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Platform Liability and Innovation*

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We study a platform's incentives to remove IP-infringing products and the effects of holding the platform liable for such infringements on innovation and welfare. We first show that platform liability can lead to either higher or lower commission rates, depending on how screening affects transaction volume. We then show that liability may spur or hinder innovation, depending on the intensity of cross-group network externalities. A sufficient condition for platform liability to reduce total welfare is that it lowers innovation, in which case all market participants–the platform, innovators, imitators, and buyers—are worse off. We also provide a sufficient condition under which platform liability raises total welfare.

Keywords: Platform, Liability, Intellectual Property, Innovation.
JEL codes: K40, K42, K13, L13, L22, L86.

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1. Introduction

In recent years, online misconduct has emerged as a major problem of the Web. A widespread activity is the sale of items infringing intellectual property (IP) rights, such as trademarks, designs, and copyright. According to the OECD (2018), counterfeits account for 3% of global trade and "e-commerce platforms represent ideal storefronts for counterfeits". The U.S. Trade Representative echoes these concerns, emphasizing that these activities undermine the comparative advantages of firms investing in innovation and creativity.[1] The damage from IP-infringing products extends beyond lost sales: weaker IP protection may reduce firms' incentives to invest in R&D and product development. Leading brands such as Nike and Birkenstock have withdrawn from major platforms, and luxury firms such as Louboutin have pursued litigation against online marketplaces for failing to prevent the sale of knock-offs of their iconic designs.[2]

As part of governing its marketplace ecosystem, a platform owner can undertake (potentially costly) measures to screen out illicit players. However, this involves a trade-off: whereas allowing low-quality merchants, possibly including IP infringers, on the platform may lower the incentives for innovative sellers to develop new products, it can also expand the platform's market reach and boost sales. Therefore, it is *a priori* unclear whether a platform has an incentive to delist IP-infringing sellers, especially when their products do not cause direct harm to consumers. Moreover, the enforcement of primary liability, that is, the possibility to directly sue and get compensation from wrongdoers, is often difficult in online markets because illicit players may be hard to identify, operate from different jurisdictions, or lack sufficient assets to compensate harmed parties. This may motivate the introduction of a liability rule that increases the platform's incentives to screen and remove illegal products.[3]

We provide a theoretical framework to understand an online platform's incentives to delist IP-infringing products and study the impact of holding platforms liable for third parties' IP infringements on innovation and welfare. We consider a setting in which an IP-infringing product does not cause any direct harm to buyers, who are fully informed about whether they are purchasing an original product or its imitation.[4] This reflects evidence that many counterfeits are neither deceptive nor harmful and may benefit consumers while harming innovators. In our framework, platform liability takes the form of a negligence-based liability rule under which

[1]Office of the United States Trade Representative [Docket Number USTR-2024-0013].

[2]On December 2022, the Court of Justice of the European Union (CJEU) ruled that online marketplaces could be held directly liable for trademark infringement under some circumstances such as for displaying advertisements of sellers that were using third-party trademarks without authorization, and for stocking and delivering the seller's infringing goods to customers [EUR-Lex - 62021CJ0148].

[3]For instance, the Anti-Counterfeiting Committee of the International Trademark Association (2023) proposed that online marketplaces should be subject to liability for the sale of specific counterfeit goods.

[4]For example, a T-shirt branded *Love* that looks similar to the branded *Levi's* might attract buyer demand and not deceive consumers as the difference between the original and its copycat product is obvious. Moreover, the fact that some consumers might discover a taste for low-quality imitations, some of which infringe IP, can also be motivated by the growing success of the ultra-fast fashion industry.

platforms need to comply with two requirements to benefit from liability exemption: a minimum screening requirement and the obligation to delist identified IP infringers.[5] We focus on the case in which the platform finds it optimal to comply with these (binding) requirements and, therefore, platform liability leads to an increase in the screening level.[6]

We develop a tractable model of a two-sided market in which all transactions between buyers and sellers occur on a monopoly platform (e.g., an e-commerce platform, or an app store). There are two types of sellers: the innovators, who incur innovation costs to develop new products that give rise to new product categories; and imitators (i.e., copycats) who sell low-quality versions of innovative products. An imitator can only exist if an innovator has developed an innovative product. With a certain probability, the copycat is legitimate and with the complementary probability, it infringes the innovator's IP. The platform makes profits by charging sellers an ad valorem commission, and commits to a screening level, that is, the probability that an IP infringer is identified. If an IP infringer is identified, it is delisted by the platform, whereas legitimate imitators cannot be delisted. Therefore, the screening level determines the degree of competition that each innovative product faces and, as a result, it affects innovators' incentives to develop new products. In this framework, the introduction of platform liability that induces a higher screening level leads to an increase in the probability that an IP-infringing product is identified and delisted, thereby reducing the expected competitive pressure that each innovator faces from an imitator. This intended effect of platform liability, which we call *IP-protection effect*, gives innovators more incentives to innovate, *all other things being equal*. However, we show that platform liability can also have unintended consequences on innovation, which can be either positive or negative.

We first characterize the platform's private incentives to screen out IP infringers. We show that a sufficient condition for the platform to engage in screening is that the volume of transactions increases locally with the screening level, starting from a situation with zero screening.

We then study the economic effects of platform liability. First, platform liability affects not only screening but also the platform's optimal pricing strategy. Contrary to the common intuition that liability necessarily increases commissions because of higher compliance costs, our analysis shows that liability can also lead to lower commissions. This occurs when the elasticity of transaction volume with respect to screening increases with the commission rate. Liability can therefore spur seller innovation by giving the platform incentives to moderate commissions.

Second, the effects of platform liability on innovation and consumer welfare depend on the

[5] This rule is adopted in many jurisdictions with respect to online e-commerce platforms. However, there is an ongoing debate about whether platforms should be considered as products and, consequently, subject to strict liability with ex-post damage compensation. For a detailed discussion, see Van Loo and Spier (2025).

[6] For example, under the EU Electronic Commerce Directive 2000, online intermediaries benefit from liability exemption provided that they act expeditiously to remove any illegal activity or information they become aware of (artt. 13-14). The EU Digital Services Act complements the Directive by adding a list of additional requirements for "very large online platforms".

intensity of cross-group network externalities, which determine participation elasticities on each side. Liability reduces imitation and raises innovators' expected profits for a given consumer participation, but it also limits competition and lowers consumer surplus per category. We show that platform liability is more likely to harm innovation the stronger the network externalities from innovators to buyers, whereas it is more likely to benefit consumers the stronger the network externalities from buyers to innovators.[7]

Third, when platform liability reduces innovation, all agents—innovators, imitators, consumers, and the platform—are worse off, making liability unambiguously undesirable. Policymakers should therefore recognize that if platform liability fails to achieve its intended goal of fostering innovation, it can have substantial adverse effects on welfare.

Finally, we compare negligence-based liability with strict liability, under which the platform must compensate for harm regardless of its screening efforts. In our framework, negligence-based liability tends to generate higher welfare when the difference in buyer surplus between monopoly and duopoly is small, or when it is relatively difficult for innovators to prove harm caused by IP-infringing imitators. Conversely, strict liability yields higher welfare in the opposite circumstances.

Related literature. This article contributes to the literature on online platforms (Caillaud and Jullien, 2003; Rochet and Tirole, 2003) and, more specifically, to work on platform governance. Recent papers on platform governance have studied non-pricing policies that distort seller competition (Karle, Peitz and Reisinger, 2020; Teh, 2022), bias innovations (Choi and Jeon, 2023), introduce deceptive features (Johnen and Somogyi, 2024), moderate harmful content (Jiménez Durán, 2022; Liu, Yildirim and Zhang, 2022; Beknazar-Yuzbashev, Jiménez-Durán and Stalinski, 2024; Madio and Quinn, 2025), delist or host low-quality sellers (Casner, 2020; Bedre-Defolie, Johansen and Madio, 2025), or protect privacy (Etro, 2021). We depart from existing work by analyzing the effects of platform liability on the commission rate, innovation, and welfare. In addition, our paper relates to the literature on how platforms influence seller innovation (Belleflamme and Peitz, 2010; Jeon and Rey, 2024), but differs by focusing on how liability affects seller innovation through its impact on the platform's screening and pricing decisions.

We also contribute to the law and economics literature on liability, which largely studies product liability when a firm sells directly to consumers and harm arises from insufficient care.[8] Our analysis instead examines intermediary liability in a two-sided environment with non-deceptive IP-infringing goods, showing how liability affects innovation and welfare.[9]

[7]We use the terms consumers and buyers interchangeably.

[8]This literature identifies conditions for liability to be socially desirable or undesirable (Daughety and Reinganum, 1995, 1997, 2006, 2008; Ganuza, Gomez and Robles, 2016; Polinsky and Shavell, 2010).

[9]See Buiten, de Streel and Peitz (2020), Lefouili and Madio (2022) and Van Loo and Spier (2025) for non-formalized economic analyses of platform liability.

A small set of papers studies platform liability for IP-infringing products or content. De Chiara et al. (2025) analyze a hosting platform's incentives to ex-ante filter copyright-infringing material and the role of right-holder takedown notices; they characterize optimal public intervention combining ex-ante regulation and ex-post liability. Our context differs in three respects: we focus on a marketplace with sellers of goods rather than a hosting platform for content; we endogenize the platform's commission alongside screening; and we study how liability affects innovation incentives. Lichtman and Landes (2003) discuss indirect liability for manufacturers whose products facilitate copyright infringement; our analysis instead focuses on digital intermediaries like marketplaces that can screen potentially IP-infringing products.

Galasso and Luo (2017) and Galasso and Luo (2022) also study the relationship between liability and innovation in the context of a supply chain. Galasso and Luo (2017) study theoretically and empirically the effect of a reduction in the malpractice liability cost on physicians' behavior and incentives to adopt innovative technologies. They show that reforms aimed at reducing liability risks for physicians may have a positive or a negative effect on innovation incentives depending on the type of technology adopted. Empirically, they also show that laws that reduce the liability of physicians are likely to generate less patenting activity in medical instruments. In an empirical analysis of the effect of product liability for medical implants, Galasso and Luo (2022) provide further evidence that changes in liability risk can have cascade effects along a vertical chain, with a significant negative effect on downstream innovation. Related to this, our theoretical analysis shows how holding platforms liable for IP-infringing products may have an adverse effect on the innovation incentives of sellers.

Work on liability for online intermediaries includes Zennyo (2023), De Chiara et al. (2023), and Hua and Spier (2025). Unlike us, these papers focus on harmful firms that impose costs on consumers. Hua and Spier (2025) show that it is optimal to hold platforms liable when harmful firms are judgment proof, but that the optimal liability regime may be partial. Zennyo (2023) considers platform liability for defective products sold by third parties and shows that the introduction of liability, taking the form of ex post compensation, can alter the incentive of the platform and potentially reduce the welfare of consumers and the variety of sellers on the platform. De Chiara et al. (2023) study the effects of imposing liability on online platforms in a context in which consumers can receive partial compensation for losses resulting from purchasing a defective product and inflict reputational punishment on the platform. By contrast, we focus on the impact of platform liability on innovation and emphasize the key role played by the intensity of cross-group network externalities in this context.

Finally, we relate to the economics of digital piracy.[10] That literature shows how pirated content can generate positive spillovers (e.g., via sampling, as in Peitz and Waelbroeck (2006*b*)). Our mechanism is different: the availability of imitations is mediated by a platform, and the effect on innovators is governed by participation externalities and the platform's pricing response.

[10] See Peitz and Waelbroeck (2006*a*) and Belleflamme and Peitz (2012) for reviews.

Outline. The remainder of the article is organized as follows. Section 2 presents the setup. Section 3 analyzes the platform's private incentives to screen. Section 4 examines the effects of platform liability on innovation, consumer surplus, and welfare. Section 5 characterizes the optimal liability rule. Section 6 concludes with remarks and policy implications. The Online Appendix contains five extensions.[11]

2. Setup

Consider an economy in which all transactions between sellers and buyers take place on a monopoly platform. There are two types of sellers: innovators and imitators.

Innovators. There is a mass one of innovators. Each of them can develop an innovative product that gives rise to a new independent product category. Innovators are heterogeneous in their cost of innovation, k, which is distributed according to a cdf $F(.)$ with density $f(.) > 0$ over the interval $[0, \overline{k}]$. We assume that $f(.)$ is continuously differentiable. Let $\varepsilon_F(k) \equiv kf(k)/F(k)$ denote the elasticity of $F(.)$.

Once an innovative product is developed, the innovator sells it through the platform. For simplicity, we assume that marginal production costs are zero, which is the case, for instance, for most digital goods. In the Online Appendix we extend the analysis to the case in which marginal production costs are strictly positive, highlighting additional mechanisms at play. Note that our definition of innovation covers not only major innovations protected by patents, but also new products and varieties protected by trademarks or copyright.

Imitators. An innovative product never competes with other innovative products but may face competition from an imitation. Such an imitation may either be legitimate, in the sense that it is similar to the innovative product within the boundaries of the law, or infringe the IP of the owner of the innovative product. The latter scenario arises, for example, when the imitation uses a name or logo that infringes a trademark.

We assume that an imitation is legitimate with probability $\nu \in (0, 1)$ and infringes the IP covering the innovative product with probability $1 - \nu$. We assume that ν is exogenous and the imitation cost is equal to zero.[12] We also assume that there is perfect information so

[11] First, we analyze the situation in which the platform lacks commitment power. Second, we examine the case with infinitely many rounds of screening. Third, we study a setting where the platform can adopt a fixed membership fee instead of an ad valorem commission. Fourth, we investigate the platform's incentives to delist IP-infringing products when some well-reputed brand owners sell exclusively through their direct channels. Finally, we consider the case where sellers face positive marginal production costs and study how screening interacts with double marginalization.

[12] In a previous version of the paper we show that endogenizing ν does not qualitatively affect our main results.

that consumers buying an imitation are not deceived, and that a legitimate imitation and one that infringes IP are perceived by consumers as homogeneous.[13] We suppose that only a single imitator joins the platform in each realized product category.[14] Finally, we assume that primary liability is not enforceable, i.e., an innovator cannot obtain damages from an IP infringer (e.g., because it is located in another jurisdiction or is judgment-proof).

The platform. The platform does not charge any price on the buyer side. On the seller side, consistently with most e-commerce platforms and app stores, the platform charges an ad valorem commission rate $\tau \in (0, 1]$ per transaction.[15] Moreover, the platform commits to a screening level $\phi \in [0, 1]$, that is, the probability that an IP infringer is identified as such.[16] Although we focus on the case in which the platform can commit to ϕ, we also analyze the case of no-commitment in the Online Appendix.

We assume that there are no type-I errors, i.e., a legitimate imitator cannot be flagged as infringing IP. If an IP infringer is identified, it can be delisted by the platform, whereas a legitimate imitator cannot be delisted.[17] We assume that screening is costly and we let $\Omega(\phi)$ denote the fixed screening cost incurred by the platform associated with a level of screening ϕ. For example, the screening activity might require sunk investments in artificial intelligence to train an algorithm that filters IP-infringing products. Alternatively, the platform can buy a filtering technology whose cost is increasing in its accuracy rate. Finally, we make the following assumption regarding the screening cost incurred by the platform.

Assumption 1. *$\Omega(0) = 0 = \Omega'(0)$, $\Omega'(\phi) > 0$, $\Omega(\phi) \underset{\phi \to 1}{\to} +\infty$.*

[13] Note that if the IP-infringing product is deceptive (i.e., it pretends to be the original), consumers would, in most cases, still have the possibility to return it and obtain a refund, either because platforms offer such an option or due to consumer protection policy. Moreover, we assume that products are not harmful. The case of harmful products is studied, for instance, by Zennyo (2023).

[14] The assumption that only one imitator enters can be justified by the fact that the presence of a second imitator, entering subsequently, would drive prices to zero and thus render the second entry unprofitable. In the Online Appendix, we generalize our analysis to the case in which there is an infinite number of periods and delisting of an imitator triggers a subsequent entry of another imitator. Our main results carry out qualitatively.

[15] Ad valorem fees are widely used by online marketplaces (e.g., Amazon, eBay) and app stores (e.g., Apple Store, Google Play), typically alongside relatively small fixed fees (e.g., \$99 for the Apple Developer Program or \$39.99 per month for Amazon Professional sellers). The economic rationale for ad valorem rates is studied by Wang and Wright (2017, 2018). In the Online Appendix, we also study the case in which the platform charges a membership fee instead of an ad valorem commission.

[16] In practice, a platform engages in repeated interactions with a large number of sellers, who may share information about the platform's behavior. This creates incentives for the platform to build and maintain a reputation. Commitment to a screening level in our static model can be a seen as a reasonable approximation of the behavior of a reputation-concerned platform in a setting with repeated interactions. By contrast, if we assume no commitment in our static model, the platform holds up innovators (see the Online Appendix), which corresponds to a platform with no reputation concerns stemming from repeated interactions.

[17] This assumption is consistent with regulations existing in the European Union. Under the P2B (platform-to-business) regulation, for example, online intermediaries should ensure fair treatment to business users and contractual relations are required to be conducted in good faith and based on fair dealing (see Regulation (EU) 2019/1150). Thus, arbitrary screening of sellers can be considered a remote possibility.

This assumption implies that the cost of achieving a very low, yet positive, screening level is very small, whereas perfect screening is prohibitively costly. Moreover, by revealed preferences, this assumption also implies that any IP infringer that is identified as such is delisted. We assume that ϕ is observable by all agents, which is consistent, for instance, with the transparency obligations imposed by the EU Digital Services Act.

Consumers. There is a unit mass of consumers. Throughout the analysis, we use the terms consumers and buyers interchangeably. We assume that consumers are ex ante homogeneous but ex post heterogeneous, meaning that they only discover their valuations for the innovators' and the imitators' products after joining the platform. This assumption simplifies the analysis by allowing us to treat consumer participation and product valuation as independent, thereby enhancing both tractability and clarity.[18]

Let n_I denote the number of product categories on the platform and u the expected buyer surplus per category. The (ex ante) utility of a buyer is $un_I - \xi$, where ξ is the opportunity cost of joining the platform. We assume that ξ is distributed according to a cdf $H(.)$ and pdf $h(.) > 0$ over a support $[0, \overline{\xi}]$. Let $\varepsilon_H(\xi) \equiv \xi h(\xi)/H(\xi)$ denote the elasticity of $H(.)$.

Market structure in each category. Market structure in each category of products is either duopolistic or monopolistic. It is monopolistic if and only if the imitator infringes IP and is identified and delisted by the platform. In each category, let π_I^m (resp., π_I^d) represent the expected profit per transaction, gross of the commission paid to the platform and the fixed innovation cost, of an innovator when it faces no competition (resp., faces competition from an imitator). Let π_C^d represent the expected profit per transaction of an imitator competing against an innovator; the subscript 'C' stands for copycats. We assume the following.

Assumption 2. $\pi_I^m > \pi_I^d + \pi_C^d$.

This assumption means that, for a given number of buyers n_B, total per-category profits of sellers are larger under a monopolistic market structure than under a duopolistic market structure.[19] One implication of this assumption is that the innovator's profit is higher when it faces no competition than when it faces competition from an imitator (i.e., $\pi_I^m > \pi_I^d$).[20]

For a given screening level ϕ, an innovator's expected profit per transaction, gross of the

[18]However, we acknowledge that in reality, consumers may have a better understanding of their valuation for products from well-established innovators, especially when these firms have a strong reputation, while their valuation of imitators' products may be less certain.

[19]In the Online Appendix, we relax the assumption of zero marginal costs. In such a case, due to the emergence of double marginalization, profits gross of commissions and marginal costs may be larger within a duopolistic market structure than within a monopolistic one.

[20]Note that we do not put any restriction on the relationship between π_I^d and π_C^d. However, a model with vertical differentiation is likely to imply $\pi_I^d > \pi_C^d$.

commission paid to the platform and the fixed innovation cost, is given by:

$$\pi_I(\phi) \equiv (1-\nu)\phi\pi_I^m + [1-(1-\nu)\phi]\,\pi_I^d. \tag{1}$$

With probability $(1-\nu)\phi$, the innovator is the only seller in its respective product category and earns monopoly profit π_I^m. With the remaining probability, the innovator competes with an imitator and earns a duopoly profit π_I^d. Given the screening level ϕ, the expected gross profit per transaction of an imitator is

$$\pi_C(\phi) \equiv [1-(1-\nu)\phi]\,\pi_C^d. \tag{2}$$

For a given number n_I of innovators who developed an innovative product, the expected consumer surplus is equal to $u(\phi)n_I$, with

$$u(\phi) \equiv (1-\nu)\phi u^m + (1-(1-\nu)\phi)u^d, \tag{3}$$

where u^m (resp., u^d) represents the expected buyer surplus per category, net of price, when the product market structure is monopolistic (resp., duopolistic). Because we focus on imitations that are neither malicious nor harmful, we assume that buyer surplus per category is higher in a duopolistic market structure than in a monopolistic one. Formally, we assume the following.

Assumption 3. $u^d > u^m > 0$.

Timing. We consider the following timing:

- Stage 1: The platform decides its screening level ϕ and commission rate τ.
- Stage 2: Each innovator decides whether to develop a new product, and joins the marketplace if she does. In each product category, an imitator joins the marketplace and is delisted with probability ϕ if it infringes IP.
- Stage 3: Buyers decide whether to join the marketplace. Upon joining it, they discover their valuations for the products and make their purchasing decisions: for each product category, they decide whether to buy and which product to buy if there is more than one product.

The equilibrium concept is Subgame Perfect Nash Equilibrium.

3. Preliminaries and private incentives

For given commission rate τ and screening level ϕ, let $n_I(\tau,\phi)$ denote the number (mass) of innovators that develop new products (and are therefore on the platform), and $n_B(\tau,\phi)$ the number (mass) of buyers on the platform. Throughout the analysis, we refer to $n_I(\tau, \phi)$ as the *amount of innovation*.

Innovators decide to develop a new product if and only if their innovation cost k is lower than the expected profit they make on the platform, net of the commission paid to the platform, i.e., $(1-\tau)\pi_I(\phi)n_B(\tau, \phi)$. Similarly, buyers join the platform if and only if their expected utility $u(\phi)n_I(\tau, \phi)$ exceeds their opportunity cost ξ. Therefore, the number of innovators and buyers on the platform are, respectively, given by

$$n_I(\tau, \phi) = F((1-\tau)\pi_I(\phi)n_B(\tau, \phi)); \qquad n_B(\tau, \phi) = H(u(\phi)n_I(\tau, \phi)). \tag{4}$$

The above equations show that there are positive cross-group externalities from buyers to innovators and from innovators to buyers. In the presence of such externalities, determining the equilibrium number of buyers and innovators on the platform requires solving for a fixed point. Specifically, from (4) it follows that:

$$n_I(\tau, \phi) = F((1-\tau)\pi_I(\phi)H(u(\phi)n_I(\tau, \phi))); \qquad n_B(\tau, \phi) = H(u(\phi)F((1-\tau)\pi_I(\phi)n_B(\tau, \phi))).$$

A sufficient condition for the existence and uniqueness of an interior and stable equilibrium is that the slopes of the functions $n_I \to F((1-\tau)\pi_I(\phi)H(u(\phi)n_I))$ and $n_B \to H(u(\phi)F((1-\tau)\pi_I(\phi)n_B))$ are less than 1. Simple algebraic manipulations show that this is satisfied if

$$\varepsilon_F \; \varepsilon_H < 1, \tag{5}$$

where ε_F and ε_H are evaluated at $(1-\tau)\pi_I(\phi)H(u(\phi)n_I)$ and $u(\phi)F((1-\tau)\pi_I(\phi)n_B)$, respectively. This condition means that the intensity of total network externalities is not too large. Indeed, ε_F is the elasticity of the number of innovators with respect to the number of buyers, which can be interpreted as the intensity of the cross-group network externalities from buyers to innovators.[21] Similarly, ε_H is the elasticity of the number of buyers with respect to the number of innovators, which can be interpreted as the intensity of the cross-group network externalities from innovators to buyers.[22] We assume that condition (5) holds in the remainder of the paper.

[21] To see why, for a given ϕ,

$$\frac{\partial n_I}{\partial n_B} = (1-\tau)\pi_I(\phi)f((1-\tau)\pi_I(\phi)n_B) = \frac{n_I}{n_B}\frac{(1-\tau)\pi_I(\phi)n_B f((1-\tau)\pi_I(\phi)n_B)}{F((1-\tau)\pi_I(\phi)n_B)} = \frac{n_I}{n_B}\varepsilon_F((1-\tau)\pi_I(\phi)n_B)).$$

Thus, for a given n_B

$$\frac{n_B}{n_I}\frac{\partial n_I}{\partial n_B} = \varepsilon_F((1-\tau)\pi_I(\phi)n_B)$$

which allows us to interpret ε_F as the intensity of the cross-group network externalities from buyers to innovators.

[22] To see why, for a given n_I, we have that

$$\frac{n_I}{n_B}\frac{\partial n_B}{\partial n_I} = \varepsilon_H(u(\phi)n_I),$$

In Stage 1, the platform acts as a private regulator of its innovation ecosystem by choosing the screening level ϕ and the commission rate τ in order to maximize the following expected profit, which we assume to be quasi-concave in ϕ and τ:[23]

$$\Pi(\tau,\phi) = \tau n_I(\tau,\phi) n_B(\tau,\phi)\Big[\pi_I(\phi)+\pi_C(\phi)\Big] - \Omega(\phi). \tag{6}$$

We assume that the commission rate is non-discriminatory, that is, all sellers are subject to the same commission rate τ.[24]

For a given commission rate τ, the impact of a marginal increase in the level of screening ϕ on the platform's expected profit is given by:

$$\begin{aligned}\frac{\partial \Pi(\tau,\phi)}{\partial \phi} =& \tau \Bigg\{ \frac{\partial [n_I(\tau,\phi) n_B(\tau,\phi)]}{\partial \phi}\Big[\pi_I(\phi)+\pi_C(\phi)\Big] \\ &+ n_I(\tau,\phi) n_B(\tau,\phi)\Big[\pi_I'(\phi)+\pi_C'(\phi)\Big]\Bigg\} - \Omega'(\phi),\end{aligned} \tag{7}$$

where, $\pi_I'(\phi)+\pi_C'(\phi) = (1-\nu)[\pi_I^m - \pi_I^d - \pi_C^d] > 0$ by Assumption 2.

This shows that a marginal increase in the screening level has two effects on the platform's expected profit in addition to its effect on the screening cost. First, for given per-transaction revenues $\tau[\pi_I(\phi)+\pi_C(\phi)]$, it leads to a change in the volume of transactions $n_B(\phi,\tau)n_I(\tau,\phi)$, which can either increase or decrease. Second, for a given volume of transactions, it raises the platform's per-transaction revenues $\tau[\pi_I(\phi)+\pi_C(\phi)]$. This, combined with the assumption $\Omega'(0) = 0$, implies the following result, where $\phi^\star$ denotes the platform's optimal screening level.

Lemma 1. *A sufficient condition for the platform to engage in screening (i.e., $\phi^\star > 0$) is that the volume of transactions $n_B(\phi,\tau)n_I(\tau,\phi)$ is locally increasing in the screening level ϕ at $\phi = 0$ for any τ.*

If the condition is not satisfied, the platform's profit can be decreasing in ϕ, which yields $\phi^\star = 0$. Interestingly, this can occur even if the screening cost is zero.

We now provide a condition under which the volume of transactions increases with the screening level. To this end, let $\varepsilon_u(\phi) \equiv -u'(\phi)\phi/u(\phi)$ denote the elasticity of buyer surplus with respect to ϕ and $\varepsilon_{\pi_I}(\phi) \equiv \pi_I'(\phi)\phi/\pi_I(\phi)$ the elasticity of the innovators' expected profit per transaction

which allows us to interpret ε_H as the intensity of the cross-group network externalities from innovators to buyers.

[23] A sufficient condition is that $f'(k)$ is sufficiently negative for any k or that $\Omega''(\phi)$ is sufficiently positive for any $\phi > 0$.

[24] Note that our results hold qualitatively if the platform were allowed to discriminate against vendors on the basis of their "innovativeness". This would imply a commission rate equal to $\tau_C^\star = 1$ for imitators and $\tau_I^\star \in [0,1)$ for the innovators. However, in practice, fee discrimination by platforms is mostly based on broad product categories (e.g., books, computer items, on Amazon) and does not occur within product categories. For an analysis of the platform's incentive to discriminate across categories, see Tremblay (2021).

with respect to ϕ. Also, let $\varepsilon_{n_I}(\tau,\phi) \equiv \frac{\partial n_I(\tau,\phi)}{\partial\phi}\phi/n_I(\tau,\phi)$ denote the elasticity of the number of innovators with respect to ϕ and $\varepsilon_{n_B}(\tau,\phi) \equiv \frac{\partial n_B(\tau,\phi)}{\partial\phi}\phi/n_B(\tau,\phi)$ the elasticity of the number of buyers on the platform with respect to ϕ.

Note first that the sign of $\partial[n_I(\tau,\phi)n_B(\tau,\phi)]/\partial\phi$ is the same as the sign of $\varepsilon_{n_I}(\tau,\phi)+\varepsilon_{n_B}(\tau,\phi)$. Moreover, from (4) it follows that:

$$\varepsilon_{n_I}(\tau,\phi) = \varepsilon_F[\varepsilon_{\pi_I}(\phi) + \varepsilon_{n_B}(\tau,\phi)], \qquad \varepsilon_{n_B}(\tau,\phi) = \varepsilon_H[\varepsilon_{n_I}(\tau,\phi) - \varepsilon_u(\phi)],$$

where ε_F is evaluated at $(1-\tau)\pi_I(\phi)n_B(\tau,\phi)$ and ε_H is evaluated at $u(\phi)n_I(\tau,\phi)$. Solving for $\varepsilon_{n_I}(\tau,\phi)$ and $\varepsilon_{n_B}(\tau,\phi)$, we obtain

$$\varepsilon_{n_I}(\tau,\phi) = \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)]}{1-\varepsilon_H\varepsilon_F}, \qquad \varepsilon_{n_B}(\tau,\phi) = \frac{\varepsilon_H[\varepsilon_F\varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1-\varepsilon_H\varepsilon_F}. \tag{8}$$

Rearranging the above terms leads to the following proposition.

Proposition 1. *A sufficient condition for the platform to engage in screening (i.e., $\phi^\star > 0$) is that $\frac{\varepsilon_{\pi_I}(0)}{\varepsilon_u(0)} > \frac{\varepsilon_H(1+\varepsilon_F)}{\varepsilon_F(1+\varepsilon_H)}$ for any τ, where ε_F is evaluated at $(1-\tau)\pi_I(0)n_B(\tau,0)$ and ε_H is evaluated at $u(0)n_I(\tau,0)$. In particular, the platform always engages in screening if $\varepsilon_H = 0$.*

The special case where $\varepsilon_H = 0$ corresponds to a scenario where $n_B(\tau,\phi) = 1$ for any (τ,ϕ), meaning that buyer participation on the platform is inelastic. As a result, there are no network externalities from innovators to buyers. In this case, the volume of transactions coincides with the amount of innovation $n_I(\tau,\phi)$. Moreover, the profit of an innovator, net of the commission rate but gross of innovation costs, is $(1-\tau)\,\pi_I(\phi)$, implying that innovators always benefit from more screening since $\pi_I'(\phi) = (1-\nu)(\pi_I^m - \pi_I^d) > 0$. Consequently, the amount of innovation increases with the screening level. Hence, in this special case, the volume of transactions always increases with the screening level, implying that the platform always engages in screening.

Another special case worth discussing is the one in which the elasticities $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant. In this scenario, the sufficient condition in Proposition 1 is more (resp., less) likely to be satisfied if ε_F (resp., ε_H) is large and ε_H (resp., ε_F) is small. Our later analysis shows that if ε_F is large (resp., ε_H is small), an increase in the screening level is likely to increase the number of buyers on the platform $n_B(\tau,\phi)$ (resp., the amount of innovation $n_I(\tau,\phi)$).

4. The impact of platform liability

We now study the impact of introducing a negligence-based liability rule under which a platform benefits from a liability exemption if and only if it complies with two requirements: (i) the screening level should be (weakly) above a certain threshold, indicated by ϕ^N; (ii) the platform removes any identified IP infringer. We focus on the interesting case in which the minimum screening requirement is binding, i.e., $\phi^N > \phi^\star$ and the cost of not being exempted from liability is sufficiently large for the platform to find it optimal to comply with the two requirements. As a consequence, platform liability leads to an increase in the screening level.

4.1. The effect of platform liability on the commission rate: a preliminary result

Let $\tau^\star(\phi)$ denote the commission rate chosen by the platform for a given screening level ϕ. In order to study how platform liability impacts the commission rate $\tau^\star(\phi)$, we first need to characterize how the platform sets the commission rate. From (6), the profit of the platform is given by

$$\Pi(\tau, \phi) = \tau n_I(\tau, \phi) n_B(\tau, \phi) \Big[\pi_I(\phi) + \pi_C(\phi)\Big] - \Omega(\phi). \tag{9}$$

Because neither $\Omega(\phi)$ nor $\pi_I(\phi) + \pi_C(\phi)$ depends on τ, the optimal commission rate for a given screening level is given by

$$\tau^\star(\phi) = \arg\max_{\tau} \tau n_I(\tau, \phi) n_B(\tau, \phi). \tag{10}$$

Thus, the problem faced by the platform when choosing the commission rate for a given screening level is the problem of a monopolist choosing a "price" τ and facing a "demand" $n_I(\tau, \phi) n_B(\tau, \phi)$, where ϕ is an exogenous parameter. As is standard in this class of problems, the effect of the exogenous parameter on the optimized price has the opposite sign of its effect on the price elasticity of demand, under usual regularity conditions. The following lemma provides a dual version of this result.

Lemma 2. *Platform liability leads to a lower commission rate (resp., a higher commission rate) if the elasticity of the volume of transactions $n_I(\tau, \phi) n_B(\tau, \phi)$ with respect to the screening level ϕ increases (resp., decreases) with the commission rate τ. Platform liability does not affect the commission if this elasticity does not change with the commission rate.*

In what follows, we first consider the case in which the elasticities $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant and characterize the impact of imposing platform liability on the commission rate, the amount of innovation, buyer participation and welfare. This allows us to neatly identify the direct channel through which a higher screening intensity affects the market outcome and distinguish it from the indirect channel via a change in the commission rate. We next generalize the analysis to the case in which the elasticities $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are not constant.

4.2. The case of constant elasticities

In this subsection, we suppose that $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant.[25] Then, using Lemma 2, it is straightforward to show the following result.

Proposition 2. *A liability rule that induces more screening has no effect on the commission rate if both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant.*

We now study the impact of platform liability on the level of innovation, that is,

$$n_I(\tau^\star(\phi^N), \phi^N) - n_I(\tau^\star(\phi^\star), \phi^\star).$$

It follows from Proposition 2 that, with constant elasticities, $\tau^\star(\phi^N) = \tau^\star(\phi^\star)$ and, therefore,

$$n_I(\tau^\star(\phi^N), \phi^N) - n_I(\tau^\star(\phi^\star), \phi^\star) = n_I(\tau^\star(\phi^\star), \phi^N) - n_I(\tau^\star(\phi^\star), \phi^\star) = \int_{\phi^\star}^{\phi^N} \frac{\partial n_I(\tau^\star(\phi^\star), \phi)}{\partial \phi} d\phi,$$

where the marginal effect of an increase in the screening level (for a commission rate fixed at $\tau^\star(\phi^\star)$) is given by:

$$\frac{\partial n_I(\tau^\star(\phi^\star), \phi)}{\partial \phi} = (1-\tau^\star(\phi^\star)) f((1-\tau^\star(\phi^\star)\pi_I(\phi) n_B(\tau, \phi)) \Big[\underbrace{\pi_I'(\phi) n_B(\tau^\star(\phi^\star), \phi)}_{\text{IP-protection effect (+)}} + \underbrace{\pi_I(\phi) \frac{\partial n_B(\tau^\star(\phi^\star), \phi)}{\partial \phi}}_{\text{market size effect (-/+)}} \Big]$$

There are two effects. First, there is a positive *IP-protection effect*. More precisely, a higher screening level reduces the competitive pressure faced by an innovator as each product category becomes more likely to be monopolistic, which increases the innovator's expected profit per transaction, i.e.,

$$\pi_I'(\phi) = (1-\nu)(\pi_I^m - \pi_I^d) > 0. \tag{11}$$

This positive effect leads to an increase in the amount of innovation for a given buyer participation.[26] Second, there is an indirect effect that is channeled by the change in buyer participation on the platform. This effect, which we refer to as the *market size effect*, can be either positive or negative depending on whether the number of buyers joining the platform increases or decreases in response to a higher screening level.

The following proposition provides sufficient conditions under which platform liability has a positive (resp., negative) impact on innovation.

[25] This implies a power function cdf of the form $\left(\frac{x}{\bar{x}}\right)^c$ where c is the constant elasticity.

[26] Note that if innovators were to compete with one another, the magnitude of the IP-protection effect may be reduced.

Proposition 3. *Suppose that $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant. Then, platform liability leads to an increase (resp., decrease) in the amount of innovation if*

$$\varepsilon_H < (>) \frac{\varepsilon_{\pi_I}(\phi)}{\varepsilon_u(\phi)}$$

for all $\phi \in [\phi^\star, \phi^N]$.

Proposition 3 shows that the amount of innovation can either increase or decrease with the screening level. Whether a higher screening level leads to a larger amount of innovation or not depends on the following trade-off. One the one hand, for a given number of buyers on the platform, a higher screening level raises each innovator's profit per category which boosts the amount of innovation. On the other hand, for a given amount of innovation, a higher screening level reduces buyer surplus per category, which lowers buyer participation. The higher the elasticity of buyer participation (i.e., ε_H), the larger the negative impact on buyer participation. Hence, as ε_H increases, platform liability is more likely to reduce the amount of innovation, as the indirect negative effect from reduced buyer participation is more likely to dominate the positive direct effect. Note that in the special case in which buyer participation is inelastic (that is, ε_H is zero), $n_I(\tau, \phi)$ is always increasing in ϕ.

Let us now study the impact of platform liability on consumer surplus, that is,

$$CS(\tau^\star(\phi^N), \phi^N) - CS(\tau^\star(\phi^\star), \phi^\star).$$

For a given level of screening, consumer surplus is

$$CS(\tau^\star(\phi), \phi) \equiv u(\phi) n_I(\tau^\star(\phi), \phi) n_B(\tau^\star(\phi), \phi) - \int_0^{u(\phi) n_I(\tau^\star(\phi), \phi)} \xi h(\xi) d\xi,$$

where $u(\phi)$ is defined in (3).

We first show that an increase in the screening level increases $CS(\tau^\star(\phi), \phi)$ if and only if it raises $U(\phi) \equiv u(\phi) n_I(\tau^\star(\phi), \phi)$, which is the surplus per consumer gross of the opportunity cost of joining the platform. From

$$CS(\tau^\star(\phi), \phi) \equiv U(\phi) H(U(\phi)) - \int_0^{U(\phi)} \xi h(\xi) d\xi,$$

it follows that

$$\frac{dCS(\tau^\star(\phi), \phi)}{d\phi} = H(U(\phi)) \frac{dU(\phi)}{d\phi}.$$

It is therefore sufficient to study how a marginal change in screening affects $U(\phi)$ to derive its effect on consumer surplus. In the special case where elasticities are constant, $\tau^\star(\phi) = \tau^\star(\phi^\star)$

for any ϕ, and therefore we have

$$\frac{dU(\phi)}{d\phi} = \frac{d[u(\phi)n_I(\tau^\star(\phi^\star),\phi)]}{d\phi} = \underbrace{\frac{\partial n_I(\tau^\star(\phi^\star),\phi)}{\partial \phi}u(\phi)}_{(-/+)} \quad + \quad \underbrace{n_I(\tau^\star(\phi^\star),\phi)u'(\phi)}_{(-)}. \tag{12}$$

There are two potentially opposite effects. First, for a given buyer surplus per category, the amount of innovation can either increase or decrease with a higher screening intensity. Second, for a given amount of innovation (and hence for a given number of product categories), raising the screening level lowers the buyer surplus per category, as the market structure is more likely to be monopolistic. Therefore, a sufficient condition for the surplus per consumer to decrease with a higher screening intensity is that the amount of innovation decreases. If the amount of innovation increases with a higher screening intensity, the two effects move in opposite directions. Formally, we have the following result.

Proposition 4. *Suppose that $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant. Then, platform liability leads to an increase (resp., decrease) in consumer surplus if*

$$\varepsilon_F > (<) \frac{\varepsilon_u(\phi)}{\varepsilon_{\pi_I}(\phi)}$$

for all $\phi \in [\phi^\star, \phi^N]$.

The intuition for the above result is similar to the one for Proposition 3: whether a higher screening level increases consumer surplus depends on the trade-off between two opposite effects. On the one hand, for a given level of buyer participation, an innovator's profit per category is higher with screening. This effect tends to increase the amount of innovation. The larger the elasticity of innovators' participation (i.e., ε_F), the greater this increase in innovation. Hence, as ε_F increases, the positive effect becomes stronger. On the other hand, for a given amount of innovation, consumer surplus per category is lower with screening. Therefore, the positive effect is more likely to outweigh the negative effect, and platform liability is more likely to increase consumer surplus when ε_F is sufficiently large.

Let us now turn to the effect of platform liability on total welfare, defined as the sum of the innovators' and imitators' surplus, the platform's profit, and consumer surplus:

$$W(\tau,\phi) = (1-\tau)n_I(\tau,\phi)n_B(\tau,\phi)[\pi_I(\phi)+\pi_C(\phi)] - \int_0^{(1-\tau)\pi_I(\phi)n_B(\tau,\phi)} kf(k)dk + \Pi(\tau,\phi) + CS(\tau,\phi) \tag{13}$$

We consider a marginal increase in the level of screening above $\phi = \phi^\star$. Differentiating total welfare with respect to ϕ given a commission rate yields[27]

$$\frac{\partial W}{\partial \phi}(\tau,\phi) = (1-\tau)\frac{\partial n_I}{\partial \phi}(\tau,\phi)n_B(\tau,\phi)\pi_C(\phi) + (1-\tau)n_I(\tau,\phi)\frac{\partial}{\partial \phi}\{n_B(\tau,\phi)[\pi_I(\phi)+\pi_C(\phi)]\} + \frac{\partial \Pi}{\partial \phi}(\tau,\phi) + \frac{\partial CS}{\partial \phi}(\tau,\phi). \tag{14}$$

The first term in (14) is positive if $\frac{\partial n_I}{\partial \phi}(\tau,\phi) > 0$. A sufficient condition for the second term in (14) to be positive is $\frac{\partial n_B}{\partial \phi}(\tau,\phi) > 0$ (because $\pi_I'(\phi) + \pi_C'(\phi) > 0$). The same condition ensures that the last term is positive. Finally, the third term is equal to zero when evaluated at $(\tau^\star(\phi^\star),\phi^\star)$. Hence, a sufficient condition for $\frac{\partial W}{\partial \phi}(\tau^\star(\phi^\star),\phi^\star) > 0$ is that $\frac{\partial n_I}{\partial \phi}(\tau^\star(\phi^\star),\phi^\star) > 0$ and $\frac{\partial n_B}{\partial \phi}(\tau^\star(\phi^\star),\phi^\star) > 0$. In words, a liability rule that leads to a marginal increase in the screening level above the privately optimal one (that is, ϕ^N is sufficiently close to $\phi^\star$) has a positive effect on social welfare if it leads to an increase in both the amount of innovation and buyer participation. Recall that Propositions 3 and 4 provide sufficient conditions for platform liability to lead to an increase in the amount of innovation and consumer surplus (and, therefore, buyer participation), respectively. Therefore, we get the following result.

Proposition 5. *Suppose that $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant. For ϕ^N sufficiently close to $\phi^\star$, platform liability leads to an increase in total welfare if*

$$\varepsilon_H < \frac{\varepsilon_{\pi_I}(\phi^\star)}{\varepsilon_u(\phi^\star)} \qquad \text{and} \qquad \varepsilon_F > \frac{\varepsilon_u(\phi^\star)}{\varepsilon_{\pi_I}(\phi^\star)}.$$

At the end of Section 4.3, we present a proposition that provides a sufficient condition for platform liability to decrease total welfare.

4.3. The general case

In this subsection, we relax the assumption that $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are constant. We start by generalizing the result regarding the effect of platform liability on the commission rate. Using Lemma 2, we obtain the following result.

Proposition 6. *Platform liability leads to a higher (resp. lower) commission rate if one of the three following conditions holds:*

(i) both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing (resp., increasing) and $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, or

[27] See the proof of Proposition 5 for the derivation.

(ii) both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are increasing (resp., decreasing) and $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, or

(iii) $\varepsilon_H = 0$ (i.e., buyer participation is inelastic) and $\varepsilon_F(\cdot)$ is decreasing (resp., increasing).

In the proof of this proposition, we first show that the elasticity of the number of transactions with respect to ϕ increases (resp., decreases) as $\varepsilon_H(\cdot)$ shifts upwards if $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ (resp., $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$), and that the elasticity of the number of transactions increases (resp., decreases) as $\varepsilon_F(\cdot)$ shifts upwards if $\varepsilon_H < \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ (resp., $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$). Note that the inequalities in conditions (*i*) and (*ii*) appear in Proposition 3 and Proposition 4, respectively. Therefore, our finding shows that an increase in the elasticity of participation of the agents on one side raises (resp., reduces) the elasticity of the number of transactions with respect to ϕ if an increase in ϕ raises (resp., reduces) the net surplus of the same agents. As the elasticity of the number of transactions is the sum of the elasticity of the amount of innovation and that of the number of buyers, if an increase in ϕ reduces say the surplus of innovators, then from (8) an upward shift in $\varepsilon_F(\cdot)$ reduces the elasticity of the amount of innovation.

In addition, $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ implies $\varepsilon_H < \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ from the assumption of $\varepsilon_F\varepsilon_H < 1$ and $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ implies $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ for the same reason. Now consider for instance the case in which both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing and $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$. As an increase in the commission reduces both the argument of ε_F and that of ε_H (and both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing), it increases both ε_F and ε_H. As $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ (which implies $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$), this increase in ε_F and ε_H reduces the elasticity of the number of transactions. Then, from Lemma 2, the platform responds by raising its commission when it is subject to platform liability.

In the special case of inelastic buyer participation ($\varepsilon_H = 0$), the elasticity of the number of transactions increases as $\varepsilon_F(\cdot)$ shifts upwards since an increase in ϕ raises the surplus of innovators. Therefore, platform liability increases (resp., reduces) the commission rate if ε_F is decreasing (resp., increasing).[28]

This proposition highlights the counterintuitive possibility that a platform may reduce its commission rate in response to the introduction of a liability rule in the presence of non-constant elasticities distributions. Understanding the direction and magnitude of the impact of increased screening on the optimal commission rate is particularly relevant for analyzing the platform's strategic responses to changes in liability rules.

We now study how platform liability affects the amount of innovation accounting for the effect

[28] Teh and Wright (2025) consider a model of competitive bottleneck with full coverage on the buyer side and find that the equilibrium commission rate increases with the number of platforms if seller participation elasticity is increasing (resp., decreasing).

on the commission rate. Totally differentiating $n_I(\tau^\star(\phi), \phi)$ with respect to ϕ yields:

$$
\begin{aligned}
\frac{dn_I}{d\phi}(\tau^\star(\phi),\phi) = & \underbrace{(1-\tau^\star) f((1-\tau^\star)\pi_I(\phi)n_B(\tau^\star,\phi))\Big[\underbrace{\pi_I'(\phi)n_B(\tau^\star,\phi)}_{\text{IP-protection effect (+)}} + \underbrace{\pi_I(\phi)\frac{\partial n_B(\tau^\star,\phi)}{\partial \phi}}_{\text{market size effect (-/+)}}\Big]}_{\text{direct effect by Proposition 3 (-/+)}} \\
& + \underbrace{\underbrace{\frac{d\tau^\star}{\partial \phi}}_{(-/+)} f((1-\tau^\star)\pi_I(\phi)n_B(\tau^\star,\phi))\Big[\underbrace{-n_B(\tau^\star,\phi) + (1-\tau^\star)\frac{\partial n_B(\tau^\star,\phi)}{\partial \tau}}_{(-)}\Big]\pi_I(\phi)}_{\text{indirect effect via a change in the commission rate (-/+)}}
\end{aligned}
\tag{15}
$$

where on the R.H.S. we use the notation $\tau^\star$ instead of $\tau^\star(\phi)$ for the sake of exposition. The first line characterizes the direct effect of a change in the screening level on innovation (see Proposition 3). The second line characterizes an additional effect channeled through the change in the commission rate, which can be either positive or negative (see Proposition 6). If the commission rate increases, this indirect effect is negative, whereas it is positive otherwise. Combining the results in Proposition 3 with those in Proposition 6, we obtain the following sufficient conditions for platform liability to lead to more (resp., less) innovation in the general case.

Proposition 7. *(i) Platform liability has a positive effect on the amount of innovation if the following two conditions hold:*

a. $\varepsilon_H < \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ and $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, where ε_H is evaluated at $u(\phi)n_I(\tau^\star(\phi), \phi)$ and ε_F is evaluated at $(1-\tau)\pi_I(\phi)n_B(\tau^\star(\phi), \phi)$,

b. both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing.

(ii) Platform liability has a negative effect on the amount of innovation if the following two conditions hold:

a. $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, where ε_H is evaluated at $u(\phi)n_I(\tau^\star(\phi), \phi)$.

b. both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing.

Consider, for instance, Proposition 7(ii). When applying Proposition 6 to obtain the condition under which platform liability increases the commission, we should take into account the condition of Proposition 7$(ii)a$, which implies $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$.

We now consider the overall effect of an increase in the screening level on consumer surplus, taking into account the endogenous nature of the commission rate. Differentiating $U(\phi) =$

$u(\phi)n_I(\tau^\star(\phi),\phi)$ with respect to ϕ yields:

$$\frac{d[u(\phi)n_I(\tau^\star(\phi),\phi)]}{d\phi} = \underbrace{\frac{\partial[u(\phi)n_I(\tau^\star(\phi),\phi)]}{\partial\phi}}_{\text{direct effect by Proposition 4 (-/+)}} + \underbrace{\frac{\partial[u(\phi)n_I(\tau^\star(\phi),\phi)]}{\partial\tau}}_{(-)} \underbrace{\frac{d\tau^\star(\phi)}{d\phi}}_{(-/+)}. \tag{16}$$

The sign of the first term in (16) is characterized in Proposition 4 and the sign of the second term in (16) is the effect on consumer surplus of the induced change in the commission rate. Since $\partial[u(\phi)n_I(\tau^\star(\phi),\phi)]/\partial\tau < 0$ (because $n_I(\tau,\phi)$ is decreasing in τ), the sign of the second term is the opposite of the sign of $d\tau^\star(\phi)/d\phi$. Combining the results in Proposition 4 with those in Proposition 6, we obtain the following sufficient conditions for higher screening to increase (reduce) consumer surplus in the general case.

Proposition 8.

(i) Platform liability leads to an increase in consumer surplus if the following two conditions hold:

a. $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, where ε_F is evaluated at $(1-\tau)\pi_I(\phi)n_B(\tau^\star(\phi),\phi)$,

b. both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing.

(ii) Platform liability leads to a decrease in consumer surplus if the following two conditions hold:

a. $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ and $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ for all $\phi \in [\phi^\star, \phi^N]$, where ε_F is evaluated at $(1-\tau)\pi_I(\phi)n_B(\tau^\star(\phi),\phi)$ and ε_H is evaluated at $u(\phi)n_I(\tau^\star(\phi),\phi)$,

b. both $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing.

Consider, for instance, Proposition 8(i). When applying Proposition 6 to obtain the condition under which platform liability decreases the commission, we should take into account the condition of Proposition 8(i)a, which implies $\varepsilon_H < \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$.

We finally turn to the effect of platform liability on total welfare. In addition to the effects identified in the previous subsection, we now have to account for the indirect effect that an increase in the screening level has on welfare through the induced change in the commission rate. As in the specific case of constant elasticities, we will focus on a scenario where ϕ^N is sufficiently close to $\phi^\star$ so that the impact of platform liability on total welfare, $W(\tau^\star(\phi^N),\phi^N) - W(\tau^\star(\phi^\star),\phi^\star)$, has the same sign as $\frac{dW}{d\phi}(\tau^\star(\phi^\star),\phi^\star)$. In the general case considered here, we have

$$\frac{dW}{d\phi}(\tau^\star(\phi^\star),\phi^\star) = \underbrace{\frac{\partial W}{\partial\phi}(\tau^\star(\phi^\star),\phi^\star)}_{\text{by Proposition 5 }(-/+)} + \frac{\partial W}{\partial\tau}(\tau^\star(\phi^\star),\phi^\star)\underbrace{\frac{d\tau^\star(\phi^\star)}{d\phi}}_{(-/+)}.$$

Since $\frac{\partial \Pi}{\partial \tau}(\tau^\star(\phi^\star), \phi^\star) = 0$ and all other parties are harmed by an increase in the commission rate, it is straightforward that $\frac{\partial W}{\partial \tau}(\tau^\star(\phi^\star), \phi^\star)$ is negative and, therefore, the indirect effect has the opposite sign of $\frac{d\tau^\star}{d\phi}$. Hence, from the above argument, Proposition 5 and Proposition 6, we obtain the following result.

Proposition 9. *For ϕ^N sufficiently close to $\phi^\star$, platform liability leads to an increase in total welfare if the following two conditions hold:*

(i) $\varepsilon_H < \varepsilon_{\pi_I}(\phi^\star)/\varepsilon_u(\phi^\star)$ *and* $\varepsilon_F > \varepsilon_u(\phi^\star)/\varepsilon_{\pi_I}(\phi^\star)$*, where* ε_H *is evaluated at* $u(\phi^\star)n_I(\tau^\star(\phi^\star), \phi^\star)$ *and* ε_F *is evaluated at* $(1 - \tau^\star(\phi^\star))\pi_I(\phi^\star)n_B(\tau^\star(\phi^\star), \phi^\star)$*,*

(ii) $\varepsilon_F(\cdot)$ *and* $\varepsilon_H(\cdot)$ *are locally decreasing at* $(1-\tau^\star(\phi^\star))\pi_I(\phi^\star)n_B(\tau^\star(\phi^\star), \phi^\star)$ *and* $u(\phi^\star)n_I(\tau^\star(\phi^\star), \phi^\star)$*, respectively.*

Note that the two conditions in Proposition 9 are identical to those in Proposition 7(i) for ϕ^N close to $\phi^\star$. One simple example where platform liability can lead to higher welfare is provided in the case where $n_B(\tau, \phi) = 1$, meaning that buyer participation is inelastic. In such a case, innovation always increases with the introduction of platform liability. Therefore, a sufficient condition for a liability rule that induces a marginal increase in the level of screening above the privately optimal level to be socially desirable is that it has a positive effect on consumer surplus and the commission rate weakly decreases.

Let us now provide a sufficient condition under which platform liability is socially undesirable. Suppose that platform liability reduces innovation. In this case, it clearly harms innovators. It also harms buyers, due to both a reduction in the number of product categories and a lower surplus per category. If platform liability leads to a (weakly) higher commission rate, the surplus of all imitators decreases, driven by demand contraction, the higher commission rate, and the decline in innovation-induced product categories. Moreover, even if the commission rate falls under platform liability, the fact that innovators' surplus declines implies that the aggregate surplus of imitators is still lower. Therefore, imitators are worse off in this case as well. Finally, the platform is harmed as it must comply with binding screening requirements to qualify for liability exemption. This discussion is summarized in the following proposition.

Proposition 10. *If platform liability leads to a reduction of innovation, it harms all parties: innovators, imitators, consumers, and the platform.*

5. Optimal Liability Rule

In our model, we consider a negligence-based liability rule, which is commonly applied in the European Union for online platforms. However, in an alternative context of primary product liability, two regimes are typically considered. Under a strict liability regime, a party that causes harm is required to compensate the victim for the harm, regardless of whether the party took steps to avoid or mitigate the harm. In contrast, under negligence-based liability, a party is liable only if it fails to meet the applicable standard of care.

Regarding platform liability, in the United States, some forms of strict liability are being explored to complement third-party liability, particularly in cases involving harmful products (which are out of the scope of our model). In our setting, the potential harm to consumers is indirect, primarily arising from reduced innovation due to the presence of illegal copycats. Additionally, to our knowledge, there is currently no policy debate about providing direct compensation to innovators for such harms. Nevertheless, it would be interesting to consider which liability regime would generate higher welfare in our context.

We model the two liability regimes as follows. As discussed before, under negligence-based liability—denoted by the superscript N—the platform must choose a screening level $\phi \geq \phi^N$ to benefit from liability exemption. As long as ϕ^N is weakly larger than ϕ^* (the privately optimal screening level absent liability), the platform will choose ϕ^N if the benefit from the exemption of liability is larger than the cost of complying, which we assume to be the case. Under strict liability—denoted by the superscript S—as we assume away primary liability, the regulator can force the platform to compensate a brand owner for the profit loss caused by an illegal copycat. To be precise, with probability $(1-\nu)\phi$, an IP-infringing product is delisted whereas with probability $(1-\nu)(1-\phi)$ it is not delisted. When it is not delisted, suppose that with probability ρ satisfying $0 < \rho < 1$, the innovator can prove that it is harmed by an IP-infringing product and get compensation of amount equal to the lost profit per transaction, which is equal to $(1-\tau)\left(\pi_I^m - \pi_I^d\right)$.

It is well-known that strict liability and negligence-based liability can theoretically lead to similar outcomes in simple models.[29] However, in our setup, the platform determines both the screening intensity and the commission rate. Consequently, even when both liability regimes lead the platform to select the same target screening intensity, denoted by ϕ^N, they may result in different commission levels. This implies that the optimal liability regime, which maximizes welfare, must consider not only its effect on the screening intensity but also its impact on the platform's choice of commission.

For the remainder of this section, we assume that buyer participation is inelastic and normalized to one ($\varepsilon_H = 0$, $n_B = 1$). Moreover, for the sake of tractability, we suppose that the distribution of k is uniform over $[0,1]$ and that the screening cost is quadratic, i.e., $\Omega(\phi) = \phi^2/2$. This implies that the platform's optimal commission under negligence-based liability is $\tau^N = 1/2$.

[29] See Cooter and Ulen (2016) for the result that both regimes lead to an efficient amount of care in a simple setup. See Van Loo and Spier (2025) for a discussion on the foundations of platform liability and discussion of incentives under the two regimes. See also Hua and Spier (2023) for a formal model of platform liability under strict and negligence-based rules.

We restrict attention to cases where negligence-based liability strictly dominates laissez-faire from a welfare perspective ($\phi^N > \phi^*$), and show that welfare under negligence-based liability may be higher or lower than under strict liability, depending on ρ, the probability that an innovator proves that it is harmed by an IP-infringing product.

Under negligence-based liability, the social planner chooses $\phi = \phi^N$ to maximize welfare knowing that the platform will subsequently choose the commission rate that maximizes its profit. Therefore, innovators' expected gross revenues are $\pi_I^N \equiv \phi^N \pi_I^m (1-\nu) + (1-(1-\nu)\phi^N)\pi_I^d$. The platform optimally sets the commission rate $\tau^\star(\phi^N)$, that is, the one that maximizes the following profit:

$$\Pi^N(\tau, \phi^N) = \tau[\phi^N(1-\nu)\pi_I^m + (1-(1-\nu)\phi^N)(\pi_I^d + \pi_C^d)]F((1-\tau)\pi_I^N) - \frac{(\phi^N)^2}{2}. \tag{17}$$

Under strict liability, the platform chooses both the commission rate and the screening level in order to maximize its profit given by

$$\Pi^S(\tau, \phi) = [\tau R(\phi) - (1-\phi)(1-\nu)\rho D(\tau)]\, n_I^S(\tau, \phi) - \frac{\phi^2}{2}, \tag{18}$$

where with probability $(1-\phi)(1-\nu)\rho$ the platform makes a compensation of $D(\tau) \equiv (1-\tau)\,(\pi_I^m - \pi_I^d)$ to the innovator, $\tau R(\phi)$ with $R(\phi) \equiv \phi(1-\nu)\pi_I^m + (1-(1-\nu)\phi)(\pi_I^d + \pi_C^d)$ is the expected profit per category, $n_I^S(\tau, \phi) \equiv F((1-\tau)\pi_I^S)$ is the number of innovators on the platform and $\pi_I^S \equiv (1-\nu)(\phi + \rho(1-\phi))\pi_I^m + [1-(1-\nu)(\phi+\rho(1-\phi))]\pi_I^d)$ is the expected gross profit of an innovator under strict liability.

In what follows, we keep considering strict liability and study the platform's incentives to choose the screening level and the commission rate. Then, we provide a welfare comparison between the two liability regimes with the aid of graphs.

For a given commission rate τ, the effect of a marginal increase in the screening level on the platform's profit is given by

$$\begin{aligned} \frac{\partial \Pi^S}{\partial \phi} =& [\tau R(\phi) - (1-\phi)(1-\nu)\rho D(\tau, \phi)] \frac{\partial n_I^S(\tau, \phi)}{\partial \phi} \\ &+ n_I^S(\tau, \phi)[\tau R'(\phi) + \rho(1-\nu)D(\tau)] - \phi. \end{aligned} \tag{19}$$

The first line identifies how an increase in the screening level affects platform's profits through a change in the participation of innovators. This effect is positive since a higher screening increases participation:

$$\frac{\partial n_I^S(\tau, \phi)}{\partial \phi} = (1-\tau)(1-\nu)(1-\rho)(\pi_I^m - \pi_I^d) > 0.$$

However, this derivative decreases in ρ. Furthermore, the bracket term multiplied by the derivative also decreases in ρ. Therefore, the compensation weakens the platform's incentive to screen captured by the first line in (19).

The first term in the second line in (19) represents the impact on the platform's profit for a given number of innovators, which arises from two sources. The first source is similar to a model with negligence-based liability, where a higher screening level increases profits per product category by making it more likely to be monopolistic, i.e., $R'(\phi) = (1-\nu)(\pi_I^m - \pi_I^d - \pi_C^d) > 0$. The second source stems from the fact that higher screening reduces the probability that the platform has to compensate innovators, thereby lowering expenses. This effect increases with ρ. Therefore, the compensation raises the platform's incentive to screen captured by the second line.

We now turn our attention to the effect of an increase in the commission rate on the platform's profit. Differentiating (18) with respect to τ yields

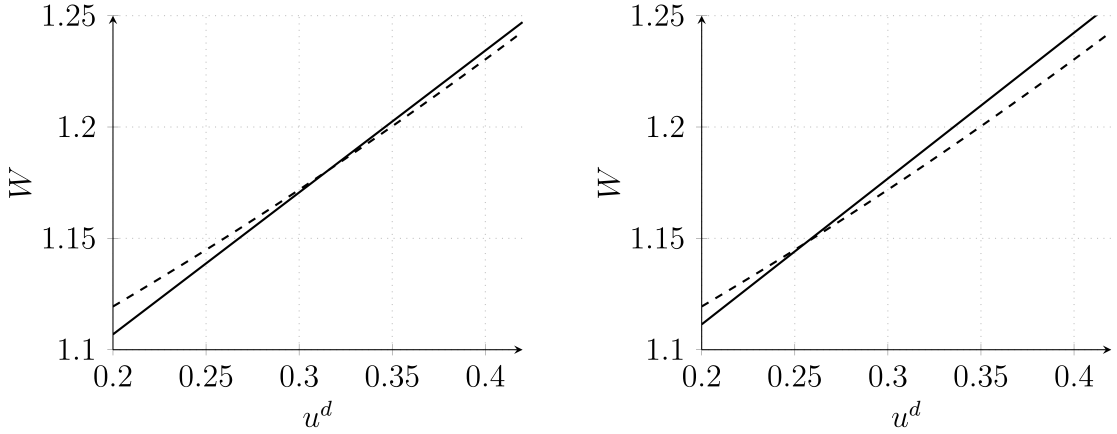
$$\begin{aligned}\frac{\partial \Pi^S}{\partial \tau} =& [\tau R(\phi) - (1-\phi)(1-\nu)\rho D(\tau,\phi)] \frac{\partial n_I^S(\tau,\phi)}{\partial \tau} \\ &+ n_I^S(\tau,\phi)[\underbrace{R(\phi)}_{\text{margin effect}} + \underbrace{(1-\phi)(1-\nu)\rho(\pi_I^m - \pi_I^d)}_{\text{compensation-saving effect}}].\end{aligned}$$

On top of the usual volume and margin effects, there are two new forces that result from the fact that by raising the commission, the platform reduces the amount of compensation per case, called *the compensation-saving effect*, but also the number of cases where compensation is made. The latter effect arises as a higher commission reduces the number of product categories. These forces induce the platform to raise the commission.

Let $(\tau^S, \phi^S) \equiv \arg\max_{(\tau,\phi)} \Pi^S(\tau,\phi)$, and let $W^N(\tau^\star(\phi^N), \phi^N)$ denote social welfare under negligence-based liability and $W^S(\tau^S, \phi^S, \rho)$ social welfare under strict liability. Note that for $\rho = 0$, strict liability is equivalent to a laissez-faire regime. Therefore, if negligence-based liability results in higher welfare than the laissez-faire regime, then by continuity, for sufficiently small ρ, negligence-based liability must also yield higher welfare than strict liability.

As a closed-form solution cannot be obtained, we rely on a graphical solution for specific values of the parameters. In our simulations, we consider relatively small values of ρ for the following reason. Contrary to the case of harmful products where the harm is likely to be evident to the affected party and hence the corresponding ρ may be large, in our case of non-harmful products and IP infringement, we expect it to be hard for innovators to prove that a harm arises from an IP-infringing product rather than from a legitimate seller. Therefore, it is reasonable to assume that the associated ρ is small.

Figure 1 presents social welfare under strict liability and under negligence-based liability. We use the following parameter values: $\pi_I^d = \pi_C^d = 0.9$, $\pi_I^m = 2$, and $u^m = 0.2$. The x-axis represents u^d. In panel (a), $\rho = 0.05$, whereas in panel (b), $\rho = 0.15$. Under this parameter range, it is always the case that $\phi^N > \phi^S$.



(a) $\rho = 0.05$ (b) $\rho = 0.15$

Figure 1: Comparison of welfare under negligence-based liability (dotted line) and strict liability (solid line) in the parameter range in which negligence-based liability dominates laissez-fare. x-axis normalized at $u^m = 0.2$. Other parameter values: $\pi_I^d = \pi_C^d = 0.9, \pi_I^m = 2$.

Two important patterns can be observed from Figure 1. First, negligence-based liability yields higher welfare when the difference $u^d - u^m$ is relatively small, while strict liability tends to produce higher welfare as u^d grows much larger than u^m. This pattern is due to the fact that, for a given number of innovators, consumers face more monopolistic product categories under negligence-based liability than under strict liability because of $\phi^N > \phi^S$. This effect gets stronger as $u^d - u^m$ increases. However, this effect is mitigated by the fact that because of $\phi^N > \phi^S$, the number of innovators tends to be larger under negligence-based liability (for not too large $u^d - u^m$). As ρ increases, the intersection point between the two lines shifts inward, indicating that strict liability becomes more socially desirable compared to negligence-based liability. The finding that a low ρ aligns with negligence-based liability, applicable in cases such as trademark violations in online marketplaces, provides further support for our main analysis.

6. Concluding remarks and policy implications

Our paper is motivated by the growing concern about the diffusion of illicit products in online markets and the mounting demands that platforms should take more responsibility in limiting (or hindering) misconduct by third parties.

From a policy standpoint, we contribute to the discussion on whether platforms should be held liable for third parties' misconduct. Our paper shows that policymakers should pay close attention to the impact of platform liability on key strategic variables of platforms as the unintended effects of platform liability substantially affect its desirability. More specifically, our analysis generates the following policy implications.

First, the introduction of platform liability may lead to either an increase or a decrease in the commission charged by a platform. This is policy-relevant because a decrease in the commission rate creates a new channel through which the imposition of platform liability may spur innovation and ultimately benefit consumers.

Second, policymakers should be aware that even though platform liability protects intellectual property, it may harm innovation. The reason is that it can lead to a higher commission rate and/or a reduction in buyer participation. This negative outcome is more likely to occur when the cross-group network externalities from innovators to buyers are strong.

Third, if platform liability harms innovation, it negatively affects all parties (i.e., innovators, imitators, consumers, and the platform). As a result, it is undoubtedly socially undesirable.

Fourth, the effects of platform liability on consumers and innovators are driven, to a large extent, by the intensity of cross-group network externalities, which determine participation elasticities on each side. Specifically, the higher the intensity of network externalities from buyers to innovators, the more likely platform liability benefits consumers. On the contrary, the higher the intensity of network externalities from innovators to buyers, the more likely platform liability harms innovation.

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Appendix

Proof of Lemma 1

We have

$$\frac{\partial \Pi}{\partial \phi}(\tau, 0) = \tau \frac{\partial n_I n_B}{\partial \phi}(\tau, 0)[\pi_I(0) + \pi_C(0)] + n_I(\tau, 0)n_B(\tau, 0)[\pi_I'(0) + \pi_C'(0)] - \Omega'(0).$$

From $\Omega'(0) = 0$ and $\pi_I'(0) + \pi_C'(0) > 0$ it follows that a sufficient condition for $\partial\Pi(\tau, 0)/\partial\phi > 0$ is that $\partial[n_I(\tau, 0)n_B(\tau, 0)]/\partial\phi$. Therefore, if $n_I(\tau, \phi)n_B(\tau, \phi)$ is locally increasing in ϕ at $\phi = 0$ then it must be that $\phi^\star > 0$.

Proof of Proposition 1

Recall that

$$\varepsilon_{n_B}(\tau, \phi) = \frac{\varepsilon_H[\varepsilon_F \varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F}, \qquad \varepsilon_{n_I}(\tau, \phi) = \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F}.$$

Since the signs of $\partial[n_I(\tau, \phi)n_B(\tau, \phi)]/\partial\phi$ and $\varepsilon_{n_I}(\tau, \phi)+\varepsilon_{n_B}(\tau, \phi)$ are the same, $\partial[n_I(\tau, \phi)n_B(\tau, \phi)]/\partial\phi > 0$ if

$$\frac{\varepsilon_H[\varepsilon_F \varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F} + \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F} > 0,$$

which can be rewritten as

$$\frac{\varepsilon_{\pi_I}(\phi)}{\varepsilon_u(\phi)} > \frac{\varepsilon_H(1 + \varepsilon_F)}{\varepsilon_F(1 + \varepsilon_H)}.$$

Proof of Lemma 2

Define $N(\tau, \phi) \equiv n_I(\tau, \phi)n_B(\tau, \phi)$. Since $\tau^\star(\phi) = \arg\max_\tau \tau N(\tau, \phi)$, it satisfies the following first-order condition:

$$N(\tau^\star(\phi), \phi) + \tau^\star(\phi)\frac{\partial N}{\partial \tau}(\tau^\star(\phi), \phi) = 0$$

Differentiating the above equation with respect to ϕ and rearranging terms (and omitting arguments), we get:

$$\frac{d\tau^\star(\phi)}{d\phi} = -\frac{\frac{\partial N}{\partial \phi} + \tau^\star \frac{\partial^2 N}{\partial \tau \partial \phi}}{2\frac{\partial N}{\partial \tau} + \tau^\star \frac{\partial^2 N}{\partial \tau^2}}.$$

The denominator is negative by the second-order condition. Therefore, $d\tau^\star/d\phi$ has the same sign as

$$\frac{\partial N}{\partial \phi} + \tau^\star \frac{\partial^2 N}{\partial \tau \partial \phi}.$$

Using the first-order condition characterizing $\tau^\star(\phi)$, this term can be rewritten as

$$\frac{\partial N}{\partial \phi} - \frac{N}{\frac{\partial N}{\partial \tau}} \frac{\partial^2 N}{\partial \tau \partial \phi}.$$

Since $\partial N / \partial \tau < 0$, we can conclude that $d\tau^\star / d\phi$ has the same sign as

$$N \frac{\partial^2 N}{\partial \tau \partial \phi} - \frac{\partial N}{\partial \phi} \frac{\partial N}{\partial \tau},$$

which has the same sign as that of $\partial \varepsilon_N / \partial \tau$ where $\varepsilon_N(\tau, \phi) \equiv \frac{\frac{\partial N(\tau,\phi)}{\partial \phi} \phi}{N}$.

Proof of Proposition 2

It is straightforward that $\varepsilon_N(\tau, \phi) = \varepsilon_{n_I}(\tau, \phi) + \varepsilon_{n_B}(\tau, \phi)$. From (8), we have:

$$\varepsilon_N(\tau, \phi) = \frac{\varepsilon_H[\varepsilon_F \varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F} + \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F}$$

Note that $\varepsilon_N(\tau, \phi)$ depends on τ only through ε_F and ε_H, which are constant. Therefore, $\varepsilon_N(\tau, \phi)$ does not depend on τ and hence the result follows from Lemma 2.

Proof of Proposition 3

Suppose ε_H and ε_F are constant. Then, τ does not depend on ϕ. Thus, the sign of $dn_I(\tau, \phi)/d\phi$ is the same as the sign of $\varepsilon_{n_I}(\tau, \phi)$. From (8), we have

$$\varepsilon_{n_I}(\tau, \phi) = \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H \varepsilon_u(\phi)]}{1 - \varepsilon_H \varepsilon_F}$$

which is positive (resp. negative) if

$$\varepsilon_H < (>) \frac{\varepsilon_{\pi_I}(\phi)}{\varepsilon_u(\phi)} \quad , \qquad \forall \phi \in [0, 1],$$

where ε_H is evaluated at $u(\phi) n_I(\tau, \phi)$.

Proof of Proposition 4

Suppose ε_H and ε_F are constant. Then, τ does not depend on ϕ. Thus, the sign of $dn_B(\tau,\phi)/d\phi$ is the same as the sign of $\varepsilon_{n_B}(\tau,\phi)$. From (8) we have

$$\varepsilon_{n_B}(\tau,\phi) = \frac{\varepsilon_H[\varepsilon_F\varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1-\varepsilon_H\varepsilon_F}$$

which is positive (resp. negative) if

$$\varepsilon_F > (<) \frac{\varepsilon_u(\phi)}{\varepsilon_{\pi_I}(\phi)},$$

where ε_F is evaluated at $(1-\tau)\pi(\phi)n_B(\tau,\phi)$.

Proof of Proposition 5

Consider (13). Integrating by parts, we have

$$\int_0^{(1-\tau)\pi_I(\phi)n_B(\tau,\phi)} kf(k)dk = (1-\tau)n_I(\tau,\phi)n_B(\tau,\phi)\pi_I(\phi) - \int_0^{(1-\tau)\pi_I(\phi)n_B(\tau,\phi)} F(k)dk.$$

Therefore,

$$\begin{aligned}\frac{\partial}{\partial\phi}\int_0^{(1-\tau)\pi_I(\phi)n_B(\tau,\phi)} kf(k)dk &= (1-\tau)\frac{\partial}{\partial\phi}[n_B(\tau,\phi)\pi_I(\phi)]n_I(\tau,\phi) \\ &+(1-\tau)\frac{\partial n_I}{\partial\phi}(\tau,\phi)n_B(\tau,\phi)\pi_I(\phi) \\ &-(1-\tau)\frac{\partial}{\partial\phi}[n_B(\tau,\phi)\pi_I(\phi)]F((1-\tau)\pi_I(\phi)n_B(\tau,\phi)).\end{aligned}$$

Since $n_I(\tau,\phi) = F((1-\tau)\pi_I(\phi)n_B(\tau,\phi)$, the first and last terms cancel out and we get the equality:

$$\frac{\partial}{\partial\phi}\int_0^{(1-\tau)\pi_I(\phi)n_B(\tau,\phi)} kf(k)dk = (1-\tau)\frac{\partial n_I}{\partial\phi}(\tau,\phi)n_B(\tau,\phi)\pi_I(\phi).$$

Therefore, differentiating (13) with respect to ϕ yields (14), that is

$$\begin{aligned}\frac{\partial W}{\partial\phi}(\tau,\phi) =&(1-\tau)\frac{\partial n_I}{\partial\phi}(\tau,\phi)n_B(\tau,\phi)\pi_C(\phi) + (1-\tau)n_I(\tau,\phi)\frac{\partial}{\partial\phi}\{n_B(\tau,\phi)[\pi_I(\phi)+\pi_C(\phi)]\} \\ &+\frac{\partial\Pi}{\partial\phi}(\tau,\phi) + \frac{\partial CS}{\partial\phi}(\tau^\star(\phi),\phi).\end{aligned}$$

The remainder of the proof is provided in the main text.

Proof of Proposition 6

It is straightforward that $\varepsilon_N(\tau,\phi) = \varepsilon_{n_I}(\tau,\phi) + \varepsilon_{n_B}(\tau,\phi)$. From (8), we have:

$$\varepsilon_N(\tau,\phi) = \frac{\varepsilon_H[\varepsilon_F\varepsilon_{\pi_I}(\phi) - \varepsilon_u(\phi)]}{1-\varepsilon_H\varepsilon_F} + \frac{\varepsilon_F[\varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)]}{1-\varepsilon_H\varepsilon_F}.$$

Note that $\varepsilon_N(\tau,\phi)$ depends on τ only through ε_F and ε_H. Rewriting $\varepsilon_N(\tau,\phi)$ as

$$\varepsilon_N(\tau,\phi) = \frac{\varepsilon_F[\varepsilon_H\varepsilon_{\pi_I}(\phi) + \varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)] - \varepsilon_H\varepsilon_u(\phi)}{1-\varepsilon_H\varepsilon_F},$$

it is straightforward to show that, everything else equal, an increase in ε_F leads to an increase (resp., decrease) in $\varepsilon_N(\tau,\phi)$ if the sign of

$$[\varepsilon_H\varepsilon_{\pi_I}(\phi) + \varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)] - \varepsilon_H^2\varepsilon_u(\phi)$$

is positive (resp., negative). As

$$[\varepsilon_H\varepsilon_{\pi_I}(\phi) + \varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)] - \varepsilon_H^2\varepsilon_u(\phi) = [1+\varepsilon_H][\varepsilon_{\pi_I}(\phi) - \varepsilon_H\varepsilon_u(\phi)],$$

it follows that an increase in ε_F leads to an increase (resp., decrease) in $\varepsilon_N(\tau,\phi)$ if the sign of

$$\varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi) - \varepsilon_H$$

is positive (resp., negative).

A similar reasoning shows that an increase in ε_H leads to an increase (resp., decrease) in $\varepsilon_N(\tau,\phi)$ if the sign of

$$\varepsilon_F - \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi),$$

is positive (resp., negative).

Consider first the scenario in which $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are increasing.

- Assume that $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$. Note that due to the assumption $\varepsilon_F\varepsilon_H < 1$, it follows that $\varepsilon_H < \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$. Hence, in this case, $\varepsilon_N(\tau,\phi)$ increases with both ε_F and ε_H. Since the argument of ε_F is

$$(1-\tau)\pi_I(\phi)n_B(\tau,\phi) = (1-\tau)\pi_I(\phi)H(u(\phi)n_I(\tau,\phi)),$$

which is decreasing in τ because $n_I(\tau,\phi)$ is decreasing in τ, and the argument of ε_H is $u(\phi)n_I(\tau,\phi)$, which is also decreasing in τ, it follows that $\varepsilon_N(\tau,\phi)$ is decreasing in τ. Therefore, by Lemma 2, a liability rule that induces more screening leads to an increase in the commission rate.

- Assume that $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$. From the assumption $\varepsilon_F \varepsilon_H < 1$, it follows that $\varepsilon_F < \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$. Hence, in this case, $\varepsilon_N(\tau, \phi)$ decreases with both ε_F and ε_H. The same argument as above then shows that $\varepsilon_N(\tau, \phi)$ is increasing in τ and implies that a liability rule that induces more screening leads to a decrease in the commission rate.

Consider now the scenario in which $\varepsilon_F(\cdot)$ and $\varepsilon_H(\cdot)$ are decreasing. A similar reasoning shows the following:

- If $\varepsilon_F > \varepsilon_u(\phi)/\varepsilon_{\pi_I}(\phi)$ then a liability rule that induces more screening leads to a decrease in the commission rate.
- If $\varepsilon_H > \varepsilon_{\pi_I}(\phi)/\varepsilon_u(\phi)$ then a liability rule that induces more screening leads to an increase in the commission rate.

Finally, in the special case of inelastic buyer participation (i.e., $\varepsilon_H = 0$), we have

$$\varepsilon_N(\tau, \phi) = \varepsilon_F \varepsilon_{\pi_I}(\phi).$$

As $\varepsilon_{\pi_I}(\phi) > 0$, $\varepsilon_N(\tau, \phi)$ is increasing (resp., decreasing) if and only if ε_F is increasing (resp., decreasing). Therefore, using Lemma 2, we conclude that a liability rule that induces more screening leads to a decrease (resp., an increase) in commission rate if ε_F is increasing (resp., decreasing).

Proof of Proposition 7

The proof follows immediately from total differentiation of $n_I(\tau^\star, \phi)$ with respect to ϕ:

$$\begin{aligned}\frac{dn_I(\tau^\star,\phi)}{d\phi} =& n_B(\tau^\star,\phi) f((1-\tau^\star)\pi_I(\phi) n_B(\tau^\star,\phi)) \Big[(1-\tau^\star)\pi_I'(\phi) - \frac{d\tau^*}{\partial\phi}\Big] \\ &+ f((1-\tau^\star)\pi_I(\phi) n_B(\tau^\star,\phi)) \Big[\pi_I(\phi)\frac{\partial n_B(\tau^\star,\phi)}{\partial\phi} + (1-\tau^\star)\frac{\partial n_B(\tau^\star,\phi)}{\partial\tau}\frac{d\tau^*}{\partial\phi}\Big]\end{aligned} \tag{A-1}$$

which we can rewrite as in (15). Combining Proposition 3 and Proposition 6, the proof is completed.

Proof of Proposition 8

The proof follows immediately from Proposition 6 and Proposition 4.

Proof of Proposition 9

The proof follows immediately from the discussion in the main text.

Proof of Proposition 10

The proof follows from the discussion in the main text and the following steps, which show that when innovators' surplus is lower with platform liability, the (aggregate) surplus of imitators is also lower with platform liability.

An innovator's surplus gross of fixed cost is

$$(1-\tau)n_B(\tau,\phi)\left[(1-\nu)\phi\pi_I^m + (1-(1-\nu)\phi)\pi_I^d\right]$$

An imitator's surplus is

$$(1-\tau)n_B(\tau,\phi)(1-(1-\nu)\phi)\pi_C^d$$

Omitting the argument of n_B, consider an increase in ϕ to $\phi'(>\phi)$, accompanied by a change in τ to $\tau'(<\tau)$ and a change in n_B to $n'_B(<n_B)$.

The reduction in n_I implies a reduction in the innovator's surplus gross of fixed cost:

$$\begin{aligned} & (1-\tau)n_B\left[(1-\nu)\phi\pi_I^m + (1-(1-\nu)\phi)\pi_I^d\right] \\ > \; & (1-\tau')n'_B\left[(1-\nu)\phi'\pi_I^m + (1-(1-\nu)\phi')\pi_I^d\right] \end{aligned} \tag{A-2}$$

We want to show that this inequality implies a reduction in an imitator's surplus (which also implies a reduction in the aggregate surplus of imitators since the number of categories is reduced):

$$\begin{aligned} & (1-\tau)n_B(1-(1-\nu)\phi)\pi_C^d \\ > \; & (1-\tau')n'_B(1-(1-\nu)\phi')\pi_C^d \end{aligned} \tag{A-3}$$

From (A-2), we have

$$(1-\tau)n_B\frac{(1-\nu)\phi\pi_I^m + (1-(1-\nu)\phi)\pi_I^d}{(1-\nu)\phi'\pi_I^m + (1-(1-\nu)\phi')\pi_I^d} > (1-\tau')n'_B$$

Therefore, we have

$$\begin{aligned} & (1-\tau')n'_B(1-(1-\nu)\phi')\pi_C^d \\ < \; & (1-\tau)n_B\frac{(1-\nu)\phi\pi_I^m + (1-(1-\nu)\phi)\pi_I^d}{(1-\nu)\phi'\pi_I^m + (1-(1-\nu)\phi')\pi_I^d}(1-(1-\nu)\phi')\pi_C^d \\ < \; & (1-\tau)n_B(1-(1-\nu)\phi)\pi_C^d \end{aligned}$$

where the second inequality is from

$$\frac{(1-\nu)\phi\pi_I^m + (1-(1-\nu)\phi)\pi_I^d}{(1-\nu)\phi'\pi_I^m + (1-(1-\nu)\phi')\pi_I^d} < 1 < \frac{(1-(1-\nu)\phi)\pi_C^d}{(1-(1-\nu)\phi')\pi_C^d}.$$

Online Appendix

In this Online Appendix, we consider five extensions. First, we analyze the situation in which the platform lacks commitment power. Second, we examine the case with infinitely many rounds of screening. Third, we study a setting where the platform can adopt a fixed membership fee instead of an ad valorem commission. Fourth, we investigate the platform's incentives to delist IP-infringing products when some well-reputed brand owners sell exclusively through their direct channels. Finally, we consider the case where sellers face positive marginal production costs and study how screening interacts with double marginalization.

A. Inability to commit

One of the assumptions in our analysis is that the platform can commit to its screening policy. However, this may not necessarily be the case in reality. If it lacks commitment power, it will choose its screening policy to maximize its profit after innovators have taken decisions to innovate and join the platform.

Suppose that the platform cannot commit to its screening policy whereas it can commit to an ad valorem commission rate, for example because the latter is part of the "Terms and Conditions" the platform sets up front. For the sake of simplicity, let us consider the case in which buyer participation is inelastic and the commission rate is exogeneously given. The lack of commitment creates a hold-up problem on the part of the platform and, therefore, the introduction of a liability rule that allows the platform to commit may raise its profit.

Specifically, absent platform liability, given a number $n_I(\tau)$ of innovators who have joined the platform marketplace, the platform maximizes the following expected profit

$$\tau n_I(\tau) n_B(\tau)[\pi_I(\phi) + \pi_C(\phi)] - \Omega(\phi).$$

The first-order condition with respect to ϕ is given by

$$\tau n_I(\tau) n_B(\tau)[\pi_I'(\phi) + \pi_C'(\phi)] = \Omega'(\phi),$$

with $\pi_I'(\phi) + \pi_C'(\phi) = (1-\nu)(\pi_I^m - \pi_I^d - \pi_C^d) > 0$ by Assumption 2. Because the transaction volume $n_I(\tau)n_B(\tau)$ no longer depends on ϕ, the platform does not internalize the benefit (resp. losses) that a higher screening level can generate by increasing (resp. decreasing) the amount of transactions. Hence, it tends to choose a lower (resp. higher) screening level than in the model with commitment if $n_I(\tau)n_B(\tau)$ is increasing (resp. decreasing) in ϕ.

Let us denote $\phi^\star$ as the optimal screening level under commitment and $\phi^{\star\star}$ as the optimal screening level under no commitment. Suppose a liability rule is introduced such that it induces the platform to achieve $\phi^N > \phi^{\star\star}$ in order to benefit from liability exemption. Then, if $\phi^\star > \phi^N$ platform liability restores (partially) the commitment power of the platform and raises its profit. If $\phi^\star < \phi^N$, platform liability can have either a positive or negative impact on the platform's profit.

Suppose now that the platform cannot commit to the commission rate in advance. In many real-world contexts, the commission rate is often determined after the innovation stage but before entry and product market interactions. In such cases, the platform will have an incentive to raise the commission rate to the highest possible level. In other words, the first-order derivative for the platform's profit with respect to τ is positive, leading to $\tau^* = 1$ (unless marginal production costs of innovators are considered). Anticipating this, however, innovators will not invest in innovations, leading to a complete choke-up of innovation, which does not seem to be realistic. For this reason, we assume that the platform chooses its commission rate before innovators' investment decisions.

B. Infinite rounds of screening

One of the assumptions in our analysis is that once an IP infringer is identified and delisted, the product category remains monopolistic and no further entry occurs. In this subsection, we allow for subsequent entry after delisting in a setting with an infinite number of periods, $t = 1, 2, ...$

Let $y(\phi) \equiv (1 - v)\phi$ denote the probability that an IP infringer is identified and delisted. Also, let s_t denote the market structure of a given product category at time t with $s_t \in \{m, d\}$ and $t = 1, 2, ...$ We assume that if at $t = 1$ the entrant is identified as an IP infringer and hence delisted (i.e., $s_1 = m$), which occurs with probability $y(\phi)$, then another imitator enters at $t = 2$. By contrast, if at $t = 1$ no IP infringement is identified and hence $s_1 = d$, which occurs with probability $1 - y(\phi)$, the market structure remains duopolistic forever after. More generally, $s_t = d$ implies $s_{t+1} = d$, whereas $s_t = m$ triggers entry at $t + 1$ and, therefore, implies that $s_{t+1} = m$ with probability $y(\phi)$ and $s_{t+1} = d$ with probability $1 - y(\phi)$. Thus, the unconditional probability that $s_t = m$ is $(y(\phi))^t$.

Let $\delta \in (0, 1)$ be the discount factor (which we assume to be common to all economic agents) and let $\nu^m(\phi)$ denote the "aggregate" probability that a given category is monopolistic. In order to obtain $\nu^m(\phi)$, we sum up the probabilities that $s_t = m$ after discounting them (i.e., $(y(\phi))^1 + \delta(y(\phi))^2 + \delta^2(y(\phi))^3 + ...$) and normalize the sum by multiplying it with $1 - \delta$, which leads to $\nu^m(\phi) \equiv \frac{(1-\delta)(1-\nu)\phi}{1-\delta(1-\nu)\phi}$. Note that $\nu^m(\phi)$ increases in ϕ. The expected revenue per transaction of an innovator is

$$\pi_I(\phi) = \nu^m(\phi)\pi_I^m + (1 - \nu^m(\phi))\pi_I^d,$$

which increases in ϕ. The expected revenue per transaction of a whole sequence of imitators in a given category is

$$\pi_C(\phi) = (1 - \nu^m(\phi))\pi_C^d,$$

which decreases in ϕ. The expected surplus of a buyer in a given product category is now

$$u(\phi) = \nu^m(\phi)u^m + (1 - \nu^m(\phi))u^d,$$

which decreases in ϕ. The above three equations are identical to (1), (2) and (3) after replacing $(1 - \nu)\phi$ in the latter with $\nu^m(\phi)$.

The expression for the profit of the platform remains qualitatively the same as it is expressed in terms of $\pi_I(\phi)$ and $\pi_C(\phi)$. We show below that the results from Section 3 carry over.

First, consider the private incentives of the platform. As $\pi_I'(\phi) > 0$ and

$$\frac{d(\pi_I(\phi) + \pi_C(\phi))}{d\phi} = \frac{d\nu^m(\phi)}{d\phi}(\pi_I^m - \pi_I^d - \pi_C^d)$$

is positive because by Assumption 2 we have $\pi_I^m > \pi_I^d - \pi_C^d$. In turn, the impact of a marginal increase in the level of screening ϕ on the platform's expected profit is qualitatively equivalent to the one in (7) where $\pi_I'(\phi) + \pi_C'(\phi)$ is given by the equation above.

This, in turn, implies that Lemma 1 and Proposition 1 fully apply. Moreover, as the optimal commission rate denoted by (10) does not change, it also follows that Lemma 2 also holds in full.

It is straightforward that also the effect of a higher screening level on the amount of innovation and consumer surplus, with both constant and non-constant elasticities, remain unchanged. Therefore, Proposition 7 and 8, respectively apply. For the same reason, it is also the case that our main results in Proposition 9 on social welfare continue to apply.

C. Fixed membership fee

Platforms can adopt alternative pricing schemes to capture value from their ecosystem. They can charge, for instance, fixed membership fees instead of (or in addition to) ad valorem commissions. In this extension, we show that our finding that the effect of platform liability on the commission rate may be either positive or negative carries over to the scenario in which the platform charges sellers a fixed membership fee rather than a commission. To enhance tractability, we do so in the special case in which buyer participation is fixed, i.e., $n_B = 1$.

Let us denote m the membership fee charged by the platform. In order to determine the platform's profit, we need to distinguish four cases:

(i) If $m > \pi_I^m$, then the number of product categories is zero and, therefore, the platform's profit gross of screening cost is zero too.

(ii) If $\pi_C^d < m \leq \pi_I^m$, then imitators do not join the platform (regardless of their nature) and all innovators whose innovation costs are lower than $\pi_I^m - m$ join the platform, which implies that the number of product categories is $F(\pi_I^m - m)$ and the platform's expected profit gross of screening cost is $mF(\pi_I^m - m)$.

(iii) If $(1-\phi)\,\pi_C^d < m \leq \pi_C^d$, then legitimate imitators are willing to pay the membership fee whereas IP-infringing imitators are not. Therefore, innovators whose innovation costs are lower than $\nu\pi_I^d + (1-\nu)\pi_I^m - m$ join the platform, which implies that the number of product categories is $F(\nu\pi_I^d + (1-\nu)\pi_I^m - m)$ and that the platform's expected profit per category is $m(1+\nu)$. Thus, the platform's expected profit gross of screening cost is $m(1+\nu)F(\nu\pi_I^d + (1-\nu)\pi_I^m - m)$.

(iv) If $m \leq (1-\phi)\,\pi_C^d$, then both types of imitators are willing to pay the membership fee but a fraction ϕ of IP-infringing imitators is screened out. Therefore, innovators whose innovation costs are lower than $\pi_I(\phi) - m$ join the platform. This implies that the number of product categories is $F(\pi_I(\phi) - m)$ and the platform's expected profit per category is $m[2-\phi(1-\nu)]$. Hence, the platform's expected profit gross of screening cost is $m[2-\phi(1-\nu)]F(\pi_I(\phi) - m)$.

Thus, the platform's expected profit net of screening cost is given by

$$\Pi\,(m,\phi) = \begin{cases} m[2-\phi(1-\nu)]F(\pi_I(\phi) - m) - \Omega(\phi) & \text{if} \quad m \leq (1-\phi)\,\pi_C^d \\ m(1+\nu)F(\nu\pi_I^d + (1-\nu)\pi_I^m - m) - \Omega(\phi) & \text{if} \quad (1-\phi)\,\pi_C^d < m \leq \pi_C^d \\ mF(\pi_I^m - m) - C(\phi) & \text{if} \quad \pi_C^d < m \leq \pi_I^m \\ -\Omega(\phi) & \text{if} \quad m > \pi_I^m. \end{cases}$$

Assume that $mF(\pi_I(\phi) - m)$ is quasi-concave in m and define

$$\tilde{m}(\phi) \equiv \arg\max_m \; m[2-\phi(1-\nu)]F(\pi_I(\phi) - m) - \Omega(\phi),$$

and

$$m^\star(\phi) \equiv \arg\max_m \; \Pi\,(m,\phi)\,.$$

If the maximum of $\Pi\,(m,\phi)$ is reached over the interval $\left[0, (1-\phi)\,\pi_C^d\right]$, i.e. $m^\star(\phi) \in \left[0, (1-\phi)\,\pi_C^d\right]$, then $m^\star(\phi) \in \left\{\tilde{m}(\phi), (1-\phi)\,\pi_C^d\right\}$; otherwise, $m^\star(\phi)$ does not depend on ϕ. This implies that a marginal increase in ϕ can either lead to an increase in $m^\star(\phi)$, lead to a decrease in $m^\star(\phi)$, or have no effect on ϕ. To see why, note that $(1-\phi)\,\pi_C^d$ decreases with ϕ and $\tilde{m}(\phi)$ can either increase or decrease in ϕ depending on the shape of $F(\cdot)$.

The analysis above shows that the impact of a higher level of screening on the membership fee can be either positive or negative.

D. Some brands do not join the marketplace

In this extension, we relax the assumption that all brand owners that develop an innovative product join the marketplace of the platform. Some brands are reluctant to join marketplace platforms because of the fear of commoditization (Hagiu and Wright, 2024). To this end, we assume that there are two types of brand owners: a portion $\lambda \in (0,1)$ of brand owners are as in our main model: they only sell via the marketplace of the platform upon the development of their innovative product and obtain $(1-\tau)\pi_I(\phi)$ as their expected profit. The remaining share of brand owners, $1-\lambda$, are *well-known* brand owners that only sells via their direct channel. These brand owners can be, for example, high-end and luxury brands (e.g., Louboutin) or brands with solid corporate reputation (e.g., Nike or Birkenstock). Because of their reputation, these brands enjoy a captive base of consumers.

For tractability reasons, we assume that the commission rate is exogenous in this setting. Besides tractability, this assumption can be justified by the fact that an e-commerce platform is unlikely to adjust the commission rate only to account for the presence of well-known brand owners. Moreover, we consider the case in which the buyer participation is fixed, i.e., $n_B = 1$. This allows us to simplify the analysis and consider the case where innovation would always increase with platform liability in the absence of a direct channel (see Proposition 7).

We assume that well-known brand owners, which we identify (with some abuse of notation) with D of "direct channel", are heterogeneous with respect to the cost of developing their new product (e.g., Nike's new shoes), which is distributed according to a cdf $G(\cdot)$ and a pdf $g(\cdot) > 0$. After a brand owner develops and introduces a new product, imitators can produce their own version of the product and sell it (only) via the marketplace of the platform even if the original brand owner is not present.[30] However, these imitations can only partially crowd out sales of major brand owners. Formally, we assume that well-known brand owners selling through their direct channel generate stream of revenues from two different sources: an amount $\sigma > 0$, which represents the revenues made from loyal consumers that only consider the branded product and never search for an alternative copycat, and an amount $\pi_D(\phi) \equiv (1-\nu)\phi\pi_D^m + (1-(1-\nu)\phi)\pi_D^d$ which represents the expected revenues made from the mass 1 of consumers that also consider buying the imitation on the marketplace, where π_D^m is the profit obtained if the brand owner does not face competition from an imitation on the platform and $\pi_D^d (< \pi_D^m)$ is the profit obtained otherwise.[31] We let $\pi_{DC}(\phi) \equiv (1-(1-\nu)\phi)\pi_{DC}^d$ be the expected profit of an imitation, where

[30]For example, while Louboutin has never sold via Amazon.com, its copycat products were largely available on the marketplace (see the well-known *Louboutin vs Amazon* trial).

[31]Note that an underlying assumption is that consumers that would also consider buying an imitation face no search cost and are always able to compare products on both the marketplace (where the imitation can be

π^d_{DC} is the profit of the imitator obtained conditional on not being delisted by the platform.

Note that, for our purpose, what is relevant is that the expected profit of these brand owners is both increasing in σ and ϕ and that the expected profit of an imitator is decreasing in ϕ. A higher σ implies that the brand owners have a larger captive base of consumers that do not rely on the marketplace for their purchasing decision. It captures the strength of the brand's reputation. A higher screening level by the platform implies that these brand owners benefit from the IP-protection effect discussed before, whereas the imitators are more likely to be delisted by the platform.

The number of well-known brand owners that develop and sell their products via their direct channel is $n_D(\sigma, \phi) = G(\sigma + \pi_D(\phi))$ and the profit of the platform is now given by:

$$\Pi(\sigma, \tau, \phi) = \tau\Big\{\lambda F((1-\tau)\pi_I(\phi))\Big[\pi_I(\phi) + \pi_C(\phi)\Big] + (1-\lambda)G(\sigma + \pi_D(\phi))\pi_{DC}(\phi)\Big\} - \Omega(\phi),$$

which we assume to be quasi-concave in ϕ. The first-order condition of the platform's expected profit with respect to ϕ is

$$\begin{aligned}\frac{\partial \Pi(\sigma,\tau,\phi)}{\partial \phi} =& \tau\lambda\Big\{\frac{\partial n_I(\tau,\phi)}{\partial \phi}\Big[\pi_I(\phi) + \pi_C(\phi)\Big] + F((1-\tau)\pi_I(\phi))\Big[\pi_I'(\phi) + \pi_C'(\phi)\Big]\Big\} \\ &+ \tau(1-\lambda)\Big\{g(\sigma+\pi_D(\phi))\pi_D'(\phi)\pi_{DC}(\phi) + G(\sigma+\pi_D(\phi))\pi_{DC}'(\phi)\Big\} - \Omega'(\phi) = 0.\end{aligned} \tag{B-1}$$

We are interested in how brand reputation shapes the platform's incentive to screen, conditional on the optimal level of screening being an interior solution. Denoting the solution to (B-1) as $\phi^{\star\star}$ and totally differentiating (B-1) with respect to σ, we observe that

$$\frac{d\phi^{\star\star}(\sigma)}{d\sigma} = -\frac{\frac{\partial^2 \Pi(\sigma,\tau,\phi^{\star\star}(\sigma))}{\partial\sigma\partial\phi}}{\frac{\partial^2 \Pi(\sigma,\tau,\phi^{\star\star}(\sigma))}{\partial\phi^2}}.$$

Since $\partial^2\Pi(\sigma,\tau,\phi^{\star\star}(\sigma))/\partial\phi^2 < 0$ by the second-order condition, the sign of $d\phi^{\star\star}(\sigma)/d\sigma$ is the same as the sign of $\partial^2\Pi(\sigma,\tau,\phi^{\star\star}(\sigma))/\partial\sigma\partial\phi$. Note that

$$\frac{\partial^2 \Pi(\sigma,\tau,\phi)}{\partial\sigma\partial\phi} = \tau(1-\lambda)\Big\{\pi_{DC}(\phi)\pi_D'(\phi)g'(\sigma+\pi_D(\phi)) + g(\sigma+\pi_D(\phi))\pi_{DC}'(\phi)\Big\},$$

which is negative if

$$\frac{\pi_{DC}'(\phi)}{\pi_{DC}(\phi)\pi_D'(\phi)} < -\frac{g'(\sigma+\pi_D(\phi))}{g(\sigma+\pi_D(\phi))}. \tag{B-2}$$

Because $\pi_{DC}'(\phi) < 0$ and $\pi_D'(\phi) > 0$, a sufficient condition for $d\phi^{\star\star}(\sigma)/d\sigma < 0$ is that $G(\cdot)$ is weakly concave. Note that in the case of a uniform distribution, (B-2) is always satisfied. Thus, in this special case, $d\phi^{\star\star}(\sigma)/d\sigma < 0$.

available) and the direct channel of the brand.

The above analysis suggests that, under relatively mild conditions on the shape of the distribution of the cost of innovation of well-known brand owners, the greater the captive base of consumers of well-known brands owing to their reputation (i.e., the greater σ), the weaker the platform's incentives to delist IP-infringing copies from the marketplace, which in turn lowers the profit of the well-known brand owners. This result underscores the concerns of Louboutin who initiated legal action against Amazon.com for not stopping third-party sellers regularly advertising knock-offs of the iconic Louboutin's red-soled stilettos. It is important to notice that, in this simplified analysis, we considered as exogenous the decision of brand owners to join the marketplace or to use their direct channel. We relegate to future research a fully-fledged analysis of the effects of platform liability when brand owners can decide, upon development of a product, whether to join the marketplace and/or to sell via their direct channel.

E. Positive marginal costs

In this section, we relax the assumption of zero marginal production costs ($c = 0$), typically applicable to digital goods, and instead assume $c > 0$, which better represents the case of physical goods sold through e-commerce marketplaces.

For tractability, we consider a simplified version of the model where buyer participation is inelastic and normalized to 1: $\varepsilon_H = 0$ and $n_B = 1$. We assume a positive and identical marginal cost c for innovators and imitators. The presence of a marginal cost generates a classical *double marginalization* problem in the product categories in which innovators become monopolists as a result of the removal of IP-infringing products. To see why, note that in the absence of imitators, given a commission $\tau(< 1)$ and the price chosen by an innovator, the latter's profit is

$$((1-\tau)p - c)D(p) = (1-\tau)(p - \frac{c}{1-\tau})D(p).$$

Let $p_I^m(\frac{c}{1-\tau})$ denote the price maximizing the above profit. Given a positive commission $\tau \in (0, 1)$, a positive marginal cost generates a double marginalization. This can be seen clearly when there is no imitator. Then, the platform's profit is given by

$$\Pi^m(\tau) = \tau p_I^m D(p_I^m) F((1-\tau)\left(p_I^m - \frac{c}{1-\tau}\right) D(p_I^m)) - \Omega(\phi),$$

where the platform's revenue per category $\tau p_I^m D(p_I^m)$ does not include any marginal cost whereas an innovator's profit $(1-\tau)\left(p_I^m - \frac{c}{1-\tau}\right) D(p_I^m)$ contains the marginal cost term. Therefore, when $c = 0$, the price chosen by the innovator p_I^m maximizes the platform's revenue per category as well and hence maximizes the platform's profit. But when $c > 0$, the price chosen by the innovator is too high relative to the one maximizing the platform's profit for two reasons. First, for a given a commission $\tau \in (0, 1)$, even if we assume that the innovator faces an effective marginal cost of c instead of $c/(1-\tau)$, $p_I^m(c)$ is too high relative to the price maximizing the platform's profit. Slightly reducing p from $p_I^m(c)$ entails a second-order loss from $F((1-\tau)(p-c)D(p))$ but generates a first-order gain from $\tau p D(p)$. Second, a positive commission which raises the innovator's effective marginal cost from c to $c/(1-\tau)$ makes the double marginalization problem worse from the platform's point of view.

Suppose that there is no horizontal differentiation between an innovative product and a copycat. Specifically, the utility of a consumer from the innovative product is $u - p_I - \varepsilon$, where $u(>0)$ is the gross surplus from the innovative product, p_I is the price of the innovative product and ε follows a distribution F_ε over $[\underline{\varepsilon}, \overline{\varepsilon}]$ with zero mean. The payoff of a consumer from the copycat is $u - \Delta - p_C - \varepsilon$, where $u - \Delta(>0)$ (with $\Delta > 0$) is the gross surplus from the copycat, p_C is the price of the copycat and ε is the same for both the innovative product and the copycat. Bertrand competition between the innovative product and the copycat leads to the following prices for the innovative product and the copycat, respectively,

$$p_I^d(\frac{c}{1-\tau}) = \Delta + \frac{c}{1-\tau}; \qquad p_C^d(\frac{c}{1-\tau}) = \frac{c}{1-\tau}.$$

The platform's profit becomes

$$\begin{aligned}\Pi(\tau,\phi) &= \tau\pi_I(\tau,\phi)n_I(\tau,\phi) - \Omega(\phi) \\ &= \tau\left[(1-\nu)\phi p_I^m D(p_I^m) + [1-(1-\nu)\phi]\, p_I^d D(p_I^d)\right] \times \\ & \quad F\left((1-\tau)\left[(1-\nu)\phi\left(p_I^m - \frac{c}{1-\tau}\right)D(p_I^m) + [1-(1-\nu)\phi]\left(p_I^d - \frac{c}{1-\tau}\right)D(p_I^d)\right]\right) - \Omega(\phi),\end{aligned}$$

where $\pi_I(\tau,\phi) \equiv (1-\nu)\phi p_I^m D(p_I^m) + [1-(1-\nu)\phi]\, p_I^d D(p_I^d)$ now represents an innovator's revenue instead of profit because of the positive marginal cost and $D_I(p_I^d, p_C^d) = D(p_I^d)$. For a given commission rate, differentiating the profit with respect to the screening level ϕ yields:

$$\begin{aligned}\frac{\partial\Pi(\tau,\phi)}{\partial\phi} &= \underbrace{\tau\pi_I(\tau,\phi)f(\cdot)(1-\tau)(1-\nu)\left[\left(p_I^m - \frac{c}{1-\tau}\right)D(p_I^m) - \left(p_I^d - \frac{c}{1-\tau}\right)D(p_I^d)\right]}_{\text{IP-protection effect }(+)} \\ & \quad - \underbrace{\tau(1-\nu)(p_I^d D(p_I^d) - p_I^m D(p_I^m))n_I(\tau,\phi)}_{\text{double marginalization effect}(-/+)} - \Omega'(\phi)\end{aligned} \tag{B-3}$$

Two effects are present. First, there is a positive *IP-protection effect* as the innovator's profit is larger under monopoly than under duopoly. Second, as p_I^m is too high relative to the price that maximizes $p_I D(p_I)$, the term on the second line, which we call the *double marginalization effect*, can be either positive or negative depending on the sign of $p_I^d D(p_I^d) - p_I^m D(p_I^m)$. It is positive (resp., negative) when the double marginalization problem is severe (resp., mild), that is $p_I^d D(p_I^d) > p_I^m D(p_I^m)$ (resp. $p_I^d D(p_I^d) < p_I^m D(p_I^m)$) holds.

If the double marginalization effect is negative, the platform always has some incentives to screen imitators (i.e., $\phi^* > 0$). However, if the double marginalization effect is positive and dominates the IP-protection effect, the platform may prefer not to screen imitators at all, even if screening is costless. In other words, contrary to our previous result obtained with $c = 0$ and inelastic buyer participation ($\varepsilon_H = 0$) in Proposition 1, the platform's profit increases with the probability of having imitators for a given commission rate.

To gain further insights and provide a tractable example, suppose that $\Omega(\phi) = 0$ for any ϕ, which makes it possible for the platform to willingly set $\phi^\star = 1$. To make the problem even simpler, we compare two extreme cases, that is the case in which the platform does not screen any IP-infringer (i.e., $\phi = 0$) and the case in which all IP-infringers are screened out (i.e., $\phi = 1$). In each case, the platform chooses the commission rate that maximizes its profit. We then compare these two cases.

Suppose that ϵ is uniformly distributed over $[-0.5, 0.5]$, k is uniformly distributed over $[0, 1]$ and $u = 1$. Then, for any given c and commission rate τ, the *IP-protection effect* is likely to be strong whenever Δ is small enough, that is when vertical differentiation between the two products is not so large. Due to tractability reasons, we provide a graphical example. We focus on the case where Δ is small (i.e., $\Delta = 0.2$) and assume that the proportion of legitimate imitators is large ($\nu = 0.9$). Below, we plot the platform's commission rate, its profit, the number of innovators, consumer surplus, and welfare as a function of the marginal cost c when the platform engages in full screening and when the platform does not screen IP infringers.

The top-left panel on the commission rate shows $\tau^\star(0) > \tau^\star(1)$, meaning that the commission rate is higher when there is no screening. This is because the platform raises the commission rate when a larger number of innovators' prices are constrained by competition. Furthermore, in the parameter range considered, $\tau^\star(0) - \tau^\star(1)$ increases in the size of the marginal cost c. This result is interesting: as marginal costs rise, double marginalization becomes more severe under full screening, which disciplines the platform to set a lower commission than under no screening, where competition from copycats partly mitigates double marginalization.

The top-right panel of Figure 2 shows that the platform has an incentive to screen only for sufficiently small values of c.[32] Indeed, for sufficiently large c, the platform prefers not to screen, as the double-marginalization problem under a monopolistic market structure becomes severe.

We note that innovators prefer screening within the relevant parameter range (central-left panel Figure 2). Consumer surplus under no screening is almost always higher than the one under full screening and the two intersect when the marginal cost reaches $c = 0.07$ (central-right panel of Figure 2). Interestingly, from a welfare perspective, the incentives of the platform and those of

[32] Note that the platform's profit for a given screening regime increases with c. For instance, under no screening, the market structure is always duopolistic. Hence, as c increases, the equilibrium price becomes higher, which is in turn taxed by the platform through a higher commission rate, leading to a higher profit. As $\nu = 0.9$, the same reasoning explains why the profit increases with c under full screening.

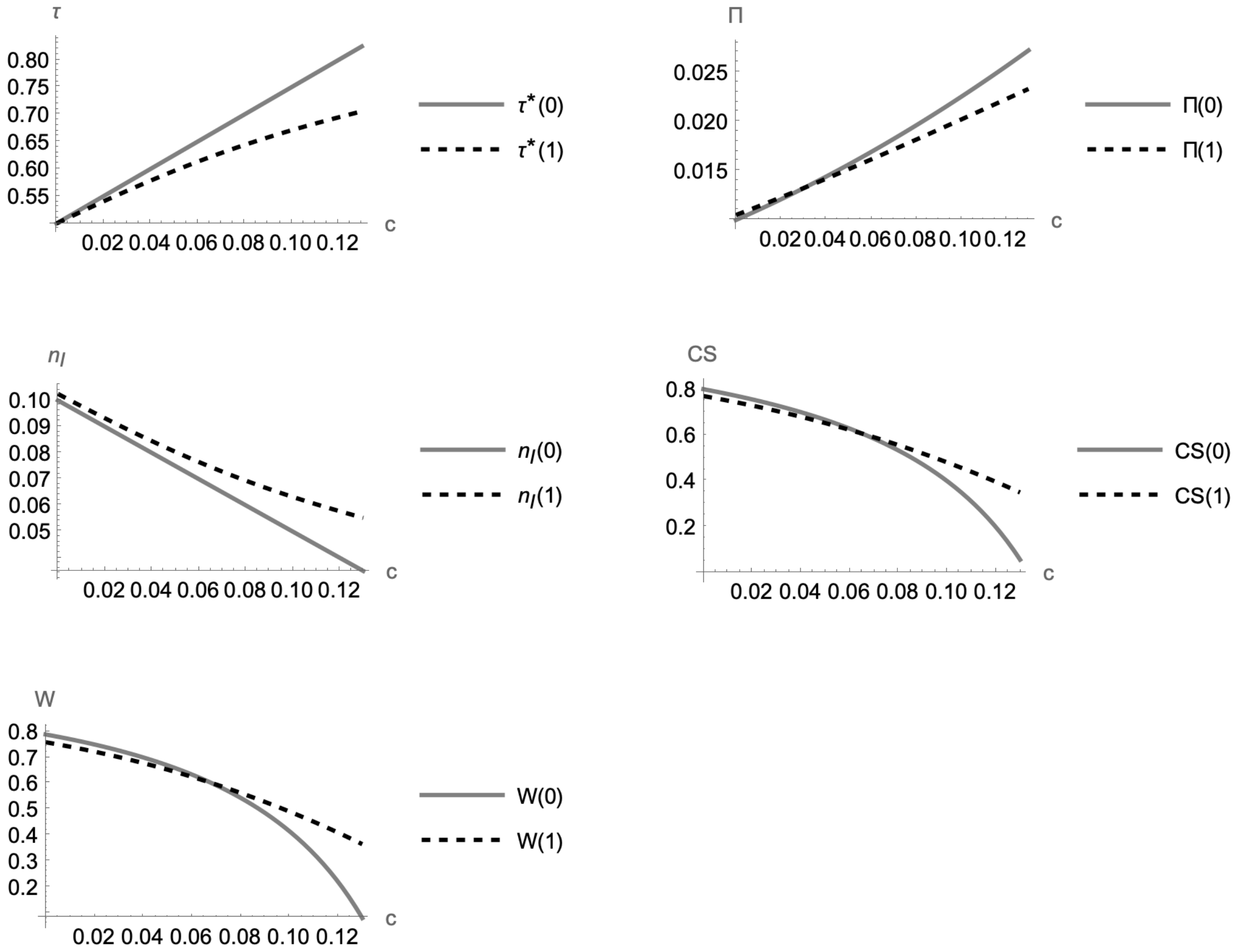

Figure 2: Commission rate, platform's profit, number of innovators, consumer surplus, and welfare with strictly positive marginal cost on the x-axis. Parameter values: $u = 1, \Delta = 0.2, \nu = 0.9$.

the social planner are misaligned. For sufficiently small marginal costs, no screening is socially desirable. Therefore, there is no justification for platform liability. But the platform prefers full screening. Conversely, for sufficiently large marginal costs, full screening is socially desirable (bottom panel of Figure 2), but the platform prefers no screening. This discrepancy happens since the platform jacks up the commission rate under no screening while its commission is disciplined by the double marginalization problem under full screening. In this case, a liability rule that would mandate full screening would be socially desirable.