China Economic Review 50 (2018) 240–264

Contents lists available at ScienceDirect

China Economic Review

journal homepage: www.elsevier.com/locate/chieco

# Managerial diversion, product market competition, and firm performance

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ARTICLE INFO

*Keywords:*
Executive compensation
Managerial diversion
Product market behavior
State-owned enterprises
China

*JEL classification:*
J33
G30

ABSTRACT

We derive the conditions under which a manager will divert and how managerial diversion affects product market performance and firm profits. Our model predicts that managerial diversion is more likely to occur and leads to more aggressive product market behavior in a firm with weak incentives and corporate governance. In these firms, the relation between managerial diversion and firm profits is inverse U-shaped. Chinese state-owned manufacturing firms are used to test our theoretical model, and we find supportive evidence.

## 1. Introduction

When ownership and management are separated, the incomplete nature of contracting and monitoring inevitably creates room for managerial opportunism, allowing managers to pursue their private benefits at shareholders' expense. Prior literature has examined various mechanisms through which managers may divert value from shareholders, including self-dealing, insider trading, embezzlement, perquisites, etc. (see Shleifer and Vishny (1997) for a survey). For example, Shleifer and Vishny (1997) argue that, when contracts are incomplete and managers possess more expertise than shareholders, residual rights of control are typically held by the managers, giving them enormous latitude for self-interested behavior. Hand and Rogow (1982) suggest that the imperfection of capital markets make insiders more likely to divert the firm's financial and managerial resources from productive uses and paralyze decision-making. Extending the current literature, this paper studies when managers engage in diversion and its impact on product market performance and firm profits, using a *two-stage* dynamic game model.

While conventional wisdom suggests that managerial diversion is a rent-seeking behavior that should be disapproved and regulated (Bebchuk & Jolls, 1999; Grossman & Hart, 1980; Jensen, 1986; Jensen & Meckling, 1976; Meulbroek, 1992; Shleifer & Wolfenzon, 2002), the existing literature in economics and finance has not yet reached consensus. Easterbrook and Fischel (1991), for example, suggest that managerial diversion is just another form of managerial compensation and, therefore, has no impact on shareholder value. Fama (1980) argues that managerial diversion can be a superior way to incentivize shareholder value creation, provided that its costs are lower than other forms of incentive compensation. He (2006) shows that managerial diversion may occur in equilibrium, and that such diversion may not hurt shareholders if it can incentivize the manager to exert more effort. He and Ho. (2011) argue that when monitoring is inefficient and expensive, the opportunity costs of monitoring are too high. Consequently, it is in the shareholders' best interest to omit monitoring and allow managers to divert firm resources. Congruously, Bruno and Claessens

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https://doi.org/10.1016/j.chieco.2018.04.009
Received 17 January 2017; Received in revised form 8 March 2018; Accepted 17 April 2018
1043-951X/ 

(2010) show that "over-monitoring" or a straight-jacket of many corporate governance rules can generate costs, harm managerial initiative, and lead to relatively lower returns and valuations.

Empirically, Roulstone (2003) finds that firms with more stringent rules on insider trading around quarterly earnings announcements tend to provide their executives with higher total and incentive pay, arguably to compensate managers for potential losses due to such restrictions. Using hand-collected data on perks in Chinese-listed companies, Zhang, Song, and Ding (2015) find strong empirical evidence that perks can motivate managers to work hard and, thus, add to firms' value (incentive view), which is more likely to occur in firms with moderate ownership concentration. Emphasizing the potential role of diversion as a form of compensation, this strand of literature argues that restrictions on managerial diversion are totally unnecessary.[1]

In the principal-agent framework, Bebchuk and Jolls (1999) show that, even taking into account the influence of allowing value diversion in setting managerial compensation, diversion behavior still reduces shareholder value. However, they also provide two scenarios in which managerial diversion can increase shareholder value: first, when the manager's benefits from value diversion exceed the direct costs to shareholders; second, when diversion creates strong managerial incentives to exert effort on the firm's behalf.

This paper studies managerial value diversion and its impact, focusing on product market performance and firm profits in a *two-stage* dynamic game model. In line with the traditional view that *ex ante* incentives, monitoring, and *ex post* punishment are three important mechanisms for alleviating the managerial agency problem, our model finds that managerial diversion is more likely when: (i) the incentive mechanisms are weak; (ii) corporate governance is weak and, therefore, the probability of detection is low; or (iii) *ex post* punishment is insufficiently severe to prevent managerial diversion *ex ante*.

Our theoretical analysis posits that managerial diversion creates strong incentives for managers to increase output and boost product market performance. The relation between managerial diversion and the firm's profits is inverse U-shaped. At modest levels, managerial diversion improves firm performance; however, excessive managerial diversion leads to poor firm performance. This reconciles the existing literature and emphasizes both the incentive compensation and rent-seeking roles of managerial diversion in affecting firm performance. The interaction of these positive and negative effects eventually generates an inverse U-shaped relationship between managerial diversion and firm profits.

Motivated by our theoretical model, our empirical study uses a large panel of Chinese firm-level data obtained from the Annual Industrial Companies Database (Chinese National Bureau of Statistics, NBS) to study the impact of managerial diversion on product market performance and firm profits in state-owned enterprises (SOEs). The data cover the universe of China's SOEs and all of the large- and medium-sized non-SOEs in the manufacturing sector.[2] Compared to using only public firm data, using the current data presents a more complete picture of the industry structure and allows the construction of a more accurate measure of product market performance (Ali, Klasa, & Yeung, 2009).

We believe that the Chinese SOE sample is especially suitable for testing our theory for the following reasons. First, SOEs operate under soft budget constraints, with loss-making firms often bailed out by the government. Misaligned managerial incentives and the absence of a market for corporate control reduce SOE managers' incentives to maximize firm value. The existing literature shows that, instead of maximizing firm value, SOE managers tend to pursue other objectives, such as pursuing their own benefits via managerial diversion (Meng & Perkins, 1998). Second, in the sample period we examine, most SOE managers' compensation packages are highly regulated and tied to their rank. Thus, both incentive mechanisms and corporate governance in SOEs tend to be weak, which might trigger managerial diversion, as our model suggests.[3] Our empirical results reveal managerial diversion in SOE firms to positively impact product market performance and have an inverse U-shaped impact on firm profits.

As a parallel test to support our theory, we also examine the impact of managerial diversion on product market performance and firm profits in private firms. Given that private firms in China are usually owner-run enterprises with very concentrated ownership,[4] the incentive mechanisms and the corporate governance in these firms are likely to be sufficiently strong to prevent managerial diversion behavior. This coincides with Jensen and Meckling's (1976) original agency theory, which sets the single owner-managed firm as the zero agency-cost base case. Indeed, Meng and Perkins (1998) find that private firms in China behave like profit-maximizing firms. We find that the effects of managerial diversion on product market performance and firm profits are negative in private firms.

Our study suggests that modest managerial diversion can only provide incentives for shareholder value creation in firms with weak corporate governance and managerial incentives. For firms with strong corporate governance and managerial incentives, managerial diversion is harmful for both product market competition and firm performance.

Our paper contributes to the voluminous literature on managerial diversion. Our results provide a novel explanation for why the

[1] This literature also includes Manne (1966, 1970)), Scott (1980), Easterbrook and Fischel (1982, 1991), Carlton and Fischel (1983), and Haddock and Macey (1987), among others.

[2] The large- and medium-sized non-SOE firms are defined as other manufacturing firms reporting > 5 million Yuan (approximately 600,000 US dollars) in annual sales. The same data have been used by Hsieh and Klenow (2009) and Li, Yue, and Zhao (2009).

[3] A recent example of such diversion is the case of Mr. Tonghai Chen, the ex-president of SinoPec (ranked 5th in Fortune Global 500 in 2011), who was prosecuted and convicted for accepting about RMB 200 million in bribes in 2008. It was found that, for about 10 years, Mr. Chen had taken monthly "entertainment" expenditures of over RMB 1 million from SinoPec's administrative expense account. For comparison, in 2006, the annual salary of the CFO of SinoPec Group was only RMB 446,090 RMB, or equivalently USD 60,000.

[4] According to the 2003 Survey of Chinese Private Firms conducted by The United Front Work Department of Communist Party of China Central Committee, All-China Federation of Industry and Commerce, and Chinese National Private Economy Research Association, the median ownership of the controlling shareholder was 70%. The same survey conducted in 1996, 1999, 2001, and 2006 reported that the percentages of private enterprises run by their owners were 97.2%, 96.8%, 96%, and 89.3%, respectively.

existing economics and finance literature has not yet reached consensus concerning the impact of managerial diversion on shareholder value. Instead of suggesting that managerial diversion is simply harmful or beneficial to shareholder value, we show that moderate managerial diversion serves to complement other incentive mechanisms and may positively impact firm value. However, excessive managerial diversion harms firm performance. The effect of diversion varies across firms with different incentive mechanisms, corporate governance, and extent of diversion.

The paper is organized as follows. Section 2 presents a simple quantity competition model to investigate when managers engage in diversion and its impact on product market competition and firm profits. Section 3 describes the hypotheses, data, and variables, and presents the summary statistics. Section 4 reports the empirical results. Finally, Section 5 presents our conclusions.

## 2. Managerial diversion and product market competition

In this section, we develop a simple Cournot (quantity) competition model to study when managers engage in diversion and its impact on product market competition and firm profits. The analyses outlined below address the following questions: *What are the conditions under which a manager will divert? When diversion occurs, how does it affect product market performance and firm profits?* A quantity competition model is employed based on the following arguments. First, as compared to a perfect competition model or a monopoly model that only include individual behavior, a Cournot competition model is a powerful approach to characterize the strategic interaction among firms (Singh & Vives, 1984), which is the key feature we aim to capture, i.e., firms with managerial diversion compete with firms without managerial diversion. Second, adopting a pure price competition model (e.g., homogeneous Bertrand) would lead to a paradox: a market with only two firms is enough to achieve perfect competition, a fact not easily found in the real economy (Tirole, 1988). Third, a Cournot model has the very good property of converging smoothly to the competitive outcome when the number of firms increases, yet coinciding with the standard monopoly model when there is only one firm. The Bertrand model, on the other hand, needs the introduction of sufficiently high heterogeneity in the produced goods to show similar properties (Kreps & Scheinkman, 1983). Finally, the paper's aim is to explore the impact of managerial diversion on firms' product market (output) performance, through which firm profits are influenced. Thus, the output channel underlying a Cournot competition model is more suitable.

Consider two firms, firm 1 and firm 2, competing in the same market. Both firms produce a homogenous good at the same marginal cost, with quantity outputs being $q_1$ and $q_2$, respectively. For simplicity, we normalize both firms' marginal costs to be 0. The market's inverse demand curve is given by$p = 1 - q_1 - q_2$.

While firm 2 is a typical profit-maximizing firm, the firm 1 manager may pursue private benefits by diverting corporate value to their own advantage. Following Desai, Dyck, and Zingales (2007), we assume that the firm 1 manager can divert the firm's income by exaggerating the marginal cost by $\gamma$ ($0 \le \gamma \le 1$), with the total diversion amount equal to $\gamma q_1$. Thus, $\gamma$ represents the diversion rate per unit of output. We then specify the probability, $\alpha$, that the shareholders will detect the value diversion. The monetary and/or nonmonetary penalty for diversion is modeled as proportional to the diversion amount, $\rho\gamma q_1$, with $\rho$ representing the severity of the penalty.[5]

The utility function for the firm 1 manager who engages in managerial diversion is specified as follows:

$$S_1 = (1 - \alpha)[\lambda(p - \gamma)q_1 + \gamma q_1 + f] + \alpha[\lambda(p - \gamma)q_1 + \gamma q_1 + f - \rho\gamma q_1] \tag{1}$$

which can be simplified to

$$S_1 = \lambda(p - \gamma)q_1 + \gamma q_1 - \alpha\rho\gamma q_1 + f = \lambda p q_1 + (1 - \alpha\rho - \lambda)\gamma q_1 + f \tag{2}$$

Eq. (2) specifies four components of the manager's utility function: (i) a fixed positive salary *f*; (ii) a performance-based bonus, proportional to profits (before paying the manager), $\lambda\pi_1$, where $\lambda$ ($0 \le \lambda \le 1$) is the reward rate and $\pi_1 = (p - \gamma)q_1$; (iii) an income diversion, $\gamma q_1$; and (iv) the expected diversion penalty, $\alpha\rho\gamma q_1$.[6] When $\gamma = 0$ or, equivalently, when $\lambda = 1$ and $\rho = 0$ (owner-manager), the manager's objective function is equivalent to maximizing the firm profit.

In firm 2, the manager simply maximizes firm profit:

$$S_2 = \pi_2(q_1, q_2) = (1 - q_1 - q_2)q_2 \tag{3}$$

Thus, when the firm 1 manager is also a profit maximizer, our model is reduced to a standard textbook Cournot competition model.

Given the model setup, whether managerial diversions occur in equilibrium depends endogenously on the combination of the exogenous policy parameters: the reward rate,$\lambda$, the penalty for diversion, $\rho$, and the probability of discovering the diversion, $\alpha$. In what follows, we consider a simple two-stage game:

- *Stage 1*: the firm 1 manager chooses whether to divert $\gamma q_1$ or 0.
- *Stage 2*: firms 1 and 2 compete, per the Cournot model.

The game is solved by backward induction.[7]

[5] The diversion rate, the reward rate and the detection rate are assumed to be exogenously given in the current model. In fact, by endogenizing diversion rate, reward rate and detection rate from the shareholders' angle, we can show that under some circumstances, the shareholders would tolerate the managerial diversion behavior to increase firm value, which echo the important view in law and economics literature that managerial diversion may not necessarily be harmful for shareholder value. The proof is available upon request.

[6] Here $\lambda$ can also be interpreted as the fractional ownership of the manager of firm 1, as in Desai et al. (2007).

### 2.1. Stage 2 equilibrium

Details of derivations of the price, outputs, and firm profits in the second stage *Cournot* equilibrium are presented in Appendix A. The resulting equilibrium price and quantities are as follows.[8]

$$q_1^* = \frac{\lambda + 2\gamma(1-\alpha\rho-\lambda)}{3\lambda},\ q_2^* = \frac{\lambda - \gamma(1-\alpha\rho-\lambda)}{3\lambda},\ p^* = \frac{\lambda - \gamma(1-\alpha\rho-\lambda)}{3\lambda} \tag{4}$$

The equilibrium profits can then be derived as:

$$\pi_1^* = \frac{q_1^*}{3} - \gamma q_1^* - \frac{\gamma(1-\alpha\rho-\lambda)}{3\lambda}q_1^*,\ \pi_2^* = \frac{[\lambda - \gamma(1-\alpha\rho-\lambda)]^2}{9\lambda^2} \tag{5}$$

### 2.2. Stage 1: When does managerial income diversion happen?

In this subsection, we discuss the optimization problem of the firm 1 manager who foresees the equilibrium outcome of stage 2 described in the previous subsection. Substituting the equilibrium values determined by Eqs. (4) and (5) into the utility function of the firm 1 manager, we can determine their utility in equilibrium as follows[9]:

$$S_1^{d*} = \frac{[\lambda + 2\gamma(1-\alpha\rho-\lambda)]^2}{9\lambda} + f \tag{6}$$

We, next, identify the conditions under which managerial diversion will emerge. In our model, the firm 1 manager has only two choices: to divert amount $\gamma q_1$ for their personal consumption or not to divert at all, in which case $\gamma = 0$. It is clear from Eq. (6) that the manager's utility increases with diversion only if:

$$\lambda < 1 - \alpha\rho \tag{7}$$

Hence, the firm 1 manager will divert if and only if condition (7) is satisfied, which implies that diversion is more likely to happen when either the incentive plan ($\lambda$) or corporate governance ($\alpha\rho$) are weak. Eq. (7) also suggests that, for firms that have difficulties detecting managerial diversion (low $\alpha$), a strong incentive plan (high $\lambda$) could be effective in preventing managerial diversion. Basu, Bhattacharya, and Mishra (1992), Mookherjee and Png (1995), and Acemoglu and Verdier (2000) derive similar results concerning bribery.

### 2.3. The impact of diversion on product market behavior

Next, we examine the impact of diversion on product market competition. It is clear from Eq. (4) that, when diversion condition (7) is met, $q_1$ is higher when $\gamma$ is positive. In other words, firm 1's output in the presence of diversion is always greater than that in the case of no diversion. This is because, within our model, diversion increases with output and, hence, higher output benefits the diverting manager. Our analysis, thus, predicts that, unlike a profit-maximizing manager, a manager who wants to divert corporate income will choose a higher level of output.

It is also clear from Eq. (4) that $q_2$ is lower when $\gamma$ is positive. In other words, firm 2's output declines when there is diversion in firm 1. This is because, as is standard in *Cournot* models, the firm 2 manager reacts to the firm 1 manager's behavior by reducing their output to prevent further declines in prices and profits. Since diversion by the firm 1 manager leads to increases in firm 1's output and declines in firm 2's output, firm 1's market share is larger in the presence of diversion and, more generally, increases with $\gamma$.

### 2.4. The impact of diversion on profits

In this sub-section, we consider the effect of diversion on firm 1's profits. From Eq. (5), differentiating firm 1's accounting profit, $\pi_1^{d*}$, with respect to $\gamma$, we have:

$$\frac{\partial \pi_1^{d*}}{\partial \gamma} = \frac{\lambda(1-\alpha\rho-4\lambda) - 4\gamma(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}{9\lambda^2} \tag{8}$$

which implies that the relation between firm 1's profits and $\gamma$ is inverse U-shaped. At modest levels, managerial diversion has a favorable effect on firm 1's profits, but they are reduced by excessive managerial diversion.

Intuitively, diversion can have both direct and indirect effects on the firm's profits. The direct effect of diversion is to reduce the profits by $\gamma q_1$. The indirect effect is due to two countervailing factors. On the one hand, as we established earlier, the output quantity, $q_1$, increases with diversion. On the other hand, as is clear from Eq. (4), the output price, $p$, declines with diversion, which reduces

[7] We also extend our basic model in the following two dimensions. First, we consider the case under which there are $n(\geq 2)$ firms in the market with $m(1 \leq m < n)$ firms facing the managerial diversion problem. Second, we examine an incomplete information game, in which the market demand is uncertain and such information is asymmetric between these two firms. We find that our basic findings remain unchanged. The proof is available upon request.

[8] Superscript "*" denotes equilibrium values of the variables.

[9] We use subscript $d$ to denote the case of diversion.

firm profits.

### 2.5. Discussion

Next, we discuss the preceding results. We extend the above basic model in the following four dimensions. First, we consider the case under which there are $n(\geq 2)$ firms in the market with $m(1 \leq m < n)$ firms facing the managerial diversion problem. Second, we examine an incomplete information game, in which the market demand is uncertain and such information is asymmetric between these two firms. Third, we endogenize diversion rate, reward rate and detection rate from the shareholders' angle. Finally, we examine the case of differentiated Bertrand competition.

#### 2.5.1. The number of firms

In this case, we assume that there are $n(\geq 2)$ firms competing in the same market, with $m(\geq 1)$ firms faced with the managerial diversion problem. The market's inverse demand curve is given by$p = 1 - \sum_{j=1}^{n} q_j$. The utility function for the manager of firm $i$ $(i = 1, \cdots, m)$who takes into account the income diversion is specified as follows:

$$S_i = \lambda(p - \gamma)q_i + \gamma q_i - \alpha\rho\gamma q_i + f, \, i = 1, \, \cdots, m \tag{9}$$

The remaining firms are assumed to be typical profit maximizing firms, whose manager simply maximizes his/her firm's profit:

$$S_k = \left(1 - \sum_{j=1}^{n} q_j\right) q_k, \, k = m + 1, \, \cdots, n \tag{10}$$

Following similar procedures as in the previous discussion (See Appendix B), we can show that the results concerning the conditions for managerial diversion to happen, the impact of diversion on product market performance, and the impact of diversion on profits still hold when we extend the simple two firm basic model to the case under which there are $n(\geq 2)$ firms in the market with $m$ $(1 \leq m < n)$ firms facing the managerial diversion problem.

#### 2.5.2. Incomplete information game

In this scenario, we assume that the inverse market demand function is $a - q_1 - q_2$, where $a$ is a random variable. $a$ is high $(a = a_H)$ with probability $\theta$ and low $(a = a_L)$ with probability $1 - \theta$. We then discuss the following two cases concerning information asymmetry between the two firms: (i) firm 1 knows whether demand is high or low, but firm 2 does not; (ii) firm 2 knows whether demand is high or low, but firm 1 does not.

Under case (i), the objective function of firm 1's manager in the case of high market demand is:

$$\underset{q_{1H}}{Max} \; \lambda(a_H - q_{1H} - q_2)q_1 + (1 - \alpha\rho - \lambda)\gamma q_{1H} + f \tag{11}$$

and the objective function of firm 1's manager in the case of low market demand is:

$$\underset{q_{1L}}{Max} \; \lambda(a_L - q_{1L} - q_2)q_1 + (1 - \alpha\rho - \lambda)\gamma q_{1L} + f \tag{12}$$

and the objective function of firm 2 is:

$$\underset{q_2}{Max} \; \theta(a_H - q_{1H} - q_2)q_2 + (1 - \theta)(a_L - q_{1L} - q_2)q_2 \tag{13}$$

To ensure positive outputs, we need to assume that $(2 + \theta)a_L > \theta a_H$ under case (i).

Under case (ii), the objective function of firm 1's manager is then:

$$\underset{q_1}{Max} \; \theta[\lambda(a_H - q_1 - q_{2H})q_1 + (1 - \alpha\rho - \lambda)\gamma q_1 + f] + (1 - \theta)[\lambda(a_L - q_1 - q_{2L})q_1 + (1 - \alpha\rho - \lambda)\gamma q_1 + f] \tag{14}$$

and the objective function of firm 2's manager in the case of high market demand is:

$$\underset{q_{2H}}{Max} \; (a_H - q_1 - q_{2H})q_{2H} \tag{15}$$

and the objective function of firm 2's manager in the case of low market demand is:

$$\underset{q_{2L}}{Max} \; (a_L - q_1 - q_{2L})q_{2L} \tag{16}$$

To ensure positive outputs, we need to assume that $(2 + \theta)a_L > \theta a_H$ under case (ii). After some tedious derivations, we can show the following for both cases: (i) the manager of firm 1 will divert if and only if $\lambda < 1 - \alpha\rho$; (ii) whether market demand is high or low, firm 1's market share in the presence of managerial diversion is always increasing in $\gamma$, and is higher than that of no diversion; (iii) whether market demand is high or low, the relationship between firm 1's accounting profit in the presence of managerial diversion and $\gamma$ is inverse U-shaped. Overall, our basic results remain to hold when we extend our simple model to an incomplete information game in which the market demand is uncertain and such information is asymmetric between these two firms. The detailed derivations are delegated to Appendix C.

### 2.5.3. Endogenized detection rate, reward rate, and diversion rate from Shareholders' angle

Now we explore the conditions under which the shareholders of firm 1 would not take measures to deter the managerial diversion behavior by endogenizing the detection rate, the reward rate, and diversion rate.

We first analyze the case under which the shareholders of firm 1 can endogenously determine the detection rate by exerting efforts or resources. We assume that the shareholders of firm 1 know that managerial diversion problem exists and they have to exert efforts or resources to deter such behavior. Specifically, $\alpha$, the detection probability, is postulated to be an increasing function of the shareholders' efforts exerted or resources used $e(\geq 0)$ in improving the detection likelihood of firm 1, and possesses the following properties: $\alpha = \alpha(e)$ with $\alpha(0) > 0$, $\alpha'(e) > 0$ and $\alpha''(e) < 0$. We also assume that $\lambda < 1 - \alpha(0)\rho$, i.e., if the shareholders of firm 1 do not exert efforts in improving the detection probability, the manager of firm 1 would choose to divert. Moreover, shareholders have to incur a cost when exerting efforts or using resources in improving the corporate governance of firm 1, which, without loss of generality, is assumed to be a function of their efforts that shares the following properties: $c = c(e)$ with $c(0) = 0$, $c'(e) > 0$ and $c''(e) \geq 0$. Other specifications remain the same as before.

The utility function for the manager of firm 1 who engages in managerial diversion now changes to be:

$$S_1 = \lambda[(\rho - \gamma)q_1 - c(e)] + \gamma q_1 - \alpha\rho\gamma q_1 + f \tag{17}$$

If the shareholders of firm 1 want to deter the managerial behavior, they have to choose an appropriate level of $e$ to maximize the following objective function:

$$\underset{e}{Max}\ \pi_1 = pq_1 - c(e) \tag{18}$$

We then consider the following simple three-stage game:

• *Stage 1*. The shareholders of firm 1 determine whether to exert their efforts or resources in improving the detection probability in firm 1, i.e., $e = 0$, or $e^*(> 0)$ that maximizes Eq. (A2). If $e = 0$, the game is reduced to the one we considered in the previous sections.

• *Stage 2*. The manager of firm 1 chooses whether to divert $\gamma q_1$ or 0.

• *Stage 3*. Firms 1 and 2 compete, *à la Cournot*.

We also use backward induction method to solve this game. Clearly, the analysis in the second and the third stages are nearly the same as the previous discussion, implying that the manager of firm 1 chooses not to divert if and only if $\alpha(e) \geq (1 - \lambda)/\rho$, Thus, in the first stage, if the shareholders of firm 1 choose to deter managerial diversion behavior, the optimization problem of the shareholders of firm 1 can be rewritten as:

$$\begin{aligned}&\underset{e}{Max}\ \pi_1 = pq_1 - c(e)\\ &s.t.\quad \alpha(e) \geq (1 - \lambda)/\rho\end{aligned} \tag{19}$$

Obviously, the shareholders will choose $e^*$ such that $\alpha(e^*) = (1 - \lambda)/\rho$. Together with the equilibrium outcomes in the second and the third stages, we have that the equilibrium profit of firm 1's shareholders under the case of deterring managerial diversion is $\pi_1^{e*} = \frac{1}{9} - c(e^*)$.

On the other hand, if the shareholders choose not to exert efforts to deter the managerial behavior, the nominal profit of firm 1 will be

$$\pi_1^{d*} = \frac{[\lambda - \gamma(1 - \alpha(0)\rho + 2\lambda)][\lambda + 2\gamma(1 - \alpha(0)\rho - \lambda)]}{9\lambda^2}$$

Hence, the shareholders of firm 1 choose NOT to deter managerial diversion if and only if $\pi_1^{e*} \leq \pi_1^{d*}$, which yields $c(e^*) \geq \frac{\lambda^2 - [\lambda - \gamma(1 - \alpha(0)\rho + 2\lambda)][\lambda + 2\gamma(1 - \alpha(0)\rho - \lambda)]}{9\lambda^2}$, i.e., the efforts or resources exerted are sufficiently expensive.

Now we move on to consider the following case: the shareholders of firm 1 can deter the managerial diversion behavior by raising the reward rate. We assume that before raising the reward rate, the original reward rate is $\lambda_0$ such that $\lambda_0 < 1 - \alpha\rho$, i.e., if the shareholders of firm 1 do not raise the reward rate, the manager of firm 1 would choose to divert. Thus, the game can be restated as follows:

• *Stage 1*. The shareholders of firm 1 determine whether to raise the reward rate to deter the managerial diversion behavior.

• *Stage 2*. The manager of firm 1 chooses whether to divert $\gamma q_1$ or zero.

• *Stage 3*. Firms 1 and 2 compete, *à la Cournot*.

Obviously, the equilibrium outcomes of the second and the third stages are the same as before. In the first stage, if the shareholders of firm 1 choose to deter managerial diversion behavior via raising reward rate, its optimization problem becomes:

$$\begin{aligned}&\underset{\lambda}{Max}\ (1 - \lambda)\pi_1 = (1 - \lambda)pq_1\\ &s.t.\quad \lambda \geq 1 - \alpha\rho.\end{aligned} \tag{20}$$

Clearly, the shareholders of firm 1 would choose $\lambda^* = 1 - \alpha\rho$ if they choose to deter the managerial diversion behavior. In this case, the payoff of firm 1's shareholders is $\frac{1 - \lambda^*}{9} = \frac{\alpha\rho}{9}$

On the other hand, if the shareholders of firm 1 choose not to deter the managerial diversion behavior, its payoff is $(1 - \lambda_0)\pi_1^{d*} = \frac{(1 - \lambda_0)[\lambda_0 - \gamma(1 - \alpha\rho + 2\lambda_0)][\lambda_0 + 2\gamma(1 - \alpha\rho - \lambda_0)]}{9\lambda_0^2}$. Hence, the shareholders of firm 1 choose NOT to deter the managerial diversion behavior if and only if $\frac{\alpha\rho}{9} \leq \frac{(1 - \lambda_0)[\lambda_0 - \gamma(1 - \alpha\rho + 2\lambda_0)][\lambda_0 + 2\gamma(1 - \alpha\rho - \lambda_0)]}{9\lambda_0^2}$, i.e., $\gamma \leq \overline{\gamma}$, where

$$\bar{\gamma} = \frac{-\lambda_0 + 4\lambda_0^2 + \alpha\lambda_0\rho}{4(-1 - \lambda_0 + 2\lambda_0^2 + 2\alpha\rho + \alpha\lambda_0\rho - \alpha^2\rho^2)} + \frac{1}{4}\sqrt{\frac{-9\lambda_0^2 + 9\lambda_0^3 + 26\alpha\lambda_0^2\rho - 10\alpha\lambda_0^3\rho - 16\alpha\lambda_0^4\rho - 25\alpha^2\lambda_0^2\rho^2 + \alpha^2\lambda_0^3\rho^2 + 8\alpha^3\lambda_0^2\rho^3}{(-1 + \lambda_0)(-1 - \lambda_0 + 2\lambda_0^2 + 2\alpha\rho + \alpha\lambda_0\rho - \alpha^2\rho^2)^2}}$$

Thus, when the diversion rate is sufficiently small, the shareholders of firm 1 would choose NOT to deter managerial diversion behavior.

Finally, we briefly discuss whether the shareholders of firm 1 should exert efforts or use resources to decrease the diversion rate. It is clear that the manager of firm 1 chooses to divert if and only if $\lambda < 1 - \alpha\rho$, which is independent of $\gamma$. The previous discussion implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\frac{\partial \pi_1^{d*}}{\partial \gamma} < 0$;when $\lambda < \frac{1-\alpha\rho}{4}$, $\frac{\partial \pi_1^{d*}}{\partial \gamma} > 0$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\frac{\partial \pi_1^{d*}}{\partial \gamma} \leq 0$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$. Hence, if the current incentive plan is sufficiently strong, the shareholders may exert efforts to lower the diversion rate. However, if the current incentive plan is relatively weak, whether the shareholders should take measures to lower the diversion rate depends on the current level of diversion rate. If the current diversion rate level is relatively small, the shareholders should not interfere; if the current diversion rate is relatively large, the shareholders of firm 1 may exert efforts or use resources to lower it, and optimal level of diversion rate chosen by the shareholders depends on the tradeoff between the cost of lowering diversion rate and the corresponding gain in firm's profit.

### 2.5.4. Bertrand competition model

Noting that the preceding results are obtained by using a basic Cournot game, we then extend our discussion to the case of differentiated Bertrand competition.

Suppose that under Bertrand competition model, each firm $i$ ($i = 1, 2$) faces a demand curve given by

$$q_i = A - p_i + bp_j, j = 1, 2, j \neq i \tag{21}$$

where $p_i$ and $p_j$ are prices charged by firms $i$ and $j$, respectively, and $b$ measures consumers' preferences over the good sold by firm $i$ relative to that sold by firm $j$. We assume that $0 < b < 1$, i.e., firm $i$'s demand is more sensitive to its own price as it is to the price charged by its competitor. The manager of each firm chooses its price to maximize its own objective function given by

$$S_1 = \lambda(p - \gamma)q_1 + \gamma q_1 - \alpha\rho\gamma q_1 + f = \lambda p q_1 + (1 - \alpha\rho - \lambda)\gamma q_1 + f \tag{22}$$

$$\underset{p_2}{Max}\ S_2 = \pi_2 = p_2(A + bp_1 - p_2) \tag{23}$$

Other specifications remain the same as before. After some tedious derivations (see Appendix D), we can show that (i) the manager of firm 1 will divert if and only if $\lambda < 1 - \alpha\rho$; (ii) firm 1's market share in the presence of managerial diversion is always increasing in $\gamma$, and is higher than that of no diversion. However, the relationship between firm 1's accounting profit in the presence of managerial diversion and $\gamma$ is no longer inverse U-shaped, rather, it is negative, which is different from that under Cournot competition model. This result is self-evident, as competition between firms are more fierce á la Bertrand than Cournot (Singh & Vives, 1984), the direct effect of diversion easily dominates the indirect revenue-increasing effect from diversion. Thus, firm's nominal profit is reduced under diversion.

## 3. Hypotheses development

In the model developed in the previous section, the managers of firms with weak incentive mechanisms and corporate governance will divert value for their own benefit. Because the total amount of diversion is positively related to the quantity produced, diversion provides extra incentive for the managers to compete aggressively in the product market. When this boosts product market performance, its impact on firm profit is inverse U-shaped under quantity competition. In this section, we test the model's implications focusing on Chinese SOEs and using private firms for comparison.

In the empirical analysis, SOEs are well representative of firms with weak incentive mechanisms and corporate governance, where managers are likely to divert value. First, most SOE managers' salaries and other compensation are highly regulated and tied to their rank, rather than their performance (low $\lambda$). Hence, their incentives are relatively weak. Second, SOEs operate under soft budget constraints, with loss-making firms usually bailed out by the government, implying low expected penalties for diversion (low $\alpha\rho$). Thus, condition (7) for managerial diversion is likely to be satisfied. Indeed, prior literature shows that SOE managers tend to pursue other objectives, such as maximizing workers' wages or transferring shareholder value for their own benefits (Meng & Perkins, 1998). However, we do not assume that all SOEs have a managerial diversion problem, since diversion only happens when condition (7) is satisfied.[10]

In contrast, private firms in China are usually owner-run enterprises with very concentrated ownership (very high $\lambda$) and profit-maximizing tendency ($\gamma = 0$). Hence, we expect to find evidence of the positive impact of managerial diversion on product market

[10] There are at least two reasons for this. First, managers in SOEs may have different career concerns. Younger managers are more likely to avoid managerial diversion to increase their prospects of political promotion (Tirole, 2001; Wan, Zhu, & Chen, 2015). Second, there exists heterogeneity among SOEs concerning corporate governance. The managers of SOEs with sufficiently good corporate governance may not choose to divert firm value.

performance in SOEs but not in private firms. We further expect to find the inverse-U shaped relation between diversion and profitability for SOEs but not private firms. These hypotheses are formulated as follows.

**Hypothesis 1.** *Compared to SOEs without a managerial diversion problem, SOEs with managerial diversion will have better product market performance.*

**Hypothesis 2.** *For SOEs with managerial diversion, product market performance improves with the extent of managerial diversion.*

**Hypothesis 3.** *For SOEs with managerial diversion, the relation between firm profits and the extent of managerial diversion is inverse U-shaped.*

## 4. Data, variables, and model

Our data were obtained from the Annual Surveys of Industrial Production conducted by the Chinese NBS from 1998 through 2006. The dataset covers all SOEs, plus other manufacturing firms with more than CNY 5 million (approximately USD 600,000) in annual sales. The dataset covers all mining firms, manufacturing firms, and firms involved in the production and supply of electricity, water, and heat. For consistency with the existing literature (Campello, 2003, 2006; Fresard, 2010), we only include manufacturing firms in our analysis.

We first drop firms with missing or negative values for total assets, employees, total wages, total liabilities, or sales. We then exclude firm-years with the business status "not in operation." To minimize the influence of outliers and misreported data in our analysis, observations with extremely high values (above the ninety-ninth percentile) or extremely low values (below the first percentile) of the variables are trimmed away. Leverage and ownership structure variables are trimmed at 0 and 1.

The database also contains detailed information on firm ownership structures, based on the fractions of paid-in-capital contributed by different types of investors, such as the state, individuals, and foreigners. We use a 50% cutoff point to identify different types of firms. Specifically, SOEs are identified as firms in which the state owns > 50% of the shares; private firms are those in which > 50% of the shares are owned by an individual investor. On this basis, 8.37% of the firm-year observations are those of SOEs and 39.53% of the firm-year observations are those of private firms.

### *4.1. Measuring managerial diversion*

Measuring managerial diversion is challenging, mainly because it is difficult to determine if particular spending is justified or a rent-seeking type of diversion. The earlier literature tests for the influence of managerial diversion indirectly by examining the valuation effect of corporate governance, assuming that better corporate governance reduces managerial diversion (see Durnev & Kim, 2005; John, Litov, & Yeung, 2008). Rajan and Wulf (2006) use a detailed and confidential compensation survey conducted by Hewitt Associates to construct a measure of perks, but it only covers 300 publicly traded U.S. firms. Yermack (2006) use the personal use of company planes as the proxy for the perks. To test our theory, we need our measure of managerial diversion to be available on a large scale for both public and private firms.

Following Ang, Cole, and Lin (2000), we construct a proxy for managerial diversion based on administrative expenses (*AExp*), which are, to a large extent, discretionary and can, thus, be abused by managers if they choose to do so. According to China Accounting Standard, the major components of administrative expenses are depreciation and amortization at the headquarters, salaries and wages at the headquarters, office supplies and office expenses, travel and lodging expenses, insurance, consulting fees, litigation fees, entertainment expenses, staff and worker training expenses, and research and development expenses.[11]

Following Luo, Zhang, and Zhu (2011), we measure managerial diversion based on abnormal administrative expenses. Specifically, we model the "normal" level of administrative expenses as a function of several firm characteristics, such as firm size, inventory, total fixed assets, the natural logarithm of the number of employees, and sales growth. The definitions of these variables are provided in Appendix B. In addition to these variables, our model (24) also includes province and industry dummies as additional control variables.

$$\frac{AExp_{i,t}}{Sales_{i,t}} = \beta_1\frac{1}{Sales_{i,t}} + \beta_2\ln employee_{i,t} + \beta_3\frac{PPE_{i,t}}{Sales_{i,t}} + \beta_4\frac{Inventory_{i,t}}{Sales_{i,t}} + \beta_5 SalesG_{i,t} + \beta_6\text{Profitability}_{i,t} + Province_j + Industry_k + Year_t + \mu_i + \varepsilon_{i,t} \tag{24}$$

We estimate this model separately using SOEs and private firms as the sample, estimating the model in each year. The residuals from the regressions measure abnormal administrative expenses. To facilitate our interpretation, we standardize the residuals at industry level within the SOE and private firm samples, respectively. The firms with positive standardized residuals will be labeled as firms with a managerial diversion problem.

[11] Ideally, we would prefer a measure that does not include such items as R&D expenses. However, only the 2005 and 2006 surveys report R&D expenses separately. We exclude R&D expenses from our measure and test Hypothesis 3 using the 2005 and 2006 sample. We find that the relationship between profitability and diversion is inverse U-shaped for SOEs. The relationship between profitability and diversion for private firms is similar to what we find in Table 8. We cannot analyze the impact of diversion on product market performance because we do not have sales growth data for 2007. However, given that the average percentage of R&D expenses in the administrative expenses is < 2%, we expect that our main findings still hold when we exclude R&D expenses from our measure.

### 4.2. Empirical model

#### 4.2.1. Managerial diversion and product market performance

Following Campello (2003, 2006), we examine whether SOEs with managerial diversion expand their market shares more aggressively in the product markets than SOEs without managerial diversion, using the following regression model:

$$SalesG_{i,t} = \alpha^* DumDiversion_{i,t-2} + \beta_1 Size_{i,t} + \sum_{j=1}^{2} \beta_{2j} SalesG_{i,t-j} + \sum_{j=1}^{2} \beta_{3j} Investment_{i,t-j} + \sum_{j=1}^{2} \beta_{4j} Leverage_{i,t-j} + Year_t + \mu_i + \varepsilon_{i,t} \quad (25)$$

This model has also been used by Fresard (2010) to examine the impact of firms' financial strength on product market behavior. In Eq. (25), the dependent variable, *SalesG*, is a firm's sales growth adjusted by its industry-year average. As Campello (2003, 2006) notes, this measure can consistently estimate product market performance across many industries and periods. The independent variables, *Size*, *Investment*, *Profitability*, and *Leverage,* are similarly industry-adjusted.[12]

The key variable for testing Hypothesis 1 is the indicator variable for SOEs associated with managerial diversion, *DumDiversion*. It takes a value of 1 for SOEs with positive standardized residuals, and 0 otherwise. Using SOEs as the sample for Eq. (25), a positive and significant $\alpha$ would indicate that firms with managerial diversion tend to expand their market shares more than their SOEs peers.

To test the positive relationship between product market performance and the magnitude of managerial diversion, we replace *DumDiversion* with the actual value of positive standardized residuals and use SOEs with managerial diversion as the sample to test Hypothesis 2. A positive and significant coefficient on *Diversion* indicates that product market performance improves with the extent of managerial diversion. As a robustness check, we use the full SOE sample and the actual value of standardized residuals, with negative standardized residuals being replaced with 0 as the measure of diversion.

### 4.3. Managerial diversion and firm profits

Our model predicts an inverse U-shaped relation between managerial diversion and profits for firms with weak incentive mechanisms and corporate governance. Following Joh (2003), we test this hypothesis using the following regression model:

$$\text{Profit}_{i,t} = \beta_0 + \gamma_1 Diversion_{i,t-1} + \gamma_2 Diversion_{i,t-1}^2 + \beta_1 Size_{i,t-1} + \beta_2 MPK_{i,t-1} + \beta_3 Leverage_{i,t-1} + \beta_4 Tangibility_{i,t-1} + \beta_5 Investment_{i,t-1} + \mu_i + \varepsilon_{i,t} \quad (26)$$

*Size*, measured by the log value of total assets, is included to reflect the benefit from economies of scale. Other control variables include *Leverage*, measured by total liability scaled by total assets; marginal productivity of capital (*MPK*), measured by sales income scaled by fixed assets; *Tangibility,* measured by the ratio of fixed assets to total assets; and *Investment*, measured by the ratio of investment to total assets. Year indicator variables are included to control for the effects of macroeconomic factors. To control for unobservable time-invariant determinants of firm profitability, the province, industry, and year dummies are included as additional control variables.

The endogeneity of managerial diversion in Eq. (25) may complicate identifying a causal link from managerial diversion to product market performance and firm performance. Our test design addresses this problem in three ways. First, we use the residuals from the Eq. (24) to construct both discrete and continuous measures of managerial diversion. Second, although the use of abnormal administrative expenses to measure managerial diversion does not fully resolve the possibility of spurious correlation due to unobservable characteristics, using relative-to-industry variables removes all industry-related factors, as potentially unobservable drivers of spurious correlation, from the estimates (Campello, 2006). Third, we estimate the effect of managerial diversion across different types of firms (SOEs versus private firms). As it is not obvious why potential omitted variables could have a stronger systematic effect on the effect of managerial diversion on product market performance and profits across various firm groups, cross-sectional contrasts should further strengthen our explanations and limit the risk of spurious correlation.

## 5. Empirical analysis

### 5.1. Sample description

Table 1 presents the mean values of the variables from Eq. (26), reported separately for SOEs and private firms. As hypothesized, SOEs have higher administrative expenses. The ratio of administrative expenses to sales for SOEs (0.147) is close to three times as high as that for private firms (0.054). The mean equality *t*-tests show that the pairwise differences in the administrative expenses between SOEs and private firms are significant at the 1% level.

Consistent with the previous literature, SOEs are also larger in terms of total assets and number of employees. Moreover, SOEs have higher leverage, lower profitability, lower investment, lower sales growth, more inventories, and more fixed assets. These differences, all significant at the 1% level, underscore the preliminary nature of the analysis of differences in administrative expenses

[12] We classify industry using 3-digit National Economy Industry codes. Following Campello (2006), to ensure that the empirical industry-year mean represents a reliable benchmark, we require that at least 100 firms (of all types of ownership structures) are present in each industry-year. The final sample covers 178 different industries.

**Table 1**
Sample statistics across different types of firms.

| | SOEs | Private | Full Sample |
|---|---|---|---|
| $AExp_{i,\ t}/Sales_{i,\ t}$ | 0.147 | 0.054** | 0.071 |
| $\ln employee_{i,\ t}$ | 5.250 | 4.693** | 4.889 |
| $PPE_{i,\ t}/Sales_{i,\ t}$ | 0.092 | 0.331** | 0.459 |
| $Inventory_{i,\ t}/Sales_{i,\ t}$ | 0.434 | 0.169** | 0.222 |
| $SalesGrowth_{i,\ t}$ | 1.144 | 0.220** | 0.187 |
| $\text{Profitability}_{i,\ t}$ | 0.010 | 0.072** | 0.062 |
| $Size_{i,\ t}$ | 10.156 | 9.456** | 9.772 |
| $MPK_{i,\ t}$ | 4.387 | 11.427** | 10.197 |
| $Leverage_{i,\ t}$ | 0.633 | 0.597** | 0.571 |
| $Tangibility_{i,\ t}$ | 0.424 | 0.353** | 0.359 |
| $Investment_{i,\ t}$ | 0.025 | 0.054** | 0.047 |
| $State_{i,\ t}$ | 0.926 | 0.003** | 0.085 |
| $\text{Private}_{i,\ t}$ | 0.025 | 0.962** | 0.402 |
| *obs* | 68,128 | 351,562 | 813,453 |

*SOEs* are firms with state ownership > 50%. *Private* firms have individual investor ownership > 50%. The variables are defined in Appendix B. Using SOEs as the benchmark, * and ** denote that the differences of the means of the variables across different types of firms are significant at the 5% and 1% levels, respectively.

in Table 1, highlighting the importance of controlling for firm characteristics in measuring abnormal administrative expenses. Using the 50% cutoff point to identify SOEs and private firms, we find that state ownership and individual ownership are, on average, 92.6% and 96.2% for SOEs and private firms, respectively.

### *5.2. The determinants of administrative expenses*

Using the SOE and private firm samples, respectively, Table 2 reports the estimations of administrative expenses with year, industry, and province dummies in the regression. We find that the administrative expenses increase as the number of employees increases, reflecting increased expenses for coordination, training, and employee development. As the total fixed assets increase, the increase in depreciation and amortization will also increase the administrative expenses. Furthermore, to meet the firm's operating needs, administrative expenses will increase as the inventory increases. Two efficiency measures, sales growth, and profitability, are inversely related to the administrative expenses. The estimation results in Table 2 justify the specification of Eq. (24) to estimate the abnormal administrative expenses.

**Table 2**
The determinants of administrative expenses.

| | SOEs | Private |
|---|---|---|
| $1/Sales_{i,\ t}$ | 48.613** | 114.838** |
| | (17.88) | (27.48) |
| $\ln employee$ | 0.011** | 0.008** |
| | (17.71) | (41.47) |
| $PPE_{i,\ t}/Sales_{i,\ t}$ | 0.027** | 0.020** |
| | (37.99) | (32.13) |
| $Inventory_{i,\ t}/Sales_{i,\ t}$ | 0.025** | 0.036** |
| | (15.00) | (37.65) |
| $SalesGrowth_{i,\ t}$ | −0.019** | −0.007** |
| | (−17.96) | (−31.23) |
| $\text{Profitability}_{i,\ t}$ | −0.275** | −0.023** |
| | (−30.71) | (−22.84) |
| *Constant* | 0.082** | 0.013** |
| | (4.84) | (2.65) |
| *Province* | Included | Included |
| *Industry* | Included | Included |
| *Year* | Included | Included |
| Observations | 68,128 | 321,562 |
| $R^2$ | 0.365 | 0.283 |

The table reports the regression of administrative expenses. *SOEs* are firms with state ownership > 50%. *Private* firms have individual investor ownership > 50%. The variables are defined in Appendix B. Coefficients on province, year, and industry dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009) +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

**Table 3**
Univariate analysis.

| | SOEs without managerial diversion | SOEs with managerial diversion | |
|---|---|---|---|
| | $zresid \leq 0$ | $zresid^{75th} > zresid > 0$ | $zresid > zresid^{75th}$ |
| $SalesGrowth_{i,\ t}$(Industry Adjusted) | −0.091 | −0.086 | −0.079* |
| $Profitability_{i,\ t}$ | 0.007 | 0.018** | 0.011** |
| $Size_{i,\ t}$ | 10.249 | 10.116** | 9.969** |
| $MPK_{i,\ t}$ | 4.669 | 4.670 | 3.538** |
| $Leverage_{i,\ t}$ | 0.649 | 0.621** | 0.605** |
| $Tangibility_{i,\ t}$ | 0.433 | 0.411** | 0.411** |
| $Investment_{i,\ t}$ | 0.027 | 0.027 | 0.020** |

*zresid* is the standardized abnormal administrative expenses within firm type and industry. The SOEs with positive standardized abnormal administrative expenses are identified as firms with managerial diversion. The variables are defined in Appendix B. Using SOEs without managerial diversion as the benchmark, * and ** denote that the differences of the means of the variables across different types of firms are significant at the 5% and 1% levels, respectively.

### *5.3. Managerial diversion and product market performance*

Using the residuals from the regression of Eq. (24) in each year as the measures of abnormal administrative expenses, we construct our measure of managerial diversion. Specifically, the residuals from Table 2 are standardized separately for each firm type by subtracting their industry mean and scaling the difference by the standard deviation of the residuals.[13] The SOEs with positive standardized abnormal administrative expenses are identified as firms with managerial diversion. Therefore, the indicator variable *DumDiversion* is set to 1 when the standardized residuals are positive, and 0 otherwise. The continuous measure of diversion is measured as the standardized abnormal administrative expenses with negative values reset to 0.[14]

Table 3 reports the univariate analysis. We first compare the product market performance between SOEs with and without managerial diversion. This shows that SOEs with managerial diversion are associated with better product market performance. Table 3 also suggests that the relationship between managerial diversion and corporate profits is an inverse-U shape. However, the summary statistics of firm characteristics suggest that firms with differing degrees of managerial diversion are significantly different in size, marginal productivity of capital, leverage, tangibility, and investment. We, next, turn to multiple regression analysis to examine the relation between managerial diversion, product market performance, and firm profitability.

Table 4 reports the estimation results for regression (25). The results show that the industry-adjusted sales growth rate of SOEs with managerial diversion is 1.1% higher than that of SOEs without managerial diversion (significant at the 1% level), which supports Hypothesis 1.

Our theoretical model also predicts that product market share should increase with the extent of managerial diversion for SOEs. We test this hypothesis in Table 5. Specifically, we re-estimate regression (25) with the diversion indicator, *DumDiversion,* replaced by its continuous measure, *Diversion*. To reduce the measurement error problem, we use two samples: the full sample and the firms with managerial diversion sample. The results show that SOEs' industry-adjusted sales growth rate increases with managerial diversion, which is consistent with Hypothesis 2. All else equal, a one-standard-deviation increase in managerial diversion in year $t$ leads to a 0.7% ∼ 1.9% gain in market share in year $t + 2$ (significant at the 1% level).

The estimated coefficients on the control variables in Table 5 have the expected signs. For example, we find that larger firms with more investment will expand their product market faster in the near future. A negative association between two-year lagged leverage and future market share development corroborates the prior finding that excessive debt hurts product market performance (Kovenock & Philips, 1995; Kovenock & Phillips, 1997).

Our interpretation of the positive relation between excessive administrative expenses and product market expansion is that managerial diversion provides strong incentives for managers to compete more aggressively in product markets. It is also possible that firms with better growth opportunities incur higher administrative costs and expand their market share faster. If this is the case, the positive relation between excessive administrative costs and future product market expansion should also hold for private firms. The results for the private firm sample, as reported in Tables 4 and 5, show that the relation between managerial diversion and product market performance for private firms is negative. The negative coefficient estimate observed for the diversion variable in private firms is consistent with Dixit (1986), who finds that, under *Cournot* competition, firms with higher costs ultimately have lower market shares.

To further address this concern, following Gilchrist and Himmelberg (1998) and Love (2003), we use the past marginal product of capital (*MPK*) and the past profitability to proxy for investment opportunities, and add industry-adjusted *MPK* and profitability into regression (25). As presented in Table 6, we find similar results.

[13] The standardization approach has been widely used in the product market performance studies (see Campello, 2006; Fresard, 2010; MacKay & Phillips, 2002). According to Campello (2006), the standardization approach allows us to use the same metric across different industry environments and to test the hypothesis that managerial diversion systematically affects product performance across different types of industries at different points in time.

[14] Using the 75th percentile of the standardized abnormal administrative expenses as the cutoff point to define managerial diversion, our main conclusions still hold.

**Table 4**
Managerial diversion and product market performance.

| | SOEs | Private |
|---|---|---|
| *DumDiversion*$_{t-2}$ | 0.011* | −0.007+ |
| | (2.42) | (−1.85) |
| *SalesG*$_{t-1}$ | −0.019+ | 0.018 |
| | (−1.75) | (1.37) |
| *SalesG*$_{t-2}$ | −0.001 | 0.018** |
| | (−0.14) | (5.86) |
| *Size*$_t$ | 0.013** | 0.028** |
| | (8.72) | (7.62) |
| *Investment*$_{t-1}$ | 0.094** | 0.186** |
| | (2.92) | (11.09) |
| *Investment*$_{t-2}$ | 0.069** | 0.079** |
| | (2.99) | (6.61) |
| *Leverage*$_{t-1}$ | 0.063** | 0.034+ |
| | (2.59) | (1.89) |
| *Leverage*$_{t-2}$ | −0.050* | −0.077** |
| | (−1.99) | (−5.59) |
| *Province* | Included | Included |
| *Industry* | Included | Included |
| *Year* | Included | Included |
| Observations | 28,962 | 101,655 |
| $R^2$ | 0.021 | 0.024 |

The table reports the pooled time-series cross-section results of regressions of sales growth. All variables are industry-adjusted. *DumDiversion* is an indicator variable set to 1 for firm-year observations with positive abnormal administrative expenses, and 0 otherwise. The variables are defined in Appendix B. Coefficients on province and year dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

**Table 5**
The level of managerial diversion and product market performance.

| | SOEs | | Private | |
|---|---|---|---|---|
| | Full Sample | Diversion Sample | Full Sample | Diversion Sample |
| *Diversion*$_{t-2}$ | 0.007** | 0.019** | −0.008** | −0.009** |
| | (3.51) | (3.46) | (−3.68) | (−5.15) |
| *SalesG*$_{t-1}$ | −0.020+ | −0.042** | 0.018 | 0.020+ |
| | (−1.77) | (−3.08) | (1.36) | (1.83) |
| *SalesG*$_{t-2}$ | −0.001 | −0.004 | 0.018** | 0.020** |
| | (−0.14) | (−0.22) | (5.81) | (5.61) |
| *Size*$_t$ | 0.013** | 0.017** | 0.028** | 0.034** |
| | (8.35) | (4.93) | (7.70) | (8.09) |
| *Investment*$_{t-1}$ | 0.095** | 0.074** | 0.186** | 0.210** |
| | (2.92) | (2.63) | (11.14) | (13.73) |
| *Investment*$_{t-2}$ | 0.070** | −0.066* | 0.078** | 0.081** |
| | (3.03) | (−2.17) | (6.56) | (4.21) |
| *Leverage*$_{t-1}$ | 0.063** | 0.019** | 0.033+ | 0.027 |
| | (2.60) | (3.46) | (1.88) | (1.45) |
| *Leverage*$_{t-2}$ | −0.050* | −0.042** | −0.076** | −0.044** |
| | (−1.99) | (−3.08) | (−5.63) | (−3.21) |
| *Province* | Included | Included | Included | Included |
| *Industry* | Included | Included | Included | Included |
| *Year* | Included | Included | Included | Included |
| *Observations* | 28,962 | 12,656 | 101,655 | 41,704 |
| $R^2$ | 0.021 | 0.036 | 0.024 | 0.029 |

The table reports the pooled time-series cross-section results of regressions of sales growth. All variables are industry-adjusted. *Diversion* is measured by the abnormal administrative expenses, with negative values reset to 0. The variables are defined in Appendix B. Coefficients on province and year dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

**Table 6**
Managerial diversion and product market performance with more control variables.

| | SOEs | | | Private | | |
|---|---|---|---|---|---|---|
| | Full Sample | Full Sample | Diversion Sample | Full Sample | Full Sample | Diversion Sample |
| $DumDiversion_{t\text{-}2}$ | 0.010* | | | −0.007+ | | |
| | (2.06) | | | (−1.89) | | |
| $Diversion_{t\text{-}2}$ | | 0.007** | 0.020** | | −0.008** | −0.010** |
| | | (3.21) | (3.71) | | (−3.75) | (−5.79) |
| $SalesG_{t\text{-}1}$ | −0.021+ | −0.021+ | −0.045** | 0.020 | 0.020 | 0.024* |
| | (−1.69) | (−1.70) | (−2.93) | (1.53) | (1.52) | (2.17) |
| $SalesG_{t\text{-}2}$ | −0.002 | −0.002 | −0.008 | 0.022** | 0.022** | 0.023** |
| | (−0.28) | (−0.29) | (−0.51) | (10.23) | (10.26) | (6.21) |
| $Size_t$ | 0.012** | 0.012** | 0.017** | 0.026** | 0.026** | 0.032** |
| | (8.02) | (7.68) | (5.43) | (7.78) | (7.87) | (8.13) |
| $Investment_{t\text{-}1}$ | 0.078* | 0.079* | 0.062* | 0.172** | 0.171** | 0.198** |
| | (2.34) | (2.33) | (2.40) | (8.11) | (8.16) | (10.01) |
| $Investment_{t\text{-}2}$ | 0.068** | 0.068** | 0.083* | 0.069** | 0.068** | 0.074** |
| | (2.86) | (2.89) | (2.48) | (6.28) | (6.21) | (3.90) |
| $Leverage_{t\text{-}1}$ | 0.076** | 0.077** | 0.092** | 0.035* | 0.035* | 0.023 |
| | (2.81) | (2.82) | (3.20) | (2.33) | (2.32) | (1.26) |
| $Leverage_{t\text{-}2}$ | −0.057* | −0.056* | −0.076** | −0.081** | −0.081** | −0.046** |
| | (−2.29) | (−2.29) | (−2.71) | (−6.08) | (−6.11) | (−3.22) |
| $Profit_{t\text{-}1}$ | 0.182** | 0.183** | 0.223** | 0.046 | 0.046 | −0.012 |
| | (3.24) | (3.24) | (4.34) | (1.12) | (1.12) | (−0.47) |
| $Profit_{t\text{-}2}$ | −0.066 | −0.065 | −0.081 | −0.080** | −0.079** | −0.035 |
| | (−1.06) | (−1.05) | (−1.17) | (−4.63) | (−4.51) | (−1.20) |
| $MPK_{t\text{-}1}$ | −0.001** | −0.001** | −0.002+ | −0.001** | −0.001** | −0.001* |
| | (−3.16) | (−3.19) | (−1.91) | (−3.82) | (−3.90) | (−1.98) |
| $MPK_{t\text{-}2}$ | 0.001 | 0.001 | 0.002** | 0.000 | 0.000 | 0.000 |
| | (1.38) | (1.37) | (4.31) | (0.05) | (0.02) | (0.07) |
| *Province* | Include | Include | Include | Include | Include | Include |
| *Industry* | Include | Include | Include | Include | Include | Include |
| *Year* | Include | Include | Include | Include | Include | Include |
| Observations | 28,962 | 28,962 | 12,656 | 101,655 | 101,655 | 41,704 |
| $R^2$ | 0.022 | 0.022 | 0.038 | 0.025 | 0.025 | 0.029 |

The table reports the pooled time-series cross-section results of regressions of sales growth. All variables are industry-adjusted. *Diversion* is measured by the abnormal administrative expenses, with negative values reset to 0. The variables are defined in Appendix B. Coefficients on province and year dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

### *5.4. Managerial diversion and product market performance: spline regression*

Our measure assumes that the abnormal positive abnormal administrative expenses reflect managerial diversion. If the effect of administrative expenses on sales growth were linear for all values of the former, that would not be consistent with managerial diversion. To see if this is the case, we follow Campello (2006) by estimating the following continuous spline regression:

$$SalesG_{i,t} = \beta_1 Size_{i,t} + \sum_{j=1}^{2} \beta_{2j} SalesG_{i,t-j} + \sum_{j=1}^{2} \beta_{3j} Investment_{i,t-j} + \sum_{j=1}^{2} \beta_{4j} Leverage_{i,t-j} + \sum_{j=1}^{2} \beta_{5j} \text{Profit}_{i,t-j} + \sum_{j=1}^{2} \beta_{5j} \text{MPK}_{i,t-j} + \alpha_1 zresid_{i,t-2} + \alpha_2 Dumknot^*(zresid_{i,t-2} - knot) + Year_t + \mu_i + \varepsilon_{i,t} \quad (27)$$

In regression (27), *Dum_knot* is an indicator variable equal to 1 if the standardized residual (*zresid*) is greater than *knot,* and 0 otherwise. For robustness purposes, we estimate regression (27) with three different values for *knot*: 0, the 75th percentile of *zresid*, and the 90th percentile of *zresid*. Our theory predicts that the estimate of $\alpha_1$ will be positive, whereas the estimate of $\alpha_2$ will not be.

Table 7 reports the estimation results of regression (27) for SOEs and the *F*-test of the null hypothesis of joint insignificance ($\alpha_1 = \alpha_2 = 0$). The results show that, while the estimate of $\alpha_2$ is significantly positive, the estimate of $\alpha_1$ is not. As the *F*-statistics validate the spline variables in the three regressions, the significant $\alpha_2$ strongly rejects uniform linearity (monotonicity) in the relation between abnormal administrative expenses and product market performance. These results are consistent with our interpretation of positive abnormal administrative expenses as managerial diversion.

For private firms, we do not observe a nonlinear relationship between the standardized abnormal administrative expenses and product market performance. For these firms, the impact of managerial diversion is significantly negative.

**Table 7**
Managerial diversion and product market performance: spline regression.

*Panel A*

| | SOEs | | |
|---|---|---|---|
| | *Knot* = 0 | *Knot* = $zresid^{75th}$ | *Knot* = $zresid^{90th}$ |
| *zresid* | −0.016* | −0.008 + | 0.000 |
| | (−2.47) | (−1.70) | (0.11) |
| *Dum_knot**(*zresid* − *knot*) | 0.037** | 0.034** | 0.032* |
| | (3.21) | (3.11) | (2.09) |
| $SalesG_{t\text{-}1}$ | −0.021 + | −0.021 + | −0.020 + |
| | (−1.90) | (−1.89) | (−1.84) |
| $SalesG_{t\text{-}2}$ | 0.001 | 0.001 | 0.000 |
| | (0.13) | (0.08) | (−0.02) |
| $Size_t$ | 0.013** | 0.013** | 0.013** |
| | (8.26) | (8.22) | (8.27) |
| $Investment_{t\text{-}1}$ | 0.097** | 0.097** | 0.096** |
| | (2.90) | (2.91) | (2.90) |
| $Investment_{t\text{-}2}$ | 0.070** | 0.070** | 0.070** |
| | (3.05) | (3.06) | (3.01) |
| $Leverage_{t\text{-}1}$ | 0.061* | 0.062* | 0.062* |
| | (2.53) | (2.54) | (2.57) |
| $Leverage_{t\text{-}2}$ | −0.050* | −0.050* | −0.051* |
| | (−1.98) | (−2.01) | (−2.02) |
| *Province* | Included | Included | Included |
| *Industry* | Included | Included | Included |
| *Year* | Included | Included | Included |
| F-stat (null of joint insignificance) | 7.51** | 8.11** | 6.93** |
| Observations | 28,962 | 28,962 | 28,962 |
| $R^2$ | 0.022 | 0.022 | 0.022 |

*Panel B*

| | Private | | |
|---|---|---|---|
| | *Knot* = 0 | *Knot* = $zresid^{75th}$ | *Knot* = $zresid^{90th}$ |
| *zresid* | −0.012** | −0.009* | −0.008** |
| | (−2.86) | (−2.56) | (−2.82) |
| *Dum_knot**(*zresid* − *knot*) | 0.006 | 0.002 | 0.000 |
| | (1.45) | (0.55) | (0.12) |
| $SalesG_{t\text{-}1}$ | 0.018 | 0.018 | 0.018 |
| | (1.36) | (1.36) | (1.36) |
| $SalesG_{t\text{-}2}$ | 0.018** | 0.018** | 0.018** |
| | (5.68) | (5.59) | (5.62) |
| $Size_t$ | 0.028** | 0.028** | 0.028** |
| | (7.62) | (7.63) | (7.67) |
| $Investment_{t\text{-}1}$ | 0.186** | 0.186** | 0.186** |
| | (11.24) | (11.21) | (11.21) |
| $Investment_{t\text{-}2}$ | 0.078** | 0.078** | 0.078** |
| | (6.56) | (6.56) | (6.56) |
| $Leverage_{t\text{-}1}$ | 0.033 + | 0.033 + | 0.033 + |
| | (1.88) | (1.88) | (1.88) |
| $Leverage_{t\text{-}2}$ | −0.076** | −0.076** | −0.076** |
| | (−5.64) | (−5.63) | (−5.63) |
| *Province* | Included | Included | Included |
| *Industry* | Included | Included | Included |
| *Year* | Included | Included | Included |
| F-stat (null of joint insignificance) | 6.73** | 8.06** | 12.65** |
| Observations | 101,655 | 101,655 | 101,655 |
| $R^2$ | 0.024 | 0.024 | 0.024 |

The table reports the results of spline regressions of sales growth. All variables are industry-adjusted. *Zresid* is the abnormal administrative expenses. *Dum_knot* is an indicator variable equal to 1 if *zresid* is greater than *knot,* and 0 otherwise. Regressions with three different values for knot are reported: 0, the 75th percentile of *zresid*, and the 90th percentile of *zresid*. The variables are defined in Appendix B. Coefficients on province and year dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

**Table 8**
The level of managerial diversion and profits.

| | SOEs | | Private | |
|---|---|---|---|---|
| | Full Sample | Diversion Sample | Full Sample | Diversion Sample |
| $Diversion_t$ | 0.005* | 0.010** | −0.003* | −0.002** |
| | (2.26) | (3.60) | (−2.19) | (−2.71) |
| $Diversion_t^2$ | −0.002** | −0.003** | 0.000 | 0.000 |
| | (−3.50) | (−3.51) | (−0.21) | (1.48) |
| $Size_t$ | 0.002** | 0.000 | −0.011** | −0.012** |
| | (4.00) | (0.37) | (−18.67) | (−12.31) |
| $MPK_t$ | 0.001** | 0.001** | 0.001** | 0.001** |
| | (10.68) | (4.82) | (14.25) | (13.13) |
| $Leverage_t$ | −0.047** | −0.062** | −0.109** | −0.111** |
| | (−22.20) | (−12.84) | (−54.91) | (−45.88) |
| $Tangibility_t$ | −0.029** | −0.021** | 0.036** | 0.046** |
| | (−8.68) | (−4.35) | (3.72) | (3.64) |
| $Investment_t$ | 0.043** | 0.055** | 0.022** | 0.026** |
| | (8.89) | (6.61) | (4.23) | (5.71) |
| *Constant* | −0.073** | −0.030** | 0.161** | 0.179** |
| | (−13.85) | (−2.62) | (19.30) | (7.73) |
| Observations | 44,408 | 12,967 | 188,852 | 67,150 |
| $R^2$ | 0.095 | 0.132 | 0.159 | 0.160 |

The table reports the pooled time-series cross-section results of regressions of profitability. *Diversion* is measured by the abnormal administrative expenses, with negative values reset to 0. The variables are defined in Appendix B. Coefficients on province, year, and industry dummies are not reported. The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

### 5.5. *Managerial diversion and firm profits*

Table 8 reports the estimation results for regression (26). The results are consistent with the hypothesized inverse *U*-shaped relation between managerial diversion and SOE profits. For SOEs, the estimate of $\gamma_1$ is positive and the estimate of $\gamma_2$ is negative, with both estimates significant at the 1% level. In the full sample regression, the coefficient estimates imply that, for firms with standardized residual administrative expenses in excess of 1.80, the predicted overall effect of diversion on profitability is negative.

For private firms, the estimate of $\gamma_1$ is significantly negative and the estimate of $\gamma_2$ is insignificant. This implies that, for firms with good incentive mechanisms and corporate governance, managerial diversion represents a pure cost.

## 6. Robustness check

In this subsection, we examine the robustness of our main empirical findings. We first replace sales growth with output growth and repeat the analyses from Tables 4–6. We find similar results. Our source dataset includes all SOEs but only non-SOE firms with annual sales in excess of CNY 5 million. As the second robustness check, we repeat our analysis excluding SOEs with less than CNY 5 million in annual sales, and our main findings still hold.

As the third robustness check, we identify SOEs with standardized abnormal administrative expenses above the 75th percentile as firms with managerial diversion. Again, the results remain similar.

One concern about our previous empirical findings is that SOEs and private firms may operate in different types of industries, which may explain the differences in our findings.

We address this issue by examining whether the results are robust to industries with different mixes of SOEs and private firms. We re-estimate the impact of managerial diversion on product market competition in industries with a large share of SOEs and in industries with a large share of private firms. Specifically, for each of our 3-digit industries, we first calculate the total sales of SOEs and private firms, respectively, as a proportion of total industry sales. The industries with the top 10 share of SOEs sales are defined as industries with a large SOE share. For this sub-sample, the average share of SOEs' sales is 31.44%. The industries with a large private firm share are defined similarly; for this sub-sample, the average share of private firms' sales is 31.30%.

To save space, we only report the coefficients on the measures of managerial diversion. Panels A and B of Table 9 show that, in both industries with a large share of SOEs and those with a large share of private firms, the impact of managerial diversion on product market competition is significantly positive for SOEs but significantly negative or insignificant for private firms, consistent with our prior findings. In Panel C of Table 9, we re-estimate the impact of managerial diversion on the profitability of SOEs and private firms in the industries dominated by each. In both types of industries, we find an inverse U-shaped relation for SOEs but not for private firms, consistent with our prior findings.

## 7. Conclusions

This paper analyzes the effect of managerial diversion on product market performance in a *Cournot* model. The model predicts

**Table 9**
Managerial diversion, product market competition, and profits.

Panel A. Managerial diversion and product market competition.

| | SOEs | | Private Firms | |
|---|---|---|---|---|
| | Dominated by Private Firms | Dominated by SOEs | Dominated by Private Firms | Dominated by SOEs |
| $DumDiversion_{t-2}$ | 0.014* | 0.012* | −0.014** | −0.005 |
| | (2.01) | (1.99) | (−4.07) | (−0.95) |
| Observations | 10,629 | 11,271 | 50,667 | 26,022 |
| $R^2$ | 0.017 | 0.028 | 0.025 | 0.023 |

Panel B. Level of managerial diversion and product market competition.

| | SOEs | | Private Firms | |
|---|---|---|---|---|
| | Dominated by Private Firms | Dominated by SOEs | Dominated by Private Firms | Dominated by SOEs |
| $Diversion_{t-2}$ | 0.020** | 0.021** | −0.012** | −0.007* |
| | (3.06) | (3.79) | (−5.08) | (−2.09) |
| Observations | 10,629 | 11,271 | 50,667 | 26,022 |
| $R^2$ | 0.018 | 0.029 | 0.025 | 0.023 |

Panel C. Level of managerial diversion and profits.

| | SOEs | | Private Firms | |
|---|---|---|---|---|
| | Dominated by Private Firms | Dominated by SOEs | Dominated by Private Firms | Dominated by SOEs |
| $Diversion_t$ | 0.010** | 0.013** | −0.001 | −0.005** |
| | (4.48) | (4.35) | (−1.16) | (−4.25) |
| $Diversion_t^2$ | −0.003** | −0.004** | 0.000 | 0.000 |
| | (−4.47) | (−4.16) | (−0.57) | (1.13) |
| Observations | 15,698 | 16,009 | 96,203 | 47,438 |
| $R^2$ | 0.102 | 0.123 | 0.181 | 0.146 |

The table reports the pooled time-series cross-section results of sales growth for industries dominated by private firms and industries dominated by SOEs. Specifically, for each 3-digit industry, we calculate the shares of total sales of SOEs and private firms to total industry sales. The industries with the top 10 share of private firms' (SOEs') sales are defined as industries dominated by private firms (SOEs). The t-statistics in parentheses are robust to heteroskedasticity and within-firm dependence, as suggested by Petersen (2009). +, *, and ** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

that managerial diversion can boost product market performance by motivating the manager to compete more aggressively in product markets. In this sense, managerial diversion serves to complement other incentive mechanisms and may positively impact shareholder value. Consistent with the rent-seeking behavior of managerial diversion, our model predicts that excessive managerial diversion harms firm performance.

We then test our model with data. In our empirical analysis, SOEs in China are well representative of firms with weak incentive mechanisms and corporate governance. Our results show that, for SOEs, managerial diversion has a positive effect on market share expansion and that the relation between diversion and profits is inverse U-shaped. The effects of diversion on product market performance and profits are mainly negative for private firms.

Our study echoes one view in law and economics literature that managerial diversion may not necessarily be harmful to shareholder value. In firms with incentive problems or weak corporate governance, moderate diversion can motivate managers to work harder in the interest of shareholders. Our finding that the effect of diversion tends to be negative for firms with good incentive mechanisms and strong corporate governance is in line with the predominant current view that diversion should be discouraged and regulated. To summarize, our study suggests that the effect of diversion varies across firms with different incentive mechanisms, corporate governance, and extent of diversion.

## Funding

This study was funded by the National Natural Science Foundation of China (grant number: 71372148), the National Social Science Foundation of China (grant number: 18VSJ072; 15BJL087), the Fundamental Research Funds for the Central Universities (grant number: 15JNYH001), Ministry of Education of the People's Republic of China (grant number: 13JJD790038; 17JZD019).

## Appendix A. Derivations for the Duopoly Cournot Model

The equilibrium for the case in which the manager diverts is characterized by the following first-order conditions, i.e., $\partial S_1/\partial q_1 = 0$ and $\partial S_2/\partial q_2 = 0$,

$$2\lambda q_1 + \lambda q_2 = \lambda(1-\gamma) + \gamma - \alpha\rho\gamma \tag{A1}$$

$$q_1 + 2q_2 = 1 \tag{A2}$$

Solving (A1) and (A2) simultaneously, we derive the equilibrium outputs:

$$q_1^{d*} = \frac{\lambda + 2\gamma(1-\alpha\rho-\lambda)}{3\lambda},\ q_2^{d*} = \frac{\lambda - \gamma(1-\alpha\rho-\lambda)}{3\lambda} \tag{A3}$$

Substituting (A3) into the market's inverse demand function, Eqs. (2), (3), firm 1's accounting profit, and firm 2's profit, respectively, yields the equilibrium price, the managers' payoffs, firm 1's accounting profit, and firm 2's profit for the case in which the manager diverts:

$$p^{d*} = \frac{\lambda - \gamma(1-\alpha\rho-\lambda)}{3\lambda},\ S_1^{d*} = \frac{[\lambda + 2\gamma(1-\alpha\rho-\lambda)]^2}{9\lambda} + f,\ \pi_1^{d*} = \frac{[\lambda - \gamma(1-\alpha\rho+2\lambda)][\lambda + 2\gamma(1-\alpha\rho-\lambda)]}{9\lambda^2} \tag{A4}$$

Conversely, when the firm 1 manager does not divert, i.e., $\gamma = 0$, their objective is reduced to

$$S_1^n = \lambda p q_1 + f \tag{A5}$$

Thus, the equilibrium for the case in which the manager does not divert is characterized by the following first-order conditions:

$$2q_1 + q_2 = 1 \tag{A6}$$

$$q_1 + 2q_2 = 1 \tag{A7}$$

Solving (A6) and (A7) simultaneously, we derive the equilibrium outputs:

$$q_1^{n*} = q_2^{n*} = \frac{1}{3} \tag{A8}$$

Plugging (A8) into the market's inverse demand function, Eqs. (A5), (3), firm 1's accounting profit, and firm 2's profit, respectively, yields the equilibrium price, the managers' payoffs, firm 1's accounting profit, and firm 2's profit for the case in which the manager does not divert:

$$p^{n*} = \frac{1}{3},\ S_1^{n*} = \frac{\lambda}{9} + f,\ \pi_1^{n*} = \frac{1}{9},\ S_2^{n*} = \pi_2^{n*} = \frac{1}{9} \tag{A9}$$

Hence, the manager will divert if and only if $S_1^{d*} > S_1^{n*}$, i.e.,

$$S_1^{d*} - S_1^{n*} = \frac{[\lambda + 2\gamma(1-\alpha\rho-\lambda)]^2}{9\lambda} - \frac{\lambda}{9} > 0$$

which immediately implies that:

$$\lambda < 1 - \alpha\rho \tag{A10}$$

From (A3) and (A8), we have:

$$q_1^{d*} - q_1^{n*} = 2\gamma(1-\alpha\rho-\lambda)/(3\lambda) > 0 \tag{A11}$$

$$\phi_1^{d*} = \frac{q_1^{d*}}{q_1^{d*} + q_2^{d*}} = \frac{\lambda + 2\gamma(1-\alpha\rho-\lambda)}{2\lambda + \gamma(1-\alpha\rho-\lambda)} \tag{A12}$$

$$\phi_1^{n*} = \frac{q_1^{n*}}{q_1^{n*} + q_2^{n*}} = \frac{1}{2} \tag{A13}$$

Therefore,

$$\phi_1^{d*} - \phi_1^{n*} = \frac{3\gamma(1-\alpha\rho-\lambda)}{2[2\lambda + \gamma(1-\alpha\rho-\lambda)]} > 0 \tag{A14}$$

$$\partial\phi_1^{d*}/\partial\gamma = \frac{3\lambda(1-\alpha\rho-\lambda)}{[2\lambda + \gamma(1-\alpha\rho-\lambda)]^2} > 0 \tag{A15}$$

From (A4) and (A9), we derive:

$$\pi_1^{d*} - \pi_1^{n*} = \frac{\gamma[\lambda(1-\alpha\rho-4\lambda) - 2\gamma(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)]}{9\lambda^2} \tag{A16}$$

(A16) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\pi_1^{d*} < \pi_1^{n*}$; when $\lambda < \frac{1-\alpha\rho}{4}$, $\pi_1{}^{d*} > \pi_1{}^{n*}$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)}{2(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\pi_1{}^{d*} \leq \pi_1{}^{n*}$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)}{2(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

Moreover, (A4) implies that

$$\frac{\partial\pi_1^{d*}}{\partial\gamma} = \frac{\lambda(1-\alpha\rho-4\lambda) - 4\gamma(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}{9\lambda^2} \tag{A17}$$

Clearly, (A17) implies that $\lambda \geq \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_1^{d*}}{\partial\gamma} < 0$;when$\lambda < \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_1^{d*}}{\partial\gamma} > 0$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\frac{\partial\pi_1^{d*}}{\partial\gamma} \leq 0$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

## Appendix B. Derivations for the n-firm Cournot competition model with m firms faced with the managerial diversion problem

In this case, we assume that there are $n(\geq 2)$ firms competing in the same market, with $m(\geq 1)$ firms faced with the managerial diversion problem. The market's inverse demand curve is given by$p = 1 - \sum_{j=1}^{n} q_j$. The utility function for the manager of firm $i$ ($i = 1, \cdots, m$)who takes into account the income diversion is specified as follows:

$$S_i = \lambda(p-\gamma)q_i + \gamma q_i - \alpha\rho\gamma q_i + f,\ i = 1,\ \cdots, m \tag{B1}$$

The remaining firms are assumed to be typical profit maximizing firms, whose manager simply maximizes his/her firm's profit:

$$S_k = \left(1 - \sum_{j=1}^{n} q_j\right)q_k,\ k = m+1,\ \cdots, n \tag{B2}$$

The equilibrium for the case in which the manager of firm $i$ ($i = 1, \cdots, m$)diverts is characterized by the following first-order conditions: $\partial S_i/\partial q_i = 0$, $i = 1, \cdots, m$, and $\partial S_k/\partial q_k = 0$, $k = m+1, \cdots, n$, which yields:

$$q_i = \frac{\lambda + (n+1-m)\gamma(1-\lambda-\alpha\rho)}{(n+1)\lambda},\ i = 1,\ \cdots, m \tag{B3}$$

$$q_k = \frac{\lambda - m\gamma(1-\lambda-\alpha\rho)}{(n+1)\lambda},\ k = m+1,\ \cdots, n \tag{B4}$$

Substituting (B3) and (B4) into the market's inverse demand function, Eqs. (B1), (B2), the accounting profit of firm $i$ ($i = 1, \cdots, m$) and the profit of firm $k$ ($k = m+1, \cdots, n$), respectively, yields the equilibrium price, the payoffs of firm $i$'s manager, the accounting profits of firm $i$ and that of firm $k$, for the case in which the manager of firm $i$ diverts:

$$p^{d*} = \frac{(n-1)\lambda - (n+1-2m)\gamma(1-\lambda-\alpha\rho)}{(n+1)\lambda},\ S_i^{d*} = \frac{[\lambda + (n+1-m)\gamma(1-\lambda-\alpha\rho)]^2}{(n+1)^2\lambda} + f,$$
$$S_k^{d*} = \pi_k^{d*} = \frac{[\lambda - m\gamma(1-\lambda-\alpha\rho)]^2}{(n+1)^2\lambda^2},$$
$$\pi_1^{d*} = \frac{[\lambda + (n+1-m)\gamma(1-\lambda-\alpha\rho)]\{\lambda - \gamma[(n+1)\lambda + m(1-\lambda-\alpha\rho)]\}}{(n+1)^2\lambda^2} \tag{B5}$$

On the other hand, when the manager of firm $i$ ($i = 1, \cdots, m$) does not divert, i.e., $\gamma = 0$, the objective of the manager of firm $i$ is reduced to

$$S_i^0 = \lambda p q_i + f \tag{B6}$$

Thus, the equilibrium outputs for the case in which the managers of all firms do not divert are given by:

$$q_i^{n*} = q_k^{n*} = \frac{1}{n+1} \tag{B7}$$

Plugging (B7) into the market's inverse demand function, Eqs. (B1), (B2), the accounting profit of firm $i$ ($i = 1, \cdots, m$) and the profit of firm $k$ ($k = m+1, \cdots, n$), respectively, yields the equilibrium price, the managers' payoffs, the accounting profits of firm $i$ ($i = 1, \cdots, m$) and the profits of firm $k$ ($k = m+1, \cdots, n$), for the case in which the managers of all firms do not divert:

$$p^{n*} = \frac{1}{n+1},\ S_i^{n*} = f + \frac{\lambda}{(n+1)^2},\ \pi_i^{n*} = \frac{1}{(n+1)^2},\ S_k^{n*} = \pi_k^{n*} = \frac{1}{(n+1)^2} \tag{B8}$$

Hence, the manager of firm $i$ will divert if and only if $S_i^{d*} > S_i^{n*}$, i.e.,

$$S_i^{d*} - S_i^{n*} = \frac{[\lambda + (n+1-m)\gamma(1-\lambda-\alpha\rho)]^2 - \lambda^2}{(n+1)^2\lambda} > 0$$

which immediately implies that

$$\lambda < 1 - \alpha\rho \tag{B9}$$

From (B3) and (B7), we have that

$$q_i^{d*} - q_i^{n*} = \frac{(n+1-m)\gamma(1-\lambda-\alpha\rho)}{(n+1)\lambda} > 0 \tag{B10}$$

$$\phi_i^{d*} = \frac{q_i^{d*}}{mq_i^{d*} + (n-m)q_k^{d*}} = \frac{\lambda + (n+1-m)\gamma(1-\lambda-\alpha\rho)}{n\lambda + m\gamma(1-\lambda-\alpha\rho)} \tag{B11}$$

$$\phi_i^{n*} = \frac{q_i^{n*}}{mq_i^{n*} + (n-m)q_k^{n*}} = \frac{1}{n} \tag{B12}$$

Therefore,

$$\phi_i^{d*} - \phi_i^{n*} = \frac{(n-m)(n+1)\gamma(1-\lambda-\alpha\rho)}{n[n\lambda + m\gamma(1-\lambda-\alpha\rho)]} > 0 \tag{B13}$$

$$\partial\phi_i^{d*}/\partial\gamma = \frac{(n-m)(n+1)\lambda(1-\lambda-\alpha\rho)}{[n\lambda + m\gamma(1-\lambda-\alpha\rho)]^2} > 0 \tag{B14}$$

From (B5) and (B8), we get

$$\pi_i^{d*} - \pi_i^{n*} = \frac{\gamma\{\lambda[(n+1-2m) - 2\lambda(n+1-m) - (n+1-2m)\alpha\rho] - \gamma(n+1-m)(1-\lambda-\alpha\rho)[(n+1)\lambda + m(1-\lambda-\alpha\rho)]\}}{\lambda^2(1+n)^2} \tag{B15}$$

(B15) immediately implies that when$\lambda < \frac{(n+1-2m)(1-\alpha\rho)}{2(n+1-m)}$, $\pi_i^{d*} > \pi_i^{n*}$ if $\gamma < \frac{\lambda[(n+1-2m)-2\lambda(n+1-m)-(n+1-2m)\alpha\rho]}{(n+1-m)(1-\lambda-\alpha\rho)[(n+1)\lambda+m(1-\lambda-\alpha\rho)]}$; otherwise, $\pi_i^{d*} \le \pi_i^{n*}$ if

$$\gamma \ge \frac{\lambda[(n+1-2m) - 2\lambda(n+1-m) - (n+1-2m)\alpha\rho]}{(n+1-m)(1-\lambda-\alpha\rho)[(n+1)\lambda + m(1-\lambda-\alpha\rho)]}.$$

Moreover, (B5) implies that

$$\frac{\partial\pi_i^{d*}}{\partial\gamma} = \frac{\lambda(1-\alpha\rho-4\lambda) - 4\gamma(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}{9\lambda^2} \tag{B16}$$

Clearly, when$\lambda < \frac{(n+1-2m)(1-\alpha\rho)}{2(n+1-m)}$, $\frac{\partial\pi_i^{d*}}{\partial\gamma} > 0$ if $\gamma < \frac{\lambda[(n+1-2m)-2\lambda(n+1-m)-(n+1-2m)\alpha\rho]}{2(1-\alpha\rho-\lambda)\{m(n+1-m)-m(n+1-m)\alpha\rho+\lambda[(n+1)(n+1-2m)+m^2]\}}$; otherwise, $\frac{\partial\pi_i^{d*}}{\partial\gamma} \le 0$ if $\gamma \ge \frac{\lambda[(n+1-2m)-2\lambda(n+1-m)-(n+1-2m)\alpha\rho]}{2(1-\alpha\rho-\lambda)\{m(n+1-m)-m(n+1-m)\alpha\rho+\lambda[(n+1)(n+1-2m)+m^2]\}}$.

## Appendix C. Derivations for the incomplete information under Cournot Competition

**Case 1.** Firm 1 knows whether demand is high or low, but firm 2 does not.

The objective function of firm 1's manager in the case of high market demand is:

$$\underset{q_{1H}}{Max}\ \lambda(a_H - q_{1H} - q_2)q_1 + (1-\alpha\rho-\lambda)\gamma q_{1H} + f \tag{C1}$$

The objective function of firm 1's manager in the case of low market demand is:

$$\underset{q_{1L}}{Max}\ \lambda(a_L - q_{1L} - q_2)q_1 + (1-\alpha\rho-\lambda)\gamma q_{1L} + f \tag{C2}$$

The objective function of firm 2 is:

$$\underset{q_2}{Max}\ \theta(a_H - q_{1H} - q_2)q_2 + (1-\theta)(a_L - q_{1L} - q_2)q_2 \tag{C3}$$

To ensure positive outputs, we need to assume that $(2+\theta)a_L > \theta a_H$ The equilibrium for the case in which the manager diverts is characterized by the first-order conditions of (C1), (C2), and (C3), which yields:

$$q_{1H}^{d*} = \frac{4\gamma(1-\lambda-\alpha\rho) + (3-\theta)\lambda a_H - (1-\theta)\lambda a_L}{6\lambda},\ q_{1L}^{d*} = \frac{4\gamma(1-\lambda-\alpha\rho) - \theta\lambda a_H + (2+\theta)\lambda a_L}{6\lambda},\ q_2^{d*} = \frac{\theta\lambda a_H + \lambda(1-\theta)a_L - \gamma(1-\lambda-\alpha\rho)}{3\lambda} \tag{C4}$$

Substituting (C4) into the market's inverse high demand function, the market's inverse low demand function, Eqs. (C1), (C2), (C3), the accounting profit of firm 1 with high market demand, the accounting profit of firm 1 with low market demand, and the profit of firm 2, respectively, yields the equilibrium price, firm 1 manager's payoff, the accounting profits of firm 1 and that of firm 2, for the case in which the manager diverts:

$$p_H^{d*} = \frac{(3-\theta)\lambda a_H - (1-\theta)\lambda a_L - 2\gamma(1-\lambda-\alpha\rho)}{6\lambda}, \qquad p_L^{d*} = \frac{(2+\theta)\lambda a_L - \theta\lambda a_H - 2\gamma(1-\lambda-\alpha\rho)}{6\lambda}$$

$$S_{1H}^{d*} = f + \frac{[4\gamma(1-\lambda-\alpha\rho) + (3-\theta)\lambda a_H - \lambda(1-\theta)a_L]^2}{36\lambda},$$

$$S_{1L}^{d*} = f + \frac{16\gamma^2(1-\lambda-\alpha\rho)^2 + \lambda[\theta a_H - (2+\theta)a_L][\theta\lambda a_H - 8\gamma(1-\lambda-\alpha\rho) - (2+\theta)\lambda a_L]}{36\lambda},$$

$$S_2^{d*} = \pi_2^{d*} = \frac{[\theta\lambda a_H + \lambda(1-\theta)a_L - \gamma(1-\lambda-\alpha\rho)]^2}{9\lambda^2},$$

$$\pi_{1H}^{d*} = \frac{[(3-\theta)\lambda a_H - 2\gamma(1+2\lambda-\alpha\rho) - \lambda(1-\theta)a_L][4\gamma(1-\lambda-\alpha\rho) + (3-\theta)\lambda a_H - \lambda(1-\theta)a_L]}{36\lambda^2},$$

$$\pi_{1L}^{d*} = \frac{[2\gamma(1+2\lambda-\alpha\rho) + \theta\lambda a_H - (2+\theta)\lambda a_L][\theta\lambda a_H - 4\gamma(1-\lambda-\alpha\rho) - (2+\theta)\lambda a_L]}{36\lambda^2}. \tag{C5}$$

On the other hand, when firm 1's manager does not divert, i.e., $\gamma = 0$, the objective function of firm 1's manager in the case of high market demand is reduced to

$$\underset{q_{1H}}{Max}\ \lambda(a_H - q_{1H} - q_2)q_1 + f \tag{C6}$$

The objective function of firm 1's manager in the case of low market demand is reduced to

$$\underset{q_{1L}}{Max}\ \lambda(a_L - q_{1L} - q_2)q_1 + f \tag{C7}$$

The objective function of firm 2 remains to be (C3).

The equilibrium for the case in which the manager of firm 1 does not divert is characterized by the first-order conditions of (C6), (C7), and (C3), which yields:

$$q_{1H}^{n*} = \frac{1}{6}[(3-\theta)a_H - (1-\theta)a_L],\ q_{1L}^{n*} = \frac{1}{6}[(2+\theta)a_L - \theta a_H],\ q_2^{n*} = \frac{1}{3}[\theta a_H + (1-\theta)a_L] \tag{C8}$$

Plugging (C8) into market's inverse high demand function, the market's inverse low demand function, Eqs. (C6), (C7), (C3), the accounting profit of firm 1 with high market demand, the accounting profit of firm 1 with low market demand, and the profit of firm 2, respectively, yields the equilibrium price, firm 1 manager's payoff, the accounting profits of firm 1 and that of firm 2, for the case in which the manager of firm 1 does not divert:

$$p_H^{n*} = \frac{1}{6}[(3-\theta)a_H - (1-\theta)a_L], \qquad p_L^{n*} = \frac{1}{6}[(2+\theta)a_L - \theta a_H]$$

$$S_{1H}^{n*} = f + \frac{1}{36}\lambda[(3-\theta)a_H - (1-\theta)a_L]^2,\ S_{1L}^{n*} = f + \frac{1}{36}\lambda[(2+\theta)a_L - \theta a_H]^2,$$

$$S_2^{n*} = \pi_2^{n*} = \frac{1}{9}[\theta a_H + (1-\theta)a_L]^2,\ \pi_{1H}^{n*} = \frac{1}{36}[(3-\theta)a_H - (1-\theta)a_L]^2,\ \ \pi_{1L}^{n*} = \frac{1}{36}[(2+\theta)a_L - \theta a_H]^2. \tag{C9}$$

Hence, the manager will divert if and only if ${S_{1H}}^{d*} > {S_{1H}}^{n*}$ and ${S_{1L}}^{d*} > {S_{1L}}^{n*}$ i.e.,

$$S_{1H}^{d*} - S_{1H}^{n*} = \frac{2\gamma(1-\lambda-\alpha\rho)[2\gamma(1-\lambda-\alpha\rho) + (3-\theta)\lambda a_H - \lambda(1-\theta)a_L]}{9\lambda} > 0$$

$$S_{1L}^{d*} - S_{1L}^{n*} = \frac{2\gamma(1-\lambda-\alpha\rho)[2\gamma(1-\lambda-\alpha\rho) - \theta\lambda a_H + (2+\theta)\lambda a_L]}{9\lambda} > 0$$

which immediately implies that

$$\lambda < 1 - \alpha\rho \tag{C10}$$

From (C5) and (C9), we have that

$$\phi_{1H}^{d*} = \frac{q_{1H}^{d*}}{q_{1H}^{d*} + q_2^{d*}} = \frac{4\gamma(1-\lambda-\alpha\rho) + (3-\theta)\lambda a_H - \lambda(1-\theta)a_L}{2\gamma(1-\lambda-\alpha\rho) + (3+\theta)\lambda a_H + (1-\theta)\lambda a_L} \tag{C11}$$

$$\phi_{1L}^{d*} = \frac{q_{1L}^{d*}}{q_{1L}^{d*} + q_2^{d*}} = \frac{4\gamma(1-\lambda-\alpha\rho) - \theta\lambda a_H + (2+\theta)\lambda a_L}{2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (4-\theta)\lambda a_L} \tag{C12}$$

$$\phi_{1H}^{n*} = \frac{q_{1H}^{n*}}{q_{1H}^{n*} + q_2^{n*}} = -1 + \frac{6a_H}{(3+\theta)a_H + (1-\theta)a_L} \tag{C13}$$

$$\phi_{1L}^{n*} = \frac{q_{1L}^{n*}}{q_{1L}^{n*} + q_2^{n*}} = \frac{(2+\theta)a_L - \theta a_H}{\theta a_H + (4-\theta)a_L} \tag{C14}$$

Therefore,

$$\phi_{1H}^{d*} - \phi_{1H}^{n*} = \frac{6\gamma(1-\lambda-\alpha\rho)[(1+\theta)a_H + (1-\theta)a_L]}{[(3+\theta)a_H + (1-\theta)a_L][2\gamma(1-\lambda-\alpha\rho) + (3+\theta)\lambda a_H + \lambda(1-\theta)a_L]} > 0 \tag{C15}$$

$$\partial\phi_{1H}^{d*}/\partial\gamma = \frac{6\lambda(1-\lambda-\alpha\rho)[(1+\theta)a_H + (1-\theta)a_L]}{[2\gamma(1-\lambda-\alpha\rho) + (3+\theta)\lambda a_H + (1-\theta)\lambda a_L]^2} > 0 \tag{C16}$$

$$\phi_{1L}^{d*} - \phi_{1L}^{n*} = \frac{6\gamma(1-\lambda-\alpha\rho)[\theta a_H + (2-\theta)a_L]}{[\theta a_H + (4-\theta)a_L][2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (4-\theta)\lambda a_L]} > 0 \tag{C17}$$

$$\partial\phi_{1L}^{d*}/\partial\gamma = \frac{6\lambda(1-\lambda-\alpha\rho)[\theta a_H + (2-\theta)a_L]}{[2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (4-\theta)\lambda a_L]^2} > 0 \tag{C18}$$

From (C5) and (C9), we get

$$\pi_{1H}^{d*} - \pi_{1H}^{n*} = \frac{\gamma\{-4\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho) + \lambda(1-4\lambda-\alpha\rho)[(3-\theta)a_H - (1-\theta)a_L]\}}{18\lambda^2} \tag{C19}$$

(C19) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\pi_{1H}{}^{d*} < \pi_{1H}{}^{n*}$; when $\lambda < \frac{1-\alpha\rho}{4}$, $\pi_{1H}^{d*} > \pi_{1H}^{n*}$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[(3-\theta)a_H-(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\pi_{1H}{}^{d*} \leq \pi_{1H}{}^{n*}$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[(3-\theta)a_H-(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

Similarly,

$$\pi_{1L}^{d*} - \pi_{1L}^{n*} = \frac{\gamma\{-4\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho) + \lambda(1-4\lambda-\alpha\rho)[(2+\theta)a_L - \theta a_H]\}}{18\lambda^2}. \tag{C20}$$

(C20) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\pi_{1L}{}^{d*} < \pi_{1L}{}^{n*}$; when $\lambda < \frac{1-\alpha\rho}{4}$, $\pi_{1L}^{d*} > \pi_{1L}^{n*}$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[(2+\theta)a_L-\theta a_H]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\pi_{1L}{}^{d*} \leq \pi_{1L}{}^{n*}$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[(2+\theta)a_L-\theta a_H]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

Moreover, (C5) implies that

$$\frac{\partial\pi_{1H}^{d*}}{\partial\gamma} = \frac{-8\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho) + \lambda(1-4\lambda-\alpha\rho)[(3-\theta)a_H - (1-\theta)a_L]}{18\lambda^2} \tag{C21}$$

Clearly, (C21) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_{1H}^{d*}}{\partial\gamma} < 0$; when$\lambda < \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_{1H}^{d*}}{\partial\gamma} > 0$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[(3-\theta)a_H-(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\frac{\partial\pi_{1H}^{d*}}{\partial\gamma} \leq 0$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[(3-\theta)a_H-(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

Similarly,

$$\frac{\partial\pi_{1L}^{d*}}{\partial\gamma} = \frac{-8\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho) + \lambda(1-4\lambda-\alpha\rho)[(2+\theta)a_L - \theta a_H]}{18\lambda^2}. \tag{C22}$$

(C22) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_{1L}^{d*}}{\partial\gamma} < 0$; when $\lambda < \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_{1L}^{d*}}{\partial\gamma} > 0$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[(2+\theta)a_L-\theta a_H]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\frac{\partial\pi_{1L}^{d*}}{\partial\gamma} \leq 0$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[(2+\theta)a_L-\theta a_H]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

**Case 2.** Firm 2 knows whether demand is high or low, but firm 1 does not.

The objective function of firm 1's manager now becomes:

$$\underset{q_1}{Max}\ \theta[\lambda(a_H - q_1 - q_{2H})q_1 + (1-\alpha\rho-\lambda)\gamma q_1 + f] + (1-\theta)[\lambda(a_L - q_1 - q_{2L})q_1 + (1-\alpha\rho-\lambda)\gamma q_1 + f] \tag{C23}$$

The objective function of firm 2's manager in the case of high market demand is:

$$\underset{q_{2H}}{Max}\ (a_H - q_1 - q_{2H})q_{2H} \tag{C24}$$

The objective function of firm 2's manager in the case of low market demand is:

$$\underset{q_{2L}}{Max}\ (a_L - q_1 - q_{2L})q_{2L} \tag{C25}$$

To ensure positive outputs, we need to assume that $(2 + \theta)a_L > \theta a_H$. The equilibrium for the case in which firm 1's manager diverts is characterized by the first-order conditions of (C23), (C24), and (C25), which yields:

$$q_1^{d*} = \frac{2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + \lambda(1-\theta)a_L}{3\lambda},\ q_{2H}^{d*} = \frac{(3-\theta)\lambda a_H - 2\gamma(1-\lambda-\alpha\rho) - (1-\theta)\lambda a_L}{6\lambda},\ q_{2L}^{d*} = \frac{(2+\theta)\lambda a_L - \theta\lambda a_H - 2\gamma(1-\lambda-\alpha\rho)}{6\lambda} \tag{C26}$$

Substituting (C26) into the market's inverse high demand function, the market's inverse low demand function, Eqs. (C23), (C24), (C25), the accounting profit of firm 1, the profit of firm 2 with high market demand, and the profit of firm 2 with low market demand, respectively, yields the equilibrium price, firm 1 manager's payoff, the accounting profits of firm 1 and that of firm 2, for the case in which the manager diverts:

$$\begin{aligned} p_H^{d*} &= \frac{(3-\theta)\lambda a_H - 2\gamma(1-\lambda-\alpha\rho) - (1-\theta)\lambda a_L}{6\lambda},\ p_L^{d*} = \frac{(2+\theta)\lambda a_L - 2\gamma(1-\lambda-\alpha\rho) - \theta\lambda a_H}{6\lambda} \\ S_1^{d*} &= f + \frac{4\gamma^2(1-\lambda-\alpha\rho)^2 + \lambda[\theta a_H + (1-\theta)a_L][4\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + \lambda(1-\theta)a_L]}{9\lambda}, \\ \pi_{2H}^{d*} &= \frac{[(3-\theta)\lambda a_H - (1-\theta)\lambda a_L - 2\gamma(1-\lambda-\alpha\rho)]^2}{36\lambda^2},\ \pi_{2L}^{d*} = \frac{[(2+\theta)\lambda a_L - \theta\lambda a_H - 2\gamma(1-\lambda-\alpha\rho)]^2}{36\lambda^2}, \\ \pi_1^{d*} &= \frac{[\alpha\gamma\rho + \theta\lambda a_H + (1-\theta)\lambda a_L - \gamma - 2\gamma\lambda][2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (1-\theta)\lambda a_L]}{9\lambda^2}. \end{aligned} \tag{C27}$$

On the other hand, when firm 1's manager does not divert, i.e., $\gamma = 0$, the objective function of firm 1's manager is reduced to

$$\underset{q_1}{Max}\ \theta[\lambda(a_H - q_1 - q_{2H})q_1 + f] + (1-\theta)[\lambda(a_L - q_1 - q_{2L})q_1 + f] \tag{C28}$$

The objective function of firm 2's manager in the case of high market demand and low market demand remain to be (C24) and (C25), respectively.

The equilibrium for the case in which the manager of firm 1 does not divert is characterized by the first-order conditions of (C28), (C24), and (C25), which yields:

$$q_1^{n*} = \frac{1}{3}[\theta a_H + (1-\theta)a_L],\ q_{2H}^{n*} = \frac{1}{6}[(3-\theta)a_H - (1-\theta)a_L],\ q_{2L}^{d*} = \frac{1}{6}[(2+\theta)a_L - \theta a_H] \tag{C29}$$

Plugging (C29) into market's inverse high demand function, the market's inverse low demand function, Eqs. (C28), (C24), (C25), the accounting profit of firm 1, the profit of firm 2 with high market demand, and the profit of firm 2 with low market demand, respectively, yields the equilibrium price, the managers' payoffs, the accounting profits of firm 1 and that of firm 2, for the case in which the manager of firm 1 does not divert:

$$\begin{aligned} p_H^{n*} &= \frac{1}{6}[(3-\theta)a_H - (1-\theta)a_L],\ p_L^{n*} = \frac{1}{6}[(2+\theta)a_L - \theta a_H] \\ S_1^{n*} &= f + \frac{1}{9}\lambda[\theta a_H + (1-\theta)a_L]^2,\ S_{2H}^{n*} = \pi_{2H}^{n*} = f + \frac{1}{36}[(3-\theta)a_H - (1-\theta)a_L]^2, \\ S_{2L}^{n*} &= \pi_{2L}^{n*} = \frac{1}{36}[(2+\theta)a_L - \theta a_H]^2,\ \pi_1^{n*} = \frac{1}{9}[\theta a_H + (1-\theta)a_L]^2 \end{aligned} \tag{C30}$$

Hence, the manager will divert if and only if $S_1^{d*} > S_1^{n*}$ i.e.,

$$S_1^{d*} - S_1^{n*} = \frac{4\gamma(1-\lambda-\alpha\rho)[\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (1-\theta)\lambda a_L]}{9\lambda} > 0,$$

which immediately implies that

$$\lambda < 1 - \alpha\rho \tag{C31}$$

From (C27) and (C30), we have that

$$\phi_1^{d*} = \frac{q_1^{d*}}{q_1^{d*} + \theta q_{2H}^{d*} + (1-\theta)q_{2L}^{d*}} = \frac{2\gamma(1-\lambda-\alpha\rho) + \theta\lambda a_H + (1-\theta)\lambda a_L}{\gamma(1-\lambda-\alpha\rho) + 2\theta\lambda a_H + 2(1-\theta)\lambda a_L} \tag{C32}$$

$$\phi_1^{n*} = \frac{q_1^{n*}}{q_1^{n*} + \theta q_{2H}^{n*} + (1-\theta)q_{2L}^{n*}} = \frac{1}{2} \tag{C33}$$

Therefore,

$$\phi_1^{d*} - \phi_1^{n*} = \frac{3\gamma(1-\lambda-\alpha\rho)}{2[\gamma(1-\lambda-\alpha\rho)+2\theta\lambda a_H+2(1-\theta)\lambda a_L]} > 0 \tag{C34}$$

$$\partial\phi_1^{d*}/\partial\gamma = \frac{3\lambda(1-\lambda-\alpha\rho)[\theta a_H+(1-\theta)a_L]}{[\gamma(1-\lambda-\alpha\rho)+2\theta\lambda a_H+2(1-\theta)\lambda a_L]^2} > 0 \tag{C35}$$

From (C27) and (C30), we get

$$\pi_1^{d*} - \pi_1^{n*} = \frac{\gamma[-2\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho)+\lambda(1-4\lambda-\alpha\rho)(\theta a_H+(1-\theta)a_L)]}{9\lambda^2} \tag{C36}$$

(C19) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\pi_1^{d*} < \pi_1^{n*}$; when $\lambda < \frac{1-\alpha\rho}{4}$, $\pi_1^{d*} > \pi_1^{n*}$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[\theta a_H+(1-\theta)a_L]}{2(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\pi_1^{d*} \leq \pi_1^{n*}$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[\theta a_H+(1-\theta)a_L]}{2(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

Moreover, (C27) implies that

$$\frac{\partial\pi_1^{d*}}{\partial\gamma} = \frac{-4\gamma(1+2\lambda-\alpha\rho)(1-\lambda-\alpha\rho)+\lambda(1-4\lambda-\alpha\rho)[\theta a_H+(1-\theta)a_L]}{9\lambda^2} \tag{C37}$$

Clearly, (C37) immediately implies that when $\lambda \geq \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_1^{d*}}{\partial\gamma} < 0$; when$\lambda < \frac{1-\alpha\rho}{4}$, $\frac{\partial\pi_1^{d*}}{\partial\gamma} > 0$ if $\gamma < \frac{\lambda(1-\alpha\rho-4\lambda)[\theta a_H+(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$; otherwise, $\frac{\partial\pi_{1H}^{d*}}{\partial\gamma} \leq 0$ if $\gamma \geq \frac{\lambda(1-\alpha\rho-4\lambda)[\theta a_H+(1-\theta)a_L]}{4(1-\alpha\rho+2\lambda)(1-\alpha\rho-\lambda)}$.

## Appendix D. Derivations for the *Bertrand* Competition model

Suppose that under Bertrand competition model, each firm $i$ ($i = 1, 2$) faces a demand curve given by

$$q_i = A - p_i + bp_j,\ j = 1, 2,\ j \neq i \tag{D1}$$

where $p_i$ and $p_j$ are prices charged by firms $i$ and $j$, respectively, and $b$ measures consumers' preferences over the good sold by firm $i$ relative to that sold by firm $j$. We assume that $0 < b < 1$, i.e., firm $i$'s demand is more sensitive to its own price as it is to the price charged by its competitor. The manager of each firm chooses its price to maximize its own objective function given by

$$S_1 = \lambda(p-\gamma)q_1 + \gamma q_1 - \alpha\rho\gamma q_1 + f = \lambda p q_1 + (1-\alpha\rho-\lambda)\gamma q_1 + f \tag{D2}$$

$$\underset{p_2}{Max}\ S_2 = \pi_2 = p_2(A + bp_1 - p_2) \tag{D3}$$

Other specifications remain the same as before.

The equilibrium for the case in which the manager diverts is characterized by the following first-order conditions, i.e., $\partial S_1/\partial p_1 = 0$ and $\partial S_2/\partial p_2 = 0$, which yields.

$$p_1^{d*} = \frac{A(2+b)\lambda - 2\gamma(1-\lambda-\alpha\rho)}{(4-b^2)\lambda},\ p_2^{d*} = \frac{2A\lambda + Ab\lambda - b\gamma(1-\lambda-\alpha\rho)}{(4-b^2)\lambda} \tag{D4}$$

Substituting (D4) into (D1), (D2), (D3), the accounting profit of firm 1 and the profit of firm 2, respectively, yields the equilibrium output of firm 1, the equilibrium output of firm 2, firm 1 manager's payoff, the accounting profits of firm 1 and that of firm 2, for the case in which the manager diverts:

$$q_1^{d*} = \frac{A(2+b)\lambda + (2-b^2)\gamma(1-\lambda-\alpha\rho)}{(4-b^2)\lambda},\ q_1^{d*} = \frac{2A\lambda + Ab\lambda - b\gamma(1-\lambda-\alpha\rho)}{(4-b^2)\lambda},$$
$$S_1^{d*} = \frac{[A(2+b)\lambda + (2-b^2)\gamma(1-\lambda-\alpha\rho)]^2}{(4-b^2)^2\lambda} + f,\ S_2^{d*} = \pi_2^{d*} = \frac{[2A\lambda + Ab\lambda - b\gamma(1-\lambda-\alpha\rho)]^2}{(4-b^2)^2\lambda^2},$$
$$\pi_1^{d*} = \frac{[A(2+b)\lambda + (2-b^2)\gamma(1-\lambda-\alpha\rho)]\{A(2+b)\lambda - \gamma[2+(2-b^2)\lambda - 2\alpha\rho]\}}{(4-b^2)^2\lambda^2} \tag{D5}$$

On the other hand, when the manager does not divert, i.e., $\gamma = 0$ the objective of the manager of firm 1 is reduced to

$$S_1^0 = \lambda p_1 q_1 + f \tag{D6}$$

Thus, the equilibrium prices for the case in which the manager does not divert are given by

$$p_1^{n*} = p_2^{n*} = \frac{A}{2-b} \tag{D7}$$

Plugging (D7) into (D1), (D2), (D3), the accounting profit of firm 1 and the profit of firm 2, respectively, yields the equilibrium output of firm 1, the equilibrium output of firm 2, firm 1 manager's payoff, the accounting profits of firm 1 and that of firm 2, for the case in which the manager does not divert:

$$q_1^{n*} = q_2^{n*} = \frac{A}{2-b},\ S_1^{n*} = \frac{A^2\lambda}{(2-b)^2} + f,\ \pi_1^{n*} = \frac{A^2}{(2-b)^2},\ S_2^{n*} = \pi_2^{n*} = \frac{A^2}{(2-b)^2} \tag{D8}$$

Hence, the manager will divert if and only if ${S_1}^{d*} > {S_1}^{n*}$, i.e.,

$$S_1^{d*} - S_1^{n*} = \frac{[A(2+b)\lambda + (2-b^2)\gamma(1-\lambda-\alpha\rho)]^2}{(4-b^2)^2\lambda} - \frac{A^2\lambda}{(2-b)^2} > 0$$

which immediately implies that

$$\lambda < 1 - \alpha\rho \tag{D9}$$

From (D5) and (D8), we have that

$$q_1^{d*} - q_1^{n*} = \frac{(2-b^2)\gamma(1-\lambda-\alpha\rho)}{(4-b^2)\lambda} > 0 \tag{D10}$$

$$\phi_1^{d*} = \frac{q_1^{d*}}{q_1^{d*} + q_2^{d*}} = \frac{A(2+b)\lambda + (2-b^2)\gamma(1-\lambda-\alpha\rho)}{(2+b)[2A\lambda + (1-b)\gamma(1-\lambda-\alpha\rho)]} \tag{D11}$$

$$\phi_1^{n*} = \frac{q_1^{n*}}{q_1^{n*} + q_2^{n*}} = \frac{1}{2} \tag{D12}$$

Therefore,

$$\phi_1^{d*} - \phi_1^{n*} = \frac{(2-b)(1+b)\gamma(1-\lambda-\alpha\rho)}{2(2+b)[2A\lambda + (1-b)\gamma(1-\lambda-\alpha\rho)]} > 0 \tag{D13}$$

$$\partial\phi_1^{d*}/\partial\gamma = \frac{A(2-b)(1+b)\lambda(1-\lambda-\alpha\rho)}{(2+b)[2A\lambda + (1-b)\gamma(1-\lambda-\alpha\rho)]^2} > 0 \tag{D14}$$

Thus, the impact of managerial diversion on firm 1's product market performance under Bertrand competition is similar to that under Cournot competition.

From (D5) and (D8), we get

$$\pi_1^{d*} - \pi_1^{n*} = -\frac{\gamma\{(2-b^2)\gamma(1-\lambda-\alpha\rho)[2+(2-b^2)\lambda-2\alpha\rho] + A(2+b)\lambda[4\lambda + b^2(1-2\lambda-\alpha\rho)]\}}{(4-b^2)^2\lambda^2} \tag{D15}$$

(D15) immediately implies that ${\pi_1}^{d*} < {\pi_1}^{n*}$, which is different from that under Cournot competition model.

Moreover, (D5) implies that

$$\frac{\partial\pi_1^{d*}}{\partial\gamma} = -\frac{2(2-b^2)\gamma(1-\lambda-\alpha\rho)[2+(2-b^2)\lambda-2\alpha\rho] + A(2+b)\lambda[4\lambda + b^2(1-2\lambda-\alpha\rho)]}{(4-b^2)^2\lambda^2} < 0 \tag{D16}$$

which is also different from that under Cournot competition model.

## Appendix E. Definition of Variables

| Variable | Description |
|---|---|
| *AExpenxe* | Administrative expenses |
| *Sales* | Sales income |
| Size | Total assets, natural logarithm used in regressions |
| *Leverage* | The ratio of total liability to total assets |
| *Inventory* | Inventory |
| *PPE* | Net fixed assets |
| Profit | The ratio of total profits to total assets |
| *Investment* | Change in net fixed assets plus depreciation this year scaled by total assets |
| *Tangibility* | The ratio of fixed assets to total assets |
| *Employee* | Number of employees |
| *SalesG* | (Sales in year $t$ − Sales in year $t-1$)/Sales in year $t-1$ |
| *MPK* | Marginal productivity of capital, defined as the ratio of sales income to net fixed assets |

## References


Acemoglu, D., & Verdier, T. (2000). The choice between market failures and corruption. *American Economic Review, 90*(1), 194–211.
Ali, A., Klasa, S., & Yeung, E. (2009). The limitations of industry concentration measures constructed with Compustat data: Implications for finance research. *Review of Financial Studies, 22*(10), 3839–3871.
Ang, J. S., Cole, R. A., & Lin, J. W. (2000). Agency costs and ownership structure. *Journal of Finance, 55*(1), 81–106.
Basu, K., Bhattacharya, S., & Mishra, A. (1992). Notes on bribery and the control of corruption. *Journal of Public Economics, 48*(3), 349–359.
Bebchuk, L. A., & Jolls, C. (1999). Managerial value diversion and shareholder wealth. *The Journal of Law, Economics, and Organization, 15*(2), 487–502.
Bruno, V., & Claessens, S. (2010). Corporate governance and regulation: Can there be too much of a good thing? *Journal of Financial Intermediation, 19*(4), 461–482.
Campello, M. (2003). Capital structure and product markets interactions: Evidence from business cycles. *Journal of Financial Economics, 68*(3), 353–378.
Campello, M. (2006). Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics, 82*(1), 135–172.
Carlton, D. W., & Fischel, D. R. (1983). The regulation of insider trading. *Stanford Law Review, 35*(5), 857–895.
Desai, M. A., Dyck, A., & Zingales, L. (2007). Theft and taxes. *Journal of Financial Economics, 84*(3), 591–623.
Dixit, A. (1986). Comparative statics for oligopoly. *International Economic Review, 27*(1), 107–122.
Durnev, A., & Kim, E. H. (2005). To steal or not to steal: Firm attributes, legal environment, and valuation. *Journal of Finance, 60*(3), 1461–1493.
Easterbrook, F. H., & Fischel, D. R. (1982). Corporate control transactions. *Yale Law Journal, 91*(4), 698–737.
Easterbrook, F. H., & Fischel, D. R. (1991). *The economic structure of corporate law.* Cambridge, UK: Harvard University Press.
Fama, E. (1980). Agency problems and the theory of the firm. *Journal of Political Economy, 88*(2), 288–307.
Fresard, L. (2010). Financial strength and product market behavior: The real effects of corporate cash holdings. *Journal of Finance, 65*(3), 1097–1122.
Gilchrist, S., & Himmelberg, C. (1998). Investment, fundamentals and finance. *NBER Macroeconomics Annual, 13*, 223–262.
Grossman, S. J., & Hart, O. D. (1980). Take-over bids, the free rider problem, and the theory of the corporation. *Bell Journal of Economics, 11*(1), 42–64.
Haddock, D. D., & Macey, J. R. (1987). A Coasian model of insider trading. *Northwestern University Law Review, 80*(6), 1449–1472.
Hand, J. H., & Rogow, R. B. (1982). Agency relationships in the close corporation. *Financial Management, 11*(1), 25–30.
He, L. (2006). Managerial diversion. *Regulation and internal control mechanism*. Available at http://ssrn.com/abstract=882865.
He, L., & Ho, S. J. K. (2011). Monitoring costs, managerial ethics, and corporate governance: A modeling approach. *Journal of Business Ethics, 99*(4), 623–635.
Hsieh, C., & Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *The Quarterly Journal of Economics, 124*(4), 1403–1448.
Jensen, M. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2), 323–329.
Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behavior, agency costs and capital structure. *Journal of Financial Economics, 3*(4), 11–25.
Joh, S. W. (2003). Corporate governance and firm profitability: Evidence from Korea before the economic crisis. *Journal of Financial Economics, 68*(2), 287–322.
John, K., Litov, L., & Yeung, B. (2008). Corporate governance and managerial Risk taking. *Journal of Finance, 63*(4), 1679–1728.
Kovenock, D., & Philips, G. (1995). Capital structure and product market rivalry: How do we reconcile theory and evidence ? *American Economic Review, 85*, 403–408.
Kovenock, D., & Phillips, G. (1997). Capital structure and product market behavior: An examination of plant exit and investment decisions. *Review of Financial Studies, 10*, 767–803.
Kreps, D., & Scheinkman, J. (1983). Quantity Precommitment and Bertrand competition yield Cournot outcomes. *Bell Journal of Economics, 14*, 326–337.
Li, K., Yue, H., & Zhao, L. (2009). Ownership, institutions, and capital structure: Evidence from China. *Journal of Comparative Economics, 37*(3), 471–490.
Love, I. (2003). Financial development and financing constraints: International evidence from the structural investment model. *Review of Financial Studies, 16*(3), 765–791.
Luo, W., Zhang, Y., & Zhu, N. (2011). Bank ownership and executive perquisites: New evidence from an emerging market. *Journal of Corporate Finance, 17*(2), 352–370.
MacKay, P., & Phillips, G. (2002). Is there an optimal industry financial structure? *NBER Working Paper, No. 9032*. University of Maryland.
Manne, H. (1966). *Insider trading and the stock market.* New York: Free Press.
Manne, H. (1970). Insider trading and the law professors. *Vanderbilt Law Review, 23*(3), 547–590.
Meng, X., & Perkins, F. (1998). Wages determination differences between Chinese state and non-state firms. *Asian Economic Journal, 12*(3), 295–316.
Meulbroek, L. K. (1992). An empirical analysis of illegal insider trading. *Journal of Finance, 47*(5), 1661–1699.
Mookherjee, D., & Png, I. (1995). Corruptible law enforcers: How should they be compensated? *The Economic Journal, 105*(428), 145–159.
Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies, 22*(1), 435–480.
Rajan, R. G., & Wulf, J. (2006). Are perks purely managerial excess? *Journal of Financial Economics, 79*(1), 1–33.
Roulstone, D. T. (2003). The relation between insider-trading restrictions and executive compensation. *Journal of Accounting Research, 41*(3), 525–551.
Scott, K. (1980). Insider trading: Rule 10b-5, disclosure and corporate privacy. *The Journal of Legal Studies, 9*(4), 801–818.
Shleifer, A., & Vishny, R. (1997). A survey of corporate governance. *The Journal of Finance, 52*(2), 737–783.
Shleifer, A., & Wolfenzon, D. (2002). Investor protection and equity markets. *Journal of Financial Economics, 66*(1), 3–27.
Singh, N., & Vives, X. (1984). Price and quantity competition in a differentiated duopoly. *RAND Journal of Economics, 15*, 546–554.
Tirole, J. (1988). *The theory of industrial organization.* MIT Press.
Tirole, J. (2001). Corporate governance. *Econometrica, 69*(1), 1–35.
Wan, H., Zhu, K., & Chen, X. (2015). Career concerns, shareholder monitoring and investment efficiency: From the perspective of compensation contract rigidity in Chinese SOEs. *China Journal of Accounting Research, 8*(1), 59–73.
Yermack, D. (2006). Flights of fancy: Corporate jets, CEO perquisites, and inferior shareholder returns. *Journal of Financial Economics, 80*(1), 211–242.
Zhang, H., Song, Y., & Ding, Y. (2015). What drives managerial perks? An empirical test of competing theoretical perspectives. *Journal of Business Ethics, 132*(2), 259–275.