counter-productive. It actually augments the malpractice behavior of firms compared to an equilibrium without intervention. The reason is that the chance of winning in court is small when the pool of cases left for consumer lawsuits consists of a relatively large share of well-behaved firms.

Surprisingly, the ability of the government to deliver evidence of 'good behavior' to consumers is crucial for product safety, by encouraging consumer lawsuits. This result has important implications and can be interpreted as a requirement from the

[2] In many countries, the detection of malpractice by the government is often followed by class actions based on the disclosed evidence.

government to be transparent about positive inspection findings, even if these findings do not lead to immediate practical consequences on the firms and compensation to consumers. In case the government is inefficient in weeding out bad firms, then the regulators should at least be in the business of giving stamps of approval to good firms. Lack of government transparency about positive findings may backfire, to the extent that government intervention may harm the public health, by deterring consumers from pursuing lawsuits. We observe this transparency in many cases in practice.

4. An important conclusion of our analysis is that improvement in the ability to detect 'bad behavior' of the producer should be complemented by reducing lawsuit cost for consumers, namely, by making courts more accessible. Another way the government can restore consumer incentive to pursue lawsuits is by improving the ability to deliver evidence on 'good behavior' of firms.
5. We show that even when the government intervention backfires in the sense that it reduces the probability that firms exert effort (which results in more damaged products), consumers may be better off by government intervention because its investigation may lead to their compensation without the need to pursue a lawsuit. Clearly, we obtain this result when the level of compensation is sufficiently large.

It is difficult for consumers to assess before purchase whether products adhere to certain safety standards in a wide array of domains including therapeutic drugs, food, cars, and medical treatment. This asymmetric information between consumers and firms naturally entails potential risks to consumers.[3] Despite the risks, people consume these products constantly. Thus, understanding how to improve the incentives of firms and assure the product safety is of considerable interest.

1.1 Literature review

While typically the effort of firms is unobservable to consumers, they may learn the quality of products from experience (for a review on experience goods see Tirole 1988).[4] Our framework enriches the classical inspection game with an additional player that may affect the firms' behavior ex-ante. In our model, consumers may pursue a lawsuit if they suspect in malpractice behavior of the firm.[5] Then, the court follows the standard *negligence rule*, according to which an injurer is held liable for the accident only if his or her level of care was below some level of care defined by a court (see Shavell 1987). When an injurer pays compensation to a victim disregarding

[3] To name several examples, home appliances may malfunction and cause damages, and automobile defects may expose passengers to crashes. In the food industry, there is an ongoing debate surrounding the issue of not only the nutritional value of certain products but also their safety.

[4] Credence goods, on the other hand, are products where consumers, regardless of their experience, never realize their true quality (see the vast literature dating back at least to Nelson (1970), Darby and Karni (1973) and Dulleck and Kerschbamer (2006).

[5] In Hörner (2002), the discipline of firms is through consumer demand. Consumers who buy low-quality products may shift their purchases to other firms. Online feedback systems is another disciplinary action that punishes 'bad sellers' by loss of sales (see e.g., Brown and Morgan 2006, Cabral and Hortacsu 2010 and Cai et al. 2014). In Fishman and Simhon (2005), producers also endogenously decide to invest in the product quality. For a recent model of experience goods with reputation considerations see Niinimäki (2023).

injurer's real fault, this is a *strict liability rule*.[6] Spier (1997) provides a model, where an injurer chooses to take care or not, and then bargains with a victim about compensation if damage is done. If the victim rejects the suggested settlement, the case goes to a court. A similar set-up of compromise is studied in Png (1987).

To assure the product safety, many of the markets for experience goods are heavily regulated and supervised by the government.[7] We focus on an ex-post investigation by a government agency that determines whether the firm invested effort (or due care) or not. We show that this policy may crowd-out consumers from pursuing lawsuits, as they rely on the investigation's findings (or lack of findings), which in turn may augment malpractice behavior of firms. For analysis of market reputational sanctions as alternative to legal sanctions see José Ganuza et al. (2016).

Our results interact with another growing literature on online feedback systems. This literature suggests that buyers avoid leaving negative feedback because of seller retaliation and harassment (see e.g., Zervas et al. (2015) on Airbnb).[8] Therefore, silence (no feedback) is bad news for consumers because it is equivalent to negative feedback to some extent. In our model, in the context of government ex-post investigation of malpractice, silence of the government (providing no feedback on the firm's behavior) is bad news for consumers under certain levels of government efficiency and may have detrimental effects in the equilibrium. Specifically, being denied a feedback about the firm, when the share of well-behaved firms left in the pool is large consumers internalize their low chances of winning a malpractice lawsuit, and hence are deterred from pursuing lawsuits to the extent that the government intervention backfires.

The remainder of the paper is organized as follows. Section 2 describes the economic framework and our results, starting from a benchmark model without government intervention in Sect. 2.1, and adding a government inspector in Sect. 2.2. Section 3 contains concluding remarks and discussion. Most of the proofs are relegated to the Appendix to facilitate the reading. The Appendix also provides a review of stylized facts on medical malpractice investigation systems in Israel and possible channels for government inefficiency.[9]

2 The model

We start from a benchmark model without government intervention. Then, we extend the model to include a government agency and compare the results to the benchmark.

[6] For models which consider strict liability rule see, for instance, Daughety and Reinganum (1995) and Henry et al. (2022).

[7] For example, governments regulate safety standards or enforce disclosure of information. Dranove and Jin (2010) review the growing volume of literature on the market response to certification and quality disclosure programs. Shavell (1984) shows that safety standards may be lower when customers can sue producers. Hua and Spier (2020) provide conditions for producers' liability to improve welfare, when the vulnerability of customers to accidents is private knowledge.

[8] Using eBay data, Nosko and Tadelis (2015) construct a measure for sellers' quality (the number of positive feedback transactions divided by the total number of transactions) that penalizes sellers who are associated with more transactions for which the buyers left no feedback.

[9] We thank Jonathan Davies, a former principal editor of the journal 'Medicine and Law' (Hebrew), for a useful review of case studies on medical malpractice.

2.1 A model without government intervention

Let P be a firm (provider or producer) that produces a product (or distributes a good or a service), and denote by C a representative consumer who buys the product or service. The firm P chooses to either exert effort (e) or not (ne), where the probability that the firm chooses to exert effort P_e and the action chosen by the firm are private knowledge of P.[10] We assume that if no effort is exerted (the case of firm's malpractice), then the firm produces a damaged good, denoted by d. If the firm exerts effort, then there is a positive probability $0 < \alpha < 1$ that the product is undamaged. But despite the effort, there is still a chance $1-\alpha$ that the product is damaged (which we also refer to as 'bad luck'). For example, when doctors exert effort, there is still a chance that the patient's condition worsens after the medical treatment because of bad luck, for which doctors are not held accountable.

If the product is undamaged, then the game ends. If the product is damaged, then the customer C decides whether to pursue a malpractice lawsuit against the firm (s) or not (ns). The probability that C chooses (s) given that the product is damaged is denoted by P_s. Note that although the consumer observes the damage, her decision is taken under uncertainty, because she cannot observe whether firms had exerted effort (or distinguish bad luck from malpractice).

The consumer payoff depends on whether the product is damaged or not. Specifically, while an undamaged product generates a maximal payoff 1 to the consumer, a damaged product yields a payoff 0 to the consumer in case she does not pursue a lawsuit. If the consumer decides to sue, then she pays a nonrefundable lawsuit cost c, $c > 0$, that includes court fees and cost of experts and lawyers. We assume that a lawsuit reveals the effort level of the firm (or equivalently whether the damaged product is a result of malpractice (ne) or bad luck (e)). Accordingly, if the damaged product is the outcome of malpractice (ne), then the lawsuit is justified and the consumer C obtains a compensation of $b > 0$. Thus, the net payoff of C when the lawsuit is justified is $b - c$.[11] Alternatively, if the provider well-behaves (chooses (e)), then the consumer malpractice lawsuit is rejected by the court (but the consumer still pays the lawsuit cost c).

The payoff of the firm P depends on the occurrence of malpractice and whether it is discovered. The firm receives the largest payoff normalized to 1 if no effort was made (ne) and the consumer did not pursue a lawsuit (ns). When the lawsuit is justified, the court imposes a penalty on the firm, reducing the firm's normalized payoff to 0. However, if the provider well-behaves (chooses (e)), then its payoff is always $0 < x < 1$, whether it is sued or not. It follows that the cost of effort for the provider is $1 - x$. This defines the game with no government intervention Γ_1, as we describe in Fig. 1.

[10] The effort of firms may manifest in different stages of production through the choice of technologies, infrastructure, inputs, conditions of storage or transportation, or in the level of self-monitoring.

[11] Note that while not necessary for our results, justice requires that the net payoff should not exceed the damage to the consumer, or $b - c \leq 1$.

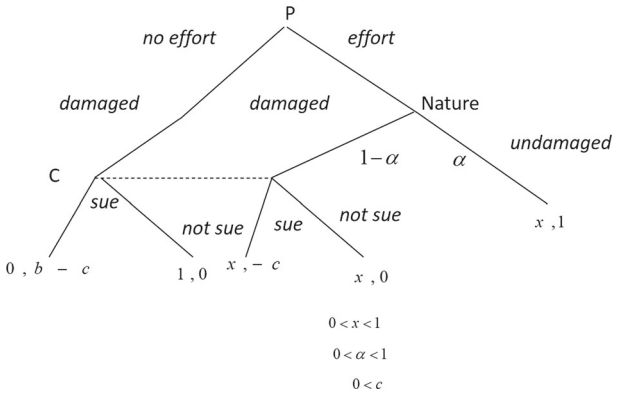


Fig. 1 Γ_1. The game without government intervention. In each pair of payoffs the first number denotes the payoff of the firm P and the second one is the payoff of the consumer C

To characterize the equilibrium, we define 'active consumer' as follows.

Definition 1 *Active consumer.*

The consumer is defined active if she plays an active role as a disciplinary body in the equilibrium. That is, she pursues lawsuits with some positive probability $P_s > 0$. Accordingly, an inactive consumer never pursues lawsuits in the equilibrium.

It is easy to verify that a sufficient condition for consumer to be inactive is that a justified lawsuit yields a negative net payoff for her, $b - c < 0$ (the compensation, b, is smaller than the cost, c). In this case, she never pursues lawsuits. We further characterize the equilibrium of the game for an interior solution, where $b > c$.

Proposition 1 *Equilibrium without government intervention.*

1. *If $b < c$, then the consumer chooses pure (ns) and the firm never exerts effort (ne).*
2. *Assume that $b > c$. Then, the Nash equilibrium is unique with mixed strategies, $0 < P_e < 1$ and $0 < P_s < 1$,*

$$P_s = 1 - x$$

and

$$P_e = \frac{b - c}{b - \alpha c}$$

Proof See Appendix.

If the net payoff of consumer is negative when the lawsuit is justified, $b < c$, then consumer is inactive (ns). Since she never pursues lawsuits, providers have no incentive to exert effort (ne). We further show in Proposition 1 that when consumers are active in the equilibrium, i.e., it is worthwhile to pursue lawsuits, there is a positive probability P_e that providers excel effort. The chance of being sued by consumer P_s encourages providers to behave well to some extent.

Note that the probability of the consumer to sue increases with the cost of effort of the firms, $1-x$, in order to maintain the indifference of the firms between (e) and (ne). Similarly, the probability of the providers to excel effort rises in $b-c$ (the net payoff of consumer in case of a justified lawsuit), in order to maintain the indifference of consumer between (s) and (ns). A similar argument applies to an increase in α, which augments $P(ne|d)$ (the chance of malpractice given that the product is damaged).

There are also other trivial equilibria. If effort yields a negative payoff to firms, $x < 0$, then firms never exert effort (ne) and consumers always pursue lawsuits (s). However, if lawsuits are free $c = 0$, then consumers always pursue lawsuits, and therefore providers always exert effort, (s) and (e), respectively. We disregard these trivial equilibria hereinafter and assume that $0 < x < 1$ and $c > 0$.

An attendant question is how a government agency that investigates malpractice may affect the incentives of providers to well-behave. We argue in the sequel that the result depends on the level of efficiency of such an institution and how its intervention affects consumer incentives to pursue lawsuits in the equilibrium. □

2.2 A model with government intervention

In this section, we add a government agency (inspector). The inspector's role is to perform an investigation of malpractice when the product is damaged. That is, a damaged product always leads to an investigation by the government agency.

We consider two types of government effectiveness in detecting the cause of the damaged product. First, given that the firm exerted effort (e), the investigation may yield positive findings (or positive feedback) on the firm, providing evidence on its good behavior with probability t ($0 \leq t \leq 1$, t is publicly known). In this case, the government publishes a positive report about the firm, clearing its name from the accusation of malpractice. As a result, no compensation is paid to the customer, the firm obtains x, and the game ends. However, with probability $1-t$ the investigation reveals no conclusive evidence despite the good behavior of the firm. Second, when malpractice (ne) indeed occurred, the inspector may reveal the malpractice with probability r ($0 \leq r \leq 1$, r is publicly known), and consequently publish a report with negative feedback on the firm. In this case, the consumer is compensated by b, a penalty of 1 is imposed on the provider, and the game ends. However, with probability $1-r$ the investigation reveals no conclusive evidence despite the malpractice of the firm.

The parameter t (or r) can be viewed as measuring the level of efficiency of the government agency in detecting good (or bad) behavior of the firm, respectively. Nevertheless, note that the probabilities $1-t$ and $1-r$ differ from the standard probabilities of I- or II- type errors. The standard notions of I- or II- type errors are false positive or negative evidence, respectively. However, in our setting, the probabilities $1-t$ and $1-r$ denote the circumstances where the inspector's investigation reaches a dead end and fails to provide evidence on the firm behavior.

Recall that a positive or a negative report of the inspector ends the game. However, without clear-cut findings, the government agency does not release a report at all and we are back to square one. At this stage, the consumer C may enter the game and play a disciplinary role. While the consumer already knows that the product is damaged,

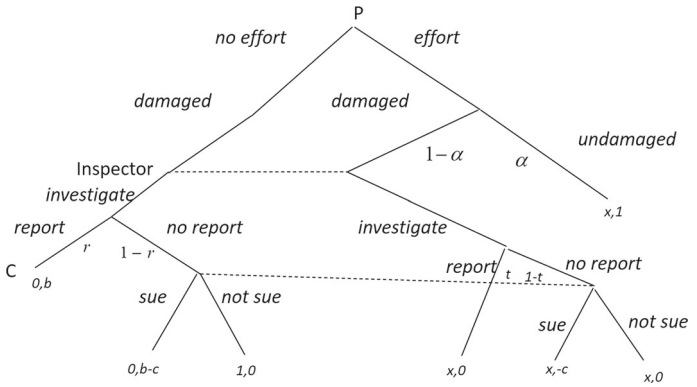


Fig. 2 The game with government intervention. In each pair of payoffs the first number denotes the payoff of the firm P and the second one is the payoff of the consumer C

she is uncertain about the chances in court because she cannot distinguish between two cases. First, there is a chance $1 - r$ that the investigation was unsuccessful to detect malpractice of firms. In this case, pursuing a lawsuit is worthwhile. Second, there is a chance $1 - t$ that the inspector failed to reveal good behavior of the firm ('bad luck'), and consequently a lawsuit will prove unjustified. Under this uncertainty about the inspector's performance, the consumer C decides whether to pursue a malpractice lawsuit. Then, the game proceeds as game Γ_1. The game is described in Fig. 2.

Next, we characterize the equilibrium with government investigation.

Proposition 2 *Equilibrium with government intervention.*

1. *Assume $r > 1 - x$. Then, in the unique Nash equilibrium, the inspector prevents malpractice altogether on its own. The firm chooses pure (e) and the consumer chooses pure (ns).*
2. *Assume that $r < 1 - x$, $b < c$. Then, in the unique Nash equilibrium no disciplinary actions are taken. The consumer chooses pure (ns), which 'guarantees' malpractice behavior of firms, pure (ne).*
3. *Assume that $r < 1 - x$, $t < 1$, and $b > c$. Then, malpractice is alleviated but not prevented completely. The Nash equilibrium is unique with mixed strategies, $0 < P_e < 1$ and $0 < P_s < 1$,*

$$P_e = \frac{(b-c)(1-r)}{(b-c)(1-r) + c(1-\alpha)(1-t)},$$

and

$$P_s = \frac{1-r-x}{1-r}.$$

Proof See Appendix.

An inspector who is sufficiently effective in collecting negative evidence ($r > 1 - x$) eliminates malpractice completely on its own. The inspector fully substitutes

the consumer as a disciplinary body, and thereby the consumer chooses never to pursue lawsuits in the equilibrium (ns). Inspection is sufficient to guarantee the effort of providers (pure (e)) without the need for additional disciplinary actions by the consumer. The reason is that an efficient inspector detects malpractice to the extent that it is more profitable for firms to exert effort than to bear the consequences when their malpractice is revealed by the inspector. As a result, the consumer is redundant and chooses not to pursue lawsuits.

However, when the inspector is insufficiently effective at collecting negative evidence ($r < 1 - x$), it cannot alleviate malpractice behavior of firms on its own. In this case, active consumers become a crucial disciplinary player against malpractice. Recall that when $b < c$ (the compensation in case of a justified lawsuit, b, is smaller than the cost, c), consumers are inactive. When a justified lawsuit yields a negative net payoff for the consumer, she never pursues lawsuits. Combined with an inefficient inspector, an inactive consumer 'guarantees' malpractice of firms. No disciplinary actions are taken against the provider ((ns)) and the equilibrium collapses to the worst scenario in terms of public health ((ne) by the provider).

Nevertheless, when justified lawsuits are worthwhile for consumers, their involvement prevents the worst scenario in terms of public health (ne by the producers). An inefficient inspector accompanied by an active consumer (who steps in to pursue lawsuits) drives the firms to well-behave to some extent. In these circumstances, we obtain an equilibrium of mixed strategies of the firm and the consumer, where the inspector's inefficiency is partially compensated by consumer lawsuits. Therefore, active consumers play a key role in enforcing good behavior of the firms when the inspector is insufficiently effective.

Note that while an efficient inspector eliminates malpractice altogether on its own, an inefficient inspector with the 'assistance' of active consumers alleviates malpractice but fails to achieve pure (e). After characterizing the equilibria with and without government intervention, we analyze the implications of government intervention on the behavior of consumers and firms. □

2.3 The implications of government intervention

In this section, we analyze the implications of government intervention in our framework by comparing the equilibrium with government intervention to our benchmark without government intervention (Propositions 1–2). Recall first that the elimination of malpractice can be achieved only by an inspector who is sufficiently effective in collecting negative evidence ($r > 1 - x$). Without government intervention, active consumers can alleviate but not prevent malpractice completely. Therefore, the intervention of an efficient inspector enforces the good behavior of firms, thereby promoting public health.

In the sequel, we examine the implications of government intervention when its effectiveness in collecting negative evidence is low ($r < 1 - x$) and consumers are active ($b > c$). Recall that in these circumstances, active consumers who pursue lawsuits ($b > c$) are essential in shifting to an equilibrium of mixed strategies, where firms exert effort to some extent. However, government intervention crowds-out consumers

lawsuits ($P_s < 1 - x$), and the crowding-out effect is larger as the inspector is more effective ($\frac{\partial P_s}{\partial r} < 0$). Is it possible that because of the crowding-out of consumers, government intervention results in more malpractice of firms than in the benchmark case? Surprisingly, the answer is yes, and the key factor that determines whether the inspector's well-intended policy backfires is its efficiency in providing positive evidence (t) relative to its efficiency in providing negative evidence (r),

Proposition 3 *Comparison of equilibrium with and without government intervention. Let $r < 1 - x$ and $b > c$. Then, compared to the equilibrium without government intervention,*

1. *Government intervention crowds-out consumer lawsuits, $P_s < 1 - x$, and the crowding-out effect is larger as the inspector is more effective, $\frac{\partial P_s}{\partial r} < 0$.*
2. *If $t > r$, government intervention alleviates malpractice behavior of firms, $P_e > \frac{b-c}{b-\alpha c}$.*
3. *If $t < r$, government intervention augments malpractice behavior of firms, $P_e < \frac{b-c}{b-\alpha c}$.*
4. *If $r = t$, the probability of firms to exert effort is identical with and without government intervention.*

The proof is immediate by Propositions 1 and 2. Proposition 3 reveals the importance of the interaction between the government inspector and the consumer. We start from the case where the inspector's level of efficiency is identical in revealing positive or negative evidence (its efficiency level does not depend on the action chosen by P, $r = t$). In this case, government intervention does not affect firm's behavior (P_e). The result changes if $r \neq t$. Government intervention improves the probability that firms well-behave when the inspector detects good behavior of firms with a higher probability than detecting malpractice of firms ($t > r$). The intuition is the following. With more good behavior cases detected by the inspector than malpractice cases, the pool of cases left for consumer lawsuits contains a large share of malpractice cases, where consumers win in court. Consequently, the consumer is more eager to sue, which induces firms to exert effort more than in the benchmark case. Formally, it is easy to verify that the probability that firms exert effort increases with t and declines with r ($\frac{\partial P_e}{\partial t} > 0$ and $\frac{\partial P_e}{\partial r} < 0$, respectively, recall Proposition 2).

In contrast, with a relatively low chance of the inspector to provide positive evidence ($t < r$), the crowding-out of consumer lawsuits augments malpractice behavior of firms relative to the benchmark case. The reason is that the smaller the relative share of positive findings detected by the inspector, the larger the share of well-behaved firms left in the pool of cases that end up in court. A pool composed mostly of well-behaved firms reduces the consumer's chance to win in court. The low winning chances further crowd-out consumers from pursuing lawsuits, which in turn reduces the probability that firms exert effort below its benchmark level. To summarize, when the government inspector is relatively inefficient in detecting positive findings, 'the more' is not 'the merrier'. That is, government intervention is harmful for public health because the crowding-out of consumer lawsuits increases the malpractice of firms.

It is important to note that even when the government intervention augments the malpractice behavior of firms ($t < r$), consumers may still favor its intervention. The reason is that an inspector that detects malpractice saves them cost of pursuing

a lawsuit. That is, if the inspector detects malpractice, they are compensated without having to pay the non-refundable lawsuit cost.

Let us compare the expected payoff of the consumer C with and without government intervention. Recall that the consumer is indifferent between suing or not when $r < 1 - x$ and $b > c$, see Propositions 1–2. Then, the expected payoff of the consumer C in the benchmark case is given by

$$EU_C = \alpha P_e,$$

and the expected payoff of the consumer with government intervention is

$$EU_C = \alpha P_e + br(1 - P_e).$$

According to Proposition 3, when $t \geq r$ the probability of firms to exert effort is weakly larger with government intervention, augmenting the expected consumer's payoff relative to the benchmark case.

Moreover, consumers may be better off with government intervention, even if it augments the malpractice behavior of firms ($t < r$), because of the chance of being compensated without pursuing a lawsuit. This chance is high when the net payoff in case of a justified lawsuit is low, $b \to c, c > 0$, reducing the consumer's incentive to sue, and thereby firm's incentive to exert effort ($P_e \to 0$, recall Propositions 1–2). Formally, with a large chance of malpractice behavior of firms, the consumer prefers government intervention offering a high chance of being compensated without pursuing lawsuits (when $P_e \to 0$, the consumer's expected payoff with government intervention converges to a higher value than the benchmark case $br > 0$).

On the other hand, a negligible lawsuit cost ($b > 0, c \to 0$) encourages the consumer to pursue lawsuits, which augments the firm's incentive to well-behave, $P_e \to 1$, reducing the chance of being compensated. In this case, the expected payoffs of consumers with and without government intervention both converge to α.

Nevertheless, when the compensation b is sufficiently low (and $t < r$), the expected payoff of C is larger in the benchmark case, because of the higher probability that firms well-behave (recall Proposition 3). In other words, alleviating malpractice in the benchmark case is more beneficial for the consumer than the small expected compensation following government inspection. To ensure that $b > c$ holds, we assume that c is proportional to b.

Proposition 4 *Comparison of consumer's expected payoff with and without government intervention.*
Let $r < 1 - x$, $b > c$.

1. *If $t \geq r$ or ($b \to c, c > 0$), then the expected payoff of C is larger with government intervention.*
2. *Let $t < r$, $b > 0, c \to 0$. Then the expected payoff of C in the model with government intervention and in the benchmark case converge to the same value.*
3. *Let $t < r$, $c = \kappa b$, $\kappa < 1$, $c > 0$. If $b < \frac{\alpha(1-\kappa)(r-t)}{r(1-\alpha\kappa)(1-t)}$, then the expected payoff of C is higher in the benchmark case. Otherwise, if $b > \frac{\alpha(1-\kappa)(r-t)}{r(1-\alpha\kappa)(1-t)}$, then the expected payoff of C is larger with government intervention.*

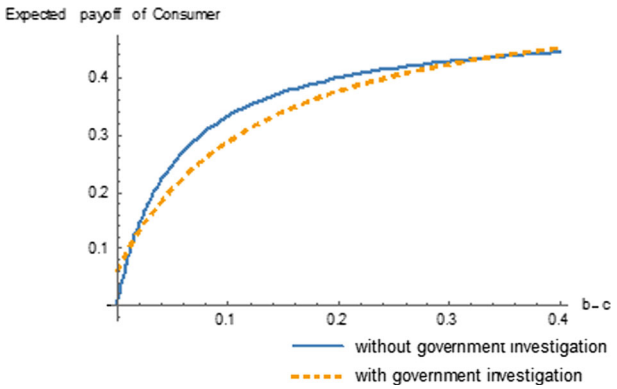


Fig. 3 Expected payoff of C with and without government intervention for $\alpha = 0.5$, $c = 0.1$, $r = 0.6$, $t = 0$, $x < 1 - r$

In Fig. 3, we provide a numerical example that compares consumer expected payoff with and without government intervention. The x-axis denotes the net payoff of the consumer in case of a justified lawsuit $(b - c)$. The example indicates that when the net payoff of the consumer in case of a justified lawsuit is sufficiently high (above 0.35), then consumers are better off with government intervention because of the chance they may be compensated without the need to pay the lawsuit cost. Below this value, consumers prefer the benchmark case (see Proposition 4 (3)). Nevertheless, for sufficiently small values of $b - c$, $b \to c$, the consumer's expected payoff is again larger with government intervention (see Proposition 4 (1)).

Suppose next that the social planner is interested in maintaining a certain probability of the firm to exert effort, P_e^*. Recall that an increase in the inspector's relative efficiency in detecting malpractice behavior of firms $(\frac{r}{t})$ leads to a reduction in the chance that the firm well-behaves $(\frac{\partial P_e}{\partial \frac{r}{t}} < 0)$ due to the crowding-out of consumers from pursuing lawsuits. To restore the desired level P_e^*, the social planner may improve the accessibility of consumers to courts by reducing the lawsuit cost c. Formally, denote by $c(\frac{r}{t}, P_e^*)$ the lawsuit cost that maintains some desired level of P_e^* given the inspector's relative effectiveness in detecting malpractice behavior of firms, $\frac{r}{t}$.

Proposition 5 *Maintaining a desired probability that firms exert effort*
Let $r < 1 - x$ *and* $b > c$. *Then,* $c(\frac{r}{t}, P_e^*)$ *exists and* $\frac{\partial c(\frac{r}{t}, P_e^*)}{\partial \frac{r}{t}} < 0$.

Therefore, we argue that improving the relative efficiency of the inspector in detecting malpractice behavior of firms should be complemented by higher accessibility to courts.

3 Discussion

We study how the interaction between two disciplinary actions affects the malpractice behavior of producers, comparing the equilibrium under different levels of government

efficiency. We show that while an efficient government agency eliminates malpractice on its own, an inefficient one is complemented by 'active' consumers who endogenously step in to pursue lawsuits. Nevertheless, an ineffective inspector may lead to more malpractice of firms, by crowding-out consumer lawsuits.

Next, we discuss some of our assumptions. We assume that the court's chance to discover malpractice behavior is larger than the inspector's (without loss of generality, the court always discovers malpractice). This assumption is quite plausible in our framework, where the court always plays after the inspector, and thereby can use at least all the information collected by the inspector. This is more prevalent in the continental juridical system, where the court, following a lawsuit, may initiate its own investigation and collect evidence (on top of the inspector's and the parties'). To examine this assumption, in Appendix B we plot two indicators taken from the World Justice Project (WJP) for 113 countries, 'government efficiency' (in blue) and 'civil justice efficiency' (in red). The impression is that typically the civil justice efficiency score is larger than the government efficiency score, consistent with our assumption. Additionally, we reject the hypothesis of equality of means of these indicators for a P-value of 7%.

Moreover, suppose that we assume more realistically that the court is not perfect, namely, the court discovers malpractice with some probability $q < 1$ (that measures the efficiency of the court). Then, the results are qualitatively robust for a sufficiently high level of court efficiency. However, if both the court efficiency and the government efficiency (q and r) are low, then naturally in the equilibrium consumers would not step in to pursue lawsuits and no disciplinary actions would take place (ni and ns), discouraging the producer from making effort (ne).

Another assumption about the court is that producers who invest effort are not immune to lawsuits but are never mistakenly convicted by the court. Assuming alternatively that they may be mistakenly convicted does not change our results qualitatively. Though, in this case a more complicated model may be considered, where the producer and the customer bargain on the compensation to the customer. For example, in Daughety and Reinganum (2011) the plaintiffs and the producer reach a settlement.

Data appendix

This section describes our data sources, all publicly available, and the indicators we use.

For the indicator of Government Efficiency, we use the World Justice Project (WJP) Rule of Law Index 2017–2018 report drawn from the assessments of more than 110,000 citizens and 3000 legal experts in 113 countries and jurisdictions. Each score of the Index is calculated using a large number of questions from two original data sources collected by the World Justice Project in each country: a General Population Poll (GPP) and a series of Qualified Respondents' Questionnaires (QRQs). They capture the experiences and perceptions of ordinary citizens and in-country professionals in their country, where 1 signifies the highest score and 0 signifies the lowest score. The report presents 8 composite factors that are further disaggregated into 44 specific subfactors. For our purpose, we use several sub-factors. First, the indicator for government

efficiency, sub-factor 6.1, measures the extent to which 'Government regulations are effectively enforced', where government regulations include e.g., labor, environmental, public health, commercial, and consumer protection regulations. This factor does not assess which activities a government chooses to regulate, nor does it consider how much regulation of a particular activity is appropriate. An alternative measure that provides similar qualitative results is sub-factor 6.3 that measures whether administrative proceedings are conducted without unreasonable delay at the national and local levels.

For the indicator of Civil Justice Efficiency, we use the same dataset, the WJP Rule of Law Index, and it is similarly measured by sub-factor 7.6, 'Civil Justice is effectively enforced'. This indicator examines if decisions are enforced effectively, the effectiveness and timeliness of the enforcement of civil justice decisions and judgments in practice. Correspondingly, an alternative measure that provides similar qualitative results is sub-factor 7.5 that measures whether court proceedings are conducted (and judgments are produced) without unreasonable delays.

Appendix A: Medical malpractice

In this section, we review stylized facts on ex-post medical malpractice investigation systems and possible channels for government inefficiency in Israel and in the United States. Our focus on medical malpractice emanates from the gravity of the problem, medical error is argued to be the third leading cause of death in the US according to the British Journal (Makary and Daniel 2016).

Ombudsman vs. courts

In Israel, the Ombudsman at the MOH processes the public complaints on medical malpractice and considers whether to establish an investigation committee. After investigation committees submit their conclusions, the director general decides whether to transfer the case to the disciplinary department for further disciplinary actions.

According to Fig. 4, there were about 1000 complaints on medical malpractice per year (a total of 9369) in the years 2008–2016. A total of 320 investigation committees were established for only 3.42% of these complaints (2.05–4.38% per year). Data on both investigation committees and disciplinary committees is available for the years 2012–2016 (excluding 2013). During this period, a total of 24 disciplinary committees were established, which is 14.8% from a total of 163 investigation committees and only 0.5% from a total of 4997 complaints submitted to the MOH. Most disciplinary committees ended in license suspension.

Suggestive evidence seems to support the view that the magnitude of this process is relatively small compared to consumer lawsuits. According to private lawyers, they usually recommend their customers to refrain from submitting complaints to the MOH and pursue medical malpractice lawsuits instead, given the considerable duration of time and non-exhaustion of the process (see report 62 of the State Comptroller of Israel, 2011, p. 260).

Year	Number of complaints	Number of investigation committees	Percentage of investigation committees	Decisions in disciplinary committees				
				Total	Acquittal	Conviction		
						Censure	warning	License suspension
2008	1,175	46	3.91	-	-	-	-	-
2009	1,075	22	2.05	-	-	-	-	-
2010	1,026	41	4.00	-	-	-	-	-
2011	1,096	48	4.38	-	-	-	-	-
2012	1,130	43	3.81	10	2	1	1	6
2013	-	-	-	8	1	0	1	6
2014	1,292	40	3.10	3	0	0	0	3
2015	1,298	40	3.08	8	1	0	1	6
2016	1,277	40	3.13	3	2	1	0	0
total	**9,369**	**320**	**3.42**	**32**	**6**	**2**	**3**	**21**

Fig. 4 Medical practice investigation in the Ministry of Health (MOH), Israel. Source: Authors calculations based on tables 5–6 in the report of the research center of the Israeli congress (2017, p. 23, 25)

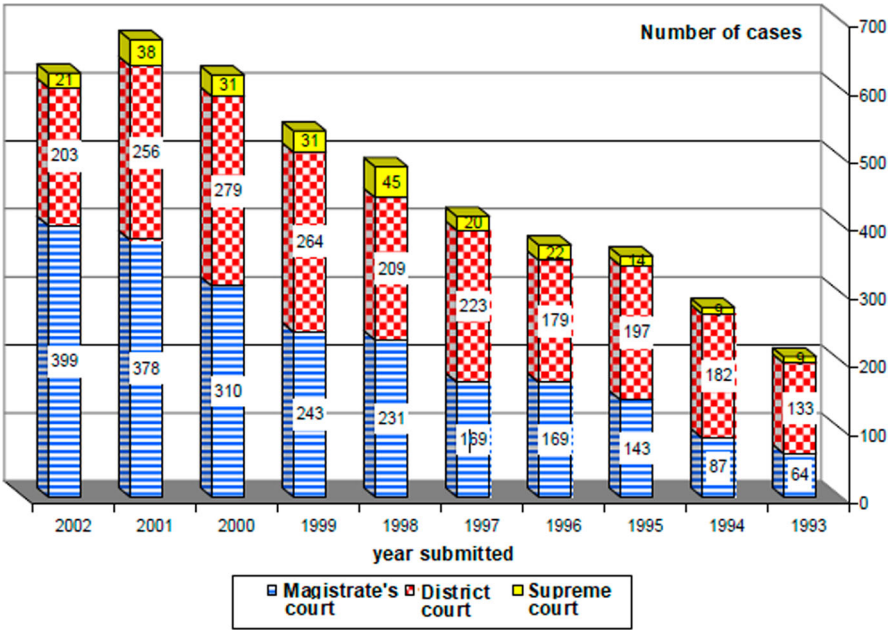


Fig. 5 Number of cases by year submitted and by court in the years 1993–2002. Source: The report of the Tana Shpenitz committee for medical malpractice in Israel (2005), P. 14, table 2.6

Figure 5 presents the number of lawsuits submitted in the years 1993–2002. Consistent with the anecdotal evidence, about 360 lawsuits were submitted to the magistrate's court per year during the period of 2000–2002, 9 times larger than the average number of investigation committees established in the MOH per year during the period of 2008–2016. Note that 360 is a lower bound to the number of lawsuits in the period of 2008–2016, because the number of lawsuits increases over time. This example illustrates that although government agencies are entitled to investigate medical malpractice, the courts may play a more crucial role in the pursuit of public health.

Potential sources for inefficiency

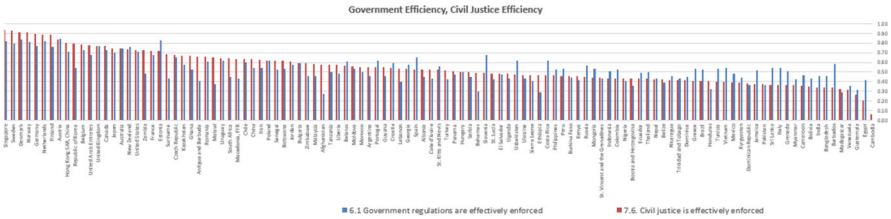
Concerns are often raised about the difficulties to detect malpractice behavior, specifically medical malpractice, because of structural and cultural reasons. For example, the Israeli Law of Patient's Rights (Paragraphs 21–22) has been criticized for providing full confidentiality to internal investigations and disciplinary committees in hospitals and to protocols of external investigation committees. Moreover, it has been argued by doctors and lawyers that there is a culture of cover-up of medical malpractice, sham peer review and retaliation against whistle-blowers in the name of professional ethics and loyalty to colleagues. Additionally, many malpractice lawsuits end up in settlements, and these settlements include a clause where patients commit to silence about the case.

Another potential reason for 'too-little-too-late' detection of malpractice may be the FDA reporting system in the US. While medical companies are supposedly obliged to report, their objectivity is questionable. They engage in lobbying their products and they finance most of the research (in the US they paid doctors more than 2 billion in 2016). Therefore, they naturally have incentives to be over optimistic about their findings (over-report positive findings and over-generalize them to population groups that have not been tested, and under-report risks and failures). The system then relies on the self-report of Doctors, which is, regrettably, voluntary.

Practically, this reporting system is argued to result in under-reporting of only 3–4% adverse effects and a time delay until complaints build-up. Moreover, as doctors and patients rely on this system, they potentially dismiss their own experience and crowd-out from reporting and pursuing lawsuits. These structural and cultural issues may pose difficulties to detect malpractice. We model them via the parameters of government efficiency.

Appendix B

See Fig. 6.



t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	0.528126271	0.543782
Variance	0.018364879	0.027897
Observations	113	113
Pearson Correlation	0.744641629	
Hypothesized Mean Difference	0	
df	112	
t Stat	-1.485389416	
P(T<=t) one-tail	0.070125008	
t Critical one-tail	1.658572629	

Fig. 6 Government efficiency vs Civil Justice efficiency (113 countries). Source: The World Justice Project (WJP) Rule of Law Index 2017–2018 report

Appendix C: Proofs

Proof of Proposition 1 1. Let $b < c$. Then, (ns) is the dominant strategy of C. Therefore, P chooses (ne) with certainty and obtains a payoff of 1.

2. Let $b > c$. In this case, there is no equilibrium with pure strategies. If P chooses (e) with certainty, then (ns) is the best reply of C. In this case, P is better off by deviating to (ne), and in response C prefers (s), which again incentivizes the firm to exert effort (e). In the unique mixed strategies equilibrium of Γ_1, P is indifferent between (e) and (ne), namely,

$$x = 1 - P_s,$$

equivalently,

$$P_s = 1 - x.$$

Let $P(ne|l)$ be the probability C assigns to the event that a lawsuit is fruitful. That is, given that the product is damaged (denoted by l), P chooses (ne),

$$P(ne|l) = \frac{1 - P_e}{P_e(1-\alpha) + 1 - P_e} = \frac{1 - P_e}{1 - \alpha P_e}.$$

Since in the equilibrium C is indifferent between (s) and (ns),

$$bP(ne|l) - c = 0,$$

or

$$P_e = \frac{b-c}{b-\alpha c}.$$

□

Proof of Proposition 2 1. Straightforward, if $x > 1-r$, then the dominant strategy of P is to exert effort (e), even when C does not pursue lawsuits (ns). Therefore, C has no incentive to pursue lawsuits and chooses (ns).
2. If $b < c$, the consumer's payoff from pursuing a lawsuit is negative even when the lawsuit is justified. In this case, C is inactive and never pursues lawsuits (ns). Therefore, since $x < 1-r$, P strictly prefers (ne).
3. Straightforward, there is no equilibrium in pure strategies in this case. In the mixed strategies equilibrium, P is indifferent between (e) and (ne) iff

$$x = (1-r)(1-P_s),$$

or

$$P_s = \frac{1-r-x}{1-r}.$$

Note that $P_s > 0$ because $r < 1-x$.
In order to define the incentive constraint of the consumer, let $P(ne|nfl)$ be the probability C assigns to the event that a lawsuit is fruitful. That is, given that the product is damaged (l) and the inspector reveals no positive or negative findings about the firm behavior (denoted by (nf)), P chooses (ne),

$$P(ne|nfl) = \frac{(1-P_e)(1-r)}{P_e(1-\alpha)(1-t)+(1-P_e)(1-r)}.$$

Recall that if the inspector provides evidence about the firm's effort, then the game ends. C is indifferent between (s) and (ns) iff

$$bP(ne|nfl) - c = 0,$$

By rearranging terms we obtain

$$P_e = \frac{(b-c)(1-r)}{(b-c)(1-r)+c(1-\alpha)(1-t)}. \tag{1}$$

□

Proof of Proposition 4 1. By Propositions 1 and 2, if $b \to c$, then $P_e \to 0$ with or without government intervention. Then the expected consumer payoff with government intervention $\to br > 0$ and the expected consumer payoff in the benchmark case $\to 0$.

2. By Propositions 1 and 2, if $c \to 0$, then $P_e \to 1$ with or without government intervention. Then the expected consumer payoff with and without government intervention $\to \alpha$.
3. Substituting $c = \kappa b$ and the probability of the firm to exert effort (Propositions 1 and 2) into the consumer's expected payoff with and without government intervention, we obtain that the expected payoff is higher without government intervention if

$$\frac{\alpha(1-\kappa)(1-r) + br\kappa(1-\alpha)(1-t)}{(1-\kappa)(1-r) + \kappa(1-\alpha)(1-t)} < \frac{\alpha(1-\kappa)}{1-\alpha\kappa}.$$

Rearranging, this inequality holds iff

$$b < \frac{\alpha(1-\kappa)(r-t)}{r(1-\alpha\kappa)(1-t)}.$$

Equivalently, the inequality switches if b is sufficiently large. □

Proof of Proposition 5 By Proposition 2, denote the desired probability that the firm exerts effort by

$$P_e^* = \frac{(b-c)(1-r)}{(b-c)(1-r) + c(1-\alpha)(1-t)}.$$

Rearranging yields the lawsuit cost that maintains the level P_e^*,

$$c(\frac{r}{t}, P_e^*) = \frac{b(1-P_e^*)}{(1-P_e^*) + P_e^*(1-\alpha)(\frac{1-t}{1-r})}.$$

Then, it is easy to verify that $\frac{\partial c(\frac{r}{t}, P_e^*)}{\partial \frac{r}{t}} < 0$ and $b > c(\frac{r}{t}, P_e^*)$. □

Declarations

Conflict of interest Authors declare no Conflict of interest.

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