Abstract

Firms value customer’s trust highly, yet the impact of corporate governance of trust-reliant firms is underexplored. This paper investigates how a firm’s brand image in the product market responds to a change in its controlling shareholder, and derives the optimal firm ownership and control structure. We consider a dynamic model of an experience-goods firm, in which a controlling shareholder actively engages in management, and the controlling share block can be traded through private negotiation. In the optimal equilibrium, customers’ level of trust in the firm is linked to its behavior in the market for corporate control, so that the controlling shareholder has proper incentives to ensure high-quality products are produced. Turnover of controlling share block enhances both firm profit and total shareholder value. Our analysis also identifies an endogenous cost of corporate control, and provides a rationale for the separation of ownership and control. We derive the optimal ownership structure and draw implications on the dynamics of control premium.

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1 Introduction

Brand name is a valuable asset to a firm, because customers’ purchasing decisions are often based on their perception of the firm’s image and reputation. Moreover, these perceptions are likely to be associated with customers’ consumption experience in their memory (Keller (1993)). Customers’ faith in the firm is particularly important if some dimensions of the firm’s products or services are difficult to monitor and contract upon. A firm with which customers find trustworthy can make more sales, charge a price premium, thus enjoy a higher profit. When the firm loses its customers’ trust, it also loses sales and profit. To build and maintain a good trustworthiness, the firm’s top executives must devote personal effort and spend the company’s valuable resources into establishing a history of offering high-quality products. In this paper, we consider firms that rely heavily on customers’ trust in the product market, and study how turnover of ownership and the design of corporate governance structure can facilitate the firm’s management of its brand value in the product market and through which enhance its profit and total shareholder value. To the best of our knowledge, this is the first study of implications of a firm’s concern for customers’ trust in the product market on the firm’s corporate governance structure.

It is standard in the literature to capture seller’s trustworthiness in the product market by considering a firm as a producer of experience goods. A product is an experience good if customers cannot observe its product quality at the time of purchase, but their consumption experience provides public signals about the product’s quality. High-quality production is costly to the firm and therefore, without proper incentive, the firm will shirk on its quality and rational customers correctly anticipate this. Klein and Leffler (1981) proposed a trust mechanism according to which if a firm continues to produce at high quality, customers will trust the firm’s management and pay a price premium for its products. Once the firm produces low quality, it loses the trust of its customers who now believe that the firm will produce at low quality. They punish the firm by either asking for a large discount on its product or not purchasing from the firm at least for some time. When the firm does not have perfect control of its quality, such punishment necessarily occurs with a positive probability on the equilibrium path, leading to destruction of shareholder value. The same trust mechanism are also at work in the firm’s relationship with its workers and investors. In these relationships, labor violation and accounting scandals are perceived as the firm’s failure in honoring the trust of workers and investors respectively. It is worthy to point out that while our model and analysis is cast in the firm’s interaction with customers, we are using an experience-good seller as a vehicle, and our messages and findings are applicable to other relationships mentioned above.

An implicit assumption of the standard trust mechanism is that the firm is owned by a single shareholder throughout the lifetime of the firm. In this paper, we revisit the trust mechanism in a setting which recognizes two commonly observed features of corporate governance: (i) in many companies there are

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1 Researchers in marketing and accounting have developed rigorous estimation techniques to assess the contribution of brand value to a firm’s profit. For some notable contributions, see Simon and Sullivan (1993) and Barth, Clement, Foster, and Kasznik (1998).

2 We follow the terminology introduced by Cabral (2005) to refer to the class of models based on moral hazard in an infinitely repeated interactions as models of trust and trustworthiness instead of models of reputation.

3 Some examples of experience goods are: movies, red wines newly introduced to the market, some consumer durables such as a new generation of smartphone.
two types of shareholders: controlling shareholders who make managerial decisions, and noncontrolling shareholders who do not; and (ii) the controlling-share block can be traded in the market for corporate control. By simultaneously studying the firm’s strategy for trust management in the product market and the design of its dynamic ownership structure, we obtain the following main findings: (i) voluntary turnover of controlling-share block can help turnaround a firm’s damaged relationship with customers and enhance the firm’s long-run shareholder value, and (ii) the optimal ownership structure is the outcome of the tradeoff between managing the controlling shareholder’s moral hazard and mitigating the punishment from the product market.

Formally, our model is a repeated game with imperfect public monitoring augmented with voluntary player turnover, and we solve for the perfect Bayesian equilibrium that maximizes the total shareholder value. In the optimal equilibrium, following a bad outcome, the controlling shareholder voluntarily sells her block of shares to a new entrepreneur through negotiation. As long as the endogenously determined negotiated price for the shares is sufficiently low, the controlling shareholder is sufficiently punished and the fear of punishment provides him enough incentive to exert personal effort and spend company’s valuable resources to improve the product’s quality. The low negotiated price can be sustained in equilibrium because if the controlling shareholder fails to sell her shares, customers would believe that the firm engages in high-quality production only if a huge discount on product price is offered. Since the new entrepreneur and the noncontrolling shareholders are not responsible for the bad outcome, once the control block changes hands, customers no longer have to punish the firm severely and will continue to pay a premium for the firm’s product. Customers’ preferential treatment of the new controlling shareholder allows the firm’s relationship with customers to be repaired through the turnover of control block. More importantly for the firm, as customers’ punishment on the firm is mitigated, the firm’s profit and the value of the noncontrolling shares are enhanced, setting our ownership turnover mechanism apart from the consumer turnover mechanism by Rob and Sekiguchi (2006), which we discuss in length in the next subsection.

It is interesting to note that in the optimal equilibrium, the gain from trade of the control block arises endogenously from the product market’s differential treatments of the incumbent and new controlling shareholders. Another noteworthy feature is that the incumbent controlling shareholder exits the firm voluntarily and she receives a price for the share block in excess of what she could get would she stay in control of the company.

In our setting, the controlling shareholder enjoys a positive private benefit in excess of the effort cost of managing the company and there is no other exogenous cost of corporate control. This means that the control premium, defined as the difference in values between controlling shares and noncontrolling shares, is positive as long as the controlling shareholder and minority shareholders receive the same stream of income per share. However, in equilibria with turnover of controlling share block, the control premium is not necessarily positive. The reason is that in the optimal equilibrium with turnover of control rights, the controlling shareholder has to bear an endogenous cost of corporate control: they have to be punished for bad outcomes on the equilibrium path while minority shareholders do not. More specifically, following
a bad outcome, the controlling shareholder has to voluntarily sell her shares at a low price while the firm’s high profit is preserved. The noncontrolling shareholders are entitled to the entire stream of high profits, while the controlling shareholder is not. This creates a wedge between the income streams offered by each controlling share and noncontrolling share. When this wedge exceeds the net private benefit of control per share, the control premium becomes negative. This theoretical possibility of negative control premium is contrary to the conventional wisdom that shares with more control rights are valued weakly higher than shares with less or no control rights. Our finding is also empirically relevant because there are well documented examples of negative control premiums. Moreover, our model predicts that the control premium is lower and more likely to be negative when a firm is performing poorly. This prediction is also consistent with empirical findings.

Our model provides a rationale for partial separation of ownership and control, and sheds light on the optimal firm ownership structure. In the optimal equilibrium, when the product quality fails, controlling shares are subject to more severe punishment than noncontrolling shares. This implies that the total shareholder value can be raised by converting some of the controlling shares into noncontrolling shares. In other words, the founder of the company can benefit by issuing noncontrolling shares after setting up the company. Note that despite this benefit of issuing noncontrolling shares, the total shareholder value does not monotonically increase in the fraction of noncontrolling shares. As more shares are converted into noncontrolling shares, the controlling shareholder’s incentive to exert effort weakens because she now receives a smaller share of the profit but is required to put forth the same amount of managerial effort to maintain high-quality production. In our framework, the optimal share structure is the outcome of a tradeoff between managing the controlling shareholder’s moral hazard problem and preserving firm value from product market’s punishment.

The structure of the paper is as follows. Below, we discuss the literature in economics and corporate finance pertinent to our study. In Section 2, we set up our model. Section 3 first analyzes the benchmark case in which the market for corporate control is shut down. We then study the effect of negotiated block trade on the firm’s profit, and show how the product market and the market for corporate control interact with each other in equilibrium. Section 4 discusses how our theory accounts for an endogenous cost of corporate control and draws implications on control premium. In Section 5, we state our model’s predictions concerning control block transactions and compare them with existing theoretical and empirical literature. In Section 6, we solve for the optimal ownership structure. Section 7 discusses some modelling issues and generalizations. The final section concludes.

1.1 Related Literature

The insight that profits from future sales incentivize sellers to engage in good behavior dates back to Klein and Leffler (1981). In their model of repeated game with perfect monitoring, when the seller sufficiently

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4 While many empirical studies have found that shares with voting rights are traded at a positive premium (see Zingales (1994) for a notable example), there are plenty of examples of negative control premium. See, for example, Chen (2004), Dyck and Zingales (2004), Kruse, Kyono, and Suzuki (2006), Lease, McConnell, and Mikkelson (1983), Pinegar and Ravichandran (2003), and Valero, Gomez, and Reyes (2008). These studies are further discussed in Section 4.

5 See, for example, Barclay and Holderness (1989) and Kruse, Kyono, and Suzuki (2006).
cares about the future, there exists a (subgame perfect) equilibrium in which buyers pay a premium to purchase from the seller if and only if the seller has always provided high-quality goods in the past. The fear of losing the future profits deters the seller from cheating (by offering low-quality goods). If the seller does not have perfect control of quality, as it is the case in reality, when she fails to provide high-quality goods, the seller must be punished by a loss in profits. The notion of firm instead of its owner as a reputation-bearer is first proposed by Kreps (1990). He points out that even though a firm owner has a finite lifetime, she is motivated to maintain a good firm record because when she retires and has to sell the firm, the buyer is willing to pay a higher price if the firm has a good record. For a comprehensive survey of the literature on trust and reputation, see Cabral (2005), and Bar-Isaac and Tadelis (2008).

Rob and Sekiguchi (2006) consider a setting of repeated duopoly, in which each firm produces experience goods. They study and characterize the (consumer) turnover equilibrium, in which customers penalize a firm’s low-quality production by switching to the firm’s competitor. According to Rob and Sekiguchi (2006), social inefficiency due to punishment of a firm failing to deliver high quality can be mitigated if the punishment is implemented by consumers switching to patronizing a different firm. Despite the apparent similarity in our punishment mechanisms, our paper is not about reducing social inefficiency. In fact, in our benchmark model without ownership turnover, social efficiency is already achieved since the firm is punished by being required to offer a one-period discount instead of reverting to low-quality production or suspension of trade. As a result, high quality is produced in every period on the equilibrium path. Instead, our ownership-turnover mechanism allows the firm to enhance its profits and total shareholder value, and the founder of the firm to capture the increase in shareholder value through issuing two classes of shares. Although Rob and Sekiguchi’s (2006) consumer-turnover mechanism enhances social efficiency, it does not raise individual firms’ profits or shareholder values as the same magnitude of punishment has to be imposed on the firm when it produces at low quality, or otherwise it would not have incentives to produce at high quality. A key element of our ownership-turnover mechanism is the creation of two classes of shares which allows the punishment to be concentrated on the controlling shareholder, while sparing the noncontrolling shareholders. In the special case where the controlling shareholder owns 100% of the shares, equilibria with ownership turnover still exist, but the total shareholder value in these equilibria is no higher than its counterpart under no ownership turnover.

Our theory considers firms in which a dominant shareholder holds a significant fraction of total shares and the rest of shares are widely held by small investors. Empirical research on corporate ownership concentration shows that the existence of controlling shareholders in modern corporations, even in large and publicly-listed ones, is prevalent (see, La Porta, Lopez-de-Silane, and Shleifer (1999) for an international study, and Gadhoum, Lang, and Young (2005) and Anderson and Reeb (2003) for studies on U.S. firms). It is common for these controlling shareholders to have control rights in excess of their cash flow rights and to actively participate in management. Closely related are empirical studies on insider ownership. Holderness, Kroszner, and Sheehan (1999) find that insiders (firm’s main officers and directors) on average owned 21 percent of the common stock of a typical firm.6 A motivation for large block ownership is that it is effective in overcoming a free-rider problem: while overseeing firm operations

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6See also Mikkelson and Partch (1989) for related findings.
and improving firm performance benefit all shareholders, these activities involve high personal cost. By assigning substantial cash-flow right to one or a few large shareholders, they have strong incentives to engage in value-improving activities. This is the view put forth by Shleifer and Vishny (1986), and Demsetz and Lehn (1985). Building on the notion that share ownership mitigates the controlling shareholder’s moral hazard, we introduce a novel benefit of separation of ownership and control and derive the optimal ownership structure in our setting.

In his seminal article, Manne (1965) suggests that the market for corporate control can incentivize incumbent managers by threatening them with the prospect of losing their job in case the firm is acquired following poor performance. Jensen and Ruback (1983) argue that control transactions such as tender offers, and proxy contests are best viewed as relatively passive shareholders choosing among competing managerial teams. In their framework, poorly performing managers are involuntarily forced out of the firm, and deprived of the rent and/or private benefit associated with their job. Barclay and Holderness (1991) identify negotiated block trade as an important class of corporate control transactions by presenting empirical evidence that negotiated block trade is very often associated with extensive post-trade managerial and board turnover. They point out that negotiated block trade is best viewed as corporate control events in which “activist stockholders.... buy control of a company and hire and fire management to achieve a better resource utilization”. In these studies, turnover of ownership and control improves the firm’s performance by making punishment for bad outcome more severe and/or replacing poor managers with more capable ones. While we also show that negotiated block trade can improve firm profit and shareholder value, turnover enhances firm profit through very different forces in our setting. In our model, the incumbent controlling shareholder exits the firm voluntarily following bad performance, and that the associated magnitude of punishment is not made more severe in our mechanism. Moreover, the entrepreneur replacing her is no more capable at running the business. Barclay and Holderness (1989, 1991) are the first systematic empirical studies of negotiated block trades. Dyck and Zingales (2004) study trades of controlling block in a large cross section of countries, with particular emphasis on factors that affect the block premium and discount. Albuquerque and Schroth (2010) conduct structural estimation of the block pricing model due to Burkart, Gromb and Panunzi (2000). We discuss the connection between the empirical findings of these studies and our model’s predictions in Sections 4 and 5.

In the theoretical literature, control transfer through negotiated block trade receives relatively little attention (compared to tender offer). Bebchuk (1994) studies the effect of different takeover laws on the efficiency of the transactions of majority blocks. Burkart, Gromb and Panunzi (2000) analyze a two-stage model of control-block transactions and study the effect of firm characteristics on the terms of transactions. In the first stage of their model, the incumbent and the incoming controlling shareholders engage in Nash bargaining, and a breakdown of the bargaining would trigger a public tender-offer stage. Stenapov (2015) considers a similar two-stage model in a different regulatory environment and shows that the optimal mode of transfers depends on the incoming controlling shareholder’s value-creation ability. In these

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7 In this paper, we abstract away from the strategic interaction among multiple blockholders by assuming there is a single controlling shareholder. This allows us to simplify the analysis and focus on the relationship between firm reputation and turnover of the control block.

8 For a comprehensive survey of block ownership and transaction, see Holderness (2003).
studies, the gain from trading the control block arises from the exogenous arrival of a new controlling shareholder with superior ability in generating profit for the firm and/or extracting private benefit of control. In contrast, the gain from trade in our model arises endogenously from customers’ differential treatment of controlling shareholders, and this feature implies that a control-block transaction is more likely to take place soon after the firm has produced low quality. Moreover, Burkart, Gromb and Panunzi (2000) and Stenapov (2015) focus on the controlling shareholder’s moral hazard in extracting private benefit of control, our model considers a different moral hazard problem: the controlling shareholder has to exert costly personal effort to ensure that high-quality products are produced with high probability. The difference in the nature of the moral hazard problem leads to distinct implications on the premium at which the control block is traded. We discuss these implications in detail in Section 5.

The most frequently cited benefits of separation of ownership and control include management specialization, risk-sharing, and liquidity constraint (Fama and Jensen (1983) and Shleifer and Vishny (1997)). By taking into account the management of customers’ trust in the product market, we identify an underexplored benefit in separating ownership and control. The benefit arises because turnover of control allows punishment to be targeted on the controlling shareholder, and the firm to regain customer trust in a less costly way. As a result, provided that the controlling shareholder’s moral hazard is properly managed, the value of noncontrolling shares and consequently the total shareholder value can be increased by issuing a larger fraction of noncontrolling shares.

2 Model

Players Time is discrete and infinite, \( t = 1, 2, \ldots \). There are three kinds of players in the game: entrepreneurs, customers, and investors. All players share the same discount factor, \( \delta \in (0, 1) \), across periods. There is a continuum of anonymous customers of measure one. The market is served by a monopoly firm possessing a technology of producing an experience good, the quality of which cannot be observed at the time of purchase. The monopoly firm is owned by one entrepreneur who has full control rights over the firm’s business decisions, and a continuum of anonymous investors who own the company’s shares but have no control rights. We call the entrepreneur with control rights the controlling shareholder and the other investors the noncontrolling shareholders. Denote the fraction of shares owned by the controlling shareholder by \( \theta \), and the remaining fraction, \( 1 - \theta \), is owned by the non-controlling shareholders. For now, \( \theta \) is assumed to be fixed and exogenous, but in Section 6, we will endogenize \( \theta \) by considering it as optimally chosen by the founder of the company. The share structure \( \theta \) and the identity of the controlling shareholder are perfectly observable to all players.

Production Technology In every period, \( t \), the production technology may yield two possible outcomes, \( y_t \in \{0, 1\} \), with each outcome representing the utility received by customers upon consumption. The realization of the outcome is publicly observable and perfectly correlated among customers consuming the goods in period \( t \). The probability of each outcome depends on both the monetary production cost the firm incurs, \( c_t \in \{c^H, c^L\} \), and the controlling shareholder’s effort choice in monitoring and managing,
$e_t \in \{e^H, e^L\}$, and we assume

$$1 > \Pr (y_t = 1|e_t = e^H \wedge c_t = c^H) \equiv p > q \equiv \Pr (y_t = 1|e_t \neq e^H \vee c_t \neq c^H) > 0.$$  

While $c_t$ is borne by all shareholders, both $c_t$ and $e_t$ are chosen by the controlling shareholder. Both $c_t$ and $e_t$ are unobservable by customers. Since $p < 1$ and $q > 0$, this is a game of imperfect public monitoring. Effort and monetary costs are perfect complements in the sense that both have to be high to result in a high likelihood of a good outcome; neither $e^H$ nor $c^H$ alone will result in high likelihood of good outcome. When $e_t = e^H$ and $c_t = c^H$, we say the firm engage in high-quality production, even though doing so does not guarantee high quality; otherwise, we say it engages in low-quality production. We assume that quality improvement is socially efficient:

$$e^H + c^H - (e^L + c^L) < p - q.$$  

The interpretation of the production technology is that quality improvement requires purchasing expensive production inputs and providing incentives for workers (who are not explicitly modelled here). To implement high-quality production, it is also necessary for the controlling shareholder to engage in effortful management and monitoring. The assumption of perfect complementarity is made for simplicity.

**Payoffs** Denote the price the firm charges by $P_t$. Denote the (normalized) values of each unit of controlling shares and noncontrolling shares in period $t$ by $V_t$ and $U_t$, respectively. A customer buying from the firm receives an instantaneous payoff of

$$\Pr (y_t = 1) - P_t.$$  

The controlling shareholder receives fraction $\theta$ of the firm’s profit and incurs effort cost $e_t$. We assume she also receives an exogenous private benefit of control, $B$. The controlling shareholder’s total payoff in period $t$ is

$$\theta V_t = B - e_t + \theta (P_t - c_t).$$  

Noncontrolling shareholders simply receive fraction $(1 - \theta)$ of the firm’s profit:

$$(1 - \theta) U_t = (1 - \theta) (P_t - c_t).$$  

We assume that $B - e^L > B - e^H > 0$ so that when the controlling shareholder and noncontrolling shareholders are

\begin{itemize}
  \item denote the price the firm charges by \( P_t \).
  \item denote the (normalized) values of each unit of controlling shares and noncontrolling shares in period \( t \) by \( V_t \) and \( U_t \), respectively.
  \item a customer buying from the firm receives an instantaneous payoff of
    \[ \Pr(y_t = 1) - P_t. \]
  \item the controlling shareholder receives fraction \( \theta \) of the firm’s profit and incurs effort cost \( e_t \). we assume she also receives an exogenous private benefit of control, \( B \).
  \item when all customers buy from the firm, her total payoff in period \( t \) is
    \[ \theta V_t = B - e_t + \theta (P_t - c_t). \]
  \item noncontrolling shareholders simply receive fraction \( (1 - \theta) \) of the firm’s profit:
    \[ (1 - \theta) U_t = (1 - \theta) (P_t - c_t). \]
\end{itemize}

\footnote{We do not include both effort cost and monetary cost purely for realism. Corollary 4 and the discussion preceding it make it clear that \( c^H - c^L \) and \( e^H - e^L \) affect the firm’s optimal ownership structure differently.}

\footnote{The assumption allows us to abstract away from the moral hazard problem of private-benefit extraction, and focus on the moral hazard problem of production monitoring. If the private benefit is partly derived from appropriating shareholders’ profit, then we have
  \[ \theta V_t = B - e_t + \theta (P_t - c_t - b); \]
  for some \( b \leq B \). The analysis will not be qualitatively affected in this alternative setup. To see this, define \( \hat{c}_t \equiv c_t + b \). Then we can express the payoffs in the form as in our model:
  \[ \theta V_t = B - e_t + \theta (P_t - \hat{c}_t); \]
  \[ U_t = P_t - c_t. \]}

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shareholders receive the same stream of income per share, the net benefit of controlling the company is positive regardless of the controlling shareholder’s effort.\textsuperscript{11} Furthermore, we assume $p - c^H > q - c^L \geq 0$.\textsuperscript{12} The assumption ensures that even if customers hold the most pessimistic belief that the firm engages in low-quality production forever, the firm can still earn a nonnegative profit, thus the values of both kinds of shares remain nonnegative.

For the analysis to be nontrivial, it is necessary that the moral hazard problem is not too severe. Specifically, we need

$$e^H - e^L + c^H - c^L \leq \frac{(p - q)^2}{1 - q}. \quad (1)$$

We adopt this assumption throughout the paper. Since $(p - q)^2 / (1 - q) < p - q$, (1) implies that quality improvement is socially efficient. In fact, it means that the efficiency gain from quality improvement must be large enough for high-quality production to be sustainable.

**Turnover of Controlling Shareholder** We model negotiated trading of the controlling share block in the following way: every period an entrepreneur arrives and may purchase the entire block of shares from the incumbent controlling shareholder. After the purchase, the entrepreneur becomes the new controlling shareholder of the firm. If acquisition does not take place in a period, the potential acquirer exits forever. When acquisition takes place, it is publicly observable. However, the actual transfer price can neither be publicly observed nor credibly disclosed by the transacting parties. This assumption captures the notion that customers’ belief (and hence strategy) does not depend on the transfer price.\textsuperscript{13} Furthermore, we assume that the transaction price is determined by Nash bargaining, and denote the incumbent’s bargaining power by $\beta \in (0, 1)$.\textsuperscript{14}

**Timeline** The following figure illustrates the timeline within each period:

\textsuperscript{11}It will be clear that in our model, these two types of shareholders will receive the same stream of incomes when ownership turnover is not allowed, or when customers treat the incumbent and the incoming controlling shareholder symmetrically. However, when ownership turnover is allowed, they may not receive the same stream of incomes.

\textsuperscript{12}The assumption that $p - c^H > q - c^L$ is consistent with the empirical finding of Fornell, Mithas, Morgeson, and Krishnan (2006) that investment in customers’ satisfaction has a significant positive impact on the company’s share price. The assumption $q - c^L \geq 0$ simplifies our analysis without affecting the main message.

\textsuperscript{13}A justification is that a typical consumer does not have enough financial literacy to easily infer from the transfer price how the surplus of a corporate control transaction is split between the transacting parties. We discuss in Section 7 the alternative setting in which the transfer price is observable.

\textsuperscript{14}In the empirical literature on negotiated block trade, Dyck and Zingales (2004) estimate that the average share of the seller’s surplus is $2/3$. Albuquerque and Schroth (2014) estimate of seller’s bargaining power is between 0.67 and 0.72.
Finally, we assume that except for share transactions, transfers between the controlling shareholder and noncontrolling shareholders are infeasible. The role of this assumption is to rule out the use of transfer between controlling and noncontrolling shareholders as a punishment device for bad outcome.\footnote{We discuss in Section 7 the practical difficulties involved in using transfers to noncontrolling shareholders as a punishment device.}

The main objective of our analysis is to characterize the \textit{optimal equilibrium} of the game. We define the optimal equilibrium as the perfect public equilibrium (PPE) that maximizes the total (normalized) shareholder value:

$$S = \theta V + (1 - \theta) U.$$ 

It will become clear in Section 6 that $S$ is also the value of the company to the founder if she can sell noncontrolling shares to perfectly competitive investors. Note that the total shareholder value is bounded from above by $\overline{S} \equiv B + p - (e^H + c^H)$, which is achieved when the firm engages in high-quality production every period and customers pay $p$ every period. The lower bound of the total shareholder value is $\underline{S} \equiv B + q - (e^L + c^L)$, which is achieved when the firm engages in low-quality production every period and customers pay $q$ every period. We are particularly interested in the condition under which the firm can achieve the highest possible total shareholder value.

3 Analysis

3.1 Benchmark: No Transfer of Controlling Share Block

This benchmark analysis considers the case in which the market for corporate control is shut down, i.e., the firm’s control right \textit{cannot} be transferred. We show that every equilibrium in which the firm engages in high-quality production necessarily entails the destruction of the firm’s profit, which hurts not only the controlling shareholder, but also noncontrolling shareholders who are not responsible for the production decision.
When the controlling shares cannot be traded, both the controlling and noncontrolling shareholders receive the present discounted value of the firm’s profit stream and the values of the two classes of shares differ only due to the private benefits and effort costs:

\[ V = U + \frac{B - e^H}{\theta} > U. \]  

(2)

In other words, there is a positive control premium of \( \frac{B - e^H}{\theta} \).

Let \( W \) be the (normalized) market value per controlling share following a bad outcome. The following incentive constraint ensures sufficient incentives for high-quality production by the controlling shareholder:

\[ \theta V \geq (1 - \delta) \left[ B - e^L + \theta (P - c^L) \right] + \delta (q \theta V + (1 - q) \theta W). \]  

(3)

If \( W \) is strictly less than \( V \), it is attained by the firm giving a sufficiently deep discount for one period. To ensure that the controlling shareholder is willing to offer the required discount, any deviation will trigger the off-the-equilibrium path on which customers believe the firm perpetually engages in low-quality production, which leads to the worst continuation equilibrium payoff for the controlling shareholder. Thus, an equilibrium perfection requirement is that \( W \geq \frac{B - e^L}{\theta} + q - c^L \). The proposition below states the values of shares in the optimal equilibrium without turnover.

**Proposition 1** Let \( \bar{V}^0(\theta) \) be the maximum equilibrium value per controlling share, \( \bar{U}^0(\theta) \) be the maximum equilibrium value per noncontrolling share, and \( \bar{S}^0(\theta) \) be the maximum equilibrium total shareholder value. Suppose (1) holds, and \( \theta > \theta_0 \equiv \frac{(1-q)(e^H-e^L)}{(p-q)^2-(1-q)(e^H-e^L)} \).

(i) If \( \delta \geq \hat{\delta}(\theta) \equiv \frac{e^H - e^L + \theta (c^H - c^L)}{q (e^H - e^L + \theta (c^H - c^L)) + \theta (p - q)^2} \),

then high-quality production is sustainable, and the equilibrium share values are given by:

\[ \bar{V}^0(\theta) = \left[ \frac{B - e^H}{\theta} + p - c^H \right] - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right), \]

\[ \bar{U}^0(\theta) = (p - c^H) - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right), \]

\[ \bar{S}^0(\theta) = B - e^H + p - c^H - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right). \]

(ii) If \( \delta < \hat{\delta}(\theta) \), then high-quality production is not sustainable in any equilibrium.

Proposition 1 points out that even with a high discount factor, the monopolist is still unable to charge customers the expected value of its product every period. This is due to the fact that the firm can only charge customers their reservation value \( p \) during the normal phase. Moreover, whenever the firm has produced a bad outcome, which happens with a positive probability, it has to offer customers a discount even if they continue to produce at high quality. This loss in profit is similar in nature to the loss in profits of collusive oligopolies under imperfect public monitoring identified by Green and Porter (1984).
Focusing on the case of $\delta \geq \tilde{\delta}(\theta)$, the first terms in $\bar{U}_0(\theta)$ and $\bar{V}_0(\theta)$ are, respectively, the accounting profit and the sum of accounting profit and net private benefit if the firm always operates in the absence of an agency problem. The second terms in $\bar{U}_0(\theta)$ and $\bar{V}_0(\theta)$ are the expected profits that must be destroyed to provide incentives for the controlling shareholder to improve output quality. Notice that the noncontrolling shareholders suffer the same loss in profits as does the controlling shareholder. Thus, the necessary punishment on the controlling shareholder imposes a negative externality on the noncontrolling shareholders, who are not responsible for the bad outcome. Perhaps more importantly, noncontrolling shareholders do not suffer from a moral hazard, so it is wasteful in terms of shareholder value to punish them for a bad outcome.

3.2 The Effect of Negotiated Block Trade

We now investigate the interplay between the product market and the market for corporate control in providing incentives for trust maintenance. Our focus is on negotiated block trade, and in our model, the market for corporate control works as follows: in each period, an entrepreneur arrives and engages in private negotiation with the incumbent controlling shareholder in acquiring the entire block of controlling shares. If negotiation yields trade, the entrepreneur becomes the new controlling shareholder; otherwise, she exits the game forever.

Consider the following equilibrium, which consists of four phases: a normal phase, an on-the-equilibrium-path punishment phase, and two off-the-equilibrium-path punishment phases.

- The game begins in the normal phase. In the normal phase, the controlling shareholder sets the price at $p$ and engages in high-quality production, i.e., exerts effort $e^H$ and incurs monetary cost $c^H$ on the firm’s behalf. If the outcome is good, there will be no turnover of controlling shareholder and the game stays in the normal phase. If the outcome is bad, the game switches to the on-the-equilibrium-path punishment phase.

- In the on-the-equilibrium-path punishment phase, the controlling shareholder sells the entire block of controlling shares to a new entrepreneur at the transaction price $T$ through Nash bargaining. The firm under the new controlling shareholder may or may not have to offer the good at a discounted price. The new controlling shareholder engages in high-quality production in the on-the-equilibrium-path punishment phase and receives a continuation payoff $\hat{W}$. The game switches back to the normal phase if the outcome in that period is good, but stays in the on-the-equilibrium-path punishment phase if the outcome is bad.

- If the Nash bargaining breaks down, then the game switches to the first off-the-equilibrium-path punishment phase in which the incumbent controlling shareholder continues to engage in high-quality production and offers a one-period price discount to customers for the experience good, receiving a continuation payoff $W$. After the one-period discount is offered, the game returns to the normal phase.

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16 In Section 4, when we analyze the company’s control premium, we will discuss a payoff equivalent equilibrium in which turnover also takes place following a good outcome.
Any other publicly observable deviations, including a deviation from the above-mentioned punishment phases, will trigger the second off-the-equilibrium-path punishment phase in which the controlling shareholder forever engages in low-quality production and sets price equal to $q$.

In the search of the optimal equilibrium, it is without loss of generality to focus on the class of equilibria outlined above. In our model, there are only two feasible ways of imposing punishment on the controlling shareholder for bad outcomes: (i) a cut in its product price;\footnote{A equivalent product-market punishment is coordinating on a certain probability of forever reverting to the low-quality-low-price equilibrium.} and (ii) an outright sale of controlling shares to the newly arrived entrepreneur at a discounted price.\footnote{Here, the sale of controlling shares must be outright simply because $\theta$ is assumed to be fixed. If we do not assume $\theta$ is fixed, the optimal relational contract may require only a partial sale of controlling shares to the newly arrived entrepreneur while the remaining controlling shares are sold as non-controlling shares to outside investors. However, the optimal relational contract always requires an outright sale of controlling shares when $\theta$ is chosen optimally by the founder of the company, the case we analyze in Section 6.} In the benchmark analysis above, we focus only on the product market punishment (i). In what follows, we shall show that as long as high-quality production can be supported, the total shareholder value can be improved relative to the benchmark case when both the product market and the market for corporate control (i.e., punishment (ii) above) are involved. By punishment (ii), i.e., punishment through the market for corporate control is used instead of punishment (i) as much as possible.

We first explain how the transaction price of the control block is determined. Recall that $W$ is the value of a controlling share in the first off-the-equilibrium-path punishment phase, i.e., when the control block is retained by the incumbent controlling shareholder, and that $\hat{W}$ is the corresponding value when ownership is transferred to the new entrepreneur. The incumbent and the new entrepreneur engages in Nash bargaining in which the bargaining power of the incumbent is $\beta$. Thus, the transaction price per share, $T$, is given by

$$T = W + \beta(\hat{W} - W). \quad (4)$$

To account for the value of a noncontrolling share $U$, notice that the company’s profit per share loses the amount $V - \hat{W}$ every time a bad outcome is realized and the control block subsequently changes hands. Both the new controlling shareholder and the noncontrolling shareholders suffer the same loss. Therefore,

$$U = (p - c^H) - \delta (1 - p) \frac{V - \hat{W}}{1 - \delta}. \quad (5)$$

Whenever $\hat{W} > W$, noncontrolling shareholders benefit from the transfer of the control block.

We show in the following proposition that by allowing the turnover of the controlling shares, the value of the noncontrolling shares can be increased and the highest possible value of the noncontrolling shares, $p - c^H$, can be attained if the discount factor is large enough. Let $\bar{U}$ and $\bar{V}$ be the values of noncontrolling shares and the controlling shares in the optimal equilibrium, respectively.

\[12\]
Proposition 2 Suppose (1) holds, $\theta > \theta_0$, and $\beta \in (0, 1)$. For each $\beta$, there exists $\tilde{\delta}(\beta, \theta) \in (\hat{\delta}(\theta), 1)$ such that

(i) if $\delta \in [0, \hat{\delta}(\theta))$, then

$$\bar{U} = q - c_L \text{ and } \bar{V} = \bar{U} + \frac{B - e^L}{\theta};$$

(ii) if $\delta = \hat{\delta}(\theta)$, then

$$\bar{U} = U^0(\theta) \text{ and } \bar{V} = V^0(\theta);$$

(iii) if $\delta \in (\hat{\delta}(\theta), \tilde{\delta}(\beta, \theta))$, then

$$\bar{U} \in (U^0(\theta), p - c^H) \text{ and } \bar{V} = V^0(\theta);$$

(iv) if $\delta \in [\tilde{\delta}(\beta, \theta), 1)$, then

$$\bar{U} = p - c^H \text{ and } \bar{V} = V^0(\theta).$$

According to Part (i) of Proposition 2, if high-quality production is not sustainable in the absence of the market for corporate control, then allowing turnover of control block cannot increase firm profits. This is because turnover of control block cannot change the fact that the worst possible punishment payoff to the controlling shareholder is $B - e^L + \theta (q - c^L)$. However, Parts (ii)-(iv) of the proposition suggest that as long as high-quality production is sustainable in the original game without turnover, then turnover can improve the noncontrolling shareholders’ value and such improvement is increasing in $\delta$. When $\delta$ is sufficiently high, specifically when $\delta \geq \tilde{\delta}(\beta, \theta)$, noncontrolling shares attain the maximum value of $p - c^H$. Figure 2 depicts what the cutoff $\tilde{\delta}(\beta, \theta)$ looks like.\(^{19}\)

![Figure 2](image)

Several remarks about the proposition and the optimal equilibrium are in order. First, although the controlling shareholder’s equilibrium payoff remains unchanged, and in both cases she earns less than $B - e^H + \theta (p - c^H)$, there is a notable difference in the way she earns that payoff. When the turnover

\(^{19}\)See equation (13) in the proof of Proposition 2 for the exact function of $\tilde{\delta}$.  

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of control block is not allowed, the controlling shareholder earns the net private benefit and her share of the firm’s stream of profits, which is less than \( p - c^H \) per period, because the firm has to offer a price discount to customers in the period following every bad outcome. On the other hand, with a turnover of control block, the controlling shareholder does not capture the entire stream of firm profits because, once a bad outcome is observed, she is prescribed to sell her controlling shares at a discounted price. This observation is closely connected to the endogenous cost of corporate control discussed in the next section.

Second, in the optimal equilibrium, the gain from trading the control block arises endogenously from customers’ differential treatment of the incumbent and incoming controlling shareholders. After a product failure, the incumbent controlling shareholder exits voluntarily, because had she stayed in the firm with a damaged customer relationship, the product market would impose a very severe punishment on the firm, leading to a very low continuation payoff to her. She is thus willing to sell her control block as long as the transaction price \( \theta T \) exceeds the continuation payoff \( \theta W \). This is possible because the new entrepreneur is not responsible for the bad outcome of the company, and is not going to be subject to the product market punishment. As a result, her value for the control block exceeds that of the incumbent. In our terminology, \( \theta \hat{W} > \theta W \). The voluntary nature of the incumbent’s exit distinguishes our model from theories that highlight the benefit of forced termination, such as the efficiency-wage theory. In efficiency-wage model, the principal must commit to terminate the agency relationship following poor performance, even though the termination is inefficient. On the other hand, there is no contractual commitment involved in our mechanism. The product market’s reaction to the change in controlling shareholder is NOT exogenously imposed. It is simply an equilibrium response: customers take optimal action given their belief, which is consistent with strategy employed by the controlling shareholders.

Third, both the product market and the market for corporate control impose punishment on a poorly performing controlling shareholder when the incumbent’s bargaining power \( \beta \) is sufficiently strong. This corresponds to case (iii) of Proposition 2. With a strong bargaining power over the incoming controlling shareholder, the incumbent is able to capture a larger fraction of the gain from trading the control block. If \( \beta \) is too high, then to make the magnitude of punishment on the incumbent sufficiently large, it is necessary to lower the equilibrium gain from trading the control block. This requires a low enough continuation payoff \( \hat{W} \) for the incoming controlling shareholder after taking over the firm. Thus, the firm will still suffer a phase of low profit under the new leadership. However, the magnitude of this profit loss is lower than in the benchmark case where the market for corporate control is absent, and consequently, \( \hat{U} > \hat{U}^0 (\theta) \).

Last but not least, our theory predicts that turnover of top management is more likely to occur when the firm has performed poorly and the turnover leads to an improvement in firm performance. This prediction is consistent with the empirical findings that CEO/ownership turnover is more frequently preceded by poor company performance (Barclay and Holderness (1989, 1991), Franks and Mayer (2001)), and that oftentimes the replacement of the CEO and/or a change in the ownership and the board directors results

\[ \delta \in (\hat{\delta}(\theta), \delta (\beta, \theta)) \]
in successful turnarounds.\textsuperscript{21} While it is certainly true that in reality, many cases of successful management (or ownership) turnover can be attributed to better management under new leadership, our theory points out that superior management ability is not necessary for a successful turnover.\textsuperscript{22} Specifically, the equilibrium we characterize has the feature that even though the new controlling shareholder is no better at running the company than the incumbent controlling shareholder, we still see an improvement in the firm’s performance following a turnover of controlling shareholder. In fact, a number of empirical studies have found that strategic change is often not an integral part of turnaround (for example, see Hambrick and Schecter (1983), Robbins and Pearce II (1992), and Kanter (2003)). Our theory provides an explanation for changes in control even in those cases in which “the potential benefits from changing blockholders are less apparent” (Barclay and Holderness (1991)).

4 Endogenous Cost of Corporate Control

In this section, we explore the \textit{endogenous cost of corporate control} in the model. The classical theory in asset pricing suggests that share value is determined by the present value of the company’s profit stream. In our model, the role played by the holders of the shares affects their value. In particular, controlling shareholder and noncontrolling shareholders are not entitled to the same profit stream. An endogenous cost of control arises in our model because the controlling shareholder must be punished following a bad outcome, while the noncontrolling shareholders either do not have to be punished (if $\delta \geq \hat{\delta}(\beta, \theta)$), or they are punished less severely than the controlling shareholder when they have to be punished (if $\delta \in (\hat{\delta}(\theta), \hat{\delta}(\beta, \theta))$). We will show that because of this cost of control, although the net private benefit per share, $(B - e^H)/\theta$, is positive, the control premium, defined as the difference between the market value of a controlling share and the market value of a noncontrolling share, may be negative. Moreover, because the punishment targeted at the controlling shareholder takes place during difficult times, the control premium is lower and more likely to be negative when the firm is performing poorly.

For ease of exposition, in the previous section, we focused on equilibria in which controlling shares are traded only following a bad outcome and noncontrolling shares are never traded. One can easily construct payoff-equivalent equilibria in which both the controlling and noncontrolling shares are traded following a good outcome. If controlling shares were traded following a good outcome, the market price would be $\bar{V}$. If noncontrolling shares were traded, the market price would be $\bar{U}$ following a good outcome and $U$ following a bad outcome. Denote the control premium following a good and bad outcome by $\Delta^H$ and $\Delta^L$ respectively. Therefore, we have $\Delta^H \equiv \bar{V} - \bar{U}$ and $\Delta^L \equiv T - U$.

\textbf{Corollary 1} (i) If $\delta > \hat{\delta}(\theta)$, then the control premium following bad outcome is lower than that following a good outcome, i.e., $\Delta^H > \Delta^L$.

\textsuperscript{21}Albuquerque and Schroth (2010) report an increase in share price of 19\% at the time of block trade. For other empirical evidence, see also Goodstein and Boeker (1991), Kaplan (1994), Martin and McConnell (1991), and Volpin (2002).

\textsuperscript{22}In our model, because a turnover of controlling shareholders always occurs after a bad outcome, on the equilibrium path, the incumbent controlling shareholder never runs the company after a bad outcome. So this is an improvement over the off-the-equilibrium path on which takeover does not occur. If we introduce some friction during takeover so that ownership does not change hands immediately following a bad outcome, we will see low on-the-equilibrium-path profit following a bad outcome and subsequent improvement following the takeover.
(ii) If $\delta > \hat{\delta}(\theta)$, then there exists a $B^* > e^H$ such that the control premium following good outcome is negative, i.e., $\Delta^H < 0$ if and only if $B \in [e^H, B^*)$.

The control premium can be negative if the private benefit of control is too small relative to the endogenous cost of corporate control. Negative control premiums have been identified empirically. Holthausen, Leftwich, and Mayers (1987) found that in large seller-initiated block transactions, buyers received price concessions. Barclay and Holderness (1989) found that 20% of their sample block trades were priced at a discount. Dyck and Zingales (2004) and Albuquerque and Schroth (2010) report 41% and 50% of block transactions were traded at a discount in their respective samples. Relationally, Lease, McConnell, and Mikkelsen (1983), Pinegar and Ravichandran (2003), and Valero, Gomez, and Reyes (2008) found that some companies’ shares with superior voting rights were traded at a discount compared to the shares with inferior voting rights. Some informal arguments for the observed negative control premiums are that shares with inferior control rights are more liquid and that the controlling shareholder may have to bear legal liabilities (Dyck and Zingales (2004)). Nevertheless, the empirical observation of negative control premiums is considered by some to be puzzling because there is no formal theory that rationalizes it.

Furthermore, Corollary 1 specifically predicts that the control premium is lower and more likely to be negative during downturns. This prediction is consistent with the empirical findings. Barclay and Holderness (1989, 1991) found that the average block premium is lower if the target firm has poor performance prior to the block trade. Dyck and Zingales (2004) found that the control premium is significantly lower for selling firms in financial distress. Relationally, Kruse, Kyono, and Suzuki (2006) compared shares with different voting rights, and found that the private benefits of control is the most negative when the target firm is financially distressed.

5 Block Premium/Discount

In this section, we discuss the model’s implications concerning the equilibrium block premium, defined as the (per-share) transaction price of the block of controlling shares minus the prevailing value of the noncontrolling shares.

Relation with the company’s post-acquisition performance Block premia involved in mergers and acquisitions are often sizeable, so those involved in these activities are naturally interested to know whether a higher block-acquisition premium is associated with a better post-acquisition performance. Traditional management theories suggest a positive relationship between the block premium and the post-acquisition performance. This is because a manager who is more capable or has identified a higher value in the target company is willing to pay a higher block premium and the company is also expected to perform better. However, this view cannot account for the negative relationships between the block

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23 In their sample of block trades in China, Dong, Uchida and Hou (2014) found that the average size of the block discount in their sample is 50%.

premium and the post-acquisition performance identified in some empirical studies (see for example, Sirower (1994) and Krishnan, Hitt, and Park (2007)).

Here, we hold fixed other parameters and study how changes in the bargaining power of the incumbent, $\beta$, affects the transfer price and the firm’s profit margin immediately after the acquisition. Recall that in the optimal equilibrium constructed above, following a bad outcome of production, the block of controlling shares is sold to a new entrepreneur at a (per-share) price of $T$ through Nash bargaining. If $\delta \in (\hat{\delta} (\theta), \tilde{\delta} (\beta, \theta))$, the firm has to offer a price discount to customers after the new entrepreneur takes control. Denote the associated discount by $D (\beta, \theta)$. It is immediate that the value of a noncontrolling share following a bad outcome, denoted by $U$, is below its value during the normal phase, $\bar{U}$:

$$p - c_H - (1 - \delta p) D (\beta, \theta) = \bar{U} < U = p - c_H - \delta (1 - p) D (\beta, \theta). \quad (6)$$

The block premium is thus given by $T - U$. If $\delta \geq \tilde{\delta} (\beta, \theta)$, then the new controlling shareholder does not have to offer any discount to customers and thus $\bar{U} = U$.

**Corollary 2** An increase in the bargaining power of the incumbent controlling shareholder $\beta$ has the following effect on the firm’s optimal equilibrium:

(i) The block premium weakly increases.

(ii) The firm’s accounting profit in the period after the turnover of the controlling shares, given by $p - c_H - D (\beta, \theta)$, weakly decreases.

Moreover, if $\delta > \hat{\delta} (\theta)$, the above relations are strict when $\beta$ is sufficiently large.

According to the corollary above, if the source of variation is different allocations of the bargaining power between the incumbent and new controlling shareholders, then our model predicts a (weakly) negative relationship between the block premium paid by the acquirer and the firm’s post-acquisition performance. One descriptive argument used by the authors who empirically identified this negative relationship is that a high acquisition premium is an indication of bad managerial decision or managerial hubris so the manager also tends to make bad decisions when running the company (for example, see Hayward and Hambrick (1997)). Our explanation is different and has more structure; in our model all managers have the same managerial ability. The negative relationship is a necessary part of the equilibrium to ensure the incumbent controlling shareholder with a higher bargaining power will not be overpaid so that she has the proper incentive to engage in high-quality production.

**Relation with minority shareholders protection** The separation of ownership and control in modern corporations stirs much research on whether the disperse minority shareholders are adequately protected in the presence of an apparent conflict of interests between controlling shareholders and non-controlling shareholders. Burkart, Gromb and Panunzi (1998) consider a setting in which the controlling shareholder can extract private benefit of control after the acquisition, and point out that a high takeover premium (probably arising from fierce competition in the takeover market) is associated with a more concentrated post-takeover ownership. This leads the controlling shareholder to extract less private benefit, improving the values of noncontrolling shares.

$^{25}$The exact formula for the discount can be found in the proof of Proposition 2.
Our model considers a different dimension of the conflict of interest between the controlling and noncontrolling shareholders: the controlling shareholder bears the full effort cost $e^H$ in maintaining high-quality production, whereas he/she is entitled to only part of the security benefit associated with strong customer trust. Interestingly, our model implies a conclusion opposite to that of Burkart, Gromb and Panunzi (1998): a high takeover premium can hurt noncontrolling shareholders. The reason is as follows. If the competition for gaining corporate control gets more intense, the incumbent controlling shareholder’s bargaining power $\beta$ increases. As shown in Corollary 2, this leads to a higher takeover premium, but a worse accounting profit of the firm. Consequently, the security benefit received by the noncontrolling shareholders goes down. The prediction that noncontrolling shareholders benefit more from block transactions that are traded at a lower price is consistent with the empirical study of Albuquerque and Schrot (2010). They find that when the block is traded at a discount, it generates a positive equity price impact more often than those cases of block premium.26

Relation with block size Both the theoretical and empirical literature in negotiated block trades have investigated the relation between the block size and the block premium. Focusing on the controlling shareholder’s moral hazard problem in extracting private benefit of control, Burkart, Gromb and Panunzi (2000) find that the block premium is always decreasing in block size. Our model can shed new light on the relation between block size and block premium by considering the controlling shareholder’s moral hazard problem in engaging in high-quality production. As we assume the private benefit of control is independent of the block size in our model, a direct effect of increasing the block size $\theta$ is that the private benefit of control per unit controlling share is diluted. To concentrate on the implication arising from incentivizing high-quality production, we consider the scenario that $B$ is close to $e^H$.

A larger block of controlling shares $\theta$ implies that the controlling shareholders’ payoff is more sensitive to changes in the (per-unit) share value. Therefore, a smaller per-unit share value reduction following a bad outcome can provide sufficient incentives for high-quality production. This in turn implies that the per-unit transfer price $T$ of the control block in the optimal equilibrium is increasing in the size of the block. Consequently, if $\delta \geq \delta (\beta, \theta)$ so that the value of noncontrolling shares $U = p - e^H$ is independent of $\theta$, then the block premium is increasing in $\theta$. Note that for a fixed pair of discount factor $\delta$ and incumbent’s bargaining power $\beta$, inequality $\delta \geq \delta (\beta, \theta)$ holds if and only if $\theta$ is sufficiently large.

On the other hand, if $\theta$ is low enough, the value of noncontrolling shares varies with $\theta$. Specifically, if the control block is larger, a smaller punishment in the form of post-takeover product price discount is needed to sustain the incentives for high-quality production, so $U$ goes up. Under the assumption of Nash bargaining over the block price, the product price discount (which determines the surplus of the bargaining) increases by more than the block price (which determines the incumbent’s share). Consequently, the block premium $T - U$ is decreasing in the block size for $\theta$ sufficiently small. The following corollary summarizes the observations above.

**Corollary 3** Suppose $B = e^H$. Then the block premium $T - U$ exhibits an $U$-shaped relation in $\theta$.

26See section 4.2 of Albuquerque and Schrot (2010).
By focusing on the moral hazard problem of high-quality production, our model predicts that for large blocks, the block premium is positively correlated with the block size. This prediction is in contrast to Burkart, Gromb and Panunzi (2000) which find that the relation is always negative, regardless of block size. The corollary above is broadly consistent with empirical evidence. Barclay and Holderness (1989) find that blocks of size exceeding 25% of total equity exhibited a significantly positive relation between block premium and block size; where the relation is slightly negative (though insignificant) for blocks of size less than 25%. Relatedly, Dyck and Zingales (2004) find that the relation between block size and block premium is positive for blocks exceeding 50% of total stake.

6 Optimal Ownership Structure

In this section, we endogenize the firm’s ownership structure by finding the optimal value of $\theta$ from the company founder’s perspective. The total payoff of the founder consists of two components, the value of the shares that she retains and the proceeds from the sales of the noncontrolling shares. We assume there is perfect competition for noncontrolling shares among investors which allows the company founder to fully capture the value of the noncontrolling shares. Therefore, the total payoff of the founder is $S = \theta V + (1 - \theta) U$. Note that this is the total shareholder value of the company at the time when the ownership structure is determined. However, it is less than the sum of the net private benefit of control and the company’s profit. This is because part of the value of the company is captured through Nash bargaining by future controlling shareholders who take over the company’s control.

Recall that in the benchmark analysis, we assume the transfer of control block is infeasible. The total shareholder value stated in Proposition 1 is increasing in $\theta$, thus implying that the optimal ownership structure is setting $\theta = 1$, i.e., the firm is fully owned by the controlling shareholder. However, the determination of the optimal ownership structure is more subtle when the transfer of the control block is feasible.

The basic tradeoff is about managing the controlling shareholder’s moral hazard problem and preserving firm profit from product market punishment. First, a small value of $\theta$ helps mitigate the moral hazard problem, as the cost of high-quality production is lower for the controlling shareholder. To see this, recall the total cost (i.e., the sum of the effort and monetary cost) that the controlling shareholder has to pay increases by $e^H - e^L + \theta (c^H - c^L)$ by engaging in high-quality production (rather than low-quality production). Thus, a smaller $\theta$ increases the value of the controlling share block. On the other hand, in the presence of the market for corporate control, a small value of $\theta$ makes the turnover mechanism less effective in generating punishment on the controlling shareholders, resulting in a lower firm revenue. To see this, note that the smaller the value of $\theta$, the more severe the punishment the turnover mechanism must impose on each unit of controlling share to preserve incentives. However, because of the Nash bargaining between the incoming and the incumbent controlling shareholders, the effectiveness of punishment is limited, and a product price discount is called for when $\theta$ is sufficiently small (recall case (iii) of Proposition 2). Moreover, this price discount is decreasing in $\theta$.\footnote{For the explicit formula, see (15) in the proof of Proposition 2.}
Define $\bar{\theta}\left(\delta\right)$ is the solution to $\delta = \check{\delta}\left(\theta, \beta\right)$. Define $\bar{\theta}\left(\delta, \beta\right)$ as the solution to $\delta = \tilde{\delta}\left(\beta, \theta\right)$. It is easy to verify that for $\delta \in \left[\check{\delta}(1), 1\right)$, $\theta < \theta\left(\delta\right) < \bar{\theta}\left(\delta, \beta\right)$ (see Figure 3).

Proposition 3 Let $\theta^*$ be the optimal fraction of the controlling shares. If $\delta \in \left[\check{\delta}(1), 1\right)$, then

(i) $\theta^*$ is unique and is in the interval $[\theta(\delta), \min\left\{\bar{\theta}(\delta, \beta), 1\right\}]$. Moreover, $\theta^* \to \bar{\theta}$ as $\delta \to 1$.

(ii) $\theta^*$ is weakly increasing in $c^H - c^L$, $e^H - e^L$, and $\beta$; and it is weakly decreasing in $\delta$. Furthermore, the above relations are strict if $\delta \in \left(\check{\delta}(\beta, 1), 1\right)$.

The main message of part (i) of Proposition 3 is that the optimal share structure is to convert some controlling shares, but not as many of them as possible, into noncontrolling shares. The comparative statics results of part (ii) arise from the tradeoff discussed above. More specifically, we can break down the marginal effect of a reduction in $\theta$ below $\bar{\theta}(\delta, \beta)$ into (a) the marginal benefit that arises from mitigating moral hazard; and (b) the marginal cost that arises from more severe product market punishment.

Recall that following a bad outcome, the value of the control block must go down by a sufficient amount to preserve the controlling shareholder’s incentives to engage in high-quality production. Specifically, the necessary reduction in the value of the control block is $\frac{1-p}{p-q} \left(\left(e^H - c^L + \theta \left(c^H - c^L\right)\right)\right)$ (see the expression for $V^0(\theta)$ in Proposition 1), thus the marginal benefit of reducing $\theta$ is $\frac{1-p}{p-q} \left(\left(c^H - c^L\right)\right)$. On the other hand, as $\theta$ goes down, the post-takeover product price discount increases, hurting the total value of noncontrolling shares. Following straightforward computation, the marginal cost of reducing $\theta$ is given by

$$\frac{\delta - 1 - p}{1 - \delta \left(p - q\right)} \left(\left(\beta^{-1} (\delta^{-1} - q) - (1 - q)\right) \left(\frac{e^H - c^L}{\theta^2} + c^H - c^L\right) - (p - q)^2 (\beta^{-1} - 1)\right).$$

First, it is immediate that an increase in $e^H - c^L$ and $\beta$ raise the marginal cost without any effect on the marginal benefit, so $\theta^*$ goes up. Second, if $c^H - c^L$ increases, the marginal cost goes up by more than

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$28\check{\theta}(\delta)$ is well-defined on the domain $[\check{\delta}(1), 1)$ as $\check{\delta}(\theta)$ is strictly decreasing in $\theta$ for $\theta \in [\theta, 1]$. $\check{\theta}(\delta, \beta)$ is also well-defined because $\check{\delta}(\beta, \theta)$ is strictly decreasing as a function of $\theta$. 

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the marginal benefit, and $\theta^*$ becomes larger. Finally, if $\delta$ increases, the marginal benefit is unaffected, whereas the marginal cost goes down, so $\theta^*$ becomes smaller. These comparative statics results hold strictly whenever $\theta^* < 1$, or equivalently, $\delta \in \left( \hat{\delta}(\beta, 1), 1 \right)$.

The tradeoff discussed above highlights conditions under which the optimal ownership structure $\theta^*$ lies strictly below $\min \{ \bar{\theta}(\delta, \beta), 1 \}$, the case in which the turnover mechanism does not perfectly restore the firm’s profit. Whether $\theta^* < \min \{ \bar{\theta}(\delta, \beta), 1 \}$ holds or not is determined by whether the marginal benefit of cutting $\theta$ exceeds the associated marginal cost evaluated at $\theta = \min \{ \bar{\theta}(\delta, \beta), 1 \}$. In particular, observe that if $c^H - c^L = 0$, there is no benefit in reducing $\theta$ below $\bar{\theta}(\delta, \beta)$, leading to $\theta^* = \min \{ \bar{\theta}(\delta, \beta), 1 \}$. On the other hand, if $e^H - e^L$ and/or $c^H - c^L$ is too large, the marginal cost of cutting $\theta$ always exceeds that of the marginal benefit, and again we have $\theta^* = \min \{ \bar{\theta}(\delta, \beta), 1 \}$. Only if $c^H - c^L$ is moderate and $e^H - e^L$ is sufficiently small, would $\theta^*$ be strictly below $\min \{ \bar{\theta}(\delta, \beta), 1 \}$.

**Corollary 4** Suppose $e^H - e^L < \frac{\delta(1-\beta)(p-q)^2}{1-9q-3\delta(1-q)}$. Then there exists a pair of positive numbers $C_2$ and $\bar{C}$ with $C < \bar{C}$ such that the optimal structure $\theta^* < \min \{ \bar{\theta}(\delta, \beta), 1 \}$ if and only if $c^H - c^L \in (C_2, \bar{C})$. If $e^H - e^L \geq \frac{\delta(1-\beta)(p-q)^2}{1-9q-3\delta(1-q)}$, then $\theta^* = \min \{ \bar{\theta}(\delta, \beta), 1 \}$ for all $c^H$ and $c^L$.

The analysis in this section is related to Zingales (1995), who derives the practice of selling cash-flow rights to disperse shareholders and selling control rights through direct bargaining as the outcome of maximization of total proceeds from the sale of a company. Our model has the similar feature that disperse shareholders are perfectly competitive and the acquirer of control rights has substantial bargaining power. Other than that, our analysis is different in several important ways. In Zingales’s model, the incumbent owner goes public if and only if the incoming controlling shareholder generates a higher profit for the firm. Furthermore, the sale of cash-flow rights is partial only if the incumbent derives a higher level of private benefit than the new owner. On the contrary, in our model, the company founder goes public and chooses selling cash-flow rights partially even if every potential controlling shareholder generates the same level of profit for the firm and derives the same level of private benefit. Our results emerge from the consideration of controlling shareholder’s moral hazard problem and mitigating the impact of product market punishment on firm value, while these factors are absent in Zingales’s analysis.

### 7 Discussion

For tractability, we have abstracted away from many issues in our analysis. Below, we discuss some of them.

**Alternative Application** The main message of our analysis is that in a repeated interaction in which punishment on players following some bad observable outcome is necessary for sustaining proper incentives, turnover of the player(s) responsible for the bad outcome can help mitigate the negative externality of punishment, thus improving the overall efficiency. We deliver this message using a monopoly experience-goods firm run by a controlling shareholder, and illustrate that the control-block transactions

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can help preserve the overall shareholder value of the firm. The same mechanism can be applied to similar settings. For instance, the controlling shareholder is responsible for managerial decision, such as project selection and account monitoring, in which costly personal effort is required for high probability of firm’s success. Moreover, a necessary condition for the firm’s success is that her fellow workers trust that she would put in effort, so are willing to work hard themselves. In order to provide sufficient incentives for the controlling shareholder, it is necessary that whenever bad outcome arises, she is punished by the workers shirking for a number of periods. Such punishment hurts all shareholders of the firm, including those not responsible for the bad outcome. To mitigate the associated negative externality, the controlling shareholder can cede control to a new entrepreneur, after which the workers restore their trust in the new management more readily.

**Observable Transfer Price** In our model, the transfer price of the control block is assumed to be unobservable to customers. The role of this assumption is to ensure that customers do not form belief about the firm’s future product quality based on the transfer price. All of our results would remain intact as long as customers’ belief about future product qualities depends only on the identity of the controlling shareholder, but not on the price at which the control block is traded. In practice, the price in a control block transaction is determined by a multitude of factors, such as the target firm’s operating costs, cash flows, and market conditions. Therefore, to a typical customer that does not possess sufficient knowledge in finance and accounting, the transfer price is a noisy indicator of the magnitude of punishment received by the incumbent controlling shareholder. As it is difficult (if not impossible) for customers to infer from the transfer price whether the incumbent is punished sufficiently for the bad outcome, a punishment mechanism based on customers’ monitoring through the transfer price is quite implausible.

In an alternative setting in which the transfer price is observable, and customers can judge the level of punishment on the controlling shareholder and form belief about the future product quality based on the transfer price, there exists equilibria in which the firm is forgiven for its bad outcome if and only if the control block is traded at a sufficiently low price. We can still model the negotiation stage as Nash bargaining, except that the surplus of the negotiation will materialize if and only if the transaction price is below a certain threshold. The optimal equilibrium of such a setting would involve the control block changing hand at the maximum possible price (that is sufficient for incentivizing high-quality production), and no product price discount is needed after the takeover. In this alternative setting, our main message that the turnover of control block can help recover customer trust and preserve firm value remains valid.

**Identity of Incoming Controlling Shareholder** In our model, the incoming controlling shareholder is a completely independent player from the incumbent controlling shareholder. The independence ensures that the gain from trading the control block received by the incoming controlling shareholder does not leak to the incumbent. It is explicit in our equilibrium construction that the incumbent controlling shareholder receives only a fraction of the surplus of the negotiated block trade, which is low enough so that he/she is sufficiently punished for the bad outcome. Consequently, if the incumbent and the incoming controlling shareholders have vested interests (for instance, sharing a common owner, or substantial cross shareholdings), then the sale of the control block may not constitute a sufficient punishment on
the incumbent controlling shareholder for the bad outcome. As customers are rational, if the control transaction appears suspicious and unconvincing (that there is an actual change in control rights), it is natural that they would not forgive the firm for the bad outcome, and the gain from trading the control block vanishes. Therefore, to recover customers’ trust in the company effectively, the control transaction must be convincing, and it is in the interests of both controlling shareholders to disclose hard information to convince the customers that the control transaction is real.

Our model can be extended to explicitly take into account the possibility that there are multiple potential acquirers and only some of them are credible of being independent. In this case, there exists equilibria in which customers forgive the firm only if the incumbent controlling shareholder sells his/her block to a credible acquirer. Suppose further that it takes several periods before a credible acquirer emerges, then there exists equilibria in which the firm is punished until such buyer arrives and the firm’s control changes hand.

In a similar vein, for our equilibrium punishment mechanism to work, it is necessary that the controlling shareholder cannot easily get around or mitigate the punishment involved in selling the control block. We discuss some conceivable attempts to game the mechanism below. First, the incumbent controlling shareholder may try to seek a buyer with weak bargaining power. However, in a competitive market for corporate control, the incumbent faces competition with other investment opportunities, so it is often necessary to cede sufficient surplus to the buyer. Second, the incumbent may try to collect hidden kickbacks from the acquirer following the control-block transaction. However, under-the-table transfers will violate the block-trade reporting requirements imposed by security-trading regulations. Finally, prior to the control-block transaction, the incumbent may be tempted to buy shares of the acquiring company, as they are expected to increase in value. However, making profits with non-public information is likely to violate regulations governing insider trading.

**Alternative Turnaround Mechanisms** We have focused on the effect of negotiated block trade on recovering customers’ trust and firm’s profit. We have done so not because this is the only possible way to preserve firm value from product market punishment. Rather, our focus is partially motivated by the fact that turnover of ownership and control is common, and by empirical findings that ownership and management turnover is an integral part of a successful turnaround. In fact, if we allow the controlling shareholder to credibly burn money (for example, by making payments to a third party), then there exist equilibria in which customers forgive the firm’s bad outcome if and only if the controlling shareholder have burnt a large enough amount of money. Requiring the controlling shareholder to burn money following every bad outcome may cause her to eventually run into her liquidity constraint because bad outcomes are associated with low (possibly negative) profits. Even if a few bad outcomes may not cause any trouble, a sufficiently long streak of bad outcomes, which always happens with a positive probability, will cause the controlling shareholder’s liquidity constraint to fail and the equilibrium to unravel. By contrast, under the turnover mechanism proposed here, the controlling shareholder will be receiving a payment for selling the controlling shares so she will not run into her liquidity constraint.

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Similarly, penalizing the controlling shareholder by requiring her to make transfers to noncontrolling shareholders following every bad outcome may be infeasible because of her liquidity constraint. Moreover, such punishment scheme is easily subject to manipulation by the controlling shareholder. For example, she may tunnel resources from the firm to finance her payments to noncontrolling shareholders, who as beneficiaries, would not object to such practice. In fact, if such mechanism was feasible and adopted, a firm’s share price would increase following bad outcomes, such as product failure or quality scandals, anticipating that payments would soon be received from the controlling shareholder. This is, however, rejected by empirical observations, as firms suffering from scandals experience a significant drop in share price and become likely takeover targets (Bernile and Jarrell (2009), Murphy, Shrieves, and Tibbs (2009)).

**Equilibrium Selection** Our analysis focuses on the perfect public equilibrium that maximizes the total shareholder value. As is typical in repeated game settings, the game we study has a large number of equilibria if the discount factor is large enough. Our focus on the optimal equilibrium for shareholder value helps illustrate the full potential of the ownership-turnover mechanism in preserving firm profit in the most transparent manner. A justification for why the optimal equilibrium is likely to realize is that the firm is assumed to be a monopoly in the product market, thus enjoying a superior bargaining power over disperse customers. On the other hand, the incumbent controlling shareholder has to face competition from other investment opportunities in market for corporate control, which would weaken her bargaining power over the buyer of the control block. Therefore, it is quite natural that the incumbent controlling shareholder is able to extract almost all of the consumers’ surplus in the product market, but has to share part of the gain from trading the control block with its buyer.

**Competition Among Potential Acquirers** We have ignored the issue of competition among potential acquirers by assuming that every period only one potential acquirer enters the game. A simple way to capture the impact of competition is to assume the bargaining power of the incumbent controlling shareholder increases with the intensity of the competition for the control block. In the extreme case where competition is so fierce that the incumbent has all the bargaining power, i.e., $\beta = 1$, negotiated block trade fails to act as a disciplinary device. We take the view that it is unlikely that the incumbent has 100% of the bargaining power for the following reasons. First, even if there are multiple potential buyers available, as long as the incumbent owner cannot commit to a grand mechanism (say by holding an auction), but instead has to sequentially bargain with one buyer at a time, then the seller will only receive a fraction of the total surplus under standard bargaining protocols. Second, oftentimes the incumbent owner has to face competition from owners of other companies trying to sell control rights in the market for corporate control, which limits their bargaining power. Finally, even in the presence of multiple potential acquirers, there exists equilibria in which customers forgive the firm only if the control block is sold to some specific one(s). In these equilibria, the incumbent’s bargaining power is limited

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31 If the transaction price of the control block is publicly observable, then competition among buyers has little impact on our equilibrium construction. Any equilibrium transaction price can be supported by the belief that if any potential owner pays an amount exceeding the equilibrium price, then the new controlling shareholder will receive the lowest possible continuation payoff. The latter payoff is supported by the customers’ self-fulfilling belief that the firm will only engage in low-quality production.

32 An example is that buyers and seller make alternate offers.
endogenously by product market reaction. We find it comforting that for any interior split of bargaining power, i.e., for $\beta \in (0, 1)$, allowing turnover of controlling shareholders increases the maximum firm profit and total shareholder value for a range of sufficiently high discount factors.

**Probabilistic Availability of New Acquirers and Costly Turnover** In our formal analysis, the market for corporate control is frictionless in the sense that there is a potential controlling shareholder available to take over the firm’s control every period. In a more realistic setting, following a bad outcome, there may not be any potential buyers immediately available. In this case, on-the-equilibrium-path punishment of the firm will continue to take place until ownership changes hands. This will give rise to a more natural empirical implication that when a firm loses customer trust, the firm’s profitability will decrease and stay low until a new controlling shareholder takes over.

8 Conclusion and Some Real-World Cases

This paper studies the corporate finance of firms whose sales and profit are sensitive to customer trust in the product market. It analyzes how the product market and the market for corporate control interact to provide the incentives for the firm’s key decision makers to put in effort into maintaining high trustworthiness of the firm. We find that turnover in the controlling share block can help a firm repair trust in its customer relationship, even if all controlling shareholders have the same ability and their departure from the firm is voluntary. More importantly, such ownership turnover enhances equilibrium profits and total shareholder value. The equilibrium property that the controlling shareholder must be punished for bad outcomes but the noncontrolling shareholders can be spared gives rise to an endogenous cost of corporate control. The theory’s predictions that the firm’s control premium can be negative, and that it is lower after the firm suffers bad product quality realizations, are consistent with evidence provided by empirical studies on negotiated block trades. Finally, we show that the firm’s founder resolves the tradeoff between managing moral hazard and preserving firm value by partially selling cash-flow rights as noncontrolling shares.

Let us conclude with some real-world cases of control-block transactions that are consistent with our theory. In the business press, it is often suggested that struggling and scandal-hit firms are likely takeover targets. Studies by Barclay and Holderness (1989) and Bernile and Jarrell (2009) confirm this observation. The recent case of Nissan acquiring Mitsubishi Motors matches a number of features of our model’s implications. Mitsubishi Motors was hit by a scandal in April 2016, in which it admitted to have been manipulating fuel economy data of four minicar models and improperly testing other Japan models since 1991. Its share price fell by a half after the scandal broke out. In May 2016, Nissan acquired 34% of its stake and became its single largest shareholder. After the acquisition, Nissan’s CEO became Mitsubishi’s chairman, and three executives joins Mitsubishi’s board of directors. The announcement of the acquisition triggered a significant positive response in Mitsubishi’s share value. Elsewhere in the world, insurance firm Old Mutual’s acquired Skandia in 2006 after the latter was hit by a series of scandals related to financial dealings and executive bonuses. PNC Bank acquired Riggs Bank from its controlling

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33 See, for example, https://www.sharesmagazine.co.uk/article/takeover-targets.
family in 2005 after the latter bank’s image was severely damaged in its involvement in a number of suspicious transactions. Admittedly, there are other factors contributing to these and other similar takeover cases, as well as alternative explanations for the apparent turnaround of the acquired firms in these cases. However, our theory which sheds new light on the understanding of control transactions provides a plausible explanation complementary to others.

**Appendix**

**Proof of Proposition 1.** First note that the controlling shareholder has the option of perpetually engaging in low-quality production and selling the product at $P_t = P = q$. When the controlling shareholder exercises this option, each noncontrolling share receives a flow payoff of $q - c^L$ and each controlling share receives $(B - c^L) / \theta + (q - c^L) > 0$. Also note that our assumption that each individual customer has zero measure and is anonymous implies that the firm may not charge higher than the expected value of the product, i.e., $P_t \leq p$.

The value of each controlling share, $V$, is given by

$$\theta V = (1 - \delta) \left[ B - e^H + \theta (P - c^H) \right] + \delta (p\theta V + (1 - p)\theta W).$$

Combining with incentive compatibility constraint (3) to eliminate $V$, we obtain

$$\frac{(1 - \delta) \left[ B - e^H + \theta (P - c^H) \right] + \delta (1 - p)\theta W}{\theta (1 - \delta p)} \geq \frac{(1 - \delta) \left[ B - e^L + \theta (P - c^L) \right] + \delta (1 - q)\theta W}{\theta (1 - \delta q)}.$$  \hspace{1cm} (7)

One immediate observation is that since $1 / (1 - \delta p) > 1 / (1 - \delta q)$, for any given $W$, the incentive constraint is easier to be satisfied with a higher $P$. Setting a higher $P$ also raises both $U$ and $V$. Therefore, in the optimal equilibrium, $P = p$.

Plugging $P = p$ into the incentive constraint (7) and rearranging gives:

$$W \leq \bar{W} (\delta, \theta) \equiv \frac{B - e^H}{\theta} + (p - c^H) - \frac{(1 - \delta p) \left( \frac{e^H - e^L}{q} + c^H - c^L \right)}{\delta (p - q)}. \hspace{1cm} (8)$$

A necessary condition for the sustainability of high effort, i.e., $\bar{W} (\delta, \theta) \geq (B - e^L) / \theta + (q - c^L)$, is given by

$$\frac{B - e^L}{\theta} + (q - c^L) \leq \frac{B - e^H}{\theta} + (p - c^H) - \frac{(1 - \delta p) \left( \frac{e^H - e^L}{q} + c^H - c^L \right)}{\delta (p - q)}. \hspace{1cm} (9)$$

As long as (9) is satisfied, there exists a

$$W \in \left[ \frac{B - e^L}{\theta} + (q - c^L), \frac{B - e^H}{\theta} + (p - c^H) - \frac{(1 - \delta p) \left( \frac{e^H - e^L}{q} + c^H - c^L \right)}{\delta (p - q)} \right]$$

such that (8) is satisfied. One immediate result is that $B$ does not affect the sustainability of high effort.
This is because the controlling shareholder receives $B$ regardless. This inequality can be rewritten as

$$\delta \geq \hat{\delta}(\theta) = \frac{e^H - e^L + \theta (e^H - c^L)}{q(e^H - e^L + \theta (e^H - c^L)) + \theta (p-q)^2}.$$  

Note that $\hat{\delta}(\theta)$ is decreasing in $\theta$, $\hat{\delta}(0) = 1/q > 1$ and

$$\hat{\delta}(1) = \frac{e^H - e^L}{q(e^H - e^L + e^H - c^L) + (p-q)^2}.$$  

If $\hat{\delta}(1) > 1$, then $\hat{\delta}(\theta) > 1$ for all $\theta$ and high effort is unsustainable for discount factors. Therefore, for the analysis to be nontrivial, it is necessary that $\hat{\delta}(1) \leq 1$, which is equivalent to (1). When (1) holds, there exists $\theta$ such that $\hat{\delta}(\theta) \leq 1$ if and only if

$$\theta \geq \bar{\theta} \equiv \frac{(1-q)(e^H - e^L)}{(p-q)^2 - (1-q) (e^H - c^L)}.$$  

For $\delta \geq \hat{\delta}(\theta)$, the maximum value of a controlling share can be obtained by plugging $W = \tilde{W}(\delta, \theta)$ from (8) into (3), and the maximum value of noncontrolling shares can be obtained using (2). Since $W$ is enforced by a discounted price, setting $W = \tilde{W}(\delta, \theta)$ means the firm gives a discount just large enough to support the incentive to engage in high-quality production. In other words, setting $W = \tilde{W}(\delta, \theta)$ maximizes $U$ and $V$, which in turn maximizes $S$.  

**Proof of Proposition 2.** (i) If $\delta < \hat{\delta}(\theta)$, then $W(\delta, \theta) < (B - e^L) / \theta + (q - c^L)$. Therefore, there does not exist any $T$ in the interval $[(B - e^L) / \theta + (q - c^L), \tilde{W}(\delta, \theta)]$. In other words, when high-quality production is not sustainable in the absence of transfer of controlling shares, allowing transfer of these shares will not improve the performance of the firm because the possibility of ownership turnover cannot lower the controlling shareholder’s continuation payoff below $B - e^L + \theta (q - c^L)$. Therefore, if $\delta < \hat{\delta}(\theta)$, only low effort can be supported in equilibrium even when turnover is allowed. Consequently, $\tilde{V} = \frac{B - e^L}{\theta} + \tilde{U}$ and $\tilde{U} = q - c^L$.

(ii) When $\delta = \hat{\delta}(\theta)$, in order to support high effort, the continuation payoff to the controlling shareholder must be set at $\theta (q - c^L) + B - e^L$ following a bad outcome, for incentive provision. When controlling shares turnover is allowed, it requires a transaction price of $\theta (q - c^L) + B - e^L$ to sustain effort. When the incumbent has positive bargaining power, this is possible only if the surplus from the trade of controlling shares is zero, i.e. the newly arrived entrepreneur has to be punished as severely as the incumbent after he takes over the firm. Thus, the firm’s profit cannot be increased by turnover. Consequently, $\tilde{U}$ and $\tilde{V}$ stay at $\tilde{U}^0(\theta)$ and $\tilde{V}^0(\theta)$ respectively.

(iii) and (iv) In order to construct the optimal equilibrium, we look for PPE that maximizes the total shareholder value $S = \theta V + (1 - \theta) U$.

An upper bound on the equilibrium value of $U$ in any PPE is $p - e^H$.

To account for the value of a controlling share $V$, a shortcut is to imagine hypothetically that every time a bad outcome arises, the controlling shareholder, instead of realizing the loss of $\theta (V - T)$ by selling her block of shares, realized the loss of $\theta (V - T)$ but then continued to hold on to the controlling shares.
With this interpretation, the value per controlling share can be expressed as

\[ V = \frac{B - e^H}{\theta} + (p - c^H) - \delta (1 - p) \frac{V - T}{1 - \delta}. \]

The equation above can be rewritten as

\[ V = \frac{1 - \delta}{1 - \delta p} \left[ \frac{B - e^H}{\theta} + (p - c^H) \right] + \frac{\delta (1 - p)}{1 - \delta p} T \]  

(10)

Thus, the equilibrium value of \( V \) is increasing in the transaction price of controlling shares \( T \), as long as \( T \) is small enough to sustain incentive for high-quality production. More precisely, the following incentive constraint must be satisfied to motivate high-quality production

\[ T \leq \bar{W} (\delta, \theta) \equiv \frac{B - e^H}{\theta} + (p - c^H) - \frac{(1 - \delta p) \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right)}{\delta (p - q)} \]  

(11)

Therefore, the maximum possible value of \( V \) in any PPE with turnover of control block and high-quality production is given by equation (10) with \( T = \bar{W} (\delta, \theta) \). Consequently, an upper bound on the equilibrium value of \( V \) in any PPE is \( \bar{V}^0 (\theta) \).

Now, we show the upper bounds on \( U \) and \( V \) can be achieved if the discount factor is large enough. This then implies that when the discount factor is large enough, the optimal equilibrium yields \( \bar{U} = p - c^H \) and \( \bar{V} = \bar{V}^0 (\theta) \).

First, in order for the controlling share to achieve the value \( \bar{V}^0 (\theta) \), we have to set \( T = \bar{W} (\delta, \theta) \). Next, recall \( \hat{W} \) is the value of controlling shares to the new controlling shareholder following an ownership turnover. Suppose high-quality production can be supported with \( \hat{W} = \bar{V}^0 (\theta) \). Then no price cut is needed in the equilibrium punishment phase and from equation (5), the noncontrolling shares achieve the value \( \bar{U} = p - c^H \). Substituting \( \hat{W} = \bar{V}^0 (\theta) \) and \( T = \bar{W} (\delta, \theta) \) into equation (4) and rearrange, we can express the value of controlling shares to the incumbent following an off-equilibrium negotiation breakdown, \( W \), as

\[ W = \frac{\bar{W} (\delta, \theta) - \beta \bar{V}^0 (\theta)}{1 - \beta} \]

This off-equilibrium value of controlling share can be supported by requiring the incumbent to offer a price discount to customers for one period. The discount is given by

\[ \frac{\bar{V}^0 (\theta) - W}{1 - \delta} = \frac{\bar{V}^0 (\theta) - \bar{W} (\delta, \theta)}{(1 - \delta) (1 - \beta)} \]

The equilibrium described above is feasible if and only if

\[ W \geq \frac{B - e^L}{\theta} + (q - c^L) \]  

(12)
This translates into the following condition:

\[
\delta \geq \bar{\delta}(\beta, \theta) \equiv \frac{e^H - e^L + \theta (c^H - c^L)}{(1 - q) \beta + q} (e^H - e^L + \theta (c^H - c^L)) + (1 - \beta) \theta (p - q)^2.
\]  

(13)

In sum, if \( \delta \in [\bar{\delta}(\beta, \theta), 1) \), \( \bar{U} = p - c^H \) and \( \bar{V} = \bar{V}^0(\theta) \) in the optimal equilibrium. The equilibrium takes the form described in the text, with \( T = \bar{W}(\delta, \theta) \). On the off-equilibrium path punishment phase in which the controlling shares are retained by the incumbent, a price cut \( \bar{V}^0(\theta) - \bar{W}(\delta, \theta) \) is offered to customers for one period. This concludes the proof for part (iv) of the proposition.

Next, suppose \( \delta \in [\tilde{\delta}(\theta), \bar{\delta}(\beta, \theta)) \). In the optimal equilibrium, \( \bar{V} > \bar{W} \), and a price discount is offered in the on-the-equilibrium punishment phase. It is therefore immediate that \( \bar{U} < p - c^H \). We now proceed to construct the optimal equilibrium.

Equation (4) can be written as

\[
\bar{W} = \frac{T - (1 - \beta) W}{\beta}
\]

(14)

Using (14) and (10), the price cut, denoted by \( D(\beta, \delta) \), can be written as

\[
D(\beta, \delta) \equiv \frac{V - \bar{W}}{1 - \delta} = \frac{1}{1 - \delta p} \left[ \frac{B - e^H}{\theta} + (p - c^H) \right] - \frac{1}{1 - \delta} \left[ \frac{1}{\beta} - \frac{\delta (1 - p)}{1 - \delta p} \right] T + \frac{1 - \beta}{\beta (1 - \delta)} W
\]

(15)

Note that because \( \delta \in [\tilde{\delta}(\theta), \bar{\delta}(\beta, \theta)) \), the price cut \( D(\beta, \delta) \) is positive for all \( T \) and \( W \) such that \( T \in [0, \bar{W}(\delta, \theta)] \) (by (11)) and \( W \geq (B - e^L) / \theta + (q - c^L) \) (by (12)). The price cut is therefore increasing in \( W \) and decreasing in \( T \) (since \( 1/\beta > 1 > \delta (1 - p) / 1 - \delta p \)). Therefore, to get the minimum equilibrium price cut, we should set \( W = (B - e^L) / \theta + (q - c^L) \) and \( T = \bar{W}(\delta, \theta) \). Note that by setting \( T = \bar{W}(\delta, \theta) \), we also achieve the upper bound on the equilibrium value of controlling shares \( V = \bar{V}^0(\theta) \). Thus, \( \bar{V} = \bar{V}^0(\theta) \).

By setting \( W = (B - e^L) / \theta + (q - c^L) \) and \( T = \bar{W}(\delta, \theta) \), the value of noncontrolling shares in the optimal equilibrium is

\[
\bar{U} = (p - c^H) - \delta \frac{1 - p}{1 - \delta} \left\{ \frac{e^H - e^L}{\theta} + \frac{c^H - c^L}{p - q} \left[ (1 - \delta^2) - q \right] \right\} (1 - q) - (p - q) (\beta^{-1} - 1)
\]

(16)

In sum, if \( \delta \in [\tilde{\delta}(\theta), \bar{\delta}(\beta, \theta)) \), \( \bar{U} \) is given by (16) and \( \bar{V} = \bar{V}^0(\theta) \) in the optimal equilibrium. The equilibrium takes the form described in the text, with \( T = \bar{W}(\delta, \theta) \). On the off-equilibrium path in which the controlling shares are retained by the incumbent, a price cut of \( \bar{V}^0(\theta) - (B - e^L) / \theta + (q - c^L) \) is offered to customers for one period.

Finally, because \( \delta \in (\bar{\delta}(\theta), \bar{\delta}(\beta, \theta)) \), it can be readily verified that

\[
\bar{U} \in \left( (p - c^H) - (1 - P) \left\{ \frac{e^H - e^L}{\theta} + \frac{c^H - c^L}{p - q} \right\}, p - c^H \right) = (\bar{U}^0(\theta), p - c^H)
\]

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Proof of Corollary 1. Based on Proposition 2, if \( \delta \geq \bar{\delta} (\beta, \theta) \), then \( \bar{V} = \bar{V}^0 (\theta) \), \( \bar{U} = \bar{U} = p - c^H \), and \( T = \bar{W} (\delta, \theta) \). The expressions for \( \Delta^H \) and \( \Delta^L \) then follow by direct substitution. It follows immediately that \( \Delta^H > \Delta^L \). Also, \( \Delta^H < 0 \) if \( \frac{B - c^H}{\theta} \) is sufficiently small.

Next, if \( \delta \in (\delta (\theta), \bar{\delta} (\beta, \theta)) \), then \( \bar{V} \) and \( T \) remain at \( \bar{V}^0 (\theta) \) and \( \bar{W} (\delta, \theta) \), respectively. The expressions for \( \bar{U} \) and \( \bar{U} \) are given by (6). According to the proof of Proposition 1,

\[
\bar{W} = \frac{\bar{W} (\delta, \theta) - (1 - \beta) \left( \frac{B - e^L}{q} + (q - c^L) \right)}{\beta}.
\]

Direct substitution gives the expressions for \( \Delta^H \) and \( \Delta^L \). Note that the term in the brackets is negative if and only if

\[
\delta > \delta_1 (\theta) = \frac{c^H - c^L + \frac{e^H - e^L}{\theta}}{(p - q)^2 + q (c^H - c^L + \frac{e^H - e^L}{\theta})}.
\]

It can be readily verified that \( \delta_1 (\theta) < \bar{\delta} (\beta, \theta) \) under (1). Thus, if \( \delta \in (\delta_1 (\theta), \bar{\delta} (\beta, \theta)) \) and \( \frac{B - c^H}{\theta} \) is sufficiently small, then \( \Delta^H \) can be negative. Finally, note that

\[
\Delta^H - \Delta^L = (\bar{V}^0 (\theta) - \bar{U}) - (\bar{W} (\delta, \theta) - \bar{U}) = \bar{W} - \bar{W} (\delta, \theta).
\]

Because \( \bar{W} - \bar{W} (\delta, \theta) > 0 \), we obtain that \( \Delta^H > \Delta^L \) as in the former case. Straightforward calculation yields the following expressions for \( \Delta^H \):

\[
\Delta^H = \begin{cases} 
\frac{B - e^H}{\theta} - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right) & \text{if } \delta \geq \bar{\delta} (\beta, \theta) \\
\frac{B - e^H}{\theta} - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right) & \text{if } \delta \in (\delta (\theta), \bar{\delta} (\beta, \theta))
\end{cases}
\]

It is immediate to see that in both cases, \( \Delta^H < 0 \) if \( B \) is sufficiently small. ■

Proof of Corollary 2. Fix a \( \theta > \frac{B}{q} \). If \( \delta \leq \bar{\delta} (\theta) \), then \( \beta \) has no effect on \( \bar{W} \) and hence no effect on the block premium and the post-acquisition accounting profit. For the rest of the proof, we consider the case \( \delta > \bar{\delta} (\theta) \).

Recall that \( \tilde{\delta} (0, \theta) = \bar{\delta} (\theta) \) and that \( \bar{\delta} (\beta, \theta) \) is strictly increasing in \( \beta \), we can thus define its inverse: let \( \tilde{\beta} (\delta, \theta) \) be the solution to \( \delta = \tilde{\beta} (\delta, \theta) \). When \( \beta \leq \tilde{\beta} (\delta, \theta) \), we have \( \delta \geq \tilde{\beta} (\delta, \theta) \). Therefore, according to the proof of Proposition 2, \( \bar{W} = \bar{V}^0 (\theta) \) and \( T = \bar{W} (\delta, \theta) \). Both the block premium, \( T - U_\theta \), and post-acquisition profit, \( p - c^H \), are locally invariant to \( \beta \).

When \( \beta > \tilde{\beta} (\delta, \theta) \), we have \( \delta < \tilde{\delta} (\beta, \theta) \). According to the proof of Proposition 2, \( T \) remains at \( \bar{W} (\delta, \theta) \) and

\[
\bar{W} = \frac{\bar{W} (\delta, \theta) - (1 - \beta) \left( \frac{B - e^L}{q} + (q - c^L) \right)}{\beta}.
\]

Therefore, \( \bar{W} \) is equal to \( \bar{V}^0 (\theta) \) when \( \beta \leq \tilde{\beta} (\delta, \theta) \) and is strictly decreasing in \( \beta \) for \( \beta \in (\tilde{\beta} (\delta, \theta), 1) \). The result then follows because the block premium varies inversely with \( \bar{W} \) while the post-acquisition accounting profit varies positively with \( \bar{W} \). ■

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Proof of Corollary 3. It is straightforward that the inequality \( \delta \geq \hat{\delta}(\beta, \theta) \) can be rearranged into \( \theta \geq \hat{\theta}(\beta, \delta) \) for some function \( \hat{\theta} \). If \( \theta \geq \hat{\theta}(\beta, \delta) \), the block premium is given by

\[
T - U = \bar{W}(\delta, \theta) - (p - c^H) = \frac{(1 - \delta p)}{\delta (p - q)} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right).
\]

Thus, the block premium is increasing in \( \theta \). If \( \theta < \hat{\theta}(\beta, \delta) \), then the block premium is given by

\[
T - U = \bar{W}(\delta, \theta) - (p - c^H) + (1 - \delta p) D(\beta, \theta).
\]

Substituting (15) into the equation above and using \( W = (B - c^L)/\theta + (q - c^L) \) and \( T = \bar{W}(\delta, \theta) \), it can be shown that the coefficient of the term \( \frac{\theta}{e^H - e^L} \) in the expression for \( T - U \) is \( \frac{1 - \beta}{\delta (1 - \delta)} \frac{(1 - \delta p)}{\theta (p - q)} > 0 \). Thus, the block premium is decreasing in \( \theta \) for \( \theta < \hat{\theta}(\beta, \delta) \). \( \blacksquare \)

Proof of Proposition 3. (i) First, it is immediately apparent that when \( \delta = \hat{\delta}(1) \), \( \theta^* \) is unique and equal to one as any lower \( \theta \) cannot support high-quality production. Similarly, for any \( \delta \in \left( \hat{\delta}(1), 1 \right) \), it is suboptimal to set \( \theta \) below \( \hat{\theta}(\delta) \).

Next, when \( \theta = \hat{\theta}(\delta) \) or equivalently, \( \delta = \hat{\delta}(\theta) \), we have that \( \bar{U} = \bar{U}^0(\hat{\theta}(\delta)) \) and \( \bar{V} = \bar{V}^0(\hat{\theta}(\delta)) \), according to Proposition 1. Therefore, \( \bar{U} - \bar{V} = -\frac{B - c^L}{\bar{\theta}(\delta)} < 0 \) and non-controlling shares is less valuable than controlling shares. Since the value of each kind of shares is strictly increasing in \( \theta \) when \( \theta \in [\hat{\theta}(\delta), \min \{ \hat{\theta}(\delta, \beta), 1 \}] \) and \( \delta \in \left( \hat{\delta}(1), 1 \right) \), the optimal ownership structure \( \theta^* \) strictly exceeds \( \bar{\theta}(\delta) \).

Moreover, if \( \bar{\theta}(\delta, \beta) < 1 \) and \( \theta \geq \bar{\theta}(\delta, \beta) \), then according to Proposition 1, \( \bar{U}(\theta) = p - c^H \) and \( \bar{V}(\theta) = \bar{V}^0(\theta) \). This gives

\[
S(\theta) = B - e^H + (p - c^H) - \frac{1 - p}{p - q} \left( e^H - e^L + \theta (c^H - c^L) \right).
\]

Therefore, \( S \) is strictly decreasing in \( \theta \) for \( \theta \geq \bar{\theta}(\delta, \beta) \) and it is suboptimal to set \( \theta \) above \( \bar{\theta}(\delta, \beta) \). We have thus established that \( \theta^* \in (\hat{\theta}(\delta, \beta), 1) \].

To see why \( \theta^* \) is unique when \( \delta \in \left( \hat{\delta}(1), 1 \right) \), recall by definitions, \( \theta \in (\hat{\theta}(\delta), \min \{ \hat{\theta}(\delta, \beta), 1 \}) \) if and only if \( \delta \in (\hat{\theta}(\theta), \hat{\theta}(\delta, \beta)) \). Using part (iii) of Proposition 1, the total shareholder value \( S(\theta) = \theta \bar{V}(\theta) + (1 - \theta) \bar{U}(\theta) \) for this range of \( \theta \) is given by

\[
S(\theta) = \theta \left[ \frac{B - e^H}{\theta} + (p - c^H) - \frac{1 - p}{p - q} \left( \frac{e^H - e^L}{\theta} + c^H - c^L \right) \right] + (1 - \theta) \left[ (p - c^H) - \delta \frac{1 - p}{1 - \delta} \left( \frac{c^H - e^L}{\theta} + c^H - c^L \right) \left[ \beta^{-1} (\delta^{-1} - q) - (1 - q) \right] - (p - q) (\beta^{-1} - 1) \right].
\]

Direct computation gives the second derivative:

\[
S''(\theta) = -2\theta^{-3} \left( \frac{1 - p}{1 - \delta} \frac{e^H - e^L}{p - q} - \delta^{-1} (\delta^{-1} - q) - (1 - q) \right) < 0.
\]

Since \( S \) is strictly concave in \( \theta \) in the interval \( [\hat{\theta}(\delta), \min \{ \hat{\theta}(\delta, \beta), 1 \}] \), \( \theta^* \) is unique when \( \delta \in \left( \hat{\delta}(1), 1 \right) \). Finally, it is easy to verify that both \( \hat{\theta}(\delta) \to \theta^* \) as \( \delta \to 1 \). Therefore, \( \theta^* \) converges to
(ii) By the strict concavity of $S(\theta)$ in the interval $[\bar{\theta}, \min \{\theta, 1\}]$, $\theta^*$ is characterized by the first order condition $S'(\theta^*) = 0$, which can be simplified into

$$\bar{\theta} = \frac{(e^H - e^L) (1 - \delta q - \beta \delta (1 - q))}{(1 - \delta) (p - q)^2 - (1 - \delta (q + \beta (1 - q))) (e^H - e^L)}.$$ 

From the proof of part (i), we know that the optimal ownership structure $\theta^*$ is given by

$$\theta^* = \min \{1, \bar{\theta}, \tilde{\theta}\},$$

where

$$\tilde{\theta} = \frac{(e^H - e^L) (1 - q\delta) - \beta \delta (1 - q)}{\delta (1 - \beta) (p - q)^2 - (1 - \delta (q + \beta (1 - q))) (e^H - e^L)}.$$ 

Note here, $\bar{\theta}$ is the inverse of $\tilde{\theta}$. Furthermore, if $\delta \in (\bar{\delta} (\beta, 1), 1)$, then $\theta^* < 1$.

It is obvious that both $\bar{\theta}$ and $\tilde{\theta}$ are strictly increasing in $e^H - e^L$ and $e^H - e^L$. Thus, $\theta^*$ is weakly increasing in $e^H - e^L$ and $e^H - e^L$ if $\delta \in (0, 1)$. It is strictly decreasing in $e^H - e^L$ and $e^H - e^L$ if $\delta \in \bar{\delta} (\beta, 1), 1$.

Direct computation shows that $\frac{\partial \bar{\theta}}{\partial \delta}, \frac{\partial \tilde{\theta}}{\partial \delta} > 0$. Thus, $\theta^*$ is weakly increasing in $\beta$ for $\delta \in (0, 1)$, and strictly increasing in $\beta$ if $\delta \in \bar{\delta} (\beta, 1), 1$.

$$\frac{\partial \bar{\theta}}{\partial \beta} = \frac{\delta (1 - \delta) (e^H - e^L) (p - q)^2}{\left(\frac{\delta (1 - \delta) (p - q)^2 - (1 - \delta (q + \beta (1 - q))) (e^H - e^L)}{e^H - e^L}\right)^2} > 0,$$

$$\frac{\partial \tilde{\theta}}{\partial \beta} = \frac{1}{2\bar{\theta}} \frac{e^H - e^L - (p - q)^2 + (e^H - e^L) (1 - q)}{(p - q)^2 - (e^H - e^L) (1 - q\delta)} > 0.$$

**Proof of Corollary 4.** Using the definitions in the proof of Proposition 3, the optimal ownership structure is strictly less than $\min \{\bar{\theta}, 1\}$ if and only if $\tilde{\theta} < 1$ and $\bar{\theta} < \bar{\theta}$. Upon straightforward algebra
manipulation, these inequalities can be written as
\[
c^H - c^L < \frac{1}{(1 - \delta q)} \left[ \delta (p - q)^2 - (e^H - e^L) \left( \frac{1 - \delta q - \beta \delta (1 - q)}{1 - \beta} \right) \right] \equiv \bar{C}, \text{ and}
\]
\[
0 > \delta (1 - \beta) (p - q)^2 \left[ \delta (1 - \beta) (p - q)^2 - (e^H - e^L) ((1 - q\delta) - \beta \delta (1 - q)) \right]
+ (1 - \beta) (1 - q\delta - \beta \delta (1 - q)) \left[ (1 - \delta q) (e^H - e^L) - 2\delta (p - q)^2 \right] (c^H - c^L)
+ (1 - \delta q - \beta \delta (1 - q))^2 (c^H - c^L)^2.
\]

The condition \( e^H - e^L < \frac{\delta (1 - \beta) (p - q)^2}{1 - \delta q - \beta \delta (1 - q)} \) ensures that \( \bar{C} \) is positive. It also ensures that inequality (17) holds at \( c^H - c^L = \bar{C} \). Combined with the observation that inequality (17) does not hold at \( c^H - c^L = 0 \), the system of inequalities above hold for some \( c^H - c^L \in (\underline{C}, \bar{C}) \), for some \( C > 0 \). Finally, direct computation shows that the efficiency requirement (1) holds for all \( c^H - c^L < \bar{C} \).

References


