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Supply chain contagion of perk consumption: Who is more likely to be corrupted?

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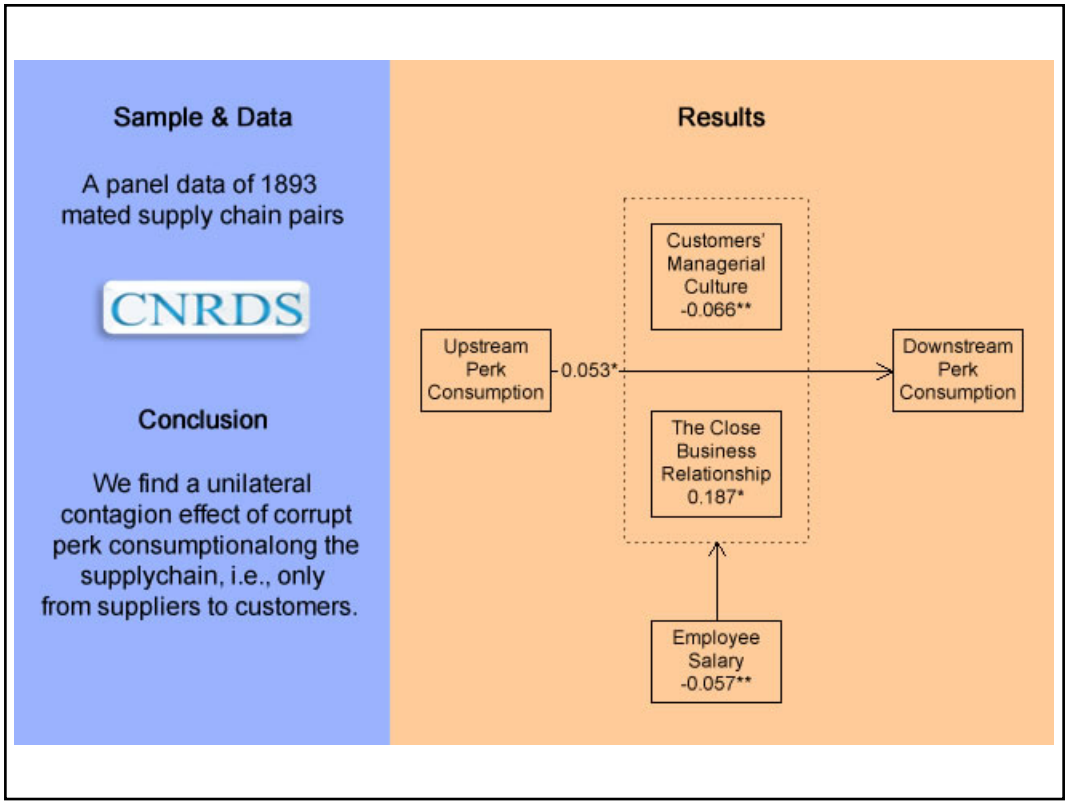
Graphical abstract



The contagion effect of managerial corruption, i.e., perk consumption, along the supply chain.

Public summary

- We find a unilateral contagion effect of corrupt perk consumption along the supply chain, i.e., only from suppliers to customers.
- To the best of our knowledge, we are the first to investigate whether and how the corrupt perk consumption of firms is influenced by their peers in the supply chain.
- Our empirical results suggest that in the supply chain, the supplier's perk consumption can positively influence that of its customers. This enhances our understanding of the determinants of managerial perk consumption.

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Abstract: The contagion of interfirm behaviours along the supply chain has become a significant issue for both supply chain management and the internal governance of firms within the supply chain. By means of panel data of 1893 mated supply chain pairs collected from Chinese listed firms, we examine the supply chain contagion effect of corruption-related perk consumption by investigating whether firms' perk consumption is influenced by their supply chain peers. We find a unilateral contagion effect of corrupt perk consumption along the supply chain, i.e., only from suppliers to customers. We suggest that suppliers exert this unilateral contagion effect by influencing customers' managerial culture and the close business relationship between them. In addition, the unilateral contagion effect would be weakened when customers have a high level of employee salary.

Keywords: perk consumption; supply chain; contagion; corruption; peer effects

CLC number: C93 **Document code:** A

1 Introduction

Along with the advancement of modern technology, the interactions between the upstream and downstream firms of the supply chain have been largely facilitated, such that the supply chain has been woven into an interfirm network[1]. The tight interactions within the supply chain can not only promote production and supply chain coordination but can also drive the propagation of many behaviors, such as information, knowledge sharing, and innovation activities[2, 3]. Both upstream and downstream firms act by imitating or being affected by the behaviors of their supply chain peers, which is known as supply chain contagion[4]. The emerging literature has investigated the contagion effect of various activities along the supply chain[5–7], suggesting the existence of the supply chain contagion effect, as well as the significance of studying this topic.

In this paper, we aim to investigate the contagion effect of managerial corruption, i.e., perk consumption, along the supply chain. Corruption is seen as a significant threat to the sustainability of supply chain management[8, 9] but is largely ignored and poorly understood in the supply chain context [10, 11]. In the literature, managerial corruption has been mainly focused on perk consumption, such as entertainment, club memberships, yachts, and jets. We argue that the corrupt perk consumption of the entities in the supply chain positively influences that of supply chain peers through at least two channels. The first channel is managerial culture. Perk consumption of a focus firm's can corrupt its supply chain peer's internal managerial culture. For instance, after knowing the peer's managers enjoy high traveling standard, managers will feel envious and be tempted by goading their firms into raising their perk consumption. The second channel is the business connection. Intuitively, when a focus firm has a close relationship with its supply chain peer, both the formal and informal interactions between them would be more frequent. This provides a window to enhance the mutual observation and imitation of corrupt consumption behaviors between them, resulting in a positive contagion effect of perk consumption.

The significance of identifying the contagion effect of perk consumption along the supply chain lies in achieving the sustainability of supply chain management. The original intentions of perk consumption mainly focus on serving firm operations and value growth. However, perk consumption in reality usually gives rise to ethics problems and is often recognized as an aspect of corrupt behaviors, which will create a bad atmosphere within the firm, thereby leading to employees' counterproductive behaviors and damaging firm value[12]. If such corrupt perk consumption can propagate along the supply chain, it will enhance transaction costs within the supply chain and ultimately harm the sustainability of the supply chain relationship in the long run. Overall, the contagion of corrupt perk consumption can cause interfirm governance concerns in supply chain management. Hence, studying the contagion effect of perk consumption along the supply chain can not only deepen the understanding of the antecedents of perk consumption from the perspective of supply chain relationships but also help improve supply chain governance and facilitate sustainable supply chain management.

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This paper makes contribution to several streams of the literature. First, we contribute to the literature on supply chain contagion by linking it to corrupt perk consumption. Over the past decade, an emerging stream of literature has focused on the contagion phenomenon along the supply chain. For instance, Ref. [6] revealed that there exists a unilateral effect on corporate social responsibility from customers to their suppliers; Ref. [5] suggested that the leverage of suppliers is positively affected by that of their major customers; and Ref. [13] indicated that suppliers' cash holding is positively influenced by that of their major customers. However, little is known about the contagion effect of unethical behaviors along the supply chain. To the best of our knowledge, we are the first to investigate whether and how the corrupt perk consumption of firms is influenced by their peers in the supply chain.

Second, we add to the literature on the corrupt perk consumption of firms. The existing studies on perk consumption have focused on its consequences, such as firm performance (e.g., Cheng et al.[14]) and stock price risk (e.g., Xu et al.[15]), and relatively few studies have concentrated on its antecedents, which mainly paid attention to executive-level characteristics (e.g., He et al.[16]). The literature has largely neglected how firms' supply chain peers, as important stakeholders, can affect their corrupt perk consumption. Our empirical results suggest that in the supply chain, the supplier's perk consumption can positively influence that of its customers. This enhances our understanding of the determinants of managerial perk consumption.

Finally, we make contributions to the ongoing literature on sustainable supply chain management. The supply chain relationship is one of the most widespread and important social connections in the economy[17], such that maintaining the sustainability of the supply chain relationship has been a broadly concerned topic for both scholars and practitioners[18]. Over the past two decades, the literature has consistently focused on the positive outcomes and driving forces of sustainable supply chains while ignoring the unethical factors that can undermine the sustainability of supply chains[10]. Corrupt perk consumption might cause interfirm "birds of a feather" and collusion within the supply chain, which is a high risk to supply chain sustainability. Hence, identifying the contagion effect of corrupt perk consumption along the supply chain will contribute to deepening how we can disrupt this contagion to promote supply chain sustainability.

The remainder of this paper is organized as follows. Section 2 reviews the related literature and develops our hypothesis regarding the supply chain contagion of perk consumption. Section 3 describes the sources and processes of our data collection and variable measurements, with descriptive statistics of the variables. Section 4 reports the empirical results and robustness checks. Section 5 conducts additional analyses, including mechanism validations and heterogeneity analyses. Finally, Section 6 concludes and discusses our findings.

2 Related literature and hypothesis development

2.1 Supply chain contagion

Over the past decade, interfirm social interactions have been largely investigated, e.g., the economic literature used terms such as peer effects, peer influences, and neighborhood effects to embody the interrelated behaviours among firms in a certain group[19]. In the field of supply chain research, such social interaction of interfirm behaviors is known as supply chain contagion[4] or propagation effects[20]. Ref. [4] defined supply chain contagion as "the propagation of interfirm behaviors from one dyadic relationship to an adjacent dyadic relationship within the supply chain"; that is, the behaviors of firms are, wittingly or unwittingly, imitated or influenced by their peers within the supply chain.

The underlying principles of supply chain contagion of interfirm behaviors may be multifold. For instance, from the perspective of social norms, a firm likes to behave the same as its peers within the supply chain[21], seeming like to make them appear to be "birds of a feather". Firms believe that similar behaviour patterns get them closer to each other, positively advancing supply chain coordination[4]. Social learning theory argues that firms tend to mimic the actions of their peers because they are risk averse[22]. They deem that following peers' actions can reduce potential unknown risk. Similarly, in the supply chain, firms often behave by learning from the behaviors of their upstream and downstream peers to reduce the detrimental impacts of asymmetric information.

As a result, due to the mutual imitation of behaviors between firms, supply chain contagion may have significant effects on not only supply chain coordination and relationship governance between firms but also internal governance and strategic decisions of those firms within the supply chain[23, 24]. It hence has received increasing concerns such as innovation diffusion[23] and financial policies[25] in the field of supply chain management. To date, the literature on the contagion effect of the supply chain has mainly focused on the contagion effect brought about by the risk of stock price collapse, supply chain default, supply chain financing, etc.[26–28] However, interfirm contagion effects of immoral or counterproductive behaviors along the supply chain, especially its empirical evidence, have rarely been studied. The contagion of unethical behaviors may increase moral hazard within the supply chain and finally decrease supply chain coordination and even damage the sustainability of supply chain relationships. Thus, exploring how unethical behaviors propagate along the supply chain is of great significance for many aspects, such as corporate governance and sustainable supply chain management.

2.2 Perk consumption and corruption

The service objects of perk consumption are different between Western and Chinese companies. In Western companies, a perk is a type of nonmonetary compensation that is seen as a component of the executives' pay package[29]. This implies that perks are special benefits for only top executives. Common examples of executives' perk consumption include chauffeur-driven cars, club memberships, entertainment, and even yachts or jets[12]. In Chinese firms, a perk consumption is a kind of managerial expense, such as traveling, hospitality, and entertainment expenditures that are reimbursed by managers at all levels, including top executives[30], which is used to build social and relational capital with government, clients

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and suppliers[31].

Although there exist differences in the connotations of perk consumption between Western and Chinese business rules, the literature based on data from different cultural backgrounds view perk consumption consistently. There are two competing viewpoints on perk consumption. The optimal contract argument advocates the use of perk consumption to motivate managers' satisfaction and productivity, arguing that it has a positive effect on firm value. However, the more widespread concerns in both practice and academia are the ethics and moral hazard behind perk consumption.

Insufficient corporate governance would induce managers to consume perks irrationally and provide breeding grounds for corruption. For instance, Ref. [31] used entertainment (e.g., eating, drinking, gifts) and travel expenditures as a measure of corruption in Chinese firms because managers may often misuse perk consumption for their private interests[12, 14], e.g., establishing their own social ties, and even reimburse "for almost any kind of entertainment and travel for any purpose, often with fake or inflated receipts"[31]. More seriously, the corrupt behaviours of managers will give rise to a bad atmosphere within the firm. It hereby largely decreases employees' enthusiasm and catalyzes their counterproductive behaviours (e.g., shirking and fraud)[32], finally destroying the firm's value. As a result, perk consumption has become a worldwide concern for regulators, policy makers and shareholders in different cultural contexts[29].

2.3 The contagion of corrupt perk consumption along the supply chain

As we argued above, although the original intention of perk consumption aims to serve business operations, superfluous managerial perk expenses, especially in corrupt entertainments and travel costs, may have a negative demonstration effect on their supply chain peers. Thus, we argue that the corrupt perk consumption of the entities in the supply chain positively influences that of supply chain peers through the following channels. First, a focus firm's perk consumption can corrupt its supply chain peer's internal managerial culture, leading its peer's managers to increase perk consumption. The supply chain relationship requires continuous social interactions between the upstream and downstream firms' managers, such that they can observe the corporate governance and managerial culture of each other. When managers observe that their supply chain peers' managers enjoy superfluous perquisites, they may use this as a reference to persuade shareholders to increase their own perks. For instance, it can be imagined that when learning their peers' managers are flying first class for business trips, managers will feel envious and be tempted by goading their firms into raising their travelling standards, leading to increased perk consumption.

Second, a focus firm's perk consumption can have a contagious influence on that of supply chain peers through the close business connection. Both the formal and informal interactions between the upstream and downstream firms' managers would be enhanced if there is a close supply chain relationship between them. It can promote mutual trust and acceptance between them, causing interfirm "birds of a feather" within the supply chain, which in turn facilitates the learning and imitation of corrupt behaviours between them. This could also cause the positive contagion effect of corrupt perk consumption along the supply chain.

As a whole, although we argue that there might exist a contagion effect of corrupt perk consumption along the supply chain, we cannot claim the direction of such a contagion effect. Thus, we propose the following null hypothesis:

H0: There does not exist a supply chain contagion effect of perk consumption; that is, perk consumption of the downstream firm cannot be influenced by that of the upstream firm, and vice versa.

3 Data and variables

3.1 Data collection

Considering the data accessibility, our sample consists of a set of Chinese supply chain pairs in which both the upstream and downstream firms are publicly listed. Since 2007, the Chinese Securities Regulatory Commission (CSRC) has required listed firms to disclose at least aggregate procurement and sales proportions of the top five suppliers and customers, respectively. Then, in 2011, the CSRC further required firms to disclose detailed proportions of each of the top five suppliers and customers and advocated that they provide more information, such as the names of the top five suppliers and customers. These requirements give us the data sources to build supply chain relationships between listed firms.

The processes of data collection are as follows. First, we collected detailed information on the top five suppliers and customers of all listed firms in China from 2003 to 2018 from the Chinese Research Data Services (CNRDS) database, which is an emerging academic database in China. Second, we removed suppliers and customers that are innominate or unlisted and determined nonrepetitive mated supply chain pairs in which both the upstream and downstream firms are publicly listed in domestic stock exchanges. Third, we acquired the data of all these mated firms' characteristics, such as located city, total assets, employee-related information and detailed terms of perk consumption, from other sub databases of CNRDS. Finally, we obtained a panel sample with 1893 mated supply chain pairs from 2010 to 2018.

3.2 Variable measurements

Perk consumption. In the annual reports of Chinese listed firms, major voluntarily disclosed terms of perk consumption include hospitality and entertainment expenses, travelling expenses, office allowances, board of directors' expenses, conference expenses, and transportation expenses. Given that we focus on the concerns regarding potential corruption behind managerial perk consumption, we follow the work of Cai et al.[31] and use the total hospitality and entertainment expenses and travelling expenses as the amount of perk consumption. For those firms that did not disclose the above expense terms, we treat the firm's perk consumption as missing data. Furthermore, as most prior studies did, to rectify the overdispersion in perk expenditures between large and small firms, we employ the ratio of the above total amount to total revenues, rather than the absolute total amount, to measure the level of perk consumption (e.g., Cheng et al.[14]; Ting & Huang[30]).

Control variables. First, we control for a set of firm char-

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acteristics that are likely to be related to perk consumption. We control for firm scale, measured by total assets (*Asset*) and the number of employees (*Employees*). Both variables are calculated using the natural logarithm of their values plus one. We also control for firm profitability, measured by return on average assets (*ROAA*). We further control the salary level of employees (*Employee salary*) and the vertical pay gap (*Pay gap*) between the top executives and average employee salary. Underpaid salary can cause low-level managers' perceptions of unfairness, probably leading to their unethical behaviours, including corruption, to offset their inner dissatisfaction, especially when the firm has a steep vertical pay gap. In addition, the pay gap can also indirectly reflect the number of firms' management hierarchies, which may have a direct influence on the amount of perk expenditures. We use a dummy variable control for firm ownership (*Ownership*), which equals one if the firm is state-owned; otherwise, it equals two. We control for the capacity of firm governance by using the ratio of independent directors on the board (*Independent director ratio*) and the duality of CEOs (*CEO duality*), which equals one if the firm's CEO also serves as the chairman of the board; otherwise, it equals two.

Second, we control for a set of characteristics that are related to the supply chain relationship. Considering that geographic distances are likely to play an important role in social interactions between upstream and downstream firms[33], we control for geographic distances (*Distances*) between cities in which upstream and downstream firms are located. Geographic distances are calculated as the natural logarithm of diameter distances between cities plus one, such that it equals zero if the firms are located in the same city. Furthermore, based on the work of Ref. [4], we use two dummy variables, *Relationship_C* and *Relationship_S*, to control for the strength of the relationship between upstream and downstream firms in a mated supply chain pair. *Relationship_C* equals one if the downstream firm is listed as one of the upstream firm's top five customers; otherwise, it equals zero. *Relationship_S* equals one if the upstream firm is ranked as one of the downstream firm's top five suppliers; otherwise, it equals zero.

Finally, we control for industry fixed effects and year fixed effects in all regression models. Industry codes consist of a letter plus a two-digit number, referring to the commonly used criterion that was issued by the CSRC in 2012. Table 1 reports the descriptive statistics of the above variables.

4 Baseline analyses

4.1 Baseline regression model

Following Ref. [6], we use the following baseline regression models to estimate the contagion effect of innovation investment along the supply chain:

$$\begin{aligned} &Downstream\_perk\_consumption = \beta_0 + \\ &\beta_1 Upstream\_perk\_consumption + \beta_2 Controls + \\ &\sum Ind + \sum Year + \varepsilon, \end{aligned} \tag{1}$$

$$\begin{aligned} &Upstream\_perk\_consumption = \gamma_0 + \\ &\gamma_1 Downstream\_perk\_consumption + \gamma_2 Controls + \\ &\sum Ind + \sum Year + \varepsilon, \end{aligned} \tag{2}$$

where $Downstream\_perk\_consumption$ and $Upstream\_perk\_consumption$ are the corrupt perk consumption of the downstream and upstream firms, which have been defined above,

Table 1. Description statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Upstream_perk_consumption	1200	0.0032	0.0041	0.0000	0.0557
Downstream_perk_consumption	1384	0.0042	0.0067	0.0001	0.1109
Downstream firm-level characteristics					
Asset	1893	23.1621	1.8594	17.3882	28.5087
Employees	1893	8.7157	1.6061	2.9444	13.2228
ROAA	1893	0.0411	0.0508	-0.3878	0.3700
Employee salary	1876	11.4974	0.5524	9.3148	15.0079
Pay gap	1865	9.1943	11.8873	0.2859	101.2449
Ownership	1893	1.3930	0.4886	1.0000	2.0000
Independent director ratio	1893	0.3062	0.1557	0.0000	0.6667
CEO duality	1893	1.8188	0.3853	1.0000	2.0000
Upstream firm-level characteristics					
Asset	1893	22.4707	1.6924	16.1167	28.5087
Employees	1893	8.1148	1.5799	2.8332	13.2228
ROAA	1893	0.0468	0.2512	-1.5584	7.2493
Employee salary	1,884	11.3849	0.5221	9.2498	15.3379
Pay gap	1878	6.6025	6.1566	0.1758	77.3121
Ownership	1,893	1.4702	0.4992	1.0000	2.0000
Independent director ratio	1893	0.3079	0.1520	0.0000	0.8000
CEO duality	1893	1.7734	0.4188	1.0000	2.0000
Pair characteristics					
Distances	1893	5.4667	2.4831	0.0000	8.1598
Relationship_C	1893	0.5843	0.4930	0.0000	1.0000
Relationship_S	1893	0.3471	0.4762	0.0000	1.0000

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respectively. *Controls* is a vector that contains all mentioned control variables, including all the variables of supply chain pairs. Furthermore, we control for suppliers' industry fixed effect (denoted by *Ind*) and year fixed effect (denoted by *Year*). Finally, ε is a random error term.

4.2 Baseline results

Table 2 presents the baseline regression results. Model 1 examines the influence of perk consumption of the downstream firm on that of the upstream firm, while Model 2 estimates the inverse influence path. Due to the missing data of perk consumption in the panel, there are 871 and 869 observations for Models 1 and 2, respectively. The results show that perk consumption of the upstream firm has a significantly positive influence on that of the downstream firm (*coefficient*=0.058, $p<0.05$), while the inverse influence path is not statistically significant. In addition, the R-square of Model 1 exceeds 0.63. These empirical results suggest a unilateral contagion effect on corrupt perk consumption along the supply chain, only from suppliers to customers.

4.3 Robustness checks

To check the robustness of our baseline results, we employ two additional analyses. First, we add more control variables into the regression models. In the supply chain, a focus firm's behaviours may also be influenced by the characteristics of its supply chain peers, such that overlooking the peer firm's characteristics may lead to potential endogeneity concerns. For instance, in the supply chain, large-scale and well-governed firms are often preferentially chosen as customers or suppliers, and doubtlessly, those firms' behaviours are also likely to be imitated by their supply chain peers[34]. Hence, controlling for the supply chain peer's characteristics can eliminate potential estimation biases. To this end, we add the peer firm's characteristics, which are mentioned above, as the control variables into the regression models of Models 1 and 2. Table 3 presents the results after adding the peer firm's characteristics. Model 3 shows that the influence of downstream perk consumption on upstream perk consumption is still nonsignificant. Model 4 indicates that perk consumption of the upstream firm still has a positive influence on that of the downstream firm (*coefficient*=0.053, $p<0.05$). The slight changes in both the coefficient and R-square of Model 4 also suggest that the influence path from the upstream firm to the downstream firm is robust after controlling for the peer firm's characteristics.

Second, we use the industry-mean-adjusted ratio as the proxy of perk consumption. Managerial perks may vary with industrial features[35]; for instance, managers are required to travel more frequently in some industries, leading to a higher level of travelling expenses. Therefore, we use the industry-mean-adjusted perk consumption to reflect excessive managerial perks. A firm's industry-mean-adjusted perk consumption is calculated by using the firm's normal ratio of perk consumption minus the industry mean ratio (denoted by Δ*Upstream_perk_consumption* and Δ*Downstream_perk_consumption*, respectively). To ensure the validity of the industry mean ratio, we remove the industries that are less than five sample firms. The results are shown in Table 4. Following the previous analyses, we also control for supply chain peer firm characteristics. The results demonstrate that perk consumption upstream still has a significant influence on that down-

Table 2. Baseline regression results.

	Upstream_perk_consumption	*Downstream_perk_consumption*
	Model 1	Model 2
Upstream_perk_consumption		0.058*(2.60)
Downstream_perk_consumption	0.065(1.76)	
Firm-level characteristics		
Asset	−0.002***(−4.01)	0.000(-0.99)
Employees	0.000(0.78)	0.000(−1.64)
ROAA	−0.019**(−3.08)	−0.001(−0.61)
Employee salary	0.001*(2.45)	−0.001*(−2.11)
Pay gap	0.000(1.58)	0.000(0.56)
Ownership	0.001**(3.33)	0.001***(3.93)
Independent director ratio	0.000(−0.20)	0.001(0.83)
CEO duality	0.000(−0.19)	0.000(1.29)
Pair characteristics		
Distances	0.000(0.23)	0.000(0.08)
Relationship_C	0.001*(2.34)	−0.001(−1.94)
Relationship_S	0.000(−0.08)	0.001*(2.19)
Industry fixed effect	YES	YES
Year fixed effect	YES	YES
R-square	0.3910	0.6305
Obs.	871	869

[Note] *$p<0.05$, **$p<0.01$, and ***$p<0.001$. t-statistics are reported in parentheses.

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stream by using industry-mean-adjusted perk consumption as a proxy (*coefficient*=0.822, $p<0.001$). This suggests that our primary results are robust.

5 Additional analyses

5.1 Mechanism validations

In this section, we attempt to verify the aforementioned channels through which the corrupt perk consumption of suppliers influences that of their customers. First, we investigate whether suppliers positively affect the perk consumption of their customers by influencing their customers' internal managerial culture. Given that the managerial culture of listed firms is difficult to directly measure, we follow Ref. [36] and use the size of customers to indicate the difficulty that they could be influenced by their suppliers. In general, the larger a firm is, the more committed its culture is, and thus the less likely it is to be affected by its supply chain partners. To test this conjecture, we measure the size of customers by using the logarithm of their total assets and add its interaction with suppliers' perk consumption into Eq. (1). If our conjecture holds, the coefficient of the interaction term should be negative and statistically significant. The results of Model 5 indicate that the size of customers has a negative effect on the influence of suppliers' perk consumption on that of customers at the 1% significance level. This suggests that the larger the number of customers is, the less likelihood that their perk consumption will be influenced by that of suppliers. Thus, the channel through which suppliers positively affect the perk consumption of their customers by influencing their customers' internal managerial culture receives support.

Second, we test whether the close business relationship is a channel that connects the perk consumption between suppliers and customers. As we argued above, suppliers could have a positive influence on customers' perk consumption through the close business connection between them. To test this conjecture, we use *Relationship_S,* which was defined previously to indicate the close business relationship between suppliers and customers. When a supplier is ranked as one of its customers' major suppliers (e.g., top five suppliers), there is a high degree of customer dependence on this supplier, leading to more social influences by the supplier. Accordingly, we add the interaction term between *Relationship_S* and suppliers' perk consumption into Eq. (1). If our conjecture is true, the coefficient of the interaction term should be positive and statistically significant. The results of Model 6 suggest that the coefficient of the interaction term is positive at the 5% significance level. This provides support for us to reveal that close business connections are indeed an underlying channel that helps facilitate the contagion effect of perk consumption from suppliers to customers.

Table 3. Robustness check by adding control variables.

	Upstream_perk_consumption	*Downstream_perk_consumption*
	Model 3	Model 4
Upstream_perk_consumption		0.053*(2.14)
Downstream_perk_consumption	0.064(1.67)	
Upstream firm-level characteristics		
Asset	−0.002***(−4.05)	0.000(−1.15)
Employees	0.000(0.89)	0.000(0.47)
ROAA	−0.019**(−3.11)	0.003**(2.63)
Employee salary	0.002*(2.52)	0.000(1.89)
Pay gap	0.000(1.43)	0.000(−0.42)
Ownership	0.001**(3.40)	0.000(1.04)
Independent director ratio	0.000(−0.26)	0.000(−0.22)
CEO duality	0.000(−0.57)	0.000(−1.38)
Downstream firm-level characteristics		
Asset	0.001*(2.13)	0.000(−0.83)
Employees	0.000(−1.66)	0.000(−1.74)
ROAA	0.000(−0.10)	−0.002(−0.94)
Employee salary	0.000(−0.99)	−0.001*(−2.31)
Pay gap	0.000(−0.47)	0.000(−0.04)
Ownership	0.000(−0.48)	0.001***(3.82)
Independent director ratio	0.001(0.85)	0.000(0.75)
CEO duality	0.001(1.65)	0.000(1.39)
Pair characteristics		
Distances	0.000(0.31)	0.000(−0.14)
Relationship_C	0.001*(2.14)	−0.001*(−2.40)
Relationship_S	0.000(0.40)	0.001(1.83)
Industry fixed effect	YES	YES
Year fixed effect	YES	YES
R-square	0.4001	0.6406
Obs.	863	863

[Note] *$p<0.05$, **$p<0.01$, and ***$p<0.001$. t-statistics are reported in parentheses.

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Table 4. Robustness check by using industry-mean-adjusted perk consumption.

	Upstream_perk_consumption	*Downstream_perk_consumption*
	Model 3	Model 4
Δ*Upstream_perk_consumption*		0.822***(8.30)
Δ*Downstream_perk_consumption*	0.307(1.21)	
Upstream characteristics		
Asset	−0.003**(−3.13)	0.002**(3.19)
Employees	0.001(1.47)	−0.002*(−2.51)
ROAA	−0.021**(−3.25)	0.005(0.27)
Employee salary	0.003*(2.3)	0.000(−0.25)
Pay gap	0.000(0.07)	0.000(1.41)
Ownership	0.001(1.68)	0.001(0.33)
Independent director ratio	0.006(1.32)	−0.001(−0.39)
CEO duality	0.000(0.44)	0.002(0.64)
Downstream characteristics		
Asset	0.001*(2.22)	−0.001(−1.29)
Employees	−0.001(−1.79)	0.000(0.35)
ROAA	−0.001(−0.11)	−0.015(−0.99)
Employee salary	0.000(−0.67)	0.000(0.12)
Pay gap	0.000(0.05)	0.000(1.42)
Ownership	−0.002(−1.42)	0.003(1.81)
Independent director ratio	−0.003(−0.85)	0.007(0.80)
CEO duality	0.000(−0.10)	−0.001(−0.93)
Pair characteristics		
Distances	0.000(−0.91)	−0.001(−1.77)
Relationship_C	0.003(1.28)	−0.007(−1.15)
Relationship_S	0.002(0.95)	−0.005(−0.84)
Industry fixed effect	YES	YES
Year fixed effect	YES	YES
R-square	0.3885	0.3869
Obs.	858	858

[Note] *$p<0.05$, **$p<0.01$, and ***$p<0.001$. t-statistics are reported in parentheses.

5.2 Heterogeneity analyses

To identify differentiated responses of downstream firms to upstream firms, we further investigate two heterogeneity analyses. First, we investigate whether the contagion effect of perk consumption is more sensitive when the supply chain relationship is geographically proximal. A short distance between downstream and upstream firms can produce a tight connection[37], promoting their social interactions. This could significantly facilitate the interactive influences of various activities, including perk consumption, between them. We use the natural logarithm of distance in kilometers between the downstream and upstream firms as an inverse indicator to reflect the geographic proximity between them. Model 7 in Table 5 shows the result of its interaction effect with the upstream firm's perk consumption. The negative coefficient of the interaction term indicates that geographic proximity might have a positive influence on the contagion effect of perk consumption, but this is statistically insignificant. This suggests that the contagion effect of perk consumption along the supply chain is irrelevant to geographic proximity.

Second, we investigate whether downstream firms with different levels of employee salary respond differently. Intuitively, a high level of salary can generally motivate employees to generate loyalty and reduce unethical behaviours. The results of Model 8 show that the employee salary of downstream firms can significantly weaken the contagion effect of perk consumption at the significance level of $p<0.01$. This finding verifies that downstream firms with a higher level of salary are less likely to be influenced by their upstream firms in perk consumption.

6 Conclusions

This article studies the contagion problem upstream and downstream of the supply chain from the perspective of perk

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Table 5. Additional analysis results.

	Downstream_perk_consumption			
	Model 5	Model 6	Model 7	Model 8
Upstream_perk_consumption	1.572**(3.49)	0.034(1.80)	0.128*(2.10)	0.546**(3.10)
Interaction terms				
Upstream_perk_consumption × *Asset*	−0.066**(−3.45)			
Upstream_perk_consumption × *Relationship_S*		0.187*(2.19)		
Upstream_perk_consumption × *Distances*			−0.013(−1.31)	
Upstream_perk_consumption × *Employee salary*				−0.057**(−2.97)
Firm-level characteristics				
Asset	0.000(0.29)	−0.000(−1.11)	−0.000(−0.96)	−0.000(−1.06)
Employees	−0.000(−1.34)	−0.000(−1.42)	−0.000(−1.64)	-0.000(-0.27)
ROAA	−0.002(−0.79)	−0.002(−0.84)	−0.001(−0.62)	-0.002(-0.83)
Employee salary	−0.001*(−2.04)	−0.001(−2.23)	−0.001*(−2.08)	-0.001*(-2.02)
Pay gap	0.000(0.17)	0.000(0.55)	0.000(0.47)	0.000(0.28)
Ownership	0.001***(4.29)	0.001***(4.02)	0.001***(4.16)	0.001***(4.13)
Independent director ratio	0.000(0.60)	0.000(0.66)	0.001(0.81)	0.000(0.72)
CEO duality	0.000(1.00)	0.000(1.14)	0.000(1.33)	0.000(1.12)
Pair characteristics				
Distances	0.000(0.24)	0.000(0.21)	0.000(0.92)	0.000(0.14)
Relationship_C	−0.001*(−2.12)	−0.001(−1.81)	−0.001(−1.89)	-0.001*(-2.06)
Relationship_S	0.001*(2.46)	0.000(0.74)	0.000*(2.21)	0.001*(2.36)
Industry fixed effect	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
R-square	0.6391	0.6352	0.6316	0.6356
Obs.	869	869	869	869

[Note] $^{*}p<0.05$, $^{**}p<0.01$, and $^{***}p<0.001$. t-statistics are reported in parentheses.

consumption. Using panel data of 1893 mated supply chain pairs collected from Chinese listed firms, we reveal that perk consumption of the upstream firm has a significant and positive influence on that of the downstream firm, while the inverse influence path is not significant. We also considered some core factors, such as the characteristics of its peer and the industry mean-adjusted ratio, and the results show that the conclusion is robust. In addition, we demonstrate that the contagion effect of upstream firms' perk consumption on that of downstream firms occurs through influencing customers' managerial culture and the close business relationship between them. Moreover, the contagion effect of perk consumption would be weakened when downstream firms have a high level of employee salary. Our findings have significant theoretical implications for the literature on sustainable supply chain management, supply chain contagion, and managerial perk consumption.

This study has important managerial implications. First, the entities in the supply chain must pay enough attention to the contagion of unethical behaviors along the supply chain and identify its potential influences on the sustainability of the supply chain relationship to take measures to decrease its negative influences. Second, shareholders and regulators should extend corporate governance to the level of social networks such as the supply chain in which firms are embedded. Firms need to pay attention to the influence of supply chain partners who have close relationships with them on their corporate governance.

This article also has limitations. Due to data accessibility, we analyse the contagion effect of perk consumption in the context of Chinese supply chains. As we argued above, the service objects and practical embodiments of perk consumption are different between Chinese and Western firms. Hence, the generalization of our findings needs to be further verified in a cross-cultural context. Future research can check our findings and identify different underlying channels by collecting data on international supply chains and can also analyse the contagion effect of other unethical behaviors along the supply chain in the cross-cultural context.

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Conflict of interest

The authors declare that they have no conflict of interest.

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