

Which is more effective for platform performance: Punishments or incentives?

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ABSTRACT

The success of third-party business-to-business (B2B) e-commerce platforms relies heavily on simultaneous governance of both sellers and buyers. This study examined and compared the effects of punishments and incentives on seller's opportunism toward platforms, buyers' trust in platforms, and platform performance using data from B2B platforms in China. The results show that punishments (both severity and speed) and incentives have differential effects on curbing sellers' opportunism and building buyers' trust. These findings not only make novel theoretical contributions to the B2B platform and governance literature by exploring platforms' triadic governance issue but also provide valuable practical suggestions for platform managers.

1. Introduction

A third-party business-to-business (B2B) e-commerce platform¹ is a two-sided market that involves a triadic relationship between a platform and a large number of sellers and buyers (see Fig. 1). Sellers (buyers) use the platform to conduct transactions with buyers (sellers), but they do not directly transact with the platform itself (Liu, Chen, & Gao, 2020). For example, ZG Group is a leading platform that serves China's steel industry supply chain (<https://www.zhaogang.com/>), including steel mills, steel distributors, and steel traders. Molbase is a platform for trading chemical products (<https://www.molbase.cn/>) that serves the chemical, pharmaceutical, and new materials industries worldwide. The world-famous Alibaba is a comprehensive wholesale trading platform (<https://www.1688.com/>) that serves sellers and buyers of clothing, packaging materials, office supplies, home decorations, building materials, and electronic goods. By using a B2B platform, sellers can enlarge their market reach and broaden their customer base, and buyers can access a wider range of products and experiences at lower prices than they could otherwise. Therefore, both sellers and buyers rely heavily on B2B platforms, empowering these platforms to manage their relationships with sellers and buyers simultaneously and to promote their own performance by facilitating transactions between sellers and buyers (Chakravarty, Kumar, & Grewal, 2014).

B2B platforms handle larger purchases and much more lucrative

transactions than business-to-consumer (B2C) platforms (Shree, Singh, Paul, Hao, & Xu, 2021). Furthermore, B2B transactions emphasize long-term relationships between buyers and sellers (Staub, Haki, Aier, Winter, & Magan, 2021), and there are fewer buyers on B2B platforms than on B2C platforms (Riemensperger & Falk, 2020). Because the Internet is virtual by nature, buyers and sellers on a B2B platform are separated by time and space, increasing their information asymmetry (Wang, Cai, Xie, & Chen, 2021). Because buyers are always at an information disadvantage (Ahearne, Atefi, Lam, & Pourmasoudi, 2022), sellers sometimes behave opportunistically by providing false product descriptions, engaging in click farming, posting deceptive advertisements, delivering products that are not fit for use, and concealing critical information. This behavior serves the interests of opportunistic sellers to the detriment of both buyers and the platform (Wang et al., 2021). Furthermore, buyers on a B2B platform may not trust the platform, an issue that does not arise in the context of offline, strictly bilateral exchanges (Chen, Huang, Davison, & Hua, 2015). They might also experience extreme anxiety about the security problems associated with online exchanges, such as products that are not fit for use, delayed deliveries, disputes with sellers related to returns or exchanges, and attempts by the platform to escape responsibility for unsafe transactions. For a platform to improve its performance, it needs to employ effective governance mechanisms that limit opportunism among sellers and promote buyers' trust in the platform.

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¹ We use the terms "B2B e-commerce platform," "B2B platform," and "platform" interchangeably.

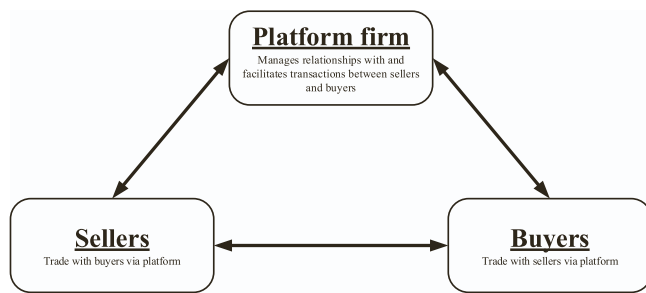


Fig. 1. Triadic Relationship between a Platform Firm, Sellers, and Buyers.

Theoretical research has focused on the antecedents of buyers' and sellers' use of B2B platforms (e.g., Grewal, Comer, & Mehta, 2001; Son & Benbasat, 2007), along with their interdependence and satisfaction in the platform context (e.g., Mallapragada, Grewal, Mehta, & Dharwadkar, 2015). Research on platform strategies to attract buyers and sellers has focused on customer orientation, value-added services, and social forums (e.g., Chakravarty et al., 2014; Lee, Fang, Kim, Li, & Palmatier, 2018; Liu et al., 2020). Although these studies have offered meaningful insights into the performance of B2B platforms, there have been only limited theoretical studies of the role of governance mechanisms in exchange partner behavior and platform performance. The exception, Grewal, Chakravarty, and Saini (2010), explored the roles of monitoring, community building, and self-participating in B2B platform governance.

Punishments and incentives are vital interfirm relationship governance mechanisms that have been examined in various contexts, including marketing channel relationships (Kim & Lee, 2017), exporter–distributor relationships (Obadia, Bello, & Gilliland, 2015), strategic alliances (Agarwal, Croson, & Mahoney, 2010), and buyer–supplier relationships (Chang, 2017). A punishment is defined as one party's enforcement of a negative outcome or withdrawal of a positive outcome when another party engages in unacceptable behavior (Antia, Bergen, Dutta, & Fisher, 2006; Wang, Gu, & Dong, 2013; Xiao, Dong, & Zhu, 2019). Incentives are defined as monetary and nonmonetary inducements (Gilliland & Bello, 2001; Kashyap, Antia, & Frazier, 2012). Most research on punishments and incentives has been conducted in the context of offline bilateral relationships; it has addressed the impact of punishments and incentives applied by one party on the slackness, compliance, or opportunism of another party (e.g., Kashyap & Murtha, 2017; Kim & Lee, 2017; Zhang, Zhang, & Shen, 2020). Few studies have explored the roles of punishments and incentives in the triadic relationships of B2B platforms, which, as market intermediaries, are associated with complicated transactions, huge markets, and a high level of exchange risk. Accordingly, they have a special need to decrease their users' dysfunctional on-platform behavior. They need to issue warnings, impose fines, and terminate the accounts of sellers (Wang et al., 2013) that violate their terms and conditions by, e.g., misreporting delivery delays (Huo, Ye, Zhao, Wei, & Hua, 2018), withholding information (Trada & Goyal, 2017), and distorting data (Paswan, Hirunyawipada, & Iyer, 2017). In addition, B2B platforms need to incentivize their users, such as by providing monetary rewards (Reimer & Benkenstein, 2016), commissions and bonuses (Kim & Lee, 2017), or virtual coins² (Li, Li, & Wang, 2018), to engage in desirable behaviors and attitudes. For these reasons, it is important to explore the effects of punishments and incentives on the governance exchange relationships on B2B platforms.

We drew on transaction cost economics (TCE) and signaling theory to develop a conceptual model of the differential effects of punishments and incentives on sellers' opportunism toward platform and buyers'

trust in platform. We addressed two research questions. (1) How can punishments and incentives improve platform performance by curbing sellers' opportunism toward the platform and building buyers' trust in the platform? (2) Which governance mechanism is the most effective in improving platform performance? We tested our conceptual model with data from a survey of 196 B2B platforms in China, and most of our hypotheses were supported.

This study makes four contributions to the platform management literature. First, despite the impressive body of theoretical literature related to interfirm relationship governance, studies have focused on the effectiveness of governance mechanisms in dyadic interfirm relationships (Ellram & Murfield, 2019; Watson, Worm, Palmatier, & Ganesan, 2015). In contrast, we explored the influence of governance mechanisms on the triadic relationships between online platforms and their users. This triadic perspective expands the interfirm governance literature and offers a more comprehensive understanding of the effectiveness of B2B platforms' governance mechanisms.

Second, little effort has been made to explore the severity and speed of punishment of sellers in the context of B2B platforms. Although both severity and speed are important dimensions of punishment (Antia et al., 2006), most studies have focused on punishment severity in the context of traditional interfirm relationships (e.g., Antia & Frazier, 2001; Kashyap & Murtha, 2017). This study simultaneously explored the effects of punishment severity and speed and compared their efficacy in curbing sellers' opportunism and improving buyers' trust in the platform. This enhances understanding of the multiple dimensions of punishment and its efficacy in governing platforms.

Third, although incentives are an important governance mechanism that has been explored in many fields (e.g., Gilliland & Bello, 2001; Kashyap et al., 2012; Kim & Lee, 2017; Zhang, Evgeniou, Padmanabhan, & Richard, 2012), little effort has been made to understand their influence on different targets in the same framework. B2B platforms must manage their relationships with both sellers and buyers. Thus, this study examined the effects of platforms' incentives toward sellers and buyers. As a result, it makes a novel contribution to the incentive literature and expands our understanding of the incentive mechanism in the context of B2B platforms.

Fourth, the literature has generally examined the effects of punishments and incentives separately (e.g., Gilliland & Kim, 2014; Wang et al., 2013). Little effort has been made to compare the effects of punishments and incentives. Furthermore, the literature has provided only limited advice for firms on this issue. This study compared the effectiveness of punishments and incentives in reducing sellers' opportunism and increasing buyers' trust in the platform, respectively, to determine which approach was the most effective. Our work not only contributes to the governance literature by revealing these differences but also provides advice for platform managers on curbing sellers' opportunism toward platform and building buyers' trust in platform.

2. Theoretical background

2.1. B2B platform and governance

A B2B platform is a typical two-sided market that contains buyers and sellers (Fang, Li, Huang, & Palmatier, 2015; Sriram et al., 2015). The trilateral interactions between the platform, buyers, and sellers constitute triadic interfirm relationships (Liu et al., 2020; Yuan, Moon, Wang, Yu, & Kim, 2021) and create a third-party control system (Gilliland, 2022). Without the participation of both buyers and sellers, a B2B platform is doomed (Cennamo & Santalo, 2013). As a market maker, a platform's most important method of achieving superior performance is to facilitate and encourage fluent, convenient negotiation and exchange between sellers and buyers (Chakravarty et al., 2014). Therefore, it is critical for platforms to manage their relationships with both types of users (Liu et al., 2020).

A major threat to the platform–seller relationship arises when a seller

² Virtual coins are user points that can be used to obtain discounts on products or platform fees.

behaves opportunistically on the platform (Crosno & Dahlstrom, 2008; Grewal et al., 2010). Sellers' opportunism toward platform refers to sellers' self-interest seeking with guile (Williamson, 1985). It includes behaviors such as violating formal contracts or informal agreements with the platform (Wathne & Heide, 2000) and is manifested when sellers fail to deliver their products on time, withhold product information, or provide low-quality products that are inconsistent with their representations to the platform. Opportunistic seller behaviors impair the platform's performance, damage its reputation, and create a high level of perceived uncertainty among buyers (Pavlou, Liang, & Xue, 2007), decreasing buyers' willingness to use the platform and even inducing their exit. Therefore, it is critical for platforms to manage sellers' opportunism toward platform, thereby improving platform performance.

A key factor that influences the platform–buyer relationship is buyers' trust in the platform (Chen et al., 2015; Shao, Zhang, Brown, & Zhao, 2022). Trust has been widely acknowledged in the literature as a critical promoting factor of business relationships and an essential element of online transactions (Bart, Shankar, Sultan, & Urban, 2005; Fang et al., 2014; Pavlou, 2002; Pavlou & Gefen, 2004). Without sufficient trust, organizations do not initiate exchanges with other organizations (Pavlou & Gefen, 2004; Poppo, Zhou, & Li, 2016). Buyers' trust in a platform is defined as buyers' belief that the platform will behave in accordance with their expectations by exhibiting competence, integrity, and benevolence (Doney & Cannon, 1997; Pavlou & Gefen, 2004). Because of the trust transfer effect, buyers' trust in the platform engenders their trust in sellers on the platform (Shao et al., 2022). More specifically, buyers who trust a platform believe that the platform has the ability both to select high-quality sellers and to regulate sellers' opportunistic behaviors. Accordingly, when buyers trust a platform, their seller-related uncertainty decreases and they have faith in the sellers' goodwill and ability (Chen et al., 2015). Although buyers do not directly transact with the platform, if the platform fosters their trust, their willingness to trust and transact with sellers also increases, improving the platform's performance.

TCE is a dominant theory in contemporary B2B research (Crosno & Brown, 2015; Geyskens, Steenkamp, & Kumar, 2006; Gorovaia & Windsperger, 2018; Rindfleisch et al., 2010; Rindfleisch & Heide, 1997). TCE assumes that economic actors intentionally serve their own interests if they have the opportunity to do so (Williamson, 1985). Because of the uncertainties and risks associated with opportunistic exchange partners, some market transactions are costly (Huo et al., 2018; Rindfleisch et al., 2010). TCE directly addresses the question of how to align governance mechanisms that safeguard interfirm exchanges by minimizing opportunism-related transaction costs (Williamson, 1985; Oliver Williamson & Tarek, 2012). With the development of TCE, some scholars have demonstrated the significant role of trust in developing transactional relationships (Guo, Straub, Zhang, & Cai, 2021). These researches have suggested that trust can effectively decrease the negotiation, drafting, and monitoring costs inherent to the transaction process (Beccerra & Gupta, 1999; Chiles & McMackin, 1996; Guo et al., 2021) and emphasized the need to govern relations by building trust (Williamson, 1993; Shalini Talwar, 2020). Accordingly, the TCE research has also focused on the issue of how to establish trust by adopting appropriate governance mechanisms (Guo et al., 2021; Zhou & Poppo, 2010).

TCE suggests varying governance mechanisms to manage interfirm relationships. The important mechanisms of punishments and incentives have received considerable attention in contexts such as marketing channels (e.g., Antia & Frazier, 2001; Gilliland & Kim, 2014), strategic alliances (e.g., Agarwal et al., 2010), and supply chains (e.g., Chelariu, Bello, & Gilliland, 2014). Some studies have found that punishments can deter users from resorting to the gray market incidence (Antia et al., 2006), reduce opportunism (Kashyap et al., 2012), and increase compliance (Kashyap & Murtha, 2017). Others have found that incentives can help achieve economic goals (Gilliland & Bello, 2001),

overcome reseller rejection (Gilliland, 2004), enhance relationship quality (Obadia et al., 2015), decrease opportunism (Kim & Lee, 2017), and reduce dealer slackness (Zhang et al., 2020). Although these studies have offered abundant insights, most of them have been conducted in the context of bilateral interfirm relationships and few have compared the effects of punishments and incentives. Thus, their conclusions might not apply to the governance of the triadic relationships that form a third-party control system consisting of a platform firm, sellers, and buyers (Gilliland, 2022), because, as set forth above, the platform's punishment of sellers has a spillover effect on buyers. To achieve its desired level of performance, the platform must carefully consider how to effectively govern its relationships with both sellers and buyers. Accordingly, the governance roles of punishments and incentives in the context of B2B platforms require intensive investigation.

2.2. Signaling role of punishment on B2B platforms

Signaling theory can explain how people evaluate companies and product quality under various circumstances, particularly when quality is difficult or impossible to observe directly (Spence, 1973). It draws on the premise that different parties to an exchange often have different levels of information about the transaction, and this information asymmetry influences their relationship (Kirmani & Rao, 2000). In exchange relationships, when facing information asymmetry, buyers tend to rely on informational cues to assess a company or product (Boulding & Kirmani, 1993; Kirmani & Rao, 2000). Informational cues can be categorized as intrinsic cues, which are features of the product itself, or extrinsic cues, which are reflected through product-related attributes (e.g., assurances from independent third parties; Hu, Wu, Wu, & Zhang, 2010; Wells, Valacich, & Hess, 2011).

In a B2B platform exchange environment, online buyers cannot touch the products or communicate with sellers face to face (Chen et al., 2015). They can only view product videos or pictures and read product descriptions or other buyers' comments. With such limited information, it is unlikely that buyers will trust the platform and sellers, and buy without considering the risk involved. Richardson, Dick, and Jain (1994) indicate that buyers' shopping choices are influenced by extrinsic cues because they can be evaluated without any particular knowledge of the product. This suggests that buyers could rely on extrinsic cues to evaluate the trustworthiness of a platform and sellers' offerings on it. Studies have explored institutional mechanisms (Fang et al., 2014), website quality (Wells et al., 2011), and website mechanisms (Chen et al., 2015) as extrinsic signals of risk deduction and trust formation in the e-commerce context. Punishment toward sellers conveys signals to buyers that the platform's rules are actively enforced, prohibiting seller dysfunctional behaviors, and that buyers' interests and rights could be protected. In addition, previous research has found that punishment can induce observing firm's opportunism (Xiao, Dong and Zhu, 2019), trust (Wang et al., 2013), and future fraud commitment (Yiu, Xu, & Wan, 2014). As such, we believe that seller punishment works as an extrinsic information cue, and could affect buyers trust in the platform.

3. Hypotheses

We developed a conceptual framework (see Fig. 2) to explore how punishments and incentives adopted by a platform firm affected sellers' opportunism toward platform, buyers' trust in platform and platform performance. More specifically, we focused on the effects of the severity and speed of punishment of sellers on sellers' opportunism toward platform and their signaling roles in building buyers' trust in platform; and the impact of incentives on both sellers and buyers. We compared the governance roles of punishments and incentives in the B2B platform context and examined the mediating effects of opportunism and trust.

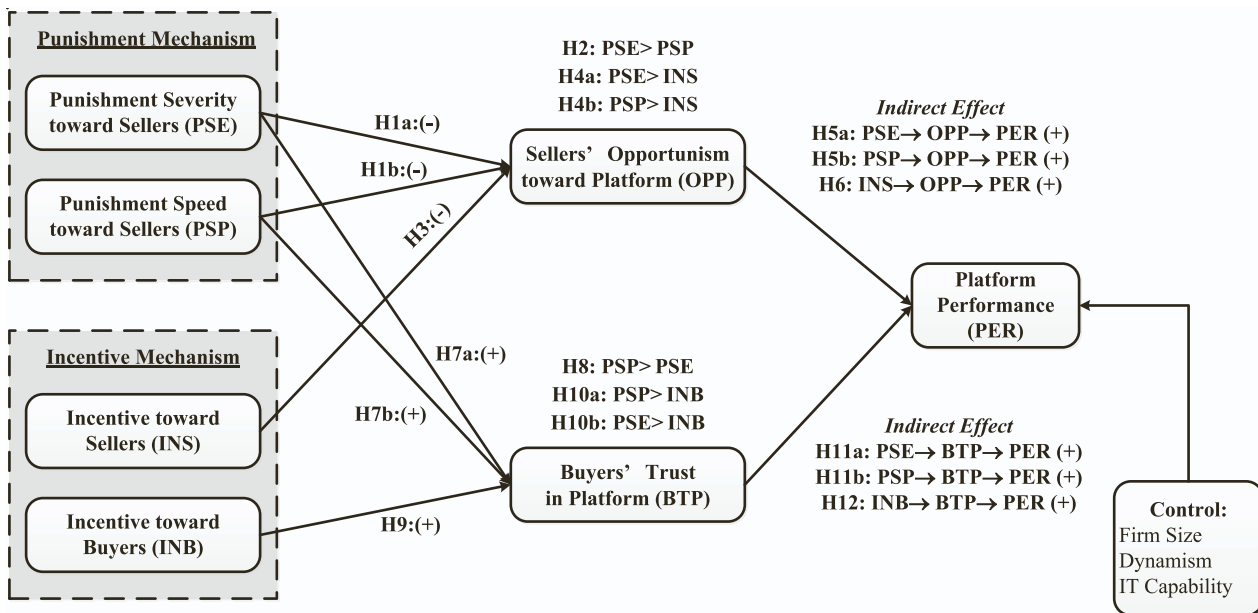


Fig. 2. Conceptual Model.

3.1. Effects of punishments and incentives toward sellers on sellers' opportunism

Punishment is a governance mechanism (Wang et al., 2013) that contributes to building group norms that specify unacceptable and acceptable behaviors (O'Reilly III & Puffer, 1989). Punishment decreases dysfunctional behavior that undermines other stakeholders (Kumar, Scheer, & Steenkamp, 1998) by eliciting negative consequences for the violating party (Antia et al., 2006; Trevino, 1992; Xue, Liang, & Wu, 2011). Such negative consequences include warnings, fines, and termination (Wang et al., 2013). Increasing the use of punishment reduces incidences of dysfunctional behavior (Antia et al., 2006; Wang et al., 2013; Yiu et al., 2014).

Punishment includes two important dimensions: severity and speed (Antia et al., 2006). Punishment severity is defined as the strength of a disciplinary response to the violation of a contractual obligation (Antia et al., 2006; Antia & Frazier, 2001). The costs associated with such negative consequences undermine the net payoff of opportunistic behaviors (Antia et al., 2006). In the B2B platform context, if the consequences of punishment toward sellers are severe enough, sellers' overall cost expectations will be outweighed by the potential gains from opportunism; therefore, sellers are less likely to commit future violations because punishment severity reduces sellers' incentive for opportunism.

Punishment speed is the time it takes for a punishment to be imposed (Antia et al., 2006), and it plays a significant role in deterrence (Gray, Miranne III, Ward, & Menke, 1982). If punishment speed toward sellers is quick, it decreases the length of time that sellers have to increase their payoff through opportunism (Antia et al., 2006). A quick response gives violating sellers little time or room to maneuver to avoid the full brunt of punishment. In contrast, when a platform delays sanctions, it provides time and opportunity for sellers to take actions to decrease the costs imposed by the punishment, allowing more time to gain from the opportunistic behavior. Thus, increasing punishment speed toward sellers curbs sellers' opportunism toward platform.

We believe that punishment severity has a stronger effect than punishment speed on suppressing sellers' opportunism toward platform, because opportunism decisions are based on a cost-benefit analysis (Xiao et al., 2019). If a platform inflicts a heavy punishment severity toward sellers, sellers incur a huge loss, significantly increasing their cost. The cost of opportunism is a direct function of the severity of the punishment received (Antia et al., 2006). Punishment speed only reflects whether

the platform enacts punishment measures quickly. Although punishment speed can decrease sellers' time to benefit from opportunistic behavior (Antia et al., 2006), it may not necessarily result in a loss for the seller. Based on the above analysis, we propose the following.

Hypothesis 1. Platform's punishment severity (a) and speed (b) toward sellers are negatively related to sellers' opportunism toward platform.

Hypothesis 2. Platform's punishment severity toward sellers has a stronger effect than punishment speed toward sellers on curbing sellers' opportunism toward platform.

Incentives—monetary and nonmonetary inducements to modify behaviors and attitudes (Gilliland & Kim, 2014)—are thought of as an economizing governance mechanism in the TCE literature (Williamson, 1983). Incentives toward sellers refer to platform's incentive efforts to influence sellers' behaviors on the platform (Zhang et al., 2012). We propose that incentives toward sellers curb sellers' opportunism for the following reasons. First, incentives toward sellers may make sellers' long-term benefits from cooperative behavior greater than the short-term gains from dysfunctional behaviors (Mishra, Heide, & Cort, 1998; Wathne & Heide, 2000). These benefits align the sellers' goals with those of the platform. Second, when a platform uses incentives mechanism to motivate sellers, it must monitor seller behavior to check whether sellers meet the reward criteria. During this process, the platform must collect seller information, and information asymmetry between sellers and the platform will be reduced. Research suggests that opportunistic behaviors are less likely to occur when information asymmetry in channel partners is decreased (Gilliland, 2003). Thus, incentives toward sellers help curb seller opportunism.

We compare the effects of punishments and incentives on sellers' opportunism toward platform. We propose that punishment mechanisms have a stronger effect on decreasing opportunism than incentive mechanisms for two reasons. First, punishments toward sellers increase seller costs, whereas incentives toward sellers bring benefit to sellers. Thus, punishments increase seller losses and incentives increase seller gains. Kahneman and Tversky (1979) proposed that the negative experience of losing money appears to be greater than the pleasure associated with gaining the same amount of money. This indicates that loss has a stronger effect than gain. In practice, platforms often provide greater punishments than incentives. Even if a platform uses the same extent of

punishments and incentives, loss from punishment has a greater influence on seller opportunism than gain from incentives. Second, from a long-term perspective, platform's punishment toward sellers not only increases sellers' short-term economic costs but also damages sellers' reputations, which will reduce sellers' long-term economic benefits. If a platform punishes a seller, buyers and other sellers on the same platform will acquire that information. The buyers will be less likely to transact with the punished seller, and the other sellers will reduce their opportunism toward the platform to avoid similar punishment. In contrast, platform's incentives toward sellers only influence seller opportunistic behavior for a short time. Thus, punishment toward sellers may reduce seller opportunism to a greater extent than incentives toward sellers. Based on the above arguments, we propose the following.

Hypothesis 3. Platform's incentives to sellers are negatively related to sellers' opportunism toward platform.

Hypothesis 4. Compared with incentives toward sellers, punishment severity (a) and punishment speed (b) toward sellers have greater effects on curbing sellers' opportunism toward platform.

3.2. The indirect effects of punishments and incentives toward sellers on platform performance through sellers' opportunism

We propose that sellers' opportunism toward platform reduces platform performance for two reasons. First, sellers' increased opportunism seriously harms the platform's reputation, resulting in a loss of prestige (Grewal et al., 2010). Platform reputation damage diffuses quickly through interfirm networks (Luo, Liu, & Xue, 2009). Accordingly, buyers will associate high transaction risk with the B2B platform because it is unjust and not well protected, and they will be less likely to engage on such a platform, which will decrease platform performance. Second, TCE suggests that opportunism within economic exchanges reduces value by increasing transaction costs (Dahlstrom & Nygaard, 1999; Williamson, 1985). If sellers' opportunism toward platform is high, the platform must spend considerable extra resources to screen and monitor seller behavior (Dahlstrom & Nygaard, 1999). Such resources could have been utilized more productively for other purposes if sellers' opportunism toward platform were relatively low (Luo, 2007). Thus, platform performance will be high when sellers' opportunism toward platform is low.

Combining H1 and H3 suggests that platform's punishments and incentives toward sellers can curb sellers' opportunism toward platform, and we believe that platform's punishments and incentives toward sellers deter sellers' opportunism and thereby increase platform performance. Therefore, we propose the following.

Hypothesis 5. The positive indirect effects of (a) punishment severity and (b) punishment speed on platform performance are mediated by reducing sellers' opportunism toward platform.

Hypothesis 6. The positive indirect effect of incentives toward sellers on platform performance is mediated by reducing sellers' opportunism toward platform.

3.3. The effects of punishments toward sellers and incentives toward buyers on buyers' trust

When sellers on a B2B platform are punished by the platform for dysfunctional behavior, buyer trust in the platform will be established and developed for several reasons. First, punishment toward sellers is regarded as an information cue (Fang et al., 2014) that dysfunctional behaviors are strictly prohibited on the platform, that the platform's rules are actively enforced, and that sellers will be punished if they violate standards. The more severe and swift the punishments of violating sellers, the more likely observing buyers are to trust the platform. Second, punishment severity and speed can induce fear in sellers (Yiu et al., 2014) and make them believe that the costs of wrongdoing

outweigh the potential benefits, which will decrease transaction uncertainty by mitigating seller opportunism (Li, Srinivasan, & Sun, 2009). To avoid sanctions from the platform, rational sellers will fulfill their transaction promises. Seeing violating sellers punished and the negative consequences of that punishment, observing buyers will be more likely to believe in the platform's integrity, benevolence, and ability to protect them.

Although punishment severity and speed toward sellers can both build buyers' trust in platform, we propose that their influences are different. In online transactions, buyers care most about transaction risk. The less risk involved in exchanges through a platform, the more likely buyers are to trust the platform. Rapid punishment by a platform quickly punishes violating sellers and reveals high-risk sellers. Such immediate measures tell buyers which sellers to carefully review or avoid and to reduce or stop transactions with as soon as possible. In contrast, punishment severity can also signal important information about violating sellers to buyers, but it cannot guarantee that buyers get this information right away. If buyers cannot quickly identify a violating seller, they are likely to enter into transactions with these sellers, causing them to face great transaction risk and possible loss. Therefore, we expect that platform punishment speed is more effective than punishment severity in building buyer trust. Therefore, we propose the following additional hypotheses.

Hypothesis 7. Platform's punishment severity (a) and speed (b) toward sellers are positively related to buyers' trust in platform.

Hypothesis 8. Platform's punishment speed toward sellers has a stronger effect than punishment severity toward sellers on building buyers' trust in platform.

Incentives toward buyers reflect a platform's incentive efforts to encourage certain buyers' behaviors on the platform (Zhang et al., 2012). Providing buyer incentives shows kindness to buyers, building their belief that the platform is benevolent. Thus, buyers will perceive affinity with the platform and have more trust in it. Furthermore, incentives toward buyers can guide buyer behaviors to realize the full potential of conducting business through the B2B platform. Thus, buyers receive more benefits from the platform's incentives, further promoting buyers' trust in the platform. In addition, platform's incentives toward buyers reflect the platform's support for buyers, which is helpful in dealing with uncertainties or perceived risks in transactions with sellers on the platform. Previous research has found that reciprocity promotes interfirm relationships (Tong, Johnson, Umesh, & Lee, 2008). Therefore, a platform's incentives toward buyers promote buyers' positive responses and trust in the platform.

We propose that the effect of punishments toward sellers on building buyers' trust is greater than the effect of incentives toward buyers for two reasons. First, when purchasing raw materials or products on a B2B platform, buyers pay far more attention to transaction risk and are more likely to choose a platform that protects their interests. Punishments toward sellers signal that the platform manages sellers well and creates a more secure exchange environment to safeguard transactions between buyers and sellers. Thus, punishments toward sellers that regulate sellers' opportunism can fulfill buyers' expectations that transactions are low-risk.

Incentives toward buyers may provide some benefits for buyers, but they cannot influence buyer behavior or change buyer perceptions of transaction risk. Thus, punishments are more likely to induce buyers' trust than incentives toward buyers. Second, loss will generate greater effects than gain (Kahneman & Tversky, 1979). In the context of B2B platforms, violations by sellers may lead to losses for buyers, and although incentives toward buyers offer some economic benefits, gains from incentives are usually less than the losses caused by violating sellers. Therefore, punishments toward sellers protect buyer interests and reduce their losses, which have more influence on building buyers' trust in the platform than incentives toward buyers.

Based on the above arguments, we propose the following hypotheses.

Hypothesis 9. Platform’s incentives toward buyers are positively related to buyers’ trust in platform.

Hypothesis 10. Compared with incentives toward buyers, punishment severity (a) and punishment speed (b) toward sellers have greater effects on building buyers’ trust in platform.

3.4. *The indirect effects of punishment toward sellers and incentives toward buyers on platform performance through buyers’ trust*

Buyers who trust a platform are more likely to trust sellers on that platform because of trust transfer logic (Doney & Cannon, 1997; Stewart, 2003). Trust transfer is a cognitive process in which one’s trust in a familiar entity can be transferred to an unknown entity when the entities have certain associations with each other (Stewart, 2003). Although buyers may not be familiar with sellers on a platform, they both have connections with the platform. Thus, we infer that buyers’ trust in sellers can be derived from their trust in the platform.

Buyers’ trust in a platform implies that buyers believe that the platform will institute regulations and enforce appropriate rules to manage opportunistic seller behavior (Xiao, Fu, & Liu, 2018). When buyers trust the platform, they may regard it as a safe and secure place in which to conduct business. Platforms usually institute rules or restrictions to protect transactions between sellers and buyers. For example, B2B platforms set up strict selection rules to review sellers who want to join the platform. In the transaction process, the platform monitors sellers’ behavior and takes serious action, such as monetary penalties or legal action, to punish sellers’ opportunistic behavior. Therefore, buyers who trust the platform perceive less risk of being taken advantage of by sellers on it (Pavlou & Gefen, 2004), and their trust in the platform is transferred to sellers.

Buyers’ trust in sellers allows buyers to rule out undesirable behaviors from a party they trust, and thus their perception of transaction risk is significantly reduced (Chen et al., 2015). Trust has been shown to be an important ingredient for long-term interorganizational relationships (Anderson & Weitz, 1989; Ganesan, 1994). Buyers who have faith in sellers are more likely to conduct transactions on a platform. Buyers who trust a platform will continue to use it and seek future transactions through it.

Taking these findings together with H7 and H9, we think that punishments toward sellers and incentives toward buyers first build buyers’ trust in platform and then increase platform performance. Therefore, we posit the following.

Hypothesis 11. The positive indirect effects of (a) punishment severity and (b) punishment speed toward sellers on platform performance are mediated by improving buyers’ trust in platform.

Hypothesis 12. The positive indirect effect of incentives toward buyers on platform performance is mediated by improving buyers’ trust in platform.

4. Methods

4.1. *Sample frame and data collection*

To explore the effectiveness of B2B platforms’ governance mechanisms, we collected data directly from these platforms. Because no prior list of B2B platforms was available in China when we conducted the data collection, we created a list of Internet-based B2B platforms by conducting an extensive Internet search. We visited all of the websites on our list to confirm their existence and suitability for our study. We finally acquired a dataset of 586 B2B platforms.

We commissioned a national marketing research firm with a good reputation and rich relevant experience of conducting firm surveys to help us collect the data. We trained their interviewers in how to obtain

reliable and valid survey data. The platforms in the sample were first contacted by telephone to obtain information on the key respondents responsible for strategic decision making, including founders, general managers, chief inspectors, and department managers. For each platform, we invited two key respondents to participate in the survey. Ultimately, we received 200 responses (a 34% response rate), 196 of which contained usable data. Demographic information on the usable responses is summarized in Table 1.

4.2. *Measures*

To test our construct, we adapted established scales to our research context and applied a 7-point Likert scale to measure the items. Punishment severity was assessed with three items from Antia and Frazier (2001). Punishment speed was measured with three items from Antia et al. (2006). For the incentives, we used five items adapted from Kashyap et al. (2012) to test incentives toward sellers and toward buyers. Opportunism was measured with four items adapted from Rokkan, Heide, and Wathne (2003). We assessed buyers’ trust in platforms using three items from Ou, Pavlou, and Davison (2014). Platform performance was measured using three items from Grewal et al. (2010).

In addition, we controlled for platform dynamism, which reflects the variability of the composition and behavior of sellers and buyers that participate in a platform (Chakravarty et al., 2014). To measure platform dynamism, we used three items from Chakravarty et al. (2014). We also controlled for information technology capability, which was assessed using three items from Grewal et al. (2010). Finally, we controlled for firm size, measured by the number of employees.

4.3. *Common method bias*

To reduce potential common method bias, two key respondents were selected from each platform to participate in the survey, and the average scores of each pair of respondents were used to represent the platform’s score in the data analysis. We used the marker variable method suggested by Podsakoff, MacKenzie, Lee, and Podsakoff (2003) and Liang, Saraf, Hu, and Xue (2007) to examine common method bias in our data. The results show that the substantive factor explained 88.1% of the variance on average and that the common method factor explained 0.2% of the variance on average. The ratio of the average substantive explained variance to the average common method-based variance is large, indicating that common method bias is not a serious problem.

4.4. *Data analysis*

4.4.1. *Measurement validation*

We used PLS-SEM to validate the measures and test our conceptual

Table 1
Demographic information.

| | Number | Percentage (%) |
|---------------------------------|--------|----------------|
| Firm size (number of employees) | | |
| ≤100 | 107 | 54.6 |
| 101–300 | 63 | 32.1 |
| 301–500 | 14 | 7.2 |
| 501–1000 | 4 | 2.0 |
| >1000 | 8 | 4.1 |
| Industry | | |
| Steel | 11 | 5.6 |
| Chemical | 13 | 6.6 |
| Textile | 9 | 4.6 |
| Machinery | 25 | 12.8 |
| Electronics | 12 | 6.1 |
| Construction materials | 8 | 4.1 |
| Multiple industries | 69 | 35.2 |
| Other | 49 | 25.0 |

model in SmartPLS. We first assessed the reliability and validity of the constructs for several criteria. As shown in Table 2, the Cronbach's α and CR for all of the constructs are above the threshold value of 0.7, indicating good reliability (Fornell & Larcker, 1981). Additionally, the average variance extracted (AVE) scores for all of the constructs are >0.5 , demonstrating adequate convergent validity (Fornell & Larcker, 1981). As seen in Table 3, the square roots of all of the constructs' AVE scores are larger than the correlations between all of the constructs, suggesting good discriminant validity. In addition, the highest heterotrait–monotrait ratio (HTMT) is 0.614, which is <0.85 . The fulfillment of the HTMT_{0.85} criterion test also shows adequate discriminant validity (Henseler, Ringle, & Sarstedt, 2015). In summary, these results suggest

Table 2
Measurements.

| Construct and item | Loading |
|--|---------|
| Punishment Severity Cronbach's $\alpha = 0.779$ CR = 0.871 AVE = 0.693 | |
| PSE1. We took tough measures when sellers violated the clauses. | 0.829 |
| PSE2. We took strict disciplinary action against sellers. | 0.838 |
| PSE3. Stern punitive action was taken against sellers. | 0.830 |
| Punishment Speed Cronbach's $\alpha = 0.835$ CR = 0.901 AVE = 0.751 | |
| PSP1. Our response to violations was instantaneous. | 0.862 |
| PSP2. We took immediate action against violations. | 0.852 |
| PSP3. Very little time elapsed between detection of violations and our response to sellers. | 0.886 |
| Incentive toward Sellers Cronbach's $\alpha = 0.974$ CR = 0.980 AVE = 0.907 | |
| INS1. Extra incentives to increase sellers' registering our platform. | 0.933 |
| INS2. Extra dollars for sellers' use our platform to sell product. | 0.963 |
| INS3. Extra monetary for participating in our promotional activities. | 0.964 |
| INS4. Extra incentives to become our senior members. | 0.969 |
| INS5. Extra incentives to promote (recommend) our platform. | 0.932 |
| Incentive toward Buyers Cronbach's $\alpha = 0.975$ CR = 0.981 AVE = 0.910 | |
| INB1. Extra incentives to increase buyers' registering our platform. | 0.928 |
| INB2. Extra dollars for buyers' use our platform to buy product. | 0.966 |
| INB3. Extra monetary for participating in our promotional activities. | 0.961 |
| INB4. Extra incentives to become our senior members. | 0.965 |
| INB5. Extra incentives to promote (recommend) our platform. | 0.948 |
| Opportunism Cronbach's $\alpha = 0.826$ CR = 0.885 AVE = 0.658 | |
| OPP1. On occasion, sellers lie about certain things in order to protect their interests. | 0.793 |
| OPP2. Sellers do not always act in accordance with our contracts. | 0.828 |
| OPP3. The sellers sometimes try to breach informal agreements between our companies to maximize their own benefit. | 0.844 |
| OPP4. The sellers will try to take advantage of "holes" in our contracts to further their own interests. | 0.777 |
| Buyers' Trust in Platform Cronbach's $\alpha = 0.848$ CR = 0.908 AVE = 0.767 | |
| BTP1. As an intermediary, buyers can trust our platform at all times. | 0.875 |
| BTP2. As an intermediary, buyers can count on our platform to do what is right. | 0.862 |
| BTP3. As an intermediary, we have a high level of integrity. | 0.889 |
| Performance Cronbach's $\alpha = 0.718$ CR = 0.841 AVE = 0.639 | |
| PER1. Return on investment relative to objective. | 0.812 |
| PER2. Sales relative to objective. | 0.781 |
| PER3. Profits relative to objective. | 0.805 |
| Dynamism Cronbach's $\alpha = 0.918$ CR = 0.947 AVE = 0.856 | |
| DYN1. Our customer demands vary a lot. | 0.921 |
| DYN2. We are often surprised by our customers' behavior. | 0.913 |
| DYN3. A lot of user firms join and/or leave our marketplace. | 0.941 |
| IT Capability Cronbach's $\alpha = 0.779$ CR = 0.868 AVE = 0.688 | |
| ITC1. We have strong IT planning capabilities. | 0.770 |
| ITC2. We are experienced with IT. | 0.884 |
| ITC3. We have adequate knowledge about IT. | 0.829 |

that the measurements for all of the constructs have sufficient reliability and validity.

5. Results

We used PLS-SEM to test our hypotheses by the bootstrapping method with 10,000 resamples. For control effects, we found that dynamism, IT capability and platform size have no significant impact on platform performance. As shown in Table 4, punishment severity ($\beta = -0.402, p < 0.001$) and punishment speed ($\beta = -0.196, p < 0.01$) both significantly curb sellers' opportunism toward platform, confirming H1a and H1b. Platform's incentives toward sellers are also negatively related to sellers' opportunism toward platform ($\beta = -0.153, p < 0.05$), indicating support for H3. Punishment severity ($\beta = 0.414, p < 0.001$) and punishment speed ($\beta = 0.292, p < 0.001$) both have significantly positive effects on buyers' trust in platform, confirming H7a and H7b. Platform's incentives toward buyers influence buyers' trust in platform insignificantly, indicating that H9 is not supported. A possible explanation is that many online third party B2B platforms have emerged in recent years (Chakravarty et al., 2014) and are still in early stages of development, so uncertainty is relatively high. In such a turbulent environment, platforms must provide incentives toward buyers to attract buyers to join. However, incentives toward buyers (especially high incentives) require a large investment, putting platforms in a risky position and causing buyers to believe that the platforms are not strong or reliable because they have to use such high incentives to attract buyers. Therefore, platform's incentives toward buyers do not necessary result in buyer trust.

To test H2, H4, H8, and H10, we compared the coefficients of punishment and incentive mechanisms on sellers' opportunism and buyers' trust in platform. As presented in Table 5, punishment severity has a greater effect than punishment speed ($\beta_1-\beta_2 = -0.206, [-0.394, -0.017]$) and incentives toward sellers ($\beta_1-\beta_3 = -0.249, [-0.444, -0.005]$) on sellers' opportunism toward platform, proving H2 and H4a. Punishment speed and incentives toward buyers are not significantly different in their effect on suppressing sellers' opportunism toward platform ($\beta_2-\beta_3 = -0.043, [-0.248, 0.185]$). Thus, H4b was not supported. A possible explanation is that quick punishment of violating sellers takes place based on established platform rules and regulations. Such rules and regulations generally indicate what punishment violating sellers will receive. Under such circumstances, the loss and benefit would be anticipated, and violating sellers may be fully prepared for the punishment. Therefore, sellers do not have much fear or uncertainty regarding punishment speed. Thus, punishment speed and incentive toward sellers make no significant difference in curbing sellers' opportunism toward platform.

Regarding building buyers' trust in platform, the effects of punishment severity and speed are not significantly different ($\beta_4-\beta_5 = 0.122, [-0.051, 0.304]$); H8 was not supported. A possible explanation is that punishment speed implies that violating sellers can be stopped in time, and that punishment severity deters other sellers and upholds justice. Both punishment severity and speed signal that the platform regulates seller behavior and secures the exchange environment. Therefore, they do not have significantly different roles in building buyers' trust. Punishment severity ($\beta_4-\beta_6 = 0.457, [0.251, 0.643]$) and speed ($\beta_5-\beta_6 = 0.335, [0.153, 0.505]$) both have greater effects than incentives toward buyers on building buyers' trust. Therefore, H10a and H10b were supported.

To explore how punishments and incentives influence platform performance, we conducted a mediation analysis to test the mediating role of opportunism and trust. As presented in Table 6, the mediation analysis results show that opportunism and trust mediate the effects of punishment severity on platform performance with observed indirect effects of 0.061 ([0.008, 0.138]) and 0.114 ([0.045, 0.203]), respectively, supporting H5a and H11a. Similarly, the results revealed that opportunism and trust mediate the effects of punishment speed on

Table 3
Correlations.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|
| 1. PSE | 0.832 | | | | | | | | | |
| 2. PSP | 0.251** | 0.867 | | | | | | | | |
| 3. INS | 0.262** | 0.271** | 0.952 | | | | | | | |
| 4. INB | 0.246** | 0.166* | 0.423** | 0.954 | | | | | | |
| 5. OPP | -0.490** | -0.342** | -0.310** | -0.240** | 0.811 | | | | | |
| 6. BTP | 0.478** | 0.385** | 0.330** | 0.102 | -0.374** | 0.876 | | | | |
| 7. PER | 0.383** | 0.267** | 0.354** | 0.274** | -0.386** | 0.455** | 0.799 | | | |
| 8. DYN | 0.161* | -0.137 | 0.141* | 0.231** | 0.042 | -0.216** | -0.130 | 0.925 | | |
| 9. ITC | 0.186** | 0.142* | 0.222** | 0.081 | -0.199** | 0.106 | 0.186** | -0.077 | 0.829 | |
| 10. FIS | -0.065 | -0.022 | -0.187** | -0.010 | 0.018 | 0.021 | -0.004 | -0.154* | 0.218** | NA |
| Mean | 5.145 | 5.035 | 4.349 | 4.291 | 2.876 | 4.934 | 5.132 | 2.863 | 4.969 | 1.690 |
| SD | 0.747 | 0.783 | 1.716 | 1.656 | 0.678 | 0.816 | 0.647 | 1.348 | 0.713 | 0.987 |

Note: *p < 0.05, **p < 0.01. The numbers in the diagonal row are the square roots of the AVE. NA = not applicable. Punishment Severity = PSE, Punishment Speed = PSP, Incentive toward Sellers = INS, Incentive toward Buyers = INB, Opportunism = OPP, Buyers' Trust in Platform = BTP, Performance = PER, Dynamism = DYN, IT Capability = ITC, Firm Size = FIS.

Table 4
Path Coefficients.

| Path | Coefficient |
|---|-------------|
| Punishment severity→Opportunism (β1) | -0.402*** |
| Punishment speed→Opportunism (β2) | -0.196** |
| Incentive toward sellers→Opportunism (β3) | -0.153* |
| Punishment severity→Trust (β4) | 0.414*** |
| Punishment speed→Trust (β5) | 0.292*** |
| Incentive toward buyers→Trust (β6) | -0.043 |
| Opportunism→Performance | -0.152* |
| Trust→Performance | 0.276** |

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

Table 5
Comparison of Coefficients.

| Δβ | Point estimation | 95% BC-CI | Conclusion |
|-------|------------------|------------------|------------|
| β1-β2 | -0.206 | [-0.394, -0.017] | β1 > β2 |
| β1-β3 | -0.249 | [-0.444, -0.005] | β1 > β3 |
| β2-β3 | -0.043 | [-0.248, 0.185] | β2 ≈ β3 |
| β4-β5 | 0.122 | [-0.051, 0.304] | β4 ≈ β5 |
| β4-β6 | 0.457 | [0.251, 0.643] | β4 > β6 |
| β5-β6 | 0.335 | [0.153, 0.505] | β5 > β6 |

Table 6
Mediation Analysis.

| Mediation path | Indirect effect | 95% BC-CI |
|---|-----------------|-----------------|
| Punishment severity→Opportunism→Performance M ₁ | 0.061 | [0.008, 0.138] |
| Punishment speed→Opportunism →Performance M ₂ | 0.030 | [0.003, 0.084] |
| Incentive toward sellers→Opportunism→Performance M ₃ | 0.023 | [0.001, 0.065] |
| Severity→Trust→Performance M ₄ | 0.114 | [0.045, 0.203] |
| Speed→Trust→Performance M ₅ | 0.081 | [0.026, 0.160] |
| Incentive toward buyers→ Trust→Performance M ₆ | -0.012 | [-0.057, 0.024] |

platform performance with observed indirect effects of 0.030 ([0.003, 0.084]) and 0.081 ([0.026, 0.160]), respectively, supporting H5b and H11b. In addition, opportunism mediates the effect of incentives toward sellers on platform performance with observed indirect effects of 0.023 (95% CI [0.001, 0.065]), supporting H6. Trust mediates the influence of incentives toward buyers on platform performance with observed indirect effects of -0.012 (95% CI [-0.057, 0.024]); therefore, H12 was not

supported. These results indicate that most of the indirect effects are significant except that between incentives toward buyers and platform performance through buyers' trust in platform. A possible explanation is that incentives toward buyers may attract buyers to the platform, but this does not mean that buyers trust it.

5.1. Robustness analysis

To check the robustness of the results, we conducted additional analyses. First, we compared the indirect effects to identify which are more effective (e.g., Wang, Zhao, & Voss, 2016). There are three mediation paths through sellers' opportunism. The results in Table 7 show that punishment severity has the greatest effect on platform performance through decreasing sellers' opportunism (D_{M1-M2} = 0.031, [0.002, 0.091]; D_{M1-M3} = 0.038, [0.001, 0.111]). The effects of punishment speed and incentive toward sellers on platform performance via opportunism are not significantly different (D_{M2-M3} = 0.007, [-0.024, 0.059]). Similarly, there are three paths through buyers' trust. The comparison results indicate that both punishment severity and speed have greater effects on performance though increasing buyers' trust than incentives toward buyers (D_{M4-M6} = 0.126, [0.049, 0.244]; D_{M5-M6} = 0.093, [0.029, 0.196]). However, the influences of punishment severity and speed are not significantly different (D_{M4-M5} = 0.033, [-0.011, 0.099]). These results are consistent with the previous results.

Second, we used the indicator f^2 to compare the effect sizes (Gefen & Pavlou, 2012) of punishments and incentives on curbing sellers' opportunism and building buyers' trust. As Tables 8 and 9 shows, punishment severity has a greater influence on sellers' opportunism than punishment speed and incentives toward buyers, but the effects of punishment speed and incentives toward sellers are not significantly different. For building buyers' trust in a platform, punishment severity and speed both have greater effects than incentives toward buyers, and their difference is not significant.

Third, we excluded some variables to re-estimate the effects of the independent variables in different models (e.g., Johnen & Schnittka, 2019). Specifically, we considered the effects of the severity of punishment of sellers, the speed of punishment of sellers, and incentives for sellers on sellers' opportunism on the platform and platform

Table 7
Comparison of Indirect Effects.

| D _M | Point estimation | 95% BC-CI | Conclusion |
|--------------------|------------------|-----------------|------------|
| D _{M1-M2} | 0.031 | [0.002, 0.091] | M1 > M2 |
| D _{M1-M3} | 0.038 | [0.001, 0.111] | M1 > M3 |
| D _{M2-M3} | 0.007 | [-0.024, 0.059] | M2 ≈ M3 |
| D _{M4-M5} | 0.033 | [-0.011, 0.099] | M4 ≈ M5 |
| D _{M4-M6} | 0.126 | [0.049, 0.244] | M4 > M6 |
| D _{M5-M6} | 0.093 | [0.029, 0.196] | M5 > M6 |

Table 8
Values of f^2 .

| Path | f^2 |
|--|-------|
| Punishment severity→Opportunism f_1^2 | 0.210 |
| Punishment speed→Opportunism f_2^2 | 0.050 |
| Incentive toward sellers→Opportunism f_3^2 | 0.030 |
| Punishment severity→Trust f_4^2 | 0.220 |
| Punishment speed→Trust f_5^2 | 0.114 |
| Incentive toward buyers→Trust f_6^2 | 0.002 |

Note: $f^2 = (R_{include}^2 - R_{exclude}^2)/(1 - R_{include}^2)$.

Table 9
 f^2 Comparison.

| Comparison | Δf^2 | 95% BC-CI | Conclusion |
|-----------------|--------------|-----------------|-----------------------|
| $f_1^2 - f_2^2$ | 0.160 | [0.013, 0.389] | $f_1^2 > f_2^2$ |
| $f_1^2 - f_3^2$ | 0.180 | [0.009, 0.421] | $f_1^2 > f_3^2$ |
| $f_2^2 - f_3^2$ | 0.020 | [-0.089, 0.134] | $f_2^2 \approx f_3^2$ |
| $f_4^2 - f_5^2$ | 0.106 | [-0.058, 0.281] | $f_4^2 \approx f_5^2$ |
| $f_4^2 - f_6^2$ | 0.218 | [0.106, 0.377] | $f_4^2 > f_6^2$ |
| $f_5^2 - f_6^2$ | 0.112 | [0.027, 0.259] | $f_5^2 > f_6^2$ |

performance. The results showed that the severity of punishment of sellers ($\beta = -0.403, p < 0.001$), the speed of punishment of sellers ($\beta = -0.197, p < 0.01$), and incentives for sellers ($\beta = -0.152, p < 0.05$) were significantly and negatively related to sellers' opportunism on the platform. In addition, we found that the severity of punishment of sellers had a greater effect on sellers' opportunism and platform performance than did punishment speed ($\Delta\beta = -0.206$, 95% BC-CI [-0.403, -0.016]) and incentives for sellers ($\Delta\beta = -0.251$, 95% BC-CI [-0.443, -0.006]). The speed of punishment of sellers did not differ from incentives for sellers in curbing sellers' opportunism on the platform ($\Delta\beta = -0.045$, 95% BC-CI [-0.246, 0.185]). We also found significant indirect effects of the severity of punishment of sellers ($M = 0.074$, 95% BC-CI [0.014, 0.162]), the speed of punishment of sellers ($M = 0.036$, 95% BC-CI [0.005, 0.093]), and incentives for sellers ($M = 0.028$, 95% BC-CI [0.003, 0.079]) through reducing sellers' opportunism on the platform.

Additionally, we examined the effects of the severity of punishment of sellers, the speed of punishment of sellers, and incentives for buyers on buyers' trust in the platform and platform performance. The results showed that seller punishment severity ($\beta = 0.414, p < 0.001$) and speed ($\beta = 0.293, p < 0.001$) were significantly and positively related to buyers' trust in the platform, but incentives for buyers were not ($\beta = -0.042, p > 0.05$). Additionally, we found that seller punishment severity ($\Delta\beta = 0.456$, 95% BC-CI [0.255, 0.641]) and speed ($\Delta\beta = 0.335$, 95% BC-CI [0.160, 0.510]) were more effective than incentives for buyers in improving buyers' trust in the platform. However, their effects were not significantly different ($\Delta\beta = 0.121$, 95% BC-CI [-0.048, 0.303]). We also found significant indirect effects of seller punishment severity ($M = 0.136$, 95% BC-CI [0.069, 0.221]) and speed ($M = 0.096$, 95% BC-CI [0.036, 0.178]) through improving buyers' trust in the platform, but the indirect effect of incentives for buyers ($M = -0.014$, 95% BC-CI [-0.063, 0.028]) was non-significant.

Generally, all of the results were consistent with our previous analysis, suggesting that our results were robust.

6. Discussion

Although B2B e-commerce marketplaces have played an important role in facilitating economic growth, the study of how to manage such online platforms using governance mechanisms has just begun (Grewal et al., 2010). This study explores the influences of punishments and incentives employed by B2B platforms on sellers' opportunism toward platform, buyers' trust in platform, and platform performance. The empirical results support most of our hypotheses and provide theoretical

and practical implications.

6.1. Theoretical implications

By exploring how B2B e-commerce platforms use governance mechanisms to improve performance, this research provides theoretical contributions to the literature on B2B platforms and governance mechanisms.

First, this study sheds new light on B2B platform literature. With their increasing popularity and rapid development, B2B platforms have been widely studied by scholars. Most of this research examines how B2B platforms improve performance by exploring the effects of marketing strategies, such as advertising (e.g., Lee et al., 2018), customer orientation (e.g., Chakravarty et al., 2014), value co-creation practices (e.g., Hein et al., 2019), and the like. Little research has explored how platform governance influences platform performance. Because most studies focusing on governance issues have been conducted in the context of traditional offline dyadic interfirm relationships (e.g., Antia et al., 2006; Antia & Frazier, 2001; Kashyap et al., 2012; Obadia et al., 2015; Wang et al., 2013), the effectiveness of governance mechanisms in the B2B platform context are unknown. To address that shortfall, this study conceptualized the rapidly emerging, two-sided B2B e-commerce platform that includes buyers, sellers, and a platform firm as a novel distribution channel (Watson et al., 2015) and explored how the platform uses governance mechanisms to manage sellers and buyers and improve performance. This triadic perspective provides a comprehensive understanding of the effectiveness of governance mechanisms in B2B platforms and enriches the B2B platform literature.

Second, this study contributes to the literature on punishment mechanisms that play an important role in governing interfirm relationships. Although previous studies have proved that punishment is an effective governance mechanism, most studies have only examined the effect of punishment severity in traditional interfirm relationships (e.g., Antia & Frazier, 2001; Kashyap & Murtha, 2017; Xiao et al., 2019). Studies that incorporate the speed dimension of the punishment mechanism and examine how it works are still rare. Punishment speed is an important dimension of punishment and needs to be explored (Antia et al., 2006). Responding to the call by Antia et al. (2006), we explore the effects of punishment severity and speed on sellers' opportunism toward platform and buyers' trust in platform. In particular, we examine the magnitude of the effects of punishment severity and speed and compare them. Therefore, this study makes a new contribution by addressing the significant role of punishment speed and revealing the differing effects of punishment severity and speed on sellers' opportunism toward platform and buyers' trust in platform, thus deepening our understanding of the punishment mechanism in the B2B platform context.

Third, this research contributes to the literature on incentive mechanisms by exploring the effects of different motivating objects simultaneously. Incentives are an important governance mechanism that have been examined in many research areas (e.g., Gilliland & Bello, 2001; Kashyap et al., 2012; Kim & Lee, 2017; Zhang et al., 2012), and their effects are widely recognized. However, the effects of the incentive mechanism in B2B platforms, which includes two incentive objects (sellers and buyers), were still unclear. To expand the understanding of incentives, we explored the effects of platform's incentives toward for sellers and buyers. Our findings offer new insights and expand our understanding of the incentive mechanism in the B2B platform context.

Fourth, this research offers novel insights into the literature on governance mechanisms by comparing the differential effects of punishments and incentives on curbing opportunism and building trust. Although prior studies have shown that both punishments (Antia et al., 2006; Wang et al., 2013; Xiao et al., 2019) and incentives (Gilliland & Bello, 2001; Kashyap et al., 2012; Kim & Lee, 2017) are effective mechanisms for governing interfirm relationships, little effort has made to compare their effectiveness. To capture the differences between

punishments and incentives, we first compare the relative significance of punishment severity and speed toward sellers, and incentives toward sellers on suppressing sellers' opportunism. Then, we examine the relative importance of punishment severity and speed toward sellers, and incentives toward buyers on building buyers' trust in platform. The findings deepen our understanding of the differences between punishments and incentives. In addition, this study offers a new perspective for academics to explore the influence of governance mechanisms.

6.2. Practical implications

Through an exploration of how punishments and incentives may affect platform performance, this research offers implications for platform managers' use of governance mechanisms.

First, it is critical for platforms to realize that punishment not only affects sellers but also generates a spillover effect that influences observing buyers. Platform owners and managers should note that punishment severity and speed are generally effective governance mechanisms and have dual effects: they can be used to curb sellers' opportunism toward platform and increase platform performance, and they can be used to improve platform performance through building buyers' trust in platform. Thus, platforms should severely punish sellers that violate rules and standards. Specifically, platforms should take punishment measures, such as warnings, rectification, credit score deduction, store closure, fines, and/or termination of the seller relationship, to punish violating sellers. In addition, the platform manager should realize that punitive measures should be conducted timely. Platforms must quickly examine and judge a seller's behavior when a buyer complains and quickly decide whether to punish the seller. Platforms should use telephone, email, or the platform system to inform sellers of the punishment decision as soon as possible.

Platforms should also inform buyers of the punitive action taken. Specifically, platforms should release the punitive information on the front page of the platform or in the platform community. By announcing a violating seller's information, the platform not only sends a positive message to buyers that the platform protects them but also sends a message to sellers that it regulates sellers' behavior, reducing their motivation for opportunism.

Second, our results indicate that incentives toward sellers can effectively suppress sellers' opportunism toward platform, but incentives toward buyers cannot improve buyers' trust in platform. Thus, platforms should carefully consider incentive objectives. If a platform wants to curb sellers' opportunism, incentives are effective. Specifically, platform managers can offer sellers extra incentives, such as free membership, privileges to participate in platform promotions, or a competent seller label, to decrease sellers' motivation to engage in behavior that violates the platform's rules and standards. If a platform wants to build buyers' trust in platform, incentives toward buyers are not effective approaches.

Third, based on our findings, both punishments and incentives toward sellers are effective governance mechanisms for reducing sellers' opportunism toward platforms, and punishment severity has a greater effect than punishment speed. Compared with incentives toward sellers, punishment severity is more effective in curbing sellers' opportunism toward platform, but the effect of punishment speed is not significantly different from that of incentives toward sellers. These findings suggest that punishment severity toward sellers should be a platform's first choice for reducing sellers' opportunism. Managers should take tough and strict punitive actions against sellers that engage in any violating or opportunistic behavior. In addition, managers should also execute punishments quickly and offer seller incentives to reduce seller opportunism.

We also found that both punishment severity and speed toward sellers have greater effects than incentives on building buyers' trust in platform, and those buyer incentives cannot significantly increase buyers' trust in platform significantly. These results imply that to build

buyers' trust in platform, platforms must use punishment severity or speed to manage seller behavior. That is, platforms should take hard punishment measures to regulate sellers' opportunistic behavior. In addition, platforms should improve monitoring capacity and respond to seller opportunistic behavior quickly. Furthermore, it is important to note that incentives toward buyers may attract buyers to the platform, but they do not build buyers' trust in platform. Establishing rules and mechanisms to protect buyers' transaction security is the best way to build buyer trust.

6.3. Limitations and directions for future research

Despite the important implications of our research, it has several limitations. First, we examined our conceptual model using cross-sectional survey data from China. Future research could collect longitudinal data to validate and extend our research findings. It could also test our conceptual model under other cultural conditions to strengthen the external validity of the research results, as buyers and sellers in non-Chinese cultures could have different responses to platform punishments and incentives than the buyers and sellers examined in our study. Second, this research contributes to the reputation literature by examining the signaling effect of the platform's punishments toward sellers. Future research could explore how platforms develop their reputations by managing sellers and buyers. Third, consistent with previous B2B platform research (Chakravarty et al., 2014; Grewal et al., 2010), we collected data from B2B platforms. However, online B2B marketplaces include both sellers and buyers, forming triadic relationships. Future studies could offer new findings based on triadic datasets. Fourth, this study explored only the effects of the severity and speed of punishment toward sellers. Future research could consider the certainty of punishment of sellers, as the enforcement of such provisions could be lax. Moreover, other B2B platform-governance mechanisms, such as monitoring, contract enforcement, and third-party certification, could be explored in future research. Fifth, this research only considered buyers' trust in platform and sellers' opportunism toward platform for comparing the governance effects of incentives and punishments. In the future, studies could simultaneously incorporate both buyers' and sellers' trust or opportunism to examine the effectiveness of governance mechanisms. Finally, future research could capture platform performance using diversified measures, such as growth (return on investment and profits), and adopt a broader conceptualization of performance, exploring buyer and seller satisfaction, learning, and innovation, all of which would deepen our understanding of successful B2B platform governance.

7. Conclusion

As a two-sided market, B2B platforms must simultaneously govern relationships with both sellers and buyers, which are keys to platform performance. In this study, we explored the effectiveness of punishments and incentives on sellers' opportunism toward platform, buyers' trust in platform, and platform performance using data from 196 Chinese B2B platforms. First, we found that punishment (severity and speed) and incentive toward sellers significantly curb sellers' opportunism toward platform. In addition, we noted that punishment severity has a greater effect than both punishment speed and incentive on curbing sellers' opportunism toward platform. However, there is no significant difference between punishment speed and incentive toward sellers in reducing sellers' opportunism. Second, we found that punishment severity and speed toward sellers significantly increase buyers' trust in platform, but the effect of incentives toward buyers on buyers' trust in platform is not significant. Furthermore, both punishment severity and speed toward sellers have greater effects than incentive toward buyers on improving buyers' trust in platform, but the effects of punishment severity and speed on buyers' trust in platform are not significantly different. Third, we found that punishment (severity and speed) and

incentive toward sellers can improve platform performance by curbing sellers' opportunism toward platform. However, incentive toward buyers does not improve platform performance through increasing buyers' trust in platform; only buyers' trust in platform mediates the relationship between punishment (severity and speed) and platform performance.

Data availability

Data will be made available on request.

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