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(Mis)perceptions of Law in Consumer Markets

Oren Bar-Gill and Kevin E. Davis^{*}

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There are good reasons to believe that consumers' behavior is sometimes influenced by systematic misperceptions of legal norms that govern product quality. Consumers might misperceive specific rules, such as those found in food safety regulations, as well as more general standards, such as the unconscionability doctrine or limitations on waivers of default substantive or procedural rights. When demand is affected by systematic misperceptions of legal norms, lawmakers may be able to maximize welfare by deviating from the legal standard that would be optimal in the absence of misperception. We use a formal model to characterize these optimal deviations under different legal regimes (with different types and magnitudes of sanctions).

Keywords: Regulation, Consumer Protection, Misperceptions

JEL Codes: D11, D18, K13, K23, L15, L51

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1. Introduction

People make mistakes about the law. This messy fact of life is often ignored in analyses of how legal rules affect behavior. Only a handful of studies consider the possibility that the people affected by a legal norm will systematically misperceive important aspects of the law.¹ Most of those studies focus on how legal misperceptions affect decisions on whether to comply with the law. The possibility that systematic misperceptions about the law will affect consumer behavior does not appear to have been investigated.

1.1 (Mis)perceptions of Law Affect Consumer Behavior in Many Markets

There is good reason to believe that consumers' behavior is affected by beliefs about the applicable law, including both its substance and how effectively it is enforced. (This is mentioned occasionally in theoretical commentary on consumer protection law, e.g., Silbey 1984; Hadfield, Howse and Trebilcock 1998, 154; Helberger 2013, 15, 40; Henson 2008.) Those beliefs form the basis for inferences about important unobservable product characteristics. For example, consumers of food products cannot observe directly whether food products have been adulterated. Accordingly, it is rational for them to base their purchasing decisions on beliefs about the stringency of the food safety regime. Thus, Chinese consumers reportedly pay a premium for food products imported from jurisdictions believed to have more stringent regulations than China (Guilliatt 2014; see also Birol et al 2010; cf Mcluskey and Loureiro 2003). There are also indications that they travel overseas to purchase brand name luxury goods at least in part to benefit from more effective anti-counterfeiting laws (Atsom et al 2012). In other countries, consumers prefer local goods over foreign alternatives. In a recent survey of European Union citizens, 44% of interviewees indicated that they were not interested in buying goods or services from sellers located in other EU countries because they were uncertain about their rights (European Commission 2011). Beliefs about the relative stringencies of different regulatory systems clearly influence consumer choice.

(Mis)perceptions of law affect numerous decisions in consumer markets. When purchasing food products that are described as "organic" or "natural," consumers are guided by their beliefs about regulations by the Department of Agriculture's Natural Organic Standards Board that define the content of such terms. When consumers buy orange juice, they are influenced by beliefs about the legal definition of "juice," specifically about how much actual fruit content the drink contains (21 CFR 146.141). When consumers purchase a microwave oven, they may be swayed by beliefs about Food and Drug Administration (FDA) regulations that set standards for radiation emitted by microwave ovens (21 CFR 1030.10). When consumers buy a child safety seat for their car, they harbor certain beliefs about Department of Transportation regulations that set minimum safety standards for this product (49 CFR 571). When consumers decide whether to purchase supplemental insurance products, they are influenced by beliefs about Medicare rules that determine which expenses are covered by the program and which are not (Hoffman and Jackson 2013). And so on.

¹ Analyses that do take the possibility of legal misperceptions into account often assume away the potentially problematic implications. A standard move is to assume that even if people make mistakes about the law, on average their beliefs are accurate.

An important set of product characteristics that are generally unobservable to consumers includes the numerous contract terms that accompany most products and services. Consumers rarely read these terms (Bakos et al 2014), and if they read they may not understand what they have read. Accordingly, when deciding whether to purchase these products and services, consumers often rely on the law. They know that the law polices the content of consumer contracts and prevents sellers from inserting excessively egregious terms. Implicitly, then, consumers form beliefs about the legal standard – what sellers can and cannot write into the contract – and these beliefs influence their purchasing decisions.

(Mis)perceptions of law are also important in markets where consumers seek the advice of agents or intermediaries to help them navigate the complexity of offered products and services. Consider a home buyer who relies on the advice of a real-estate agent or a mortgage broker. Or consider an employee who trusts that her employer is offering the best possible retirement plan or healthcare plan (Jackson 2008). Consumers and employees generally cannot observe the expertise of these advisers or whether they are subject to a conflict of interests. The decision whether to seek advice is, therefore, influenced by beliefs about the law, specifically about how the law polices the competence of the agent and whether the law forces her to be a loyal adviser.

Consumers' beliefs about the legal rules that influence their purchasing decisions are often wrong. And not just wrong, but systematically wrong. Consumers lack an accurate understanding of the legal standards that define “organic” or “natural” foods (Campbell et al 2014; Olsen 2014). Consumers overestimate the likelihood that contract terms, like exculpatory clauses, will be held enforceable in court (Mueller 1970; Stolle and Slain 1997). Consumers overestimate the extent to which the law protects them against waivers of their rights to access courts (Sovern et al 2014). Consumers generally overestimate the extent to which the law protects their privacy against incursions by firms which receive personal information in the course of various transactions (Hoofnagle and Urban 2014: 281-282). And, in the related employment context, many “at will” employees falsely believe that the law protects them against dismissal without just cause (Kim 1997).

1.2 (Mis)perceptions of Law: Positive and Normative Implications

We use a formal model to investigate the effects of systematic misperceptions of law on consumer behavior. At a basic level, misperceptions of law generate misperceptions of product quality and thus cause demand (or quantity) distortions – consumers purchase too many or too few products. Lawmakers can mitigate these distortions by adjusting the legal standard, specifically by deviating from the first-best legal standard, i.e., the legal standard that would be optimal in the absence of misperception. It may seem that the legal standard should be adjusted to correct the misperception: If misperception of law leads to an underestimation of quality, the legal standard should be raised; and if misperception of law leads to an overestimation of quality, the legal standard should be lowered. This intuition, we show, is not necessarily accurate. Consider a misperception of law that results in an underestimation of quality and thus to an inefficiently low demand. A higher legal standard increases perceived quality and thus demand for the product. But a higher standard also increases production costs and liability costs, raising prices and reducing the number of products purchased. When the former effect is stronger, the

legal standard should be raised – correcting the misperception. However, when the latter effect is stronger, the legal standard should be lowered – confirming the misperception.

After identifying the direction in which the legal standard should be adjusted – whether it should be increased or decreased relative to the first-best level, we ask how far away from the first-best level should we go. The answer to this question, we show, depends on the legal regime. In particular, we compare a large sanctions (LS) regime, where sanctions are sufficiently large to guarantee sellers’ compliance with the legal standard, to a liability-equals-harm (LH) regime. In the LS regime, any deviation from the first-best legal standard, to correct demand distortions caused by the misperception, results in a quality distortion. In the LH regime, such a quality distortion exists only when the legal standard is reduced below the first-best level; when the legal standard is increased above the first-best level, sellers will not meet the high standard and so there will be no quality distortion. Therefore, when the legal standard needs to be increased in response to the misperception, the optimal increase is larger in the LH regime. This also means that social welfare will generally be higher in an optimally designed LH regime.

Our analysis relies on several assumptions. First, we assume that consumers cannot directly observe product quality. As explained in Section 1.1, (mis)perception of law is important with respect to unobservable product characteristics. We further assume that consumers cannot infer product quality from the offered price. In reality, price is a noisy function of many variables relating to the seller’s production function and to market structure. It is, therefore, reasonable to assume that price provides only limited information about quality. Nevertheless, the assumption that consumers do not draw any quality inference from price is a strong, bounded rationality assumption. (We note that this assumption – that consumers, or investors, fail to draw rational inferences from prices – is not uncommon in the literature. See, e.g., Hong and Stein 1999, and Eyster and Rabin 2005.) For our analysis, it is crucial that consumers cannot perfectly infer quality from price; otherwise, (mis)perception of law would be irrelevant. Our main results should hold if consumers were able to draw imperfect inferences from prices, such that their perceptions of quality were still affected by (mis)perception of law. Finally, we assume that consumers understand sellers’ incentives, e.g., they understand that if the legal regime imposes large sanctions for deviating from the legal standard, then sellers will meet the legal standard (though consumers might misperceive the standard that sellers will want to meet). We acknowledge the tension between this assumption, which endows consumers with a significant level of sophistication, and the assumption that consumers are boundedly rational and do not draw any inferences from the price. Our purpose is to study misperception of law, while minimizing other deviations from the perfect rationality benchmark (at least at this stage).

Our model most naturally applies to a regulatory agency charged with setting product standards in a fault-based regime. Good examples are the FDA, which sets standards for the preparation and labeling of various sorts of foods and for the operation of food-preparation devices (like microwave ovens), or the Department of Agriculture’s Natural Organic Standards Board, which sets standards for foods and agricultural products labeled as organic; and the Consumer Product Safety Commission, which sets safety standards for a wide variety of consumer products. The model also applies to courts charged with defining more open-ended standards such as the Lanham Act’s prohibition of “false or misleading” advertising, or the common law unconscionability standard. These regimes provide for several different types of sanctions,

including civil or criminal penalties of varying amounts (payable to the state), as well as compensatory or supracompensatory damages (payable to consumers). Our policy prescriptions, about optimal adjustments to the legal standard in response to misperception, could prove especially helpful to regulatory agencies with the capacity to assess the type and direction of the misperception. Indeed, empirical assessments of consumer (mis)perceptions are becoming increasingly common in legal rulemaking. The survey studies that are routinely conducted under the Lanham Act further suggest that lawmakers may be able to obtain the necessary information.

Our analysis applies most directly to an important set of legal doctrines that expressly rely on consumer perceptions. For example, under insurance law, a court must consider the reasonable expectations of consumers when determining the scope of the insurance policy (Keeton 1970, 967. See also Restatement (Second) of Contracts, Sec. 211(3).) Similarly, under the Federal Trade Commission's proposed privacy law framework, the legal standard applicable to companies' data collection and usage practices (specifically, whether express consumer consent is required) depends on consumers' reasonable expectations about how their personal information is used (see Federal Trade Commission 2012, p. 38). These legal doctrines appear to adopt the approach of confirming the misperception – if consumers underestimate the protection that the law guarantees and thus the quality of the product, i.e., if they believe that the law allows insurance companies to write policies with many limits on coverage or that the law allows companies to freely use private information, then the legal standard adapts to these low expectations. This approach, we will show, is optimal under certain conditions, but not others.

While we focus on the legal standard as the main policy instrument, we note that there are other ways to address the social welfare costs created by misperceptions of law. Lawmakers can use disclosure, consumer education and taxes or subsidies. Also, a shift from a fault-based regime to a strict liability regime would render irrelevant consumers' misperceptions of law. We chose not to focus on these alternative policy approaches not because they are less important, but rather because their benefits and costs are not unique to the subject-matter of this paper – misperceptions of *law*. We also note that market corrections are possible: Sellers may attempt to correct for the misperception through advertising, especially when it leads to an underestimation of quality. (Sellers might also attempt to exacerbate the misperception, especially when it leads to an overestimation of quality.)

1.3 Related Literature

Our analysis builds on the standard products liability model (Shavell 1987), adding the possibility of consumer misperception about the legal standard. Shavell (1987, 99) considers how misperception about the fault standard will affect the behavior of sellers but not that of consumers. In the products liability literature, the classic analyses of consumer misperceptions are Spence (1977) and Polinsky and Rogerson (1983). This literature considers misperceptions of product risks, not misperceptions of law. Spence (1977), and much of the literature that followed, focuses on strict liability. We are interested in studying misperceptions of law and, therefore, we focus on fault-based regimes. Polinsky and Rogerson (1983) study a fault-based, negligence regime and compare it to strict liability; but they consider only misperceptions of product risk, not misperceptions of law. Moreover, we add to the products liability literature, by considering the level of the legal standard as a policy variable.

We study the imperfect enforcement of consumer protection law and possible misperceptions about the level of enforcement. In so doing, we hope to create a bridge between the literature on consumer protection and products liability and the literature on law enforcement. Our analysis is broadly related to work in the law enforcement literature that considers misperceptions, by potential offenders, about the legal standard (or, equivalently, about whether their behavior meets or violates the legal standard) (Kaplow 1990) and about the level of enforcement (Sah 1991; Bebchuk and Kaplow 1992; and Jolls 2005). More specifically, our analysis of imperfectly enforced quality standards in consumer markets takes the classic model of public enforcement of law (Polinsky and Shavell 2000) applies it to the consumer context and adds the possibility of misperceptions about the content and enforcement of the law.

1.4 Roadmap

The paper proceeds as follows: Section 2 introduces our formal model and presents our framework of analysis. Section 3 solves the model under the assumption of perfect (costless) enforcement, assuming that liability for deviation from the legal standard is owed to the state. Section 4 extends the analysis to the case where liability is owed to consumers. Section 5 relaxes the perfect (costless) enforcement assumption. Section 6 considers privately assumed liability, via contractual warranties. Section 7 concludes. Proofs are relegated to an Appendix.

2. Framework of Analysis

2.1 Players and Timing

There are three players (or groups of players): the lawmaker, sellers and consumers. The lawmaker moves first and sets the legal standard and the level of enforcement. Second, sellers move, setting quality and price. Third, consumers make purchasing decisions. Finally, the lawmaker moves again, imposing sanctions on, or requiring damages payments from, sellers who failed to meet the legal standard. There is no discounting. Sellers accurately perceive the law, whereas consumers might misperceive it. We consider two types of lawmakers – a naïve lawmaker who sets the legal standard (and level of enforcement) as if there were no consumer misperception, and a sophisticated lawmaker who adjusts the legal standard in response to consumer misperception.

2.2 Basic Setup

Let $q \in [0,1]$ denote the quality of the product on the relevant, regulated dimension. The quality level is a decision variable chosen by the seller. Higher quality entails higher cost (for the seller). Let $c(q)$ denote the seller's per-unit production cost. We assume that $c'(q) > 0$ and $c''(q) > 0$. The value of the product to the consumer is: $v + u(q)$, where v is a base-value that is distributed among consumers according to the CDF $F(v)$, and $u(q)$ is a value component that varies with the quality level in a manner common to all consumers. We assume that $u'(q) > 0$ and $u''(q) < 0$.

2.3 The Law

Let $l \in [0,1]$ denote the law or, more accurately, the legal standard that governs the quality of the product in question.² It is useful to think of l as a quality floor – the minimum quality level that a product must meet to comply with the law. We assume that setting l is costless (regardless of the level of legal protection). Let $e \in [0,1]$ denote the level of enforcement or probability of being caught. Increasing the enforcement level is costly. Specifically, let $C(e)$ denote the enforcement cost. We assume that $C'(e) > 0$ and $C''(e) > 0$. This formulation implies that enforcement costs are independent of seller behavior, i.e., of q .

A seller that breaks the law and offers a product quality below l is subject to liability. Let $L(q, l, e)$ represent the liability cost. We assume that the seller's choice of quality (q) affects liability in a binary way: if $q < l$, the seller bears liability, and if $q \geq l$, the seller bears no liability. In practice, liability may be a continuous function of the quality level.³ This specification represents a fault-based regime (rather than a strict liability regime).

2.4 Consumer Misperceptions

The key feature of our model is that consumers can hold systematic misperceptions about the law, consistent with the empirical literature discussed in section 1. We do not model the processes by which these misperceptions arise, mainly because our formal model is intended to be compatible with several different assumptions about those processes.

Many consumers possess imperfect information about the law. They collect only limited information about the legal regime. And they update this information only sporadically and incompletely, typically as a result of a high-profile event such as a surprising judicial decision or a major legislative initiative or a significant enforcement action. In the interim, legal standards and levels of enforcement might change in ways that fail to attract widespread attention from consumers.

Imperfect information can easily lead to systematic misperceptions. Consumers who do not have recent information about the applicable law in a particular product market are likely to extrapolate from what they know about the law that was in effect at an earlier point in time. Similarly, consumers may have better information about some markets than others. Those consumers may extrapolate from their beliefs about the law that governs other products, or even from their overall estimate of how much trust to place in government. These kinds of extrapolations can lead consumers to hold systematically mistaken beliefs about rules governing a particular product at a particular time, even if their beliefs across all product markets and across all time periods are unbiased.

Systematic misperceptions might also result from biased interpretations of imperfect information. For example, consumers might focus unduly on salient information. A salient pro-

² We assume that l is specific to the product in question and that varying l does not affect the law applicable to other products.

³ The analysis below assumes that consumers understand how sellers respond to the (misperceived) legal standard, given the (misperceived) imperfect enforcement.

consumer event might lead consumers to overestimate the level of legal protection, whereas a salient pro-business event might lead to the opposite misperception. Optimism might lead consumers to overestimate the extent to which the law protects their interests. Consumers may also be affected by biases that are specific to their beliefs about law. For instance, some may be biased in favor of the general conclusion that the legal system is tilted against them. Others might be biased in favor of the conclusion that written documents are legally enforceable in accordance with their terms, no matter how harsh those terms may be (Eigen 2008).

Depending on why they arise, misperceptions may be more or less variant to the actual legal standard. For instance, suppose consumers misperceive the standard that applies in a given market because they extrapolate from outdated information or from their experience in other markets. These kinds of misperceptions will be invariant to changes in the actual legal standard in the relevant market. However, misperceptions might also be caused by consumers averaging across the standards applied across all markets, or by biased assessments of the actual legal standard. These kinds of misperceptions will vary with the actual legal standard in the relevant market.

To capture systematic misperceptions of law that are more or less variant to the actual legal standard we let $\hat{l} = \bar{l} + \delta l$ denote the perceived law, where $\bar{l} \in [0,1]$ and $\delta \in \left[0, \frac{1-\bar{l}}{\bar{l}}\right]$. \bar{l} is a constant which captures a baseline level of misperception that is invariant to the actual legal standard. The value of δ determines the extent to which perceptions of law vary with the actual legal standard. When $\delta = 0$ changes in the legal standard have no effect on consumer perceptions. When $\delta \in (0,1)$, changes in the perceived legal standard are smaller than actual changes in the legal standard. And when $\delta > 1$, changes in the perceived legal standard are larger than actual changes in the legal standard. The level of enforcement may be similarly misperceived by consumers. Let $\hat{e} = \bar{e} + \gamma e$ denote the perceived enforcement level, where $\bar{e} \in [0,1]$ and $\gamma \in \left[0, \frac{1-\bar{e}}{\bar{e}}\right]$.

Misperceptions of law can lead to misperceptions of product quality. Let $\hat{q}(q, \hat{l}, \hat{e})$ denote the perceived quality. To focus on the effects of perceptions, and misperceptions, about the law, we assume that consumers have no direct information about actual quality, q .⁴ Perceived quality, therefore, will not be a function of q : $\hat{q}(\hat{l}, \hat{e})$. The assumption that consumers have no direct information about actual quality, q , is a strong, and unrealistic, assumption. Clearly sellers can try to educate consumers about the quality of their products and consumers learn about quality from their own experience and from the experience of others. Again, this assumption, is made in order to focus attention on the relationship between perceptions, and misperceptions, of law and perceived quality. Note that misperceptions about the law are important only to the extent they affect the perceived quality. The perceived value of the product is: $v + u(\hat{q})$.

⁴ Later we make the further assumption that they cannot infer quality from the price selected by the seller.

2.5 The Consumer's Decision

The consumer decides whether to purchase the product. The consumer will purchase the product if the perceived (net) value of the product is positive. The perceived value of the product to the consumer, net of the price (p), is:

$$V(\hat{q}, p) = v + u(\hat{q}) - p.$$

A consumer with $V > 0$, or $v > \tilde{v}(\hat{q}, p) \equiv p - u(\hat{q})$ will purchase the product. Assuming a unit mass of consumers, the quantity (or number of product units) purchased is: $Q(\hat{q}, p) = 1 - F(\tilde{v}(\hat{q}, p))$.

2.6 The Seller's Decisions

The seller sets the quality $q \in [0,1]$ and the price p . We assume that the seller is operating in a competitive market and thus sets price equal to total cost (including both production costs and liability costs): $p = c(q) + L(q, l, e)$. The seller then sets quality to maximize the perceived value of its product (in the eyes of consumers), $V(\hat{q}, p) = v + u(\hat{q}) - p$ subject to the zero-profit, $p = c(q) + L(q, l, e)$ constraint. Or, equivalently, the seller sets quality to maximize:

$$u(\hat{q}) - c(q) - L(q, l, e)$$

Stated differently: We assume that price competition guarantees that sellers make zero profit. We also assume that sellers wish to maximize demand for their product and, specifically, that sellers choose a quality level that would maximize demand.

Three forces could plausibly influence the seller's choice of product quality:

- (1) Higher quality results in higher perceived quality, which in turn increases the perceived utility from the product (and thus demand).
- (2) Higher quality entails higher cost.
- (3) Higher quality reduces the risk of liability.

As explained above, in order to focus on the implications of perceptions (and misperceptions) about the law, we assume that consumers have no direct information about quality, meaning that actual quality does not affect perceived quality and perceived utility. In other words, we assume away the first force. We also assume that consumers understand how sellers respond to the (misperceived) legal standard, given the (misperceived) imperfect enforcement.

2.7 The Social Objective Function

The social objective function is:

$$W = \int_{\tilde{v}(l)}^{\infty} [v + u(q(l)) - c(q(l))] f(v) dv - C(e)$$

where $\tilde{v}(l) = p(l) - u(\hat{q}(l)) = c(q(l)) + L(q(l), l) - u(\hat{q}(l))$. Note that liability payments, L , are welfare-neutral transfers and are not counted independently in the social welfare function. Still, L affects social welfare through its effect on the number of product units purchased.

2.8 First-Best Optimum

If a social planner could set the quality q , it would set q to maximize: $u(q) - c(q)$. Call this first-best quality level: q^* . The quality level satisfies the FOC: $c'(q^*) = u'(q^*)$. In the first-best, every consumer who obtains a value from the product that exceeds the cost of manufacturing the product should purchase the product. Accordingly, first-best demand is characterized by: $\tilde{v}^* = c(q^*) - u(q^*)$. There is no need for enforcement in the first-best: $C(0) = 0$. In this first-best world, social welfare is given by:

$$W^* = \int_{\tilde{v}^*}^{\infty} [v + u(q^*) - c(q^*)] f(v) dv$$

2.9 Optimal Legal Standard

To find the optimal legal standard, l , we need to solve: $\max_l W$. Let $l^* = \arg \max_l W$. The derivative $\frac{dW}{dl}$ is:

$$Q(\tilde{v}(l)) \cdot [u'(q) - c'(q)] \frac{dq}{dl} + \frac{dQ(\tilde{v}(l))}{dl} \cdot w(\tilde{v}(l))$$

where:

$Q(\tilde{v}(l)) = 1 - F(\tilde{v}(l))$ represents the quantity purchased;

$\frac{dQ(\tilde{v}(l))}{dl} = -f(\tilde{v}(l)) \frac{d\tilde{v}(l)}{dl} = f(\tilde{v}(l)) \left[u'(\hat{q}) \frac{d\hat{q}}{dl} - c'(q) \frac{dq}{dl} - \frac{dL(q,l)}{dl} \right]$ represents the net quantity effect (NQE), the effect of changes in l on the purchasing decisions of the marginal consumer; and

$w(\tilde{v}(l)) = \tilde{v} + u(q) - c(q) = c(q) + L(q, l) - u(\hat{q}) + u(q) - c(q) = u(q) - u(\hat{q}) + L(q, l)$ represents the net social benefit generated by the marginal purchase.

The FOC captures two kinds of welfare effects (and the tradeoff between them):

- (1) The infra-marginal effect – the effect on consumers who would purchase the product anyway. An increase in l raises product quality by $\frac{dq}{dl}$ and this translates into both an increase in utility, $u'(q)$, and an increase in cost (and price), $c'(q)$.⁵ Since the infra-marginal effect is driven by changes in product quality, we refer to it as the “quality effect.”

⁵ We focus on welfare effects and, therefore, do not consider the effect on price per se. An increase in l raises the price by $p'(l) = \frac{dc(q(l))}{dl} + \frac{dL(q(l),l)}{dl}$. Sellers increase quality, to meet the higher legal standard, or bear liability for failing to meet the higher standard. Both costs are passed on to consumers in the form of higher prices. These price effects have distributional implications, which are not captured by our welfare function.

(2) The marginal effect – the effect of changes in l on the purchasing decisions of the marginal consumer, multiplied by the net social benefit generated by the marginal purchase ($w(\tilde{v})$). The net quantity effect (NQE), $\frac{dQ(\tilde{v}(l))}{dl}$, can be either positive or negative, depending on whether the effect of the increase in perceived utility outweighs the effect of the increase in liability and production costs. An increase in l results in an increase in perceived quality, and thus perceived utility, $u'(\hat{q}) \frac{d\hat{q}}{dl}$, pushing quantity up. An increase in l also results in an increase in cost, $c'(q) \frac{dq}{dl}$, and in liability, $\frac{dL(q,l)}{dl}$, which result in a higher price and push quantity down. The social benefit of the marginal purchase, $w(\tilde{v}(l))$, can also be either positive or negative, depending on the actual utility associated with the marginal purchase, the perceived utility and the liability cost.

3. Perfect (Costless) Enforcement

3.1 General

We assume initially that enforcement is perfect and costless. Given perfect enforcement, we investigate the implications of consumer perceptions, or misperceptions, about the legal standard, l . As described in Section 2.4 above, we assume $\hat{l} = \bar{l} + \delta l$ and let perceived quality be a function of \hat{l} : $\hat{q}(\hat{l}) = \hat{q}(\bar{l} + \delta l)$. We simplify further and assume a linear relationship between the perceived legal standard and perceived quality. We can thus write: $\hat{q} = \delta l + k$, where k can represent some fixed/benchmark beliefs about the legal standard or product quality. This simplifying assumption can be viewed as a reduced-form account of the perceived quality. For example, if consumers believe that, in equilibrium, sellers meet the legal standard (see Section 3.2 below), then we have: $\hat{q}(\hat{l}) = \hat{l} = \bar{l} + \delta l$ (which corresponds to our reduced form account with $k = \bar{l}$); and if consumers believe that sellers set $q = q^*$ regardless of the legal standard (see Section 3.3 below), then we have: $\hat{q}(\hat{l}) = q^*$ (which corresponds to our reduced form account with $\delta = 0$ and $k = q^*$).

In a negligence-type regime, the lawmaker sets l . The liability function is:

$$L(q, l) = \begin{cases} s, & q < l \\ 0, & q \geq l \end{cases}$$

where s is the (legal) sanction from failing to meet the legal standard l . We assume, initially, that s is sufficiently large, such that the seller is induced to meet the legal standard, i.e., $q = l$. We call this the “Large Sanctions (LS)” case. Since consumer protection laws do not necessarily impose Large Sanctions we also consider alternatives. We next study the implications of an assumption that liability is set equal to harm. We call this the “Liability equals Harm (LH)” case. The remaining possibilities – Weak Liability (WL), where liability is smaller than harm, and the Intermediate Liability (IL) case, where liability exceeds harm but is not high enough to guarantee compliance with the legal standard – are discussed in the Appendix.

3.2 Large Sanctions

3.2.1 Market Outcome

In the LS case, s is sufficiently large, such that the seller is induced to meet the legal standard, i.e., $q = l$.⁶ Therefore, the seller bears no liability in equilibrium: $L = 0$. And price will be $p = c(q)$. As explained in the Introduction, we assume that consumers cannot infer the seller's choice of q from observing the price, p . If consumers were able to infer q from p , then misperception about the legal standard would be irrelevant. The lawmaker would set $l = q^*$; the seller would meet this standard and set $q = l = q^*$ and, correspondingly, $p = c(q^*)$; and the consumer would observe p and infer q^* .⁷

3.2.2 Naïve Lawmaker

We first assume that the lawmaker is naïve, in the sense that she does not adjust the legal standard in response to the misperception, but rather sets $l = q^*$. We assess the social welfare cost of misperception, when the lawmaker sets $l = q^*$. This would induce the seller to set $q = l = q^*$.

While $l = q^*$ leads the seller to provide optimal quality ($q = l = q^*$), the quantity will be inefficient if there is misperception. Specifically, quantity is characterized by $\tilde{v}(\hat{q}) = c(q^*) - u(\hat{q})$, as compared to the no-misperception level $\tilde{v}^* = c(q^*) - u(q^*)$.

When $\hat{q} < q^*$, quantity will be too low: $\tilde{v}(\hat{q}) > \tilde{v}^*$ which implies $Q(\tilde{v}(\hat{q})) < Q(\tilde{v}^*)$, and positive (net) value transactions will be lost; the net social benefit generated by the marginal purchase ($(w(\tilde{v}))$) is positive. The social welfare cost will be:

$$\Delta W|_{\hat{q} < q^*} = \int_{\tilde{v}^*}^{\tilde{v}(\hat{q})} [v + u(q^*) - c(q^*)] f(v) dv$$

When $\hat{q} > q^*$, quantity will be excessive: $\tilde{v}(\hat{q}) < \tilde{v}^*$ which implies $Q(\tilde{v}(\hat{q})) > Q(\tilde{v}^*)$, and negative (net) value transactions will take place; the net social benefit generated by the marginal purchase ($(w(\tilde{v}))$) is negative. The social welfare cost will be:

⁶ The seller will not set $q > l$, because that would require a higher price and reduce demand. Recall that, in our model, consumers do not observe quality and so a higher quality does not increase demand.

⁷ This would be the outcome, if we added the possibility of misperception to the classic product's liability model in Shavell (1987). In this model, the social objective function is: $u(s) - s[x + h(x)]$, where x is the level of care (or quality of the product), $h(x)$ is the harm to consumers (which can be conceptualized as the reduction in the benefit from the product caused by lower quality), s is the number of units sold (equivalent to demand in our setup) and $u(s)$ is the utility to all consumers from the products that are purchased. Optimal care (quality) solves: $h'(x^*) = -1$. Optimal quantity solves: $u'(s^*) = x^* + h(x^*)$. A negligence rule with a Due Care Standard (DCS) $\bar{x} = x^*$ leads to optimal care/quality and optimal quantity. (The DCS, \bar{x} , is equivalent to l in our setup.) Now add misperception: Consumers think that care (quality) equals \hat{x} and, correspondingly, that harm equals $h(\hat{x})$. Seller meets the actual DCS and sets care (quality) $x = \bar{x}$ and price $p = \bar{x}$ (assuming a competitive market). Consumers infer care (quality) from the price, neutralizing the effects of the misperception. In this model, the lawmaker should set $l = \bar{x} = x^*$, and the misperception is harmless.

$$\Delta W|_{\hat{q} > q^*} = \int_{\tilde{v}(\hat{q})}^{\tilde{v}^*} [v + u(q^*) - c(q^*)] f(v) dv$$

3.2.3 Sophisticated Lawmaker

We now assume that the lawmaker attempts to adjust the legal standard in response to the misperception. If perceived quality, \hat{q} , is a function of the legal standard, l , then the lawmaker can correct the quantity distortion, albeit at the cost of introducing a quality distortion.

We first ask whether the legal standard should be set above or below q^* . The answer depends on the direction of the misperception – under- vs. overestimation of quality – and the net quantity effect as evaluated at $l = q^*$: $NQE(q^*) \equiv \left. \frac{dQ(\tilde{v}(l))}{dl} \right|_{l=q^*}$. When misperception of law leads to underestimation of quality, the legal standard should be adjusted to increase demand. When $NQE(q^*)$ is positive, demand can be increased by raising the legal standard above q^* . When $NQE(q^*)$ is negative, demand can be increased by reducing the legal standard below q^* . Conversely, when misperception of law leads to overestimation of quality, the legal standard should be adjusted to decrease demand. Demand can be decreased by reducing the legal standard below q^* when $NQE(q^*)$ is positive, and by raising the legal standard above q^* when $NQE(q^*)$ is negative.

We can now state the following proposition:

Proposition 1: In the LS case,

- (a) When misperception of law leads to underestimation of quality ($\hat{q} < q$), the marginal purchase at $l = q^*$ generates a net social gain, $w(\tilde{v}) > 0$, and the legal standard should be adjusted to increase demand. Therefore, $l_{LS}^* > q^*$ if $NQE(q^*) > 0$; and $l_{LS}^* < q^*$ if $NQE(q^*) < 0$.
- (b) When misperception of law leads to overestimation of quality ($\hat{q} > q$), the marginal purchase at $l = q^*$ generates a net social loss, $w(\tilde{v}) < 0$, and the legal standard should be adjusted to reduce demand. Therefore, $l_{LS}^* < q^*$ if $NQE(q^*) > 0$; and $l_{LS}^* > q^*$ if $NQE(q^*) < 0$.

Proposition 1 also sheds light on whether the legal standard should be designed to confirm or to correct consumers' misperceptions. Confirming misperceptions means that when there is underestimation ($\hat{q} < q$) the optimal standard is lower than the first-best standard ($l < q^*$), and when there is over-estimation ($\hat{q} > q$) the optimal standard is higher ($l > q^*$). In other words, it involves setting a legal standard that deviates from the first-best quality level in the direction of the perceived quality so that $(\hat{q} - q) \cdot (l - q^*) > 0$. Correcting misperceptions involves the opposite approach: when perceived quality is underestimated, the legal standard should be increased in order to “pull up” the perceived quality; and when perceived quality is overestimated, the legal standard should be reduced in order to “pull down” the perceived quality. In other words, it involves setting a legal standard that deviates from the first-best quality level in the direction opposite to that of the perceived legal standard so that $(\hat{q} - q) \cdot (l - q^*) < 0$.

Proposition 1 has the following Corollary:

Corollary 1: In the LS case,

- (a) If $NQE(q^*) < 0$, then a legal standard that is optimally set will confirm misperceptions, i.e.
 $(\hat{q} - q) \cdot (l - q^*) > 0$.
- (b) If $NQE(q^*) > 0$, then a legal standard that is optimally set will correct misperceptions, i.e.
 $(\hat{q} - q) \cdot (l - q^*) < 0$.

The Corollary shows that the key determinant of whether it is appropriate to confirm or to correct misperceptions is the net quantity effect, $NQE(q^*)$. Correcting misperceptions is optimal when $NQE(q^*) > 0$. In this scenario, the effect of a change in perceived quality outweighs the effect on sellers' costs. In contrast, confirming misperceptions is optimal when $NQE(q^*) < 0$. In this scenario, the effect on sellers' costs outweighs the effect of a change in perceived quality. This is most obvious in the special case of misperceptions that are completely insensitive to the actual legal standard, i.e. $\delta = 0$. In this case, $\frac{d\tilde{v}(l)}{dl}\Big|_{l=q^*} = c'(q^*) - \delta u'(\hat{q}(l = q^*)) = c'(q^*) > 0$ and thus $NQE(q^*) < 0$. This means that a legal standard stricter than the first-best standard unambiguously reduces the number of consumers who purchase the product – there is no increase in perceived quality to offset the effects of the increase in cost. This is only optimal when consumers over-estimate quality (Proposition 1(b)).

To further characterize the optimal legal standard, and the attainable social welfare level, we ask how far should the lawmaker deviate from $l = q^*$. Deviations from $l = q^*$ effectively correct quantity distortions caused by the misperception (the marginal effect). But they also create quality distortions, as sellers meet the legal standard (the infra-marginal effect). The optimal legal standard balances these marginal and infra-marginal effects. In terms of social welfare, the social welfare loss caused by the misperception can be divided into a quantity effect – either excessive or insufficient quantity – and a quality effect due to the quality distortion caused when sellers meet a standard that deviates from q^* .

Observation 1: In the LS case,

- (a) When $\hat{q} < q$ (underestimation), it is optimal to increase (decrease) the legal standard above (below) q^* ; the optimal legal standard balances quantity distortions (the marginal effect) against quality distortions (the infra-marginal effect). The social welfare cost is:

$$\begin{aligned} \Delta W_{LS}|_{\hat{q} < q} &= \int_{\tilde{v}^*}^{\tilde{v}(l_{LS}^*)} [v + u(q^*) - c(q^*)] f(v) dv \\ &+ \int_{\tilde{v}(l_{LS}^*)}^{\infty} [(u(q^*) - c(q^*)) - (u(l_{LS}^*) - c(l_{LS}^*))] f(v) dv \end{aligned}$$

- (b) When $\hat{q} > q$ (overestimation), it is optimal to decrease (increase) the legal standard below (above) q^* ; the optimal legal standard balances quantity distortions (the marginal effect) against quality distortions (the infra-marginal effect).

$$\begin{aligned} \Delta W_{LS}|_{\hat{q} > q} &= - \int_{\tilde{v}(l_{LS}^*)}^{\tilde{v}^*} [v + u(l_{LS}^*) - c(l_{LS}^*)] f(v) dv \\ &+ \int_{\tilde{v}^*}^{\infty} [(u(q^*) - c(q^*)) - (u(l_{LS}^*) - c(l_{LS}^*))] f(v) dv \end{aligned}$$

3.3 Liability Equals Harm

3.3.1 Market Outcome

In the LS case (Section 3.2), the sanction was assumed to be sufficiently large, such that the seller was induced to choose $q = l$, regardless of the level of l . We now replace this large sanction with a sanction that equals the harm caused by failure to meet the legal standard. A natural way to define this harm is by the difference in utility, to the consumer, between a product that meets the legal quality standard and a product with the actual quality level chosen by the seller: $s = u(l) - u(q)$.⁸ The liability function is:

$$L(q, l) = \begin{cases} s = u(l) - u(q) & , q < l \\ 0 & , q \geq l \end{cases}$$

Substituting into the seller's objective function from Section 2.6, the seller maximizes:

$$u(\hat{q}) - c(q) - L(q, l) = \begin{cases} u(\hat{q}) - c(q) - (u(l) - u(q)) & , q < l \\ u(\hat{q}) - c(q) & , q \geq l \end{cases}$$

The distinctive feature of this case is that the seller will sometimes choose not to meet the legal standard, bear liability and transfer the liability cost to consumers through a higher price. Specifically –

Lemma 1:

- (a) If the lawmaker sets $l \leq q^*$, then the seller will meet the legal standard.
- (b) If the lawmaker sets $l > q^*$, then the seller will not meet the legal standard and will set $q = q^*$.

The intuition behind Lemma 1 is that for $q \leq q^*$, by definition, the harm to consumers from failing to increase quality exceeds the incremental production costs. Accordingly, when liability equals harm the seller is better off avoiding liability. By contrast, for $q > q^*$ the harm from failing to increase quality is less than the incremental production costs and so with liability equal to harm the seller is better off incurring liability.⁹

3.3.2 Naïve Lawmaker

We first assume that the lawmaker is naïve and sets $l = q^*$. According to Lemma 1, the seller will meet the standard and choose $q = l = q^*$, as in the LS case. The implications of misperception, in terms of demand distortions and the resulting social welfare costs, will also be identical to those derived in Section 3.2.2.

⁸ This formulation of the liability function corresponds to the Kahan (1989) revision of the negligence definition in Shavell (1987).

⁹ Kahan's (1989: 432-434) model of the effects of liability for negligence generates a comparable result for the same reason.

3.3.3 Sophisticated Lawmaker

As in the LS case (Section 3.2.3), whether the legal standard should be set above or below q^* depends on the direction of the misperception – under- vs. overestimation of quality – and the net quantity effect, $NQE(q^*)$. The difference between the LH case and the LS case is in the magnitude of the optimal deviation from q^* , as explained below. For now, we can simply replicate Proposition 1:

Proposition 2: In the LH case,

- (a) When misperception of law leads to underestimation of quality ($\hat{q} < q$), the marginal purchase at $l = q^*$ generates a net social gain, ($w(\tilde{v}) > 0$), and the legal standard should be adjusted to increase demand. Therefore, $l_{LH}^* > q^*$ if $NQE(q^*) > 0$; and $l_{LH}^* < q^*$ if $NQE(q^*) < 0$.
- (b) When misperception of law leads to overestimation of quality ($\hat{q} > q$), the marginal purchase at $l = q^*$ generates a net social loss, ($w(\tilde{v}) < 0$), and the legal standard should be adjusted to reduce demand. Therefore, $l_{LH}^* < q^*$ if $NQE(q^*) > 0$; and $l_{LH}^* > q^*$ if $NQE(q^*) < 0$.

We can also replicate Corollary 1:

Corollary 2: In the LH case,

- (a) If $NQE(q^*) < 0$, then a legal standard that is optimally set will confirm misperceptions, i.e. $(\hat{q} - q) \cdot (l - q^*) > 0$.
- (b) If $NQE(q^*) > 0$, then a legal standard that is optimally set will correct misperceptions, i.e. $(\hat{q} - q) \cdot (l - q^*) < 0$.

To further characterize the optimal legal standard, and the attainable social welfare level, we ask how far should the lawmaker deviate from $l = q^*$. The main difference, as compared to the LS case, is observed when the optimal legal standard is above the first-best level. In the LS case, the seller meets the higher standard, resulting in a quality distortion. This quality distortion must be balanced against the benefit from a higher standard (namely, the reduction in the quantity distortion caused by the misperception). In the LH case, the seller does not meet the higher standard and so there is no quality distortion. As a result, the legal standard can be set higher and social welfare is increased (but see the qualification in Section 3.4 below).

Observation 2: In the LH case,

- (a.1) When $\hat{q} < q$ (underestimation) and $NQE(q^*) > 0$, it is optimal to increase the legal standard above q^* until (1) the first-best level of social welfare is reached, or (2) a further increase no longer raises quantity. In the latter case, the social welfare cost is:

$$\Delta W_{LH} |_{\hat{q} < q} = \int_{\tilde{v}^*}^{\tilde{v}^{(l_{LH}^*)}} [v + u(q^*) - c(q^*)] f(v) dv$$

- (a.2) When $\hat{q} < q$ (underestimation) and $NQE(q^*) < 0$, it is optimal to decrease the legal standard below q^* ; the optimal legal standard balances quantity distortions (the marginal effect) against quality distortions (the infra-marginal effect). The social welfare cost is: $\Delta W_{LH} |_{\hat{q} < q} = \Delta W_{LS} |_{\hat{q} < q}$.

(b.1) When $\hat{q} > q$ (overestimation) and $NQE(q^*) > 0$, it is optimal to decrease the legal standard below q^* ; the optimal legal standard balances quantity distortions (the marginal effect) against quality distortions (the infra-marginal effect). The social welfare cost is: $\Delta W_{LH}|_{\hat{q}>q} = \Delta W_{LS}|_{\hat{q}>q}$.

(b.2) When $\hat{q} > q$ (underestimation) and $NQE(q^*) < 0$, it is optimal to increase the legal standard above q^* until (1) the first-best level of social welfare is reached, or (2) a further increase no longer reduces quantity. In the latter case, the social welfare cost is:

$$\Delta W_{LH}|_{\hat{q}>q} = - \int_{\tilde{v}(l_{LH}^*)}^{\tilde{v}^*} [v + u(q^*) - c(q^*)] f(v) dv$$

3.4 Comparison: LS v. LH

The direction in which the optimal legal standard deviates from q^* is the same in both the LS and LH cases. Moreover, when the optimal legal standard is below q^* , this standard is identical in both the LS and LH cases. But, when the optimal legal standard is above q^* , its precise level will be different in the LS and LH cases. The divergence stems from the fact that in LH there is no quality distortion when l is increased above q^* , as explained in Section 3.3.3 above.

To be more precise, the optimal legal standard is above q^* in two scenarios: (1) when quality is underestimated, so that the marginal consumer generates a positive surplus, and the net quantity effect is positive; and (2) when quality is overestimated, so that the marginal consumer generates a negative surplus, and the net quantity effect is negative. In these scenarios, the marginal effect works to increase l in both the LS and LH cases. In the LH case, the seller maintains $q = q^*$ as l is increased above q^* . Therefore, the infra-marginal effect is zero, and we are left only with the marginal effect. The legal standard, l , should be increased until the marginal effect is zero: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v}) = -f(\tilde{v}(l)) \cdot (u'(l) - \delta u'(\hat{q})) \cdot w(\tilde{v}) = 0$. In the LS case, the marginal effect is: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v}) = -f(\tilde{v}(l)) \cdot (c'(l) - \delta u'(\hat{q})) \cdot w(\tilde{v})$. Note that, while $\tilde{v}^{LS} \neq \tilde{v}^{LH}$, $w(\tilde{v}^{LS}) = w(\tilde{v}^{LH})$ is identical in both the LS and LH cases. And, in the LS case, we must also account for the infra-marginal effect: when high sanctions guarantee $q = l$, moving away from $l = q^*$ results in inefficiency that is measured by $u'(q) - c'(q)$.

In scenario (1), a higher legal standard increases the quantity sold: $\left. \frac{d\tilde{v}(l)}{dl} \right|_{l=q^*} < 0$. For $l > q$, $c'(l) > u'(l)$, and so $\frac{d\tilde{v}(l)}{dl}$ is larger, i.e., less negative in the LS case. Intuitively, the benefit – in terms of the marginal effect – from a higher standard is smaller in the LS case. Therefore, the optimal standard is lower in the LS case. Not to mention the infra-marginal effect, which keeps the optimal standard low in the LS case, but not the LH case. This also means that social welfare is larger in the LH case. Social welfare is clearly larger, when LH induces the first-best outcome. Social welfare is larger in the LH case, even when LH does not induce the first-best. Since, in this scenario, $\tilde{v}^{LH} < \tilde{v}^{LS}$, LH does better in reducing the quantity distortion caused by the misperception; and there is no quality distortion.

In scenario (2), a higher legal standard decreases the quantity sold: $\frac{d\tilde{v}(l)}{dl}\Big|_{l=q^*} > 0$. For $l > q$, $c'(l) > u'(l)$, and so $\frac{d\tilde{v}(l)}{dl}$ is larger, i.e., more positive in the LS case. Intuitively, the benefit – in terms of the marginal effect – from a higher standard is larger in the LS case. On the other hand, the infra-marginal effect keeps the optimal standard low in the LS case, but not the LH case. Accordingly, in scenario 2 the optimal standard in the LS case can be either higher or lower than the optimal standard in the LH case. (And, therefore, \tilde{v}^{LH} can be either higher or lower than \tilde{v}^{LS} .) LH generates a larger social welfare level, when it induces the first-best outcome. When LH does not induce the first-best, either LH or LS can generate a larger social welfare level.

These results are summarized in the following propositions:

Proposition 3 (Comparison – Optimal Legal Standard):

(a) When $\hat{q} < q$ (underestimation): $l_{LH}^* > l_{LS}^* > q^*$ if $NQE(q^*) > 0$; and $l_{LH}^* = l_{LS}^* < q^*$ if $NQE(q^*) < 0$.

(b) When $\hat{q} > q$ (overestimation): $l_{LH}^* = l_{LS}^* < q^*$ if $NQE(q^*) > 0$; if $NQE(q^*) < 0$, then l_{LH}^* can be either larger or smaller than l_{LS}^* and both are larger than q^* .

Proposition 4 (Comparison – Welfare):

(a) When $\hat{q} < q$ (underestimation): if $NQE(q^*) > 0$, LH generates a higher social welfare level; if $NQE(q^*) < 0$, LH and LS generate the same social welfare level.

(b) When $\hat{q} > q$ (overestimation): if $NQE(q^*) > 0$, LH and LS generate the same social welfare level; if $NQE(q^*) < 0$, then either LH or LS can generate a higher social welfare level.

4. Liability Owed to Consumers

4.1 General

We have thus far assumed that (monetary) sanctions for deviating from the legal standard are paid to the state. In some cases, however, liability is owed to consumers, and the consumers receive (money) damages when sellers deviate from the legal standard. We now extend our model to such cases. We retain the assumption of perfect enforcement, and let liability equal $L(q, l)$.

The seller's cost function remains as before; the seller does not care whether she is making liability payments to the state or to consumers. Accordingly, the price remains: $p = c(q) + L(q, l)$. The difference is in the value of the transaction to consumers. The perceived value of the product to the consumer, net of the price (p), is:

$$V(\hat{q}, p) = v + u(\hat{q}) - p + L(\hat{q}, \hat{l})$$

Note that perceptions of the legal standard affect demand by influencing consumers' perceptions of both the quality of the product, \hat{q} , and the damages they will recover, $L(\hat{q}, \hat{l})$. The seller

maximizes $V(\hat{q}, p) = v + u(\hat{q}) - p$ subject to the zero-profit, $p = c(q) + L(q, l, e)$ constraint. Or, equivalently, the seller sets quality to maximize:

$$u(\hat{q}) - c(q) - L(q, l) + L(\hat{q}, \hat{l})$$

The social objective function remains:

$$W = \int_{\tilde{v}(l)}^{\infty} [v + u(q(l)) - c(q(l))] f(v) dv$$

but with $\tilde{v}(l) = p(l) - u(\hat{q}(l)) - L(\hat{q}, \hat{l}) = c(q(l)) + L(q(l), l) - u(\hat{q}(l)) - L(\hat{q}, \hat{l})$.

To find the optimal legal standard, we study the derivative $\frac{dW}{dl}$:

$$[1 - F(\tilde{v}(l))] \cdot [u'(q) - c'(q)] \frac{dq}{dl} - f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v})$$

The differences, as compared to the Section 3 analysis, follow from the differences in the $\tilde{v}(l)$ and $\frac{d\tilde{v}(l)}{dl}$ terms. Specifically:

- (1) The infra-marginal effect: With a higher standard the share of consumers who purchase the product increases because consumers value the prospect of recovering damages.
- (2) The marginal effect: In addition to the Section 3 effects, an increase in l also results in an increase in perceived liability, $\frac{dL(\hat{q}, \hat{l})}{dl}$, which raises the perceived benefit, to the consumer, from the transaction. Accordingly, when liability is owed to consumers, a higher standard provides an additional push towards more purchases. But, looking at the value of these purchases, we see that the marginal consumer who buys, or does not buy, the product generates a smaller net social benefit: the smaller \tilde{v} implies a smaller $w(\tilde{v}) = \tilde{v} + u(q) - c(q)$.

4.2 Large Sanctions

As long as consumers understand that sellers will meet the legal standard and set $l = q$, the results from Section 3 continue to hold. Sellers do not pay damages to consumers in the LS case (as they did not pay fines to the state in the Section 3 analysis). As long as consumers do not mistakenly think that they will receive damages payments, the Section 3 analysis applies.

4.3 Liability Equals Harm

4.3.1 Market Outcome

The liability function remains as in Section 3. But now we must also introduce the perceived liability function:

$$L(\hat{q}, \hat{l}) = \begin{cases} u(\hat{l}) - u(\hat{q}) & , \hat{q} < \hat{l} \\ 0 & , \hat{q} \geq \hat{l} \end{cases}$$

Taking into account perceived liability, the perceived value of the product to the consumer net of price is:

$$V(\hat{q}, p) = \begin{cases} v + u(\hat{l}) - c(q) - L(q, l) & , \hat{q} < \hat{l} \\ v + u(\hat{q}) - c(q) - L(q, l) & , \hat{q} \geq \hat{l} \end{cases}$$

In this case, consumers value products at v plus the utility from the greater of the estimated quality and the estimated legal standard; when they believe that quality is below the legal standard they expect a payment of damages to put them in the same position as if the standard had been met.

The seller maximizes:

$$u(\hat{q}) - c(q) - L(q, l) + L(\hat{q}, \hat{l}) = \begin{cases} u(\hat{l}) - c(q) - (u(l) - u(q)) & , q < l \text{ and } \hat{q} < \hat{l} \\ u(\hat{q}) - c(q) - (u(l) - u(q)) & , q < l \text{ and } \hat{q} \geq \hat{l} \\ u(\hat{l}) - c(q) & , q > l \text{ and } \hat{q} < \hat{l} \\ u(\hat{q}) - c(q) & , q > l \text{ and } \hat{q} \geq \hat{l} \end{cases}$$

The analysis closely resembles the Section 3 analysis. The four domains effectively collapse into two: Starting with the two $q < l$ domains, the derivative w.r.t. q is $u'(q) - c'(q)$, regardless of misperception. This means that the seller will want to increase quality when $q < q^*$ and to reduce quality when $q > q^*$. In the two $q > l$ domains, the derivative w.r.t. q is $-c'(q)$, regardless of misperception. This means that the seller will want to decrease quality. Recall that, in our framework, q does not affect \hat{q} and so the seller will not try to change quality in order to move from a $\hat{q} < \hat{l}$ domain to a $\hat{q} \geq \hat{l}$ domain or vice versa. Therefore, Lemma 1 (from Section 3) continues to hold.

4.3.2 Naïve Lawmakers

We first assume that the lawmaker is naïve and sets $l = q^*$. As in Section 3.3.2, the seller will meet the standard and choose $q = l = q^*$. Consumer demand depends on the relationship between the perceived legal standard, \hat{l} , and perceived quality, \hat{q} . If $\hat{q} \geq \hat{l}$, then perceived liability is zero, $L(\hat{q}, \hat{l}) = 0$, and the Section 4.3.2 results apply. If $\hat{q} < \hat{l}$, then perceived liability

is positive, $L(\hat{q}, \hat{l}) > 0$, and demand is higher when liability is owed to consumers. The increased demand is welfare enhancing when $\hat{q} < q^*$ and welfare reducing when $\hat{q} > q^*$.

4.3.3 Sophisticated Lawmakers

As in Section 3, whether the legal standard should be set above or below q^* depends on the net quantity effect $\frac{dQ(\tilde{v}(l))}{dl}$ (evaluated at $l = q^*$) and on the net social value from the marginal purchase (also evaluated at $l = q^*$). In Section 3, the net social value from the marginal purchase was a function only of the direction of the quality misperception. Here the net social value from the marginal purchase is also a function of the misperceptions of the liability standard and the relationship between the perceived quality and the perceived legal standard.

Specifically, when consumers do not expect to recover damages demand is distorted by misperceptions of product quality. When consumers expect to recover damages demand is distorted by misperceptions of the legal standard. The net social benefit from the marginal purchase is positive

- (i) When $\hat{q} \geq \hat{l}$ and $\hat{q} < q$ (no expected recovery and underestimation of quality), and
- (ii) When $\hat{q} < \hat{l}$ and $\hat{l} < l$ (expected recovery and underestimation of legal standard).

The net social benefit from a marginal purchase is negative

- (i) When $\hat{q} \geq \hat{l}$ and $\hat{q} > q$ (no expected recovery and overestimation of quality), and
- (ii) When $\hat{q} < \hat{l}$ and $\hat{l} > l$ (expected recovery and overestimation of legal standard).

We can now state the following parallel to Proposition 2.

Proposition 5: In the LH case, the following results obtain:

- (a) When (i) $\hat{q} \geq \hat{l}$ and $\hat{q} < q$, or (ii) $\hat{q} < \hat{l}$ and $\hat{l} < l$, the marginal purchase generates a net social gain, $w(\tilde{v}) > 0$, and the legal standard should be adjusted to increase demand. Therefore, $l_{LH}^* > q^*$ if $NQE(q^*) > 0$; and $l_{LH}^* < q^*$ if $NQE(q^*) < 0$.
- (b) When (i) $\hat{q} \geq \hat{l}$ and $\hat{q} > q$, or (ii) $\hat{q} < \hat{l}$, $\hat{l} > l$, the marginal purchase generates a net social loss, $w(\tilde{v}) < 0$, and the legal standard should be adjusted to reduce demand. Therefore, $l_{LH}^* < q^*$ if $NQE(q^*) > 0$; and $l_{LH}^* > q^*$ if $NQE(q^*) < 0$.

Remark (Comparison to Strict Liability): Our focus is on consumer misperceptions about the legal standard. We therefore study a negligence-type regime, where liability is triggered by a seller's failure to meet the legal standard. In a strict liability regime, there is no legal standard that might be misperceived. (Although there could be misperception about the level of damages.) Strict liability has been shown to provide an effective response to misperceptions about product quality or risk, which should be distinguished from the misperceptions of law that we study (Spence 1977, Shavell 1987, Shavell 2004, Polinsky and Shavell 2010). There could be a mixed regime with (i) a strict liability component, i.e., damages equal to harm that are paid to the consumer, and (ii) a fine paid to the state when the seller fails to meet a quality floor. In such a regime, misperception of law should have no effect on demand, as in Spence 1977, Shavell 1987, Shavell 2004, Polinsky and Shavell 2010.

5. Costly Enforcement

5.1 General

The perfect enforcement assumption that we have adopted in the previous sections is, of course, unrealistic. Even if $e = 1$ were achievable, it would entail a substantial social cost, $C(e = 1)$, that would generally render perfect enforcement socially undesirable. We, therefore, turn to study the implications of imperfect enforcement.

As a benchmark, consider first the assumption of zero enforcement of the regulation, $e = 0$. If consumers get no quality signal, namely, if actual quality (q) has no effect on perceived quality (\hat{q}), then when the regulation is not enforced, sellers will set $q = 0$ (a lemons problem). Also note that, with zero enforcement, the legal standard, l , is irrelevant.

5.2 Exogenous Enforcement

The results derived in section 3 concerning the optimal legal standard continue to hold when enforcement is imperfect and the level of enforcement, e , is positive and set exogenously. The level of enforcement merely determines whether it is feasible for the lawmaker to impose liability equivalent to Large Sanctions, Intermediate Liability, Liability Equal to Harm or Weak Liability.

If the sanction can be costlessly raised, then imperfect enforcement does not interfere with optimal policy. Consider the LS case. The lawmaker will set s sufficiently high to compensate for the low e and induce the seller to always meet the legal standard, l . The results derived for the LS case in Section 3.2 continue to hold. (Compare: Sanction multiplier result in Polinsky and Shavell (2000).) Next, consider the LH case. With perfect enforcement, we saw that the lawmaker can set liability equal to harm by selecting $L(q, l) = s = u(l) - u(q)$ for $q < l$. With imperfect enforcement, we can still have liability equal to harm if we set $s = \frac{1}{e}[u(l) - u(q)]$, such that $L(q, l, e) = e \cdot s = u(l) - u(q)$ for $q < l$. (We assume that sellers are risk neutral.) If higher levels of s are possible we can also have higher levels of liability, in other words, Intermediate Liability. Accordingly, the results derived in Sections 3.3 and 3.4 are robust to the introduction of imperfect enforcement, when the appropriate sanction multiplier is applied.

If it is costly to raise sanctions, then imperfect enforcement may constrain policy choices. The lower the maximum feasible sanction, the lower the feasible level of liability. For instance, if e is small, it might not be possible to replicate the LS case, namely, it might not be possible to set the sanction, s , sufficiently high to induce the seller to always meet the legal standard. If e is even smaller, such that $\frac{1}{e}[u(l) - u(q)]$ exceeds the maximum feasible sanction, it might not be possible to replicate the LH case, and the lawmaker will be able to impose only weak liability.

The results derived in Section 4 for the case where Liability is Owed to Consumers can also be extended to accommodate imperfect, exogenous enforcement. This extension, however, would need to account for consumers' risk aversion. As compared to the perfect enforcement analysis

in Section 4, imperfect enforcement entails a lower probability of receiving higher damages. This would be less attractive for a risk-averse consumer. To be more precise: keeping the expected value of L constant, a move from perfect to imperfect enforcement would reduce the share of consumers who purchase the product. Correspondingly, the marginal consumer who buys, or does not buy, the product would generate a larger net social benefit.

Of course, when we shift to imperfect enforcement, misperceptions about the level of enforcement, e , would need to be considered, in conjunction with misperceptions about the legal standard, l . Specifically, consumers who perceive a higher enforcement level will also perceive a higher quality level, in the same way that a higher perceived standard, l , raises the perceived quality. These (mis)perceptions will affect the optimal legal standard.

5.3 Endogenous Enforcement

We now endogenize the level of enforcement and ask how the lawmaker should optimally set both l and e , given the possibility of consumer misperception. Our analysis follows Polinsky and Shavell (2000) (specifically, Sec. 4.2) who study an optimal law enforcement model with fault-based liability, albeit without misperception of law. Polinsky and Shavell consider three policy variables: the fault standard (l), the enforcement level (e) and the sanction (s). They replicate Becker's (1968) maximal sanction result in the fault-based liability context, and proceed to derive a second main result, which they summarize as follows: "It is generally optimal for the standard to be lower than that associated with first-best behavior. The reason is that there is a savings in enforcement costs from reducing the standard (a lower standard does not require as high a probability of detection to induce compliance), and the first-order net social loss from more individuals committing the harmful act is zero (starting at a standard corresponding to first-best behavior)."

We adapt the Polinsky and Shavell (2000) framework to the consumer products context and introduce the possibility of misperception. Two central insights from Polinsky and Shavell apply to the consumer products context: (1) the sanction should be set at the maximal level, and (2) when enforcement costs are higher the optimal legal standard is lower. The relationship between the optimal legal standard and the first-best quality q^* (which corresponds to first-best behavior in Polinsky and Shavell (2000)) is complicated by the possibility of consumer misperception. Without misperception an immediate extension of Polinsky and Shavell's analysis implies: $l^* < q^*$. With misperception, the optimal legal standard may be above q^* . The preceding analysis has shown that, when misperception is introduced, the optimal legal standard, in a world of perfect, costless enforcement, can be either above or below q^* . When the optimal legal standard is below q^* , moving from costless enforcement to costly enforcement further reduces the optimal legal standard. When the optimal legal standard is above q^* , costly enforcement reduces the optimal legal standard as compared to the costless enforcement benchmark. But this reduced standard can be either above or below q^* . Stated differently, if we define the Polinsky and Shavell first-best benchmark not as q^* , but rather as the optimal legal standard with misperception but costless enforcement, then their result applies: costly enforcement reduces the standard as compared to this benchmark.

Shifting to the optimal level of enforcement, e^* . The (mis)perceptions of law framework adds a new dimension to the analysis. The chosen level of enforcement affects the perceived level of enforcement and thus the perceived quality of the product. These effects influence the optimal enforcement level, as (mis)perceptions of the legal standard influenced the optimal legal standard.

6. Warranties

We have studied government-imposed legal standards and the implications of consumer misperception about these standards. In some cases, sellers may voluntarily set quality standards and assume liability for failure to meet these self-imposed standards, through contractual provisions. For example, a coffee seller might promise to sell only fair trade coffee, or a retailer might offer a warranty that its products are 'safe and non-toxic'. If the contractual commitment takes the form of a warranty to consumers then the analysis in Section 4 would apply. If violation of the standards results in liability to a third party, such as a private organization that certifies compliance with fair trade standards, an adaptation of the analysis in Section 3 would be applicable. As explained above, however, our model is limited to fault-based regimes. It does not apply to a self-imposed strict liability regime in which, the seller agrees to compensate the consumer for harm caused by product failure. Many warranties take this form and their effects have been examined in prior work (see, e.g., Grossman, 1981). Note that sellers would be expected to design self-imposed quality regimes in response to consumer misperception. Clearly, the seller's objective function would be different from the social welfare function that we maximized in Sections 3 and 4. From this perspective, a warranty is simply another product feature. Other work has studied the positive and normative implications of consumer misperception about product features and of sellers' strategic response to such misperception (see, e.g., Speigler, 2011; Bar-Gill, 2012).

7. Conclusion

Our model identifies several key factors that bear on how to set legal standards when consumer perceptions of product quality are affected by systematic misperceptions of law, most importantly: (1) whether the misperceptions lead to under- or overestimation of quality, and (2) the relative sensitivity of consumers' perceived utility, on the one hand, and sellers' production costs and liability costs, on the other hand, to marginal changes in the law. Our analysis also highlights the importance of taking into account the magnitude of expected sanctions (LS v. LH) in assessing the impact of adjustments in the legal standard on sellers' behavior and on the welfare effects of misperception. We believe that our policy prescriptions are actionable, especially by expert regulatory agencies. (Yet we also recognize the challenges in obtaining reliable information about consumer misperceptions of law and about market responses to adjustments in the legal standard.)

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Appendix

Proof of Proposition 1

We evaluate the derivative $\frac{dW}{dl}$ at $l = q^*$ where $u'(q^*) = c'(q^*)$. In the LS case, s is sufficiently large, such that the seller is induced to meet the legal standard, i.e., $q = l$. This assumption implies $L = 0$ and $\frac{dq}{dl} = 1$. Plugging in $\hat{q} = \delta l + k$, the derivative $\frac{dW}{dl}$ at $l = q^*$ is: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v})$, where $\tilde{v}(l) = c(q) - u(\hat{q})$, $\frac{d\tilde{v}(l)}{dl} = c'(q) - \delta u'(\hat{q})$, and $w(\tilde{v}) = u(q) - u(\hat{q})$. Notice that we are left with only the marginal effect. This follows from the fact that at q^* , $u'(q^*) = c'(q^*)$ – for the infra-marginal consumers, at q^* the benefits of increased quality are offset exactly by the price increase necessary to cover the increased production costs.

To see whether l should be increased above q^* , or reduced below q^* , we need to determine the sign of the FOC at $l = q^*$. In the absence of misperception, $\hat{q} = q$, $w(\tilde{v}) = u(q) - u(\hat{q}) = 0$. Moreover, under these conditions, $\delta = 1$ and $k = 0$ so $\frac{d\tilde{v}(l)}{dl} = c'(q) - u'(\hat{q})$, which also equals zero when evaluated at $l = q^*$. For both these reasons the FOC equals zero at $l = q^*$. This confirms that in the absence of misperception the lawmaker should set the legal standard equal to the first-best quality level.

Now consider the sign of the FOC at $l = q^*$ with misperception. First, the sign of $w(\tilde{v}) = u(q) - u(\hat{q})$ is determined by the direction of the misperception: Underestimation of quality, $\hat{q} < q$, implies $w(\tilde{v}) > 0$, and overestimation of quality, $\hat{q} > q$, implies $w(\tilde{v}) < 0$. Second, as explained above, the net quantity effect,

$$\left. \frac{dQ(\tilde{v}(l))}{dl} \right|_{l=q^*} = -f(\tilde{v}(q^*)) \left. \frac{d\tilde{v}(l)}{dl} \right|_{l=q^*} = f(\tilde{v}(q^*)) [\delta u'(\hat{q}(l = q^*)) - c'(q^*)],$$

can be either positive or negative, depending on how sensitive demand is to changes in perceptions of law ($\delta u'(\hat{q})$) as well as how sensitive cost is to changes in quality ($c'(q)$).

QED

Proof of Lemma 1

In the $q < l$ range, the derivative of the seller's objective function w.r.t. q is: $u'(q) - c'(q)$. (Recall our assumption that actual quality does not affect perceived quality.) If $u'(q) - c'(q) > 0$ (at $q \leq l$), then the seller will set $q = l$. If $u'(q) - c'(q) < 0$ (at $q = l$), then the seller will prefer not to meet the legal standard and set q such that $u'(q) - c'(q) = 0$, i.e., the seller will set $q = q^*$. Note that $u'(q) - c'(q) > 0$ when $q < q^*$ and that $u'(q) - c'(q) < 0$ when $q > q^*$ (since $u(q) - c(q)$ is maximized at q^*). In the $q \geq l$ range, the derivative of the seller's objective function w.r.t. q is: $-c'(q) < 0$, which means that the seller will always choose $q = l$.

QED

Proof of Proposition 2

We evaluate $\frac{dW}{dl}$ at $l = q^*$. As before, the infra-marginal effect is zero (since $u'(q^*) = c'(q^*)$) and we can focus on the marginal effect: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v})$. Start with $\tilde{v}(l = q^*) = c(q^*) - u(\hat{q}(l = q^*)) + L(q^*, l = q^*)$. And note that $L(q^*, l = q^*) = u(l = q^*) - u(q^*) = 0$. We thus have: $\tilde{v}(l = q^*) = c(q^*) - u(\hat{q}(l = q^*))$. Next consider: $\frac{d\tilde{v}(l)}{dl} = c'(q) \frac{dq}{dl} + \frac{dL(q,l)}{dl} - u'(\hat{q}) \frac{d\hat{q}}{dl}$. We have seen that, for $l \leq q^*$, $\frac{dq}{dl} = 1$ and $L(q, l) = 0$. Therefore, for $l = q^* - \epsilon$: $\frac{d\tilde{v}(l)}{dl} \Big|_{l=q^*} = c'(q^*) - \delta u'(\hat{q}(l = q^*))$. We have also seen that, for $l > q^*$, $\frac{dq}{dl} = 0$ and $L(q, l) = u(l) - u(q)$. Therefore, for $l = q^* + \epsilon$: $\frac{d\tilde{v}(l)}{dl} \Big|_{l=q^*} = u'(l = q^*) - \delta u'(\hat{q}(l = q^*))$. And, since $u'(q^*) = c'(q^*)$, we have: $\frac{d\tilde{v}(l)}{dl} \Big|_{l=q^*} = c'(q^*) - \delta u'(\hat{q}(l = q^*))$.

QED

Proof of Proposition 5

To see whether the lawmaker should set the legal standard at, above or below the first-best quality level, we evaluate $\frac{dW}{dl}$ at $l = q^*$, focusing on the marginal, quantity effect: $\frac{dQ(\tilde{v}(l))}{dl} \cdot w(\tilde{v})$. The difference, as compared to Proposition 2, is in the net social benefit from the marginal purchase. Here we have: $w(\tilde{v}) = \tilde{v} + u(q) - c(q) = c(q) + L(q, l) - u(\hat{q}) - L(\hat{q}, \hat{l}) + u(q) - c(q) = u(q) + L(q, l) - u(\hat{q}) - L(\hat{q}, \hat{l})$. From Lemma 1, we know that $L(q, l) = 0$ when $l = q^*$ (since the seller will meet the legal standard), leaving us with $w(\tilde{v}) = u(q) - u(\hat{q}) - L(\hat{q}, \hat{l})$. When $\hat{q} \geq \hat{l}$, $L(\hat{q}, \hat{l}) = 0$, and we have: $w(\tilde{v}) = u(q) - u(\hat{q})$. When $\hat{q} < \hat{l}$, $L(\hat{q}, \hat{l}) = u(\hat{l}) - u(\hat{q})$, and we have: $w(\tilde{v}) = u(q) - u(\hat{l})$, or $w(\tilde{v}) = u(l) - u(\hat{l})$ (since $l = q = q^*$).

The remainder of the proof follows from the discussion in Section 4.3.3.

QED

Intermediate and Weak Liability

Section 3: Liability Owed to the State

The analysis largely follows the analysis of the LH case. In that case, $\tilde{l} = q^*$ serves as an important threshold: the seller sets $q = l$ when $l < q^*$ and sets $q = q^*$ when $l \geq q^*$ (Lemma 1). This threshold value is an increasing function of the liability level; when liability costs are larger, sellers will choose to increase quality and bear greater production costs in order to avoid liability. In the IL case, where liability exceeds harm but is not high enough to guarantee compliance with any legal standard, $\tilde{l} > q^*$. In the WL case, where liability is smaller than harm, $\tilde{l} < q^*$.

To find the optimal legal standard in each of these cases, we again evaluate $\frac{dW}{dl}$ at $l = q^*$. In the IL case, we know that the seller will meet the legal standard: $q = l = q^*$. We can, therefore, focus on the marginal effect: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v})$. We have: $\frac{dq}{dl} = 1$ and $L(q, l) = 0$ when $l = q^* < \tilde{l}_{IL}$ and so the derivative $\frac{dW}{dl}$ is identical to the derivative in the LS case. We can thus replicate Proposition 1 in the IL case, as we did in the LH case.

The relationship between the optimal legal standard and q^* is less straightforward in the WL case. In this case, the seller will not meet the legal standard: $q < l = q^*$. In our analysis above, the infra-marginal effect, $[1 - F(\tilde{v}(l))] \cdot [u'(q) - c'(q)] \frac{dq}{dl}$, was zero, because $u'(q^*) - c'(q^*) = 0$. Here, $u'(q) - c'(q) > 0$. Still, the infra-marginal effect is zero, because in the WL case we have $\frac{dq}{dl} = 0$ when $l = q^* > \tilde{l}_{WL}$. Therefore, we can again focus on the marginal effect: $-f(\tilde{v}(l)) \cdot \frac{d\tilde{v}(l)}{dl} \cdot w(\tilde{v})$. We have: $\tilde{v}(l = q^*) = c(q^*) - u(\hat{q}(l = q^*)) + L(q < q^*, l = q^*)$, larger than in the LH case. The net social benefit from the marginal purchase, $w(\tilde{v}) = u(q) - u(\hat{q}) + L(q, l)$, is smaller, as compared to the LH case, since liability is too weak to compensate for the reduced quality. Next consider: $\frac{d\tilde{v}(l)}{dl} = c'(q) \frac{dq}{dl} + \frac{dL(q, l)}{dl} - u'(\hat{q}) \frac{d\hat{q}}{dl}$. Since $\frac{dq}{dl} = 0$, we have: $\left. \frac{d\tilde{v}(l)}{dl} \right|_{l=q^*} = \frac{dL(q^*, l)}{dl} - \delta u'(\hat{q}(l = q^*))$, as compared to $\left. \frac{d\tilde{v}(l)}{dl} \right|_{l=q^*} = c'(q^*) - \delta u'(\hat{q}(l = q^*))$ in the LH case. We can replicate Proposition 1 in the WL case, but only after revising the conditions for $w(\tilde{v}) > 0$ (and for $w(\tilde{v}) < 0$) and noting that the value $\left. \frac{dQ(\tilde{v}(l))}{dl} \right|_{l=q^*}$ is different.

Section 4: Liability Owed to Consumers

IL Case: Liability now exceeds harm: $L(q, l) > u(l) - u(q)$ when $q < l$. And perceived liability exceeds perceived harm: $L(\hat{q}, \hat{l}) > u(\hat{l}) - u(\hat{q})$, when consumers believe that the seller failed to meet the quality standard, i.e., when $\hat{q} < \hat{l}$. Consider the net social benefit from the marginal purchase: $w(\tilde{v}) = u(q) + L(q, l) - u(\hat{q}) - L(\hat{q}, \hat{l})$. We know that $L(q, l) = 0$ when $l = q^*$ (since the seller will meet the legal standard), leaving us with $w(\tilde{v}) = u(q) - u(\hat{q}) - L(\hat{q}, \hat{l})$. When $\hat{q} \geq \hat{l}$, $L(\hat{q}, \hat{l}) = 0$, and we have: $w(\tilde{v}) = u(q) - u(\hat{q})$, as in the LH case. The difference arises when $\hat{q} < \hat{l}$ and $L(\hat{q}, \hat{l}) > u(\hat{l}) - u(\hat{q})$. We have: $w(\tilde{v}) < u(q) - u(\hat{l})$, or $w(\tilde{v}) < u(l) - u(\hat{l})$ (since $l = q = q^*$). The larger perceived liability reduces the net social benefit from a marginal purchase. Specifically, the net social benefit from a marginal purchase can be negative even when $\hat{l} < l$ (in contrast to the results summarized in Section 4). Moreover, the value $\left. \frac{dQ(\tilde{v}(l))}{dl} \right|_{l=q^*}$ is different in the IL case, as compared to the LH case.

WL Case: Liability is now lower than harm: $L(q, l) < u(l) - u(q)$ when $q < l$. And perceived liability is lower than perceived harm: $L(\hat{q}, \hat{l}) < u(\hat{l}) - u(\hat{q})$, when consumers believe that the seller failed to meet the quality standard, i.e., when $\hat{q} < \hat{l}$. Consider the net social benefit from the marginal purchase: $w(\tilde{v}) = u(q) + L(q, l) - u(\hat{q}) - L(\hat{q}, \hat{l})$. With weak liability, the seller will not meet the legal standard when set at $l = q^*$. When $\hat{q} \geq \hat{l}$, $L(\hat{q}, \hat{l}) = 0$, and we have:

$w(\tilde{v}) = u(q) + L(q, l) - u(\hat{q})$, as in Section 3. When $\hat{q} < \hat{l}$ and $L(\hat{q}, \hat{l}) < u(\hat{l}) - u(\hat{q})$, we have: $w(\tilde{v}) > u(q) + L(q, l) - u(\hat{l})$, which is smaller than the $w(\tilde{v})$ from Section 4 (since $\hat{q} < \hat{l}$). And the value $\left. \frac{d\tilde{v}(l)}{dl} \right|_{l=q^*}$ is smaller, relative to the Section 3 value, as explained above.