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Controlling Shareholders and Innovation: Evidence From Trademark Registrations

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ABSTRACT

We examine how controlling shareholders influence corporate innovation, using trademark registration data from Chinese listed firms between 2003 and 2020. We find that the effect of control depends on the nature of the controlling entity: in state-owned enterprises (SOEs), government control is associated with significantly lower levels of innovation output, whereas in non-SOEs, greater authoritative power of the controlling shareholder is positively associated with innovation. Our findings suggest that institutional investors may help mitigate agency problems related to innovation in SOEs, although their role is limited in non-SOEs. Additional analyses reveal that trademarks are positively linked to future firm performance and that controlling shareholder authority is positively associated with innovation efficiency. Our findings underscore the importance of ownership structure in shaping firms' innovation strategies and outcomes.

1 | Introduction

Innovation is more critical than ever for the survival of corporations in the 21st century. As technologies across industries evolve rapidly, product and service life cycles are shortening, leaving little room in the market for firms that fail to innovate. Corporations seeking growth often invest in costly innovation, as it is widely considered the cornerstone of long-term competitiveness (Arrow 1962; Manyika et al. 2010). Firms that do not continuously innovate may risk falling behind due to forces of “creative destruction.” Jeff Bezos, founder of Amazon, emphasized the need for innovation in a competitive environment: “The other thing about competition is that you do not want to play on a level playing field. This is why you need innovation... The only way to stay ahead and to keep that unlevel playing field, which is what you certainly want, is to innovate.”¹

Investing in innovation, however, is not an easy task. As noted by Hölmstrom (1989), Scherer and Harhoff (2000), and Minetti et al. (2015), innovation entails significant upfront investment and long time horizons before realizing output. The returns are highly uncertain, and the process is characterized by information asymmetries, resulting in elevated agency costs (Aboody and Lev 2000; Minetti et al. 2015). These agency costs are particularly high for managers with limited tenure, who face pressure from short-term capital markets. The mismatch between short-term costs and long-term benefits of innovation may deter investment, especially when innovation outcomes remain opaque during the process, making it difficult to justify delayed returns to shareholders and investors (Stein 1988).

In this study, we investigate the role of controlling shareholders in promoting corporate innovation. The effect of a controlling

All authors contributed equally to completing the paper.

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shareholder is likely to depend on the shareholder's identity and objectives. In state-owned enterprises (SOEs), where controllers may emphasize political or social goals over shareholder value, managers may be less incentivized to pursue long-term, firm value-enhancing innovation. In contrast, in non-SOEs where controllers prioritize shareholder value, there may be a trade-off between weaker short-term performance and higher long-term value.² The misaligned incentives of myopic CEOs focused on short-term outcomes can be mitigated by the involvement of strong controlling shareholders. If such shareholders shield managers from short-term market pressures, the firm may be better positioned to pursue long-term innovative projects (Asker et al. 2015).

Using data of publicly listed Chinese firms from 2003 to 2020, we examine whether government ownership hinders innovation. We find that SOEs engage in significantly fewer innovative activities compared to non-SOEs. For non-SOEs, we adopt the framework of Finkelstein (1992) to construct a proxy for the authority (or power) of controlling shareholders. We find that, among non-SOEs, innovation increases with the authority of the controlling shareholder.

While the vast majority of academic literature on innovation focuses on technological innovation, typically measured by research and development (R&D) expenditures and/or patent filings, we broaden the scope to include non-technological ("soft") innovation, and emphasize commercialized innovation, which we measure using trademark registrations.³

R&D expenditures generally capture corporate input into innovation at the upstream (early-stage) of the innovation value chain, while patent data reflect intermediate-stage outputs of technological innovation. However, innovation, and a firm's capacity to sustain competitive advantage, can manifest in forms beyond technological breakthroughs. For example, improvements in service delivery or the introduction of new marketing methods are also key forms of innovation that often escape patent coverage.

Trademark registrations, by contrast, serve as a useful proxy for downstream innovation, that is, innovations that are ultimately commercialized and brought to market. Consumer goods companies, for instance, register trademarks to protect their brands and products, create a recognizable identity for customers, and prevent competitors from exploiting their market presence. Similarly, service firms, especially in industries characterized by high information asymmetry such as finance, IT, and digital services, use trademarks to establish legitimacy and market differentiation (Castaldi 2018, 2020). In this sense, trademarks are not only outcomes of advertising investments but also reflect R&D efforts aimed at market realization.⁴

To illustrate the distinction between upstream and downstream innovation, consider two of Amazon's well-known innovations: "1-Click" and "Amazon Prime."

"1-Click" was an early technological breakthrough allowing customers to make purchases with a single click after securely storing their payment and shipping details. This feature

significantly reduced cart abandonment rates of Amazon.com visitors.⁵ It was patented by the United States Patent and Trademark Office (USPTO) in 1999 and registered as a trademark in 2015.

In contrast, "Amazon Prime," which offered paid members free unlimited two-day shipping, was an innovative service model that transformed customer expectations in e-commerce. Although never patented, Amazon Prime was registered as a trademark in 2008 and later again as "Prime" in 2017. Both "1-Click" and "Amazon Prime" were commercially significant innovations, but only one was captured in patent data.

This example underscores the limitation of patent-based measures, especially in service industries. Trademark data captures both "1-Click" and "Amazon Prime," whereas patent data only captures the former. Therefore, we focus on the downstream stage of the innovation value chain and use trademark registration as our primary innovation proxy (Castaldi 2020).⁶

This study contributes to several strands of the literature:

First, it adds to the literature on ownership structure and corporate innovation. Our finding that SOEs engage in fewer innovation activities than non-SOEs supports existing research suggesting that innovation performance is superior in the private sector (Shleifer 1998; Fang et al. 2017). We also find that ownership concentration, specifically, strong controlling shareholder authority, can promote downstream innovation. This challenges the conventional view in corporate governance that concentrated ownership leads to underinvestment in innovation, a problem typically mitigated by external investors (Aghion et al. 2013; Minetti et al. 2015). In our context, we show that while institutional investors help mitigate underinvestment in innovation at SOEs, their effect is minimal in non-SOEs where powerful controlling shareholders directly foster innovation.

Second, our paper contributes to the literature on innovation proxies. In accounting and finance, innovation is most commonly proxied by R&D expenditures (Lev and Sougiannis 1996; Barron et al. 2002; Kothari et al. 2002; Beck et al. 2016), patent data (Gu and Wang 2005; Bernstein 2015; Kraft et al. 2018), or both (Becker-Blease 2011; Hirshleifer et al. 2012). Other studies have shown that R&D subsidies increase patent activity (Bronzini and Piselli 2016; Howell 2017), while Hagedoorn and Cloodt (2003) evaluate various innovation proxies and conclude that R&D, patent counts, citations, and new product announcements all capture important dimensions of innovation. By using trademark data, we contribute to a smaller but growing literature that treats trademark registrations as a meaningful proxy for commercialization-driven innovation (Mendonça et al. 2004; Sandner and Block 2011; Flikkema et al. 2014, 2019; Faurel et al. 2024).

The remainder of the paper is organized as follows. Section 2 develops our hypotheses. Section 3 describes the data and presents summary statistics. Section 4 reports the empirical results and Section 5 provides robustness checks. Section 6 concludes.

2 | Literature Review and Hypotheses Development

2.1 | State Ownership and Corporate Innovation

In some firms, the government is the controlling shareholder. In emerging markets and countries with centrally planned economies, such as former communist states, a substantial portion of the largest listed companies remains under direct or indirect government ownership. For these government-controlled corporations, the primary objective is often not market survival through cost reduction or product improvement, but rather the provision of goods or services to the broadest population possible. Aligning with these public service goals can enhance the career prospects of managers within such firms. As a result, management at government-owned companies may prioritize political objectives, such as ensuring a “stable” supply of goods or services, rather than “better” products or services (Shleifer 1998), or employing excess labor (Boycko et al. 1996).

Early works comparing SOEs to non-SOEs focus on short-term performance measures before and after the privatization of SOEs, and find that, in general, non-SOEs are superior to SOEs in terms of operating efficiency and profitability (Boubakri and Cosset 1998; D'souza and Megginson 1999; Dewenter and Malatesta 2001; Megginson et al. 1994).

State ownership has often been found to be less conducive to corporate innovation than private ownership. Munari and Oriani (2005) find that R&D is more efficient in privately owned firms than in privatized firms using data from Western Europe. Using a global sample of privatization data, Boubakri et al. (2013) find that state ownership is negatively associated with corporate risk-taking, an essential ingredient for innovation. Belloc (2014) claims, however, that the weaker innovation performance of SOEs is not necessarily due to state ownership per se, but is often related to less commitment to long-term investment strategies, corruption, and political interference.

More recently, studies using Chinese data show, in general, more innovation in non-SOEs than in SOEs where the government controls the firm (Ning et al. 2025; Boudreaux 2024). Castelnovo (2022) claims that, in the EU, in some medium high-tech industries, SOEs outperform non-SOEs in terms of innovation, but as Boudreaux (2024) suggests, this may be because the EU is more market-oriented than China. From a related perspective, Aghion et al. (2023) find that regulatory burdens can reduce corporate innovation, which is broadly consistent with our finding that government ownership dampens innovation incentives. As Marshall (1907) aptly noted, “A government could print a good edition of Shakespeare's works, but it could not get them written.” Based on this reasoning, we hypothesize that innovation intensity is lower in government-controlled firms.

H1. *SOEs register fewer trademarks than non-state-owned enterprises.*

2.2 | Ownership in Non-SOEs and Corporate Innovation

While the impact of government ownership on corporate innovation is relatively well documented, the relationship between ownership and innovation in non-SOEs is more nuanced. In firms with diffused ownership, where management is separate from ownership, one key impediment to innovation is managerial job security. Because most shareholders lack the ability to accurately evaluate the long-term prospects of innovation projects, managerial performance is often judged by short-term results. This dynamic can lead to managerial myopia, where managers prioritize near-term outcomes to safeguard their positions.

Stein (1988) argues that the threat of a potential takeover may incentivize such myopia. Conversely, in settings where managers are less concerned about job turnover, they may be more willing to invest in long-term projects such as corporate innovation (Chemmanur and Tian 2018). However, if managerial entrenchment occurs, where job security is high regardless of performance, managers may pursue a “quiet life” strategy, avoiding risky but potentially valuable investments. Using anti-takeover provisions as a proxy for job security, Bertrand and Mullainathan (2003) find evidence that entrenched managers tend to favor stability and risk aversion over growth. Other studies suggest that the relationship between job security and innovation may be non-linear, with moderate levels of job security encouraging innovation and excessive entrenchment hindering it (Aghion et al. 2013; Sapra et al. 2014).

Beyond job security, blockholders, particularly institutional investors, may help mitigate underinvestment in innovation in firms with dispersed ownership (Aghion et al. 2013). David et al. (2001) emphasize that activism is essential; ownership alone is insufficient to drive innovation. Large outside investors, such as pension or hedge funds, are known to discipline management through both direct intervention, for example, voicing concerns (Brav et al. 2008; Clifford 2008; Greenwood and Schor 2009) and indirect pressure, for example, the threat of exit (Edmans 2009; Parrino et al. 2003; Bushee and Goodman 2007). Such monitoring reduces the likelihood that managers will pursue private benefits at the expense of shareholders. Hölmstrom (1989) argues that enhanced monitoring, combined with decentralized decision-making and performance-based incentives, can foster innovation. Miller et al. (2022) find that monitoring institutional ownership positively influences firm innovation. Li and Liu (2023) find that common institutional ownership significantly promotes corporate innovation. Wang and Li (2023) find that minority shareholder activism in China is positively related to a firm's future innovation.

Other aspects of ownership structure also affect innovation. Schmid et al. (2014), using German data, find that founding families that are actively involved in management positively influence innovation outcomes. Bushee (1998) finds that long-term institutional ownership is less likely to cut R&D expenditures under earnings pressure. Hill and Snell (1988) report that in research-intensive industries, shareholder dominance correlates with innovation, in line with our argument with controlling shareholders. Similarly, Choi et al. (2011) and Choi

et al. (2012) find that foreign ownership is positively associated with innovation in China and South Korea, respectively.

In emerging markets, many non-SOEs exhibit concentrated ownership, often in environments with weaker investor protection. Such concentrated control structures are frequently criticized for poor corporate governance (Dyck and Zingales 2004; Young et al. 2008). In underdeveloped capital markets, external governance mechanisms, such as market competition, institutional monitoring, and takeover threats, may be insufficient to curb tunneling or other self-serving behaviors by controlling shareholders. Under these circumstances, owners who are primarily interested in extracting private benefits may de-emphasize long-term investments, including innovation.

On the other hand, controlling shareholders, especially founders, family members, or large stakeholders deeply committed to the company, are inherently long-term investors. Their interests are less aligned with short-term performance and more focused on sustained value creation. Fahlenbrach (2009) finds that founder-CEO firms invest more heavily in R&D and exhibit higher capital expenditures, suggesting a stronger focus on long-term value creation. Similarly, Chen et al. (2013) provide evidence that family firms invest more in innovation. Their long-term orientation may reduce capital market pressure for immediate results and create an environment more conducive to innovation. Tsao et al. (2019) further show that family ownership mitigates myopic R&D cuts in response to short-term performance pressures. In this context, concentrated ownership could actually lower the agency cost of innovation, provided the controlling shareholder supports innovative activity.

Empirical findings on the link between ownership concentration and innovation are mixed. Choi et al. (2011) and Choi et al. (2012) find that concentrated ownership is not significantly associated with innovation in China or South Korea, while Francis and Smith (1995) report that, in the U.S., firms with diffused ownership innovate less than those with concentrated ownership.

We argue that simply measuring the ownership stake of the largest shareholder may not fully capture the dynamics between concentrated ownership and innovation. As Schmid et al. (2014) suggest, active management by founding families has a different effect on innovation than passive ownership through voting rights alone.

To better capture this nuance, we propose a concept of controlling shareholder authority. Founders and their families may have a deep emotional and strategic commitment to their companies and a strong incentive to pursue long-term growth. When such shareholders are actively involved in management, for example, as board chairs or executives—their influence can directly foster innovation. We argue that the authority of controlling shareholders is stronger when they are both deeply invested in the company's identity (e.g., as founders or family members) and actively engaged in its strategic direction (e.g., as board chairs or CEOs).

This long-term focus allows controlling shareholders to insulate management from short-term market pressures and prioritize innovation. Accordingly, we hypothesize:

H2. *Private firms with stronger controlling shareholder authority register more trademarks.*

3 | Data and Main Variables

We obtain our data from the China Stock Market and Accounting Research (CSMAR) database, which provides comprehensive accounting, financial, patent, and trademark information. Our sample consists of all A-share listed firms from 2003 to 2020. The final sample includes 31,668 firm-year observations with complete data, including lagged independent variables, covering 3140 unique firms. A subsample of non-state-owned enterprises (non-SOEs) includes 19,170 firm-year observations representing 2390 unique firms.

3.1 | Proxy for the Authority of Controlling Shareholders

Extant studies on conflicts between management and shareholders primarily focus on CEO power, examining how powerful CEOs may act against the interests of dispersed outside shareholders. The literature employs various measures of CEO power, including CEO-chairman duality (Hermalin and Weisbach 1998; Jackling and Johl 2009), CEO ownership (Vepurskaitė and Adams 2013), CEO tenure (Morck et al. 1988; Brookman and Thistle 2009), and CEO compensation (Grinstein and Hribar 2004; Florackis and Ozkan 2009).

In this study, we examine how controlling shareholders influence managerial decision-making in firms with concentrated ownership. We use the level of authoritative power of the controlling shareholder as a proxy for their dominance. Following the approach of Finkelstein (1992) and Tang et al. (2011), we construct an index of controlling shareholder power based on multiple dimensions to assess its impact on innovation outcomes. Specifically, the index includes four components: (i) whether the controlling shareholder serves as the chairman of the board, (ii) whether the controlling shareholder is the CEO of the firm, (iii) whether the controlling shareholder is the company's founder, and (iv) whether the controlling shareholder is a family member of the founder.

To construct the index, we assign a value of 1 to each dimension if the condition is met, and 0 otherwise. For example, a dummy variable equals 1 if the controlling shareholder is the chairman, and 0 if not; the same applies for being a CEO, founder status, and family association. The controlling shareholder power index is then calculated by summing these components, resulting in a score ranging from 0 to 4.

3.2 | Proxy for Corporate Innovation

We use newly registered trademarks as a proxy for corporate innovation. However, not all trademark registrations

necessarily reflect innovation efforts. For instance, firms may register new trademarks as part of a rebranding strategy to market existing products, or they may register trademarks across multiple industries to prevent dilution or secure future market entry. These actions do not always signal innovation. To address this concern, we follow Flikkema et al. (2019) and exclude trademarks registered in more than 10 NICE classes, as broader coverage is more likely to reflect strategic protection than innovation.⁷

Our primary innovation measure is $\text{Ln}(1 + \text{Trademarks})$, where Trademarks denotes the number of newly registered trademarks covering 10 or fewer NICE industries by a firm in a given fiscal year. Under the NICE classification, there are 34 product classes and 11 service classes. Firms may register a trademark across multiple NICE industries. We classify a trademark as: (1) Product innovation if registered only in product classes, (2) Service innovation if registered only in service classes, and (3) Non-innovative if registered across both product and service classes (Flikkema et al. 2019).

Xiao et al. (2024) classify trademarks based on whether they appear in advertising, product packaging, annual reports, or major news portals (e.g., Baidu, Sina, Sohu). They find that both “in-use” trademarks and “unused but related to current business” trademarks are positively associated with firm value, whereas “unused and unrelated to current business” trademarks, presumably registered for strategic purposes, are not. Based on this, they distinguish between “self-use” and “strategic” trademarks.

In this spirit, we also construct a measure of trademark breadth, defined as the number of NICE industries covered by a single trademark. For each firm-year, average trademark breadth is calculated using only trademarks registered in 10 or fewer NICE industries. A broader trademark suggests that the innovation is protected across more markets, enhancing its potential application and increasing its strategic value. We interpret trademark breadth as a proxy for strategic trademarking linking corporate innovation to potential corporate value creation, particularly through the expansion of innovation's real options.

3.3 | Control Variables

Unlike patents, which protect the technological components of products and services, trademarks protect their commercialization. Patents are granted for technological inventions within a jurisdiction, whereas trademarks are issued when a product or service is newly introduced by a firm, regardless of technological novelty. In our analysis, we control for both patents and R&D expenditures, as these variables complement and, in some cases, substitute for trademarks. Specifically, patents and R&D expenditures proxy for upstream innovation—early in the innovation value chain—while trademarks reflect downstream innovation, capturing efforts closer to commercialization.

In addition, we control for a range of firm-level characteristics that may influence innovation output. Since corporate control

by insiders can be moderated by external blockholders, such as institutional investors, we include institutional ownership as a control variable. Institutional investors are generally expected to encourage long-term value creation and innovation (Aghion et al. 2013), so we anticipate a positive association with innovation outcomes.

We also control for firm size, measured as the natural logarithm of one plus total assets, as larger firms are typically more innovative (Zoltan and Audretsch 1988; Morck et al. 1988). Similarly, firms with greater growth opportunities—measured by the book-to-market ratio—are expected to invest more in innovation. Lastly, we include controls for asset tangibility, financial leverage, and liquidity, the latter proxied by operating cash flow.

4 | Empirical Results

In this section, we present the results of our empirical analysis, followed by robustness checks and a discussion of the findings.

4.1 | Descriptive Statistics

Panel A of Table 1 reports descriptive statistics for the full sample. All variables, except for indicator variables, are winsorized at the 1st and 99th percentiles. The mean of $\text{Ln}(1 + \text{Trademarks})$ is 0.532, corresponding to an average of 0.702 trademark registrations per firm-year. These trademarks span an average of 0.425 industries, with the mean of $\text{Ln}(1 + \text{Breadth})$ equal to 0.354. The average number of patents granted per firm-year is 5.554. Other control variables are generally consistent with prior studies. Approximately 39.5% of firm-years in the full sample are classified as SOEs.

Panel B presents summary statistics for the non-SOE subsample. In this group, firms register an average of 0.793 trademarks per year, spanning 0.480 industries. Non-SOEs are granted, on average, 6.315 patents per firm-year. These figures suggest that innovation activity is generally higher among non-SOEs. Finally, the controlling shareholder authority index for non-SOE firms averages 1.748.

4.2 | Innovations in SOEs

We begin by examining how corporate innovation activities differ between SOEs and non-SOEs. Specifically, we estimate the following model using ordinary least squares (OLS):

$$\text{Ln}(1 + \text{Trademarks}_{it}) = \alpha + \beta \text{D}(\text{SOE})_{it-1} + \Gamma \text{Controls}_{it-1} + \delta_i + \phi_t + \epsilon, \quad (1)$$

where $\text{Ln}(1 + \text{Trademarks}_{it})$ is our proxy for corporate innovation.⁸ Given that innovation requires time and that trademark registrations may reflect the outcome of multi-year innovation efforts, we use lagged values for all independent variables to mitigate simultaneity concerns. $\text{D}(\text{SOE})$ is a dummy variable equal to one for state-owned enterprises and zero otherwise. We include year fixed effects (δ_t) and firm fixed effects (ϕ_i) to control for temporal shocks and time-invariant firm characteristics,

TABLE 1 | Descriptive statistics.

Variables	N	Mean	Std. Dev.	Min	Median	Max
Panel A: Full sample						
Ln(1 + Trademarks)	31,668	0.532	0.890	0.000	0.000	3.714
Ln(1 + Breadth)	31,668	0.354	0.538	0.000	0.000	2.398
D(SOE)	31,668	0.395	0.489	0.000	0.000	1.000
Institutional ownership	31,668	0.461	0.244	0.001	0.001	0.926
D(LTII)	31,668	0.487	0.500	0.000	0.000	1.000
Ln(1 + Patents)	31,668	1.880	1.690	0.000	0.000	6.238
Ln(Total asset)	31,668	21.930	1.410	19.310	19.310	27.180
Book-to-market	31,668	0.613	0.265	0.000	0.000	1.123
Tangibility	31,668	0.221	0.165	0.002	0.002	0.695
R&D	31,668	0.004	0.011	0.000	0.000	0.070
Leverage	31,668	0.444	0.221	0.051	0.051	1.011
Operating cash flow	31,668	0.045	0.075	−0.196	−0.196	0.261
Net margin	27,932	0.050	0.219	−1.268	−1.268	0.526
ROA	28,528	0.030	0.073	−0.338	−0.338	0.211
Stock return	28,528	0.228	0.693	−0.685	−0.685	2.901
Tobin's Q	18,683	2.361	1.713	0.841	0.841	10.980
Panel B: Non-SOEs						
Ln(1 + Trademarks)	19,139	0.584	0.916	0.000	0.000	3.714
Ln(1 + Breadth)	19,139	0.392	0.557	0.000	0.000	2.398
Controlling SH authority	19,139	1.748	1.470	0.000	0.000	4.000
IV(Controlling SH authority)	19,033	1.678	0.743	0.000	0.000	4.000
Institutional ownership	19,139	0.381	0.251	0.001	0.001	0.926
D(LTII)	19,139	0.516	0.500	0.000	0.000	1.000
Ln(1 + Patents)	19,139	1.992	1.596	0.000	0.000	6.238
Ln(Total asset)	19,139	21.650	1.218	19.310	19.310	27.180
Book-to-market	19,139	0.567	0.256	0.000	0.000	1.123
Tangibility	19,139	0.196	0.143	0.002	0.002	0.695
R&D	19,139	0.005	0.013	0.000	0.000	0.070
Leverage	19,139	0.396	0.215	0.051	0.051	1.011
Operating cash flow	19,139	0.044	0.075	−0.196	−0.196	0.261
Net margin	16,670	0.049	0.242	−1.268	−1.268	0.526
ROA	16,889	0.032	0.080	−0.338	−0.338	0.211
Stock return	16,889	0.207	0.664	−0.685	−0.685	2.901
Tobin's Q	12,184	2.559	1.785	0.841	0.841	10.980

Note: This table presents descriptive statistics for the variables used in this study. Panel A reports statistics for the full sample, while Panel B presents statistics for the subsample of non-SOEs. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, Ln(1 + Breadth) is the natural logarithm of one plus the average number of distinct industries (as defined by NICE classes) in which a trademark is registered for in a given firm-year, D(SOE) is one for state-owned enterprises and zero otherwise, and Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A.

TABLE 2 | Effect of SOE on innovation activities.

	Dependent variable: Ln(1 + Trademarks)			
	(1)	(2)	(3)	(4)
D(SOE)	−0.157*** (0.0280)	−0.172*** (0.0279)	−0.043* (0.0255)	−0.047* (0.0254)
Institutional ownership	0.151*** (0.0526)	0.088* (0.0534)	0.006 (0.0427)	0.014 (0.0477)
Ln(1 + Patents)	0.023*** (0.0081)	0.027*** (0.0084)	0.006 (0.0052)	0.003 (0.0053)
Ln(1 + Total asset)	0.152*** (0.0116)	0.183*** (0.0146)	0.091*** (0.0086)	0.079*** (0.0124)
Book-to-Market	−0.292*** (0.0346)	−0.464*** (0.0525)	−0.077*** (0.0198)	−0.100*** (0.0269)
Tangibility	−0.363*** (0.0647)	−0.371*** (0.0653)	−0.080* (0.0462)	−0.099** (0.0474)
R&D	4.128*** (0.5990)	4.923*** (0.8904)	2.040*** (0.4969)	2.147*** (0.6899)
Leverage	−0.306*** (0.0477)	−0.340*** (0.0494)	−0.082** (0.0351)	−0.062* (0.0356)
Operating cash flow	0.827*** (0.1118)	0.769*** (0.1094)	−0.094* (0.0557)	−0.094* (0.0560)
Constant	−2.509*** (0.2338)	−3.031*** (0.2848)	−1.357*** (0.1832)	−1.090*** (0.2541)
Observations	31,668	31,668	31,668	31,668
Adjusted- R^2	0.0788	0.0844	0.5705	0.5720
Firm FE	No	No	Yes	Yes
Year FE	No	Yes	No	Yes

Note: This table provides results of the regression of innovation on SOE. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and D(SOE) is one for state-owned enterprises and zero otherwise. Definitions of all variables are provided in Appendix A. Numbers in parenthesis are standard errors and ***, **, and * indicate 1%, 5%, and 10% statistical significance, respectively.

respectively. Control variables include institutional ownership, number of patents granted, firm size, growth opportunities, asset tangibility, R&D expenditures, financial leverage, and operating cash flow, as previously discussed. The estimation results are presented in Table 2.

Consistent with our hypothesis, Table 2 shows that SOEs tend to be associated with lower levels of corporate innovation compared to non-SOEs. In Column (1), which does not include fixed effects, the coefficient on D(SOE) is negative and statistically significant at the 1% level. Given the mean value of Ln(1 + Trademarks) is 0.532 (from Table 1), the estimated coefficient of −0.157 corresponds to an average of 0.455 registered trademarks per firm-year for SOEs—approximately 35% fewer trademarks than non-SOEs. This reflects a substantial reduction in innovation activity associated with government ownership.

The coefficients on other control variables in Column (1) are generally consistent with prior literature. Firms with higher institutional ownership, more patents, larger size, greater growth opportunities, higher R&D spending, lower leverage, and stronger liquidity tend to exhibit more innovation. Interestingly, asset tangibility is negatively associated with innovation, contrary to our expectation that firms with more tangible assets might have a greater capacity to innovate.

Column (2) adds year fixed effects, and the results remain qualitatively similar to those in Column (1). The adjusted- R^2 increases only marginally, indicating that time variation alone does not explain much additional variance. In contrast, Column (3), which includes only firm fixed effects, shows a substantial increase in model fit, with an adjusted- R^2 of 0.5705. This suggests that time-invariant firm-specific factors account for a significant share of the variation in trademark registrations.

Even after controlling for firm fixed effects, the SOE indicator remains statistically significant at the 10% level, underscoring its persistent negative effect on innovation.

Column (4) presents results from our most rigorous specification, which includes both year and firm fixed effects. While the magnitude of the SOE coefficient is smaller than in Columns (1) and (2), it still indicates an 11% decrease in trademark registrations for SOEs, an economically meaningful effect. Additionally, once firm fixed effects are included, the previously significant effects of institutional ownership and patents disappear. This may suggest that institutional investors have limited influence on innovation outcomes in the context of Chinese SOEs.

Overall, the results support our first hypothesis: government control is associated with lower levels of corporate innovation.

4.3 | Innovations in Non-SOEs

Having documented that government control negatively affects corporate innovation, we now turn our attention to non-SOEs to examine the role of controlling shareholders in driving innovation. Specifically, we use our constructed authority index of the controlling shareholder to analyze how varying levels of shareholder control influence corporate innovation among non-SOEs. The following model is estimated:

$$\ln(1 + \text{Trademarks}_i) = \alpha + \beta \text{Authority}_{i-1} + \Gamma \text{Controls}_{i-1} + \delta_i + \phi_i + \varepsilon_i, \quad (2)$$

where Authority_{i-1} represents the lagged index of the controlling shareholder authority. Estimation results are presented in Table 3.⁹

Consistent with our hypothesis, firms with more authoritative controlling shareholders are associated with greater innovation. In Column (1), a one-unit increase in the authority index is associated with an increase in trademark registrations from 0.793 to 0.954, an approximately 20.3% increase. Institutional ownership also shows a significant positive effect: a one standard deviation increase in institutional ownership corresponds to a 112.2% increase in the number of registered trademarks, a stronger effect than that of controlling shareholder authority.

However, when we include firm fixed effects in Columns (3) and (4), institutional ownership loses statistical significance. This suggests that once time-invariant firm characteristics are accounted for, institutional investors do not appear to further promote innovation in non-SOEs, possibly due to limited influence in mitigating the agency cost of innovation. In contrast, the authority index remains significant at the 5% level, though with a smaller magnitude. In Column (4), a one-unit increase in shareholder authority leads to a 6.9% increase in trademark registrations.

Another noteworthy finding is the role of patent grants. With firm fixed effects, lagged patents become significantly associated with trademarks in Table 3, unlike in the SOE analysis

(Table 2), where patents had no significant effect. As patents represent upstream innovation and trademarks capture downstream commercialization, this result suggests that non-SOEs more effectively translate technological innovations into marketable products. SOEs, in contrast, may (1) pursue a broader array of patents, only some of which are commercialized, or (2) operate in sectors where few technological innovations are needed. These findings offer indirect evidence that non-SOEs pursue more market-focused and efficient innovation strategies.

In summary, the results in Table 3 support our hypothesis: greater authority of controlling shareholders mitigates the agency costs of innovation, leading to more effective commercialization efforts in non-SOEs.

4.4 | Institutional Ownership, Controlling Shareholders, and Corporate Innovation

As discussed earlier in the literature review, prior studies suggest that institutional ownership may positively influence corporate innovation. In this subsection, we examine whether institutional ownership affects trademark registration and how this effect differs between SOEs and non-SOEs.

In Table 2 (full sample) and Table 3 (non-SOEs), institutional ownership loses statistical significance in predicting trademark registration once both year and firm fixed effects are included. To further investigate heterogeneous effects, we first estimate the following model for the full sample, incorporating an interaction term between the SOE indicator and institutional ownership:

$$\begin{aligned} \ln(1 + \text{Trademarks}_i) = & \alpha_1 + \beta_1 D(\text{SOE})_{i-1} + \beta_2 \text{Institutional Ownership}_{i-1} \\ & + \beta_3 D(\text{SOE})_{i-1} \times \text{Institutional Ownership}_{i-1} \\ & + \Gamma_1 \text{Controls}_{i-1} + \delta_i + \phi_i + \varepsilon_i, \end{aligned} \quad (3)$$

where β_3 captures the incremental effect of institutional ownership on trademark registration in SOEs.

Next, we assess whether the influence of institutional ownership varies with the level of controlling shareholder authority among non-SOEs using the following specification:

$$\begin{aligned} \ln(1 + \text{Trademarks}_i) = & \alpha_2 + \beta_4 \text{Authority}_{i-1} + \beta_5 \text{Institutional Ownership}_{i-1} \\ & + \beta_6 \text{Authority}_{i-1} \times \text{Institutional Ownership}_{i-1} \\ & + \Gamma_2 \text{Controls}_{i-1} + \delta_i + \phi_i + \varepsilon_i, \end{aligned} \quad (4)$$

where β_6 indicates whether institutional ownership is more effective in promoting innovation as shareholder authority increases.

Estimation results are reported in Table 4: Column (1) corresponds to Equation (3) for the full sample, and Column (3) corresponds to Equation (4) for non-SOEs. In Column (1), institutional ownership alone does not significantly affect trademark registration, but its interaction with the SOE indicator is positive and significant. This suggests that in Chinese SOEs, where internal governance may hinder innovation, institutional investors can play a corrective

TABLE 3 | Effect of control on corporate innovation activities in non-SOEs.

	Dependent variable: Ln(1 + Trademarks)			
	(1)	(2)	(3)	(4)
Controlling SH Authority	0.086*** (0.0123)	0.092*** (0.0123)	0.027** (0.0119)	0.030** (0.0120)
Institutional ownership	0.403*** (0.0678)	0.371*** (0.0689)	0.004 (0.0570)	0.016 (0.0634)
Ln(1 + Patents)	0.007 (0.0102)	0.011 (0.0104)	0.017** (0.0073)	0.016** (0.0074)
Ln(1 + Total asset)	0.217*** (0.0158)	0.248*** (0.0191)	0.112*** (0.0124)	0.105*** (0.0172)
Book-to-Market	−0.362*** (0.0409)	−0.526*** (0.0610)	−0.118*** (0.0259)	−0.126*** (0.0349)
Tangibility	−0.261*** (0.0868)	−0.271*** (0.0875)	−0.015 (0.0726)	−0.041 (0.0739)
R&D	4.025*** (0.6513)	5.000*** (1.0546)	1.816*** (0.5389)	2.805*** (0.7981)
Leverage	−0.329*** (0.0612)	−0.377*** (0.0632)	−0.150*** (0.0477)	−0.138*** (0.0486)
Operating cash flow	0.949*** (0.1412)	0.881*** (0.1409)	−0.092 (0.0742)	−0.096 (0.0748)
Constant	−4.098*** (0.3247)	−4.665*** (0.3833)	−1.795*** (0.2693)	−1.651*** (0.3575)
Observations	19,139	19,139	19,139	19,139
Adjusted- R^2	0.0999	0.1049	0.5759	0.5771
Firm FE	No	No	Yes	Yes
Year FE	No	Yes	No	Yes

Note: This table provides results of the regression of innovation on corporate control. In this analysis, we use a subsample of non-SOE firms to investigate how controlling shareholders affect innovation in non-SOEs. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A. Numbers in parentheses are standard errors and ***, **, and * indicate 1%, 5%, and 10% statistical significance, respectively.

role. Specifically, in SOEs with average levels of institutional ownership, a one standard deviation increase in institutional ownership is associated with a 9.2% increase in trademark registration.

By contrast, Column (3) shows that β_4 is insignificant, indicating that institutional ownership does not significantly influence innovation depending on the level of controlling shareholder authority in non-SOEs. These findings suggest that, unlike in the private sector of developed markets, external institutional ownership does not play a major role in promoting corporate innovation among non-SOEs.¹⁰ Taken together, the results in Table 4 indicate that institutional investors effectively mitigate agency problems in innovation within SOEs, whereas in non-SOEs, this role is largely assumed by controlling shareholders whose authority better facilitates corporate innovation.

To explore the effect of long-term institutional investors, who are shown in the literature to better support long-term innovation strategies, we estimate the following models:

$$\begin{aligned} \text{Ln}(1 + \text{Trademarks}_t) = & \alpha_1 + \beta_1 \text{D(SOE)}_{t-1} + \beta_2 \text{D(LTII)}_{t-1} \\ & + \beta_3 \text{D(SOE)}_{t-1} \times \text{D(LTII)}_{t-1} \\ & + \Gamma_1 \text{Controls}_{t-1} + \delta_t + \varepsilon_1, \end{aligned} \quad (5)$$

and

$$\begin{aligned} \text{Ln}(1 + \text{Trademarks}_t) = & \alpha_2 + \beta_4 \text{Authority}_{t-1} + \beta_5 \text{D(LTII)}_{t-1} \\ & + \beta_6 \text{Authority}_{t-1} \times \text{D(LTII)}_{t-1} \\ & + \Gamma_2 \text{Controls}_{t-1} + \delta_t + \varepsilon_2, \end{aligned} \quad (6)$$

where D(LTII) is a dummy variable identifying firms with relatively stable institutional ownership over time, in the spirit of Gaspar et al. (2005). Specifically, we calculate the average of annual changes in institutional ownership by firm across the

sample period. Firms with below-median change in institutional ownership are classified as having more long-term institutional investors. Since this variable is time-invariant, we do not include firm fixed effects in these regressions.

TABLE 4 | The role of institutional investors in corporate innovation.

	Dependent variable: Ln(1 + Trademarks)			
	Full sample		Non-SOEs	
	(1)	(2)	(3)	(4)
D(SOE)	−0.124*** (0.0467)	−0.222*** (0.0388)		
Controlling SH Authority			0.041*** (0.0157)	0.088*** (0.0150)
Institutional ownership	−0.036 (0.0548)	0.103* (0.0567)	0.075 (0.0815)	0.374*** (0.0722)
D(LTII)		−0.028 (0.0311)		−0.024 (0.0461)
D(SOE) × Inst. ownership	0.153* (0.0803)			
D(SOE) × D(LTII)		0.100** (0.0493)		
Controlling SH Authority × Inst. ownership			−0.045 (0.0408)	
Controlling SH Authority × D(LTII)				0.008 (0.0193)
Ln(1 + Patents)	0.003 (0.0053)	0.027*** (0.0084)	0.016** (0.0074)	0.011 (0.0104)
Ln(1 + Total asset)	0.078*** (0.0124)	0.184*** (0.0146)	0.104*** (0.0171)	0.246*** (0.0193)
Book-to-Market	−0.099*** (0.0269)	−0.466*** (0.0521)	−0.128*** (0.0349)	−0.525*** (0.0609)
Tangibility	−0.099** (0.0473)	−0.369*** (0.0652)	−0.044 (0.0741)	−0.268*** (0.0878)
R&D	2.125*** (0.6904)	4.980*** (0.8891)	2.797*** (0.7983)	5.000*** (1.0539)
Leverage	−0.058 (0.0356)	−0.343*** (0.0492)	−0.139*** (0.0485)	−0.379*** (0.0634)
Operating cash flow	−0.096* (0.0561)	0.769*** (0.1074)	−0.096 (0.0748)	0.873*** (0.1383)
Constant	−1.048*** (0.2566)	−3.057*** (0.2858)	−1.648*** (0.3572)	−4.623*** (0.3907)
Observations	31,668	31,668	19,139	19,139

(Continues)

TABLE 4 | (Continued)

	Dependent variable: Ln(1 + Trademarks)			
	Full sample		Non-SOEs	
	(1)	(2)	(3)	(4)
Adjusted-R ²	0.5721	0.0851	0.5771	0.1049
Firm FE	Yes	No	Yes	No
Year FE	Yes	Yes	Yes	Yes

Note: This table provides regression of trademark registration on interaction terms with institutional ownership or the dummy for long-term institutional investors. Columns (1) and (2) are for the full sample, while Columns (3) and (4) are for non-SOEs. In Columns (1) and (3), institutional ownership is interacted with the dummy for SOEs and controlling shareholder authority, respectively. In Columns (2) and (4), the dummy for long-term institutional investors is interacted with the dummy for SOEs and controlling shareholder authority, respectively. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, D(SOE) is one for SOEs and zero otherwise, Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder, Institutional ownership is the percentage of shares owned by institutional investors, and D(LTII) is one if the mean annual change in institutional ownership is below the sample median, and zero otherwise. Definitions of all variables are provided in Appendix A. Numbers in parentheses are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

Results are reported in Columns (2) and (4) of Table 4. In Column (2), the interaction term between the SOE dummy and long-term institutional investors is positive and significant. Furthermore, under this specification, institutional ownership also positively affects trademark registration, suggesting long-term institutional investors add further value.¹¹ However, again, long-term institutional investors in non-SOEs are not associated with higher levels of innovation activities.

4.5 | Motivations for Trademark Registration

Xiao et al. (2024) classify trademarks based on whether they appear in advertising, product packaging, annual reports, or major news portals in China (e.g., Baidu, Sina, Sohu), and they find that both “in-use” trademarks and those “unused but related to current business” are positively associated with firm value, whereas “unused and unrelated to current business” trademarks, presumably registered for strategic purposes, are not. Based on this distinction, the authors classify trademarks into “self-use” and “strategic” categories. Building on their framework, we examine whether motivations for trademark registration differ between SOEs and non-SOEs.

To proxy for motivations behind trademark registration, we utilize trademark breadth, defined as the number of NICE classes (industries) covered by each trademark. As discussed in Flikkema et al. (2019), trademarks registered across a broader set of industries may serve strategic purposes, such as deterring potential competitors, especially when some of those industries are not directly related to the firm's current operations. In the European context, Flikkema et al. (2019) set a threshold at three industries due to the EU's flat fee structure for up to three NICE classes. Firms registering beyond that threshold are likely doing so for broader strategic protection.

In China, the trademark system allows for a flat fee across up to 10 NICE classes. Following a similar logic, we exclude trademarks registered for more than 10 classes, which are more likely to reflect strategic intent not directly linked to ongoing business activity. Within the remaining sample, we argue that

trademarks covering fewer classes, particularly those registered for a single class, are more likely to reflect self-use. Conversely, trademarks covering more industries likely reflect broader strategic motivations. Accordingly, we use average trademark breadth at the firm-year level as a proxy for the extent of strategic trademarking.

For this analysis, we estimate the following models:

$$\text{Ln}(1 + \text{Breadth}_t) = \alpha + \beta_1 \text{D(SOE)}_{t-1} + \Gamma_1 \text{Controls}_{t-1} + \delta_t + \phi_i + \varepsilon_1, \quad (7)$$

and

$$\text{Ln}(1 + \text{Breadth}_t) = \alpha + \beta_2 \text{Authority}_{t-1} + \Gamma_2 \text{Controls}_{t-1} + \delta_t + \phi_i + \varepsilon_2, \quad (8)$$

where variables are defined as above.

Table 5 presents the regression results. In Columns (1) and (2), the SOE indicator is not significantly associated with trademark breadth, suggesting that SOEs are no more likely than non-SOEs to register trademarks across a broader set of industries. This implies that SOEs are not more inclined toward strategic trademarking. In contrast, Columns (3) and (4) show that controlling shareholder authority is significantly and positively associated with trademark breadth. This indicates that firms with more powerful controlling shareholders are more likely to register trademarks not only for current use but also for long-term strategic protection, potentially as a means to deter future competition.

This result aligns with our earlier finding that greater controlling shareholder authority is associated with a higher volume of trademark registrations. Taken together, the findings highlight meaningful differences in the motivation behind trademarking between SOEs and non-SOEs. While SOEs appear to engage in trademarking primarily for self-use, non-SOEs, particularly those with strong controlling shareholders, are more likely to use trademarks for both operational and strategic purposes.

TABLE 5 | Self-use vs. strategic use of trademarks.

	Dependent variable: Ln(1 + Breadth)			
	Full sample		Non-SOE	
	(1)	(2)	(3)	(4)
D(SOE)	−0.086*** (0.0129)	−0.018 (0.0166)		
Controlling SH Authority			0.049*** (0.0059)	0.021** (0.0086)
Institutional ownership	0.014 (0.0242)	0.012 (0.0338)	0.162*** (0.0311)	0.019 (0.0449)
Ln(1 + Patents)	0.010*** (0.0036)	−0.003 (0.0036)	0.006 (0.0044)	0.006 (0.0048)
Ln(1 + Total asset)	0.071*** (0.0051)	0.049*** (0.0078)	0.099*** (0.0065)	0.060*** (0.0106)
Book-to-Market	−0.143*** (0.0166)	−0.048** (0.0186)	−0.196*** (0.0207)	−0.057** (0.0244)
Tangibility	−0.264*** (0.0318)	−0.087*** (0.0328)	−0.234*** (0.0443)	−0.044 (0.0503)
R&D	1.931*** (0.3128)	0.366 (0.4344)	1.803*** (0.3444)	0.907* (0.5199)
Leverage	−0.177*** (0.0248)	−0.023 (0.0259)	−0.183*** (0.0316)	−0.067* (0.0353)
Operating cash flow	0.307*** (0.0541)	−0.021 (0.0430)	0.341*** (0.0708)	−0.061 (0.0572)
Constant	−0.999*** (0.1003)	−0.647*** (0.1611)	−1.708*** (0.1310)	−0.903*** (0.2213)
Observations	31,916	31,668	19,431	19,170
Adjusted- R^2	0.0531	0.3204	0.0656	0.3299
Firm FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Note: This table provides regression of trademark breadth on SOE dummy and controlling shareholder authority. Columns (1) and (2) are for the full sample, while Columns (3) and (4) are for non-SOEs. Ln(1 + Breadth) is the natural logarithm of one plus the average number of distinct industries (as defined by NICE classes) in which a trademark is registered for in a given firm-year. D(SOE) is one for SOEs and zero otherwise. Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A. Numbers in parentheses are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

4.6 | Controlling Shareholder Authority and Innovation Efficiency

In the preceding sections, we documented that within non-SOEs, stronger controlling shareholder authority is associated with a higher number of trademark registrations. However, an increase in trademark registrations could stem either from greater investment in innovation (e.g., higher R&D expenditure) or from more efficient utilization of innovation resources (Hirshleifer et al. 2013).

To investigate whether stronger shareholder authority leads to increased investment in innovation, we estimate the following model:

$$R\&D_t = \alpha + \beta \text{Authority}_{t-1} + \Gamma \text{Controls}_{t-1} + \delta_t + \phi_i + \varepsilon. \quad (9)$$

Estimation results are reported in Columns (1) and (2) of Table 6. In Column (1), controlling shareholder authority appears to have a statistically significant, though economically small, effect on

TABLE 6 | Innovation efficiency.

	Dependent variables			
	R&D		Ln(1 + Trademarks)	
	(1)	(2)	(3)	(4)
Controlling SH Authority	0.000*** (0.0001)	0.000 (0.0001)	0.088*** (0.0126)	0.033*** (0.0123)
R&D _{<i>t</i>-1}	0.871*** (0.0054)	0.656*** (0.0134)	6.741*** (1.8198)	6.127*** (1.4430)
Controlling SH Authority × R&D _{<i>t</i>-1}				
Controlling SH Authority = 1			-3.680 (2.3992)	-3.181** (1.5555)
Controlling SH Authority = 2			-2.896 (2.5184)	-6.356*** (1.8340)
Controlling SH Authority = 3			-3.221 (2.3681)	-3.914** (1.7487)
Controlling SH Authority = 4			-2.770 (2.1806)	-2.626 (1.6499)
Institutional ownership	-0.001*** (0.0003)	-0.003*** (0.0006)	0.409*** (0.0679)	0.009 (0.0638)
Ln(1 + Patents)	0.001*** (0.0000)	0.000*** (0.0001)	0.007 (0.0102)	0.016** (0.0074)
Ln(1 + Total asset)	0.000*** (0.0001)	0.000* (0.0002)	0.216*** (0.0158)	0.108*** (0.0173)
Book-to-Market	-0.001*** (0.0002)	0.000 (0.0003)	-0.361*** (0.0409)	-0.132*** (0.0348)
Tangibility	-0.004*** (0.0004)	0.001 (0.0007)	-0.261*** (0.0869)	-0.035 (0.0740)
Leverage	-0.002*** (0.0003)	0.001* (0.0005)	-0.326*** (0.0615)	-0.138*** (0.0483)
Operating cash flow	0.000 (0.0009)	0.000 (0.0008)	0.952*** (0.1414)	-0.096 (0.0748)
Constant	0.000 (0.0012)	-0.002 (0.0035)	-4.099*** (0.3245)	-1.714*** (0.3596)
Observations	19,138	19,138	19,139	19,139
Adjusted- <i>R</i> ²	0.6116	0.8239	0.1000	0.5776
Firm FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Note: This table examines whether controlling shareholder authority in non-SOEs is associated with more investment in R&D or improves innovation efficiency. In Columns (1) and (2), we regress R&D expenditure on the lagged controlling shareholder authority to identify the statistical association between the two. In Columns (3) and (4), we regress trademark registration on the interaction term of lagged controlling shareholder authority and lagged R&D expenditure. *R&D* is the ratio of research and development expenditure to total assets, Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A. Numbers in parenthesis are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

R&D expenditure. However, once year and firm fixed effects are included in Column (2), the significance disappears. These results suggest that the higher number of trademarks observed in firms with strong controlling shareholder authority is not driven by increased R&D spending, but may instead reflect greater efficiency in translating existing investments into marketable innovation.

We then examine whether firms with stronger controlling shareholder authority demonstrate greater innovation efficiency by estimating the following interaction model:

$$\begin{aligned} \text{Ln}(1 + \text{Trademarks}_t) = & \alpha + \beta_1 \text{Authority}_{t-1} + \beta_2 \text{R\&D}_{t-1} \\ & + \beta_3 \text{Authority}_{t-1} \times \text{R\&D}_{t-1} + \Gamma \text{Controls}_{t-1} \\ & + \delta_t + \phi_i + \epsilon. \end{aligned} \quad (10)$$

Columns (3) and (4) of Table 6 present the results. In Column (4), which includes both firm and year fixed effects, controlling shareholder authority remains positively and significantly associated with trademark registrations. The interaction term between Authority and R&D expenditure (β_3) is negative and statistically significant, suggesting that the marginal effect of R&D on trademark output decreases as shareholder authority increases—at least initially.

However, further examination of the marginal effects across varying levels of authority indicates a U-shaped moderation pattern. At lower levels of controlling shareholder authority, R&D appears less effective in generating trademarks, but as authority increases to higher levels, the marginal return to R&D improves.

Taken together, these results suggest that stronger shareholder authority is not associated with higher R&D investment per se, but rather enhances the efficiency with which R&D is converted into commercially oriented innovation, particularly when authority is at its highest levels.

4.7 | Future Performance

Having documented that non-SOEs engage in more trademark-based innovation than SOEs, and that within non-SOEs, controlling shareholder authority positively influences corporate innovation, we next examine whether such innovation translates into improved future firm performance. We consider both accounting-based performance measures (net margin and return on assets, ROA) and market-based performance measures (stock return and Tobin's Q) in the year following trademark registration. Specifically, we regress each performance outcome on the number of trademark registrations using the following specification:

$$\text{Performance}_{t+1} = \alpha + \beta \text{Ln}(1 + \text{Trademarks}_t) + \Gamma \text{Controls}_t + \delta_t + \phi_i + \epsilon, \quad (11)$$

where Performance_{t+1} denotes one of the four outcome variables. Estimation results are reported in Table 7.

As shown in Column (1), the number of trademarks is not significantly associated with future net margin. However, Columns

(2) and (3) indicate that trademark registrations are positively and significantly related to future ROA and stock returns, respectively. These results suggest that trademark-based innovation may be value-enhancing, supporting our interpretation that trademarks serve as a proxy for commercially meaningful innovation. In Column (4), the coefficient on trademark registrations is positive but statistically insignificant when using Tobin's Q as the outcome variable.

It is important to note, however, that the relation between trademark registration and future firm performance should be interpreted with caution due to potential endogeneity concerns. As Shu et al. (2022) emphasize, firms with stronger unobserved fundamentals may both register more trademarks and achieve superior future performance, making trademarks partly a proxy rather than a causal driver.

4.8 | Change in the Controlling Shareholder Authority

In the previous analyses, we examined the relationship between the level of controlling shareholder authority and corporate innovation in non-SOEs. However, if the authority level is relatively stable over time within a given firm, regressions based on levels may primarily capture cross-sectional differences rather than within-firm dynamics. To address this concern, we estimate a model using changes in controlling shareholder authority within firms over time, specified as follows:

$$\text{Ln}(1 + \text{Trademarks}_t) = \alpha + \beta \Delta \text{Authority}_t + \Gamma \text{Controls}_{t-1} + \delta_t + \phi_i + \epsilon, \quad (12)$$

where $\Delta \text{Authority}_t$ is the year-over-year change in the authority of controlling shareholders. The estimation results are presented in Table 8.

In Columns (1) and (2), we restrict the sample to firm-years in which there was a change in the authority of the controlling shareholder. There are 1968 such firm-years, representing approximately 10% of all non-SOE observations, an infrequent but non-negligible occurrence. In Column (1), the coefficient on $\Delta \text{Authority}_t$ is positive and statistically significant. Economically, a one-unit increase in controlling shareholder authority corresponds to a 7.4% increase in trademark registrations. In Column (2), we add year fixed effects, and the coefficient remains statistically significant, though with slightly reduced magnitude.

Columns (3) and (4) expand the analysis to include all non-SOE firm-years, rather than only those with a change in authority. In Column (3), the coefficient on $\Delta \text{Authority}_t$ is again positive and highly significant, with an effect size approximately 38% larger than that in Column (1). After adding both firm and year fixed effects in Column (4), the coefficient remains statistically significant, though somewhat attenuated.

Overall, the results in Table 8 reinforce our earlier findings: within non-SOEs, an increase in the controlling shareholder authority is positively associated with subsequent corporate innovation activity, as proxied by trademark registrations.

TABLE 7 | Future performance.

	Dependent variables			
	Net margin	ROA	Stock return	Tobin's Q
	(1)	(2)	(3)	(4)
Ln(1 + Trademarks)	0.007*** (0.0022)	0.002*** (0.0007)	0.010* (0.0051)	0.009 (0.0167)
Institutional ownership	0.174*** (0.0196)	0.071*** (0.0059)	−0.022 (0.0331)	0.975*** (0.1659)
Ln(1 + Patents)	0.002 (0.0020)	0.000 (0.0006)	−0.002 (0.0035)	−0.019 (0.0135)
Ln(1 + Total asset)	−0.012** (0.0051)	−0.007*** (0.0015)	−0.208*** (0.0080)	−0.680*** (0.0501)
Book-to-Market	−0.092*** (0.0102)	−0.043*** (0.0032)	0.567*** (0.0242)	−1.354*** (0.0848)
Tangibility	−0.056** (0.0251)	−0.025*** (0.0075)	0.155*** (0.0380)	−0.520*** (0.1942)
R&D	1.084*** (0.2482)	0.202*** (0.0771)	4.562*** (0.5080)	4.889*** (1.5971)
Leverage	−0.106*** (0.0211)	−0.031*** (0.0061)	0.135*** (0.0276)	0.652*** (0.1920)
Operating cash flow	0.222*** (0.0260)	0.115*** (0.0083)	0.289*** (0.0528)	0.759*** (0.1825)
Constant	0.321*** (0.1059)	0.194*** (0.0315)	4.345*** (0.1621)	17.577*** (1.0704)
Observations	27,841	28,424	28,424	18,556
Adjusted- R^2	0.2007	0.3058	0.5691	0.6759
Firm FE	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: This table examines the impact of trademark registration on future performance. Net margin is the ratio of net income to revenue, ROA is the ratio of net income to total assets, Stock return is the year-over-year percentage change in stock price, including dividends, Tobin's Q is calculated as (market value of equity + book value of debt) divided by the book value of total assets, and Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year. Definitions of all variables are provided in Appendix A. Numbers in parentheses are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

5 | Robustness Checks

In this subsection, we conduct a series of additional analyses to assess the robustness of our main findings presented in the previous section.

5.1 | Instrumental Variable

As with most empirical studies in corporate finance, our analysis may be subject to endogeneity concerns, particularly due to omitted variables that could jointly influence both controlling shareholder authority and trademark registration. To mitigate this concern, we employ an instrumental variables (IVs) approach.

Our chosen instrument is the industry-average controlling shareholder authority. For an instrument to be valid, it must satisfy two key conditions: (i) the relevance condition, which requires the instrument to be correlated with the endogenous regressor (in this case, the firm-level controlling shareholder authority); and (ii) the exclusion restriction, which requires that the instrument affects the dependent variable, trademark registration, only through its effect on the endogenous regressor.

The relevance condition is evaluated through the first stage of the two-stage least squares (2SLS) estimation. If the industry-average controlling shareholder authority significantly predicts firm-level controlling shareholder authority, the instrument

TABLE 8 | Change in controlling shareholder authority.

	Dependent variable: Ln(1 + Trademarks)			
	Years with change		All years	
	(1)	(2)	(3)	(4)
ΔControlling SH authority	0.032** (0.0127)	0.027** (0.0128)	0.044*** (0.0113)	0.018** (0.0091)
Institutional ownership	0.127 (0.1035)	0.071 (0.1063)	0.116** (0.0584)	−0.024 (0.0622)
Ln(1 + Patents)	−0.014 (0.0167)	−0.017 (0.0170)	0.018* (0.0103)	0.016** (0.0074)
Ln(1 + Total asset)	0.177*** (0.0319)	0.207*** (0.0363)	0.212*** (0.0158)	0.108*** (0.0173)
Book-to-Market	−0.183** (0.0831)	−0.276** (0.1088)	−0.356*** (0.0408)	−0.126*** (0.0349)
Tangibility	−0.066 (0.1563)	−0.059 (0.1563)	−0.324*** (0.0870)	−0.041 (0.0737)
R&D	1.242 (1.7999)	5.498** (2.7792)	4.365*** (0.6523)	2.810*** (0.7992)
Leverage	−0.464*** (0.1067)	−0.470*** (0.1094)	−0.454*** (0.0580)	−0.150*** (0.0484)
Operating cash flow	0.590** (0.2788)	0.565** (0.2806)	0.982*** (0.1412)	−0.093 (0.0748)
Observations	1968	1968	19,139	19,139
Adjusted- R^2	0.0386	0.0474	0.0903	0.5769
Firm FE	No	No	No	Yes
Year FE	No	Yes	No	Yes

Note: This table presents results from repeating our main analysis by using change in controlling shareholder authority. Columns (1) and (2) uses the subsample of firm-years in which the controlling shareholder authority changed from the previous year, and Columns (3) and (4) uses all firm-years. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and ΔControlling SH Authority is the year-over-year change in sum of four indicator variables reflecting authority of the controlling shareholder: Whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A. Numbers in parenthesis are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

satisfies the relevance condition. As reported in the first stage of our IV estimation, this condition holds.

The exclusion restriction is inherently untestable, but we argue it is plausible in our context. It is unlikely that the average controlling shareholder authority at the industry level directly affects an individual firm's trademark registration decisions, except through its influence on that firm's own shareholder authority. While industry dynamics could in principle affect trademark registrations, our fixed effects specification mitigates such concerns. Therefore, we consider the exclusion condition to be satisfied.

Our first-stage model is:

$$\text{Authority}_{i-1} = \alpha + \beta \text{Industry average authority}_{i-1} + \Gamma \text{Controls}_{i-1} + \delta_i + \phi_i + \varepsilon. \quad (13)$$

We then use the predicted values of controlling shareholder authority from the first-stage regression as the independent variable in the second-stage model:

$$\text{Ln}(1 + \text{Trademarks}_i) = \alpha + \beta \text{Predicted authority}_i + \Gamma \text{Controls}_i + \delta_i + \phi_i + \varepsilon. \quad (14)$$

The results are presented in Table 9. To evaluate instrument strength, we report the Kleibergen–Paap rk Wald F-statistic from the first-stage regression, and to assess the validity of the second-stage result under weak identification, we report the Anderson–Rubin Wald F-statistic. In the first stage, the industry-average controlling shareholder authority is statistically significantly associated with the firm-level controlling shareholder authority, satisfying the relevance condition for a valid instrument. The Kleibergen–Paap F-statistic exceeds the Stock–Yogo critical value of 16.38 (for a 10% maximal

TABLE 9 | Instrumental variable method.

	Dependent variables	
	Controlling SH	
	Authority	Ln(1 + Trademarks)
	First stage	Second stage
Controlling SH Authority		0.567** (0.2622)
IV(Controlling SH Authority)	0.066*** (0.0157)	
Institutional ownership	−0.891*** (0.1179)	0.496* (0.2549)
Ln(1 + Patents)	−0.024*** (0.0076)	0.028*** (0.0095)
Ln(1 + Total asset)	−0.061*** (0.0146)	0.136*** (0.0202)
Book-to-Market	0.137*** (0.0301)	−0.175*** (0.0433)
Tangibility	−0.071 (0.0974)	0.041 (0.0955)
R&D	−5.167*** (0.5692)	4.617*** (1.4762)
Leverage	−0.352*** (0.0737)	0.059 (0.1117)
Operating cash flow	0.043 (0.0738)	−0.101 (0.0852)
Constant	3.437*** (0.3175)	
Observations	19,033	19,033
F(1,2385)	17.91	6.14
Adjusted-R ²	0.0676	−0.3493
Firm FE	Yes	Yes
Year FE	Yes	Yes

Note: This table presents results from our two-stage least squares (2SLS) specification using instrumental variable. Our instrument is the industry average controlling shareholder authority in the first-stage regression. We use the predicted controlling shareholder authority as our main independent variable in the second stage. Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder, Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and IV(Controlling SH authority) is the industry-year average of controlling shareholder authority. Definitions of all variables are provided in Appendix A. Presented estimates are marginal effects, and standard errors are presented in parentheses. We report the Kleibergen–Paap rk Wald F-statistic for the first stage and the Anderson–Rubin Wald F-statistic for the second-stage regression. ***, **, and * represent 1%, 5%, and 10% significance, respectively.

TABLE 10 | Trademark registration in subsequent years.

	Dependent variables: Ln(1 + Trademarks) in year		
	<i>t</i> + 1	<i>t</i> + 2	<i>t</i> + 3
	(1)	(2)	(3)
Controlling SH Authority	0.032*** (0.0115)	0.043*** (0.0125)	0.040*** (0.0125)
Institutional ownership	0.035 (0.0483)	0.028 (0.0488)	0.059 (0.0521)
Ln(1 + Patents)	0.003 (0.0053)	0.004 (0.0055)	−0.004 (0.0059)
Ln(1 + Total asset)	0.077*** (0.0123)	0.054*** (0.0126)	0.042*** (0.0129)
Book-to-Market	−0.103*** (0.0269)	−0.095*** (0.0273)	−0.059** (0.0283)
Tangibility	−0.100** (0.0473)	−0.058 (0.0487)	0.027 (0.0489)
R&D	2.165*** (0.6884)	3.677*** (0.8244)	−0.556 (19.0979)
Leverage	−0.052 (0.0357)	−0.023 (0.0386)	−0.009 (0.0411)
Operating cash flow	−0.094* (0.0561)	−0.022 (0.0597)	0.057 (0.0615)
Constant	−1.117*** (0.2549)	−0.642** (0.2604)	−0.410 (0.2656)
Observations	31,668	28,426	25,020
Adjusted-R ²	0.5721	0.5795	0.5838
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: This table presents results from repeating our main analysis by using trademark registration in future years. Column (1) uses the trademark registration 1 year after controlling shareholder authority is measured; Columns (2) and (3) use the trademark registration 2 and 3 years after measuring controlling shareholder authority, respectively. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year, and Controlling SH authority is the sum of four indicator variables reflecting the authority of the controlling shareholder: Whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder. Definitions of all variables are provided in Appendix A. Numbers in parentheses are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

IV size), indicating that the instrument is not weak. In the second stage, the predicted controlling shareholder authority is positively and significantly associated with the number of trademark registrations. The Anderson–Rubin Wald F-statistic confirms that the endogenous regressor significantly affects the dependent variable, even under weak identification.¹²

TABLE 11 | Controlling shareholder authority index excluding CEO indicator.

	Dependent variable: Ln(1 + Trademarks)				
	(1)	(2)	(3)	(4)	(5)
Controlling SH Authority	0.033** (0.0156)	0.040** (0.0196)	0.096*** (0.0186)	0.037** (0.0160)	
Δ Controlling SH authority					0.044*** (0.0121)
Institutional ownership	0.022 (0.0651)	0.051 (0.0818)	0.381*** (0.0759)	0.015 (0.0655)	−0.029 (0.0622)
D(LTII)			−0.019 (0.0462)		
CS authority $\times$ Inst. ownership		−0.033 (0.0560)			
CS authority $\times$ D(LTII)			0.009 (0.0241)		
R&D _{<i>t</i>−1}	2.794*** (0.7987)	2.789*** (0.7995)	5.210*** (1.0526)	5.897*** (1.3560)	2.804*** (0.7988)
Controlling SH Authority $\times$ R&D _{<i>t</i>−1}					
Controlling SH Authority = 1				−3.654** (1.4813)	
Controlling SH Authority = 2				−8.293*** (1.9155)	
Controlling SH Authority = 3				−2.553* (1.4768)	
Constant	−1.652*** (0.3576)	−1.649*** (0.3572)	−4.501*** (0.3906)	−1.714*** (0.3582)	−1.654*** (0.3579)
Observations	19,139	19,139	19,139	19,139	19,139
Adjusted- <i>R</i> ²	0.5770	0.5770	0.1019	0.5777	0.5771
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table reports results from repeating the main analyses using the controlling shareholder index excluding the CEO indicator. The dependent variable is Ln(1 + Trademarks). Column (1) regresses trademark registration on controlling shareholder authority repeating Table 3; Columns (2) and (3) add interactions with institutional ownership variables repeating Table 4; Column (4) adds an interaction with R&D expenditures repeating Table 6; and Column (5) uses the change in controlling shareholder authority as the main independent variable repeating Table 8. Ln(1 + Trademarks) is the natural logarithm of one plus the number of registered trademarks in a given firm-year. Controlling SH authority (or CS authority) is the sum of three indicator variables reflecting authority of the controlling shareholder: Whether the controlling shareholder is the founder, serves as a chairman, or is a family member of the founder, and Δ Controlling SH Authority is the year-over-year change in the controlling shareholder authority. Coefficient estimates of control variables are omitted for brevity. Definitions of all variables are provided in Appendix A. Numbers in parenthesis are standard errors and ***, **, and * represent 1%, 5%, and 10% significance, respectively.

5.2 | Trademark Registration in Subsequent Years

There is typically a time lag between innovation efforts and their eventual commercialization, such that trademark registrations may occur beyond the immediate following year. To account for this dynamic, we extend our baseline analysis in Table 3 by

examining trademark registrations in years $t + 2$ and $t + 3$ as alternative dependent variables.

The results are presented in Table 10. Column (1) replicates Column (4) of Table 3, our baseline specification with both firm and year fixed effects, using trademark registrations in year

$t + 1$. Columns (2) and (3) then report the results for trademark registrations in years $t + 2$ and $t + 3$, respectively.

As shown in the table, the coefficient on controlling shareholder authority remains positive and statistically significant in both extended periods. These findings confirm the robustness of our earlier results and provide further evidence that greater authority of controlling shareholders promotes sustained innovation activity over time.

5.3 | Controlling Shareholder Authority

The proxy for controlling shareholder authority in our study combines four indicator variables, each taking the value of one if the controlling shareholder serves as chairman of the board, CEO, founder, or family member of the founder. Because the CEO role involves direct participation in corporate management decisions, we conduct robustness tests excluding this dimension. We implement two approaches. First, using the full sample, we reconstruct the index without the CEO indicator, so that it ranges from zero to three, and rerun the main analyses. Second, we exclude firm-years in which the controlling shareholder is the CEO and repeat the analyses. Results from the first approach are reported in Table 11, while results from the second approach are omitted for brevity but available upon request. Column (1) of Table 11 repeats the analysis from Table 3; Columns (2) and (3) replicate Table 4; Column (4) corresponds to Table 6; and Column (5) to Table 8. Both approaches yield results that are qualitatively similar to our baseline, confirming that our findings are not driven by cases in which the controlling shareholder also serves as CEO.

6 | Conclusions

In this paper, we studied how controlling shareholders of firms affect corporate innovation activities. As was hypothesized, we find that downstream corporate innovation, as measured by trademark registration, tends to be less active in SOEs than in non-SOEs. Within the private sector, corporate innovation is positively associated with the authoritative power of controlling shareholders, suggesting that controlling shareholders with stronger authority may facilitate innovation efforts that are more likely to be commercialized.

While we focus on trademark-based innovation, we also compared results using patent data. Notably, we do not find a significant relationship between controlling shareholder authority and patent filings, highlighting the importance of distinguishing between upstream and downstream innovation. This distinction underscores our paper's main contribution: trademarks offer a complementary lens to traditional patent-based studies by capturing the commercialization aspect of innovation.

Overall, our findings suggest that ownership structure, particularly the role of controlling shareholders, is a crucial determinant of innovation outcomes. These insights have implications for policymakers and investors seeking to understand how different governance mechanisms can promote or hinder firm-level innovation.

While our study provides evidence on the relationship between controlling shareholders and trademark-based innovation, it is not without limitations. In particular, due to data constraints, we are unable to observe certain potentially important investor characteristics and use IVs such as the distance between firm headquarters and local government agencies or political connections of key executives. Future research with access to more detailed data could offer deeper insights into the underlying mechanisms and further validate our findings.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data used in this study is obtained from China Stock Market & Accounting Research (CSMAR).

Endnotes

- ¹ Reagan National Defense Forum, December 7, 2019.
- ² Given that the term “private” can refer to either “non-government” or “unlisted” firms, we use the term “non-SOE” to denote listed companies in China that are owned by non-governmental institutions or individuals.
- ³ The third edition of the Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, published in 2005 by the Organization for Economic Co-operation and Development (OECD) and the Statistical Office of the European Communities (Eurostat), broadens the definition of innovation. It defines innovation as “the introduction of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations.”
- ⁴ Thus, trademarks serve as a better proxy for innovation when linked to corporate performance than R&D expenditures, which are a premature signal of performance, and patents, which may not timely or accurately capture the commercial value or potential of innovations.
- ⁵ Cart abandonment rate refers to the percentage of online shoppers who add items to their cart but leave the website without completing the purchase. According to the Baymard Institute, the average cart abandonment rate for online retailers is approximately 70%. In their survey (allowing multiple responses), about 18% of respondents cited a long or complicated checkout process as a reason for abandoning their cart. See: <https://baymard.com/lists/cart-abandonment-rate>.
- ⁶ Another example highlighting the difference between patent and trademark registration involves Apple. Apple first filed for a patent on a foldable phone in 2011 and was granted the patent in 2014. However, as of the end of 2024, Apple has yet to introduce a foldable phone to the market. Samsung also filed its first patent on foldable phones in 2011 but released the world's first commercial foldable phone in 2019. Since trademarks are generally registered only for products and services that have been commercialized, Apple has no trademark for foldable phones. In this case, patent data may misleadingly suggest that Apple and Samsung are equally innovative, whereas trademark data more accurately reflects the difference in commercialization outcomes.
- ⁷ In Flikkema et al. (2019), the threshold of three industries is based on the European trademark registration system, which charges a flat fee for up to three classes. In contrast, China applies a flat registration fee for up to ten classes, so we adopt ten as our threshold. In untabulated results, we confirm that our findings remain qualitatively similar when using the three-industry threshold. We also acknowledge that product innovation can occur under an existing brand name—for example, when firms pursue a branded-house strategy (Hay 2015).

- ⁸ Recent methodological research has raised concerns about the use of log transformation with count data that includes zeros, as it may introduce measurement bias and distort inference (Chen and Roth 2023; Cohn et al. 2022). To address this issue, we replicate our main analysis using both Poisson regression and ordinary least squares (OLS) with the raw count of trademark registrations as the dependent variable. The results, though untabulated, are qualitatively similar across these alternative specifications, suggesting that our findings are robust to the choice of transformation.
- ⁹ In untabulated results, we repeat the analysis using the full sample of firms. The findings are generally stronger and more statistically significant than those reported in Table 3.
- ¹⁰ In untabulated results, we examined the relationship between institutional ownership and trademark registration across a range of model specifications. The only instance in which institutional ownership is significantly associated with corporate innovation is in a univariate regression without any fixed effects. However, once year or firm fixed effects are included, the association between institutional ownership and corporate innovation becomes statistically insignificant.
- ¹¹ Ideally, it would be informative to distinguish between state-affiliated and private institutional investors in SOEs, as their objectives and influence may differ. Unfortunately, our data do not provide sufficient detail to identify the nature of institutional investors. We acknowledge this as a limitation and leave it for future research to explore this dimension.
- ¹² The adjusted R^2 in the second stage is negative, which can occur in IV regressions with numerous fixed effects or limited variation in the instrumented variable. As emphasized by Angrist and Pischke (2009) and Wooldridge (2012), the purpose of two-stage least squares (2SLS) estimation is to obtain consistent causal estimates rather than to maximize model fit.

References

- Aboody, D., and B. Lev. 2000. "Information Asymmetry, R&D, and Insider Gains." *Journal of Finance* 55, no. 6: 2747–2766.
- Aghion, P., A. Bergeaud, and J. Van Reenen. 2023. "The Impact of Regulation on Innovation." *American Economic Review* 113, no. 11: 2894–2936.
- Aghion, P., J. Van Reenen, and L. Zingales. 2013. "Innovation and Institutional Ownership." *American Economic Review* 103, no. 1: 277–304.
- Angrist, J. D., and J.-S. Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.
- Arrow, K. J. 1962. "Economic Welfare and the Allocation of Resources for Invention." In *The Rate and Direction of Inventive Activity: Economic and Social Factors*, edited by R. Nelson. Princeton University Press.
- Asker, J., J. Farre-Mensa, and A. Ljungqvist. 2015. "Corporate Investment and Stock Market Listing: A Puzzle?" *Review of Financial Studies* 28, no. 2: 342–390.
- Barron, O. E., D. Byard, C. Kile, and E. J. Riedl. 2002. "High-Technology Intangibles and Analysts' Forecasts." *Journal of Accounting Research* 40, no. 2: 289–312.
- Beck, T., T. Chen, C. Lin, and F. M. Song. 2016. "Financial Innovation: The Bright and the Dark Sides." *Journal of Banking and Finance* 72: 28–51.
- Becker-Blease, J. R. 2011. "Governance and Innovation." *Journal of Corporate Finance* 17: 947–958.
- Belloc, F. 2014. "Innovation in State-Owned Enterprises: Reconsidering the Conventional Wisdom." *Journal of Economic Issues* 48, no. 3: 821–848.
- Bernstein, S. 2015. "Does Going Public Affect Innovation?" *Journal of Finance* 70, no. 4: 1365–1403.
- Bertrand, M., and S. Mullainathan. 2003. "Enjoying the Quiet Life? Corporate Governance and Managerial Preferences." *Journal of Political Economy* 111, no. 5: 1043–1075.
- Boubakri, N., and J.-C. Cosset. 1998. "The Financial and Operating Performance of Newly Privatized Firms: Evidence From Developing Countries." *Journal of Finance* 53, no. 3: 1081–1110.
- Boubakri, N., J.-C. Cosset, and W. Saffar. 2013. "The Role of State and Foreign Owners in Corporate Risk-Taking: Evidence From Privatization." *Journal of Financial Economics* 108, no. 3: 641–658.
- Boudreaux, C. J. 2024. "When Do State-Owned Enterprises Innovate? The Moderating Role of Pro-Market Institutions." *Industry and Innovation* 32, no. 4: 383–412.
- Boycko, M., A. Shleifer, and R. W. Vishny. 1996. "A Theory of Privatization." *Economic Journal* 106, no. 435: 309–319.
- Brav, A., W. Jiang, F. Partnoy, and R. Thomas. 2008. "Hedge Fund Activism: Corporate Governance, and Firm Performance." *Journal of Business Research* 63, no. 4: 1729–1775.
- Bronzini, R., and P. Piselli. 2016. "The Impact of R&D Subsidies on Firm Innovation." *Research Policy* 45, no. 2: 442–457.
- Brookman, J., and P. D. Thistle. 2009. "CEO Tenure, the Risk of Termination and Firm Value." *Journal of Corporate Finance* 15, no. 3: 331–344.
- Bushee, B., and T. Goodman. 2007. "Which Institutional Investors Trade Based on Private Information About Earnings and Returns?" *Journal of Accounting Research* 45, no. 2: 289–321.
- Bushee, B. J. 1998. "The Influence of Institutional Investors on Myopic R&D Investment Behavior." *Accounting Review* 73: 305–333.
- Castaldi, C. 2018. "To Trademark or Not to Trademark: The Case of the Creative and Cultural Industries." *Research Policy* 47, no. 3: 606–616.
- Castaldi, C. 2020. "All the Great Things You Can Do With Trademark Data: Taking Stock and Looking Ahead." *Strategic Organization* 18, no. 3: 472–484.
- Castelnovo, P. 2022. "Innovation in Private and State-Owned Enterprises: A Cross-Industry Analysis of Patenting Activity." *Structural Change and Economic Dynamics* 62: 98–113.
- Chemmanur, T. J., and X. Tian. 2018. "Do Antitakeover Provisions Spur Corporate Innovation? A Regression Discontinuity Analysis." *Journal of Financial and Quantitative Analysis* 53, no. 3: 1163–1194.
- Chen, V. Y., S.-M. Tsao, and G.-Z. Chen. 2013. "Founding Family Ownership and Innovation." *Asia-Pacific Journal of Accounting & Economics* 20, no. 4: 429–456.
- Chen, Y., and J. Roth. 2023. "Log Transformation of Count Data Can Introduce Bias: A Cautionary Note." *Journal of Applied Econometrics* 38, no. 1: 123–138.
- Choi, S.-B., S.-H. Lee, and C. Williams. 2011. "Ownership and Firm Innovation in a Transition Economy: Evidence From China." *Research Policy* 40, no. 3: 441–452.
- Choi, S.-B., B. I. Park, and P. Hong. 2012. "Does Ownership Structure Matter for Firm Technological Innovation Performance? The Case of Korean Firms." *Corporate Governance: An International Review* 20, no. 3: 267–288.
- Clifford, C. P. 2008. "Value Creation or Destruction? Hedge Funds as Shareholder Activists." *Journal of Corporate Finance* 14, no. 4: 323–336.
- Cohn, J. B., Y. Liu, and M. I. Wardlaw. 2022. "Look Before You Log: The Pitfalls of Using Log-Transformed Dependent Variables." *Accounting Review* 97, no. 3: 117–144.

- David, P., M. A. Hitt, and J. Gimeno. 2001. "The Influence of Activism by Institutional Investors on R&D." *Academy of Management Journal* 44: 144–157.
- Dewenter, K. L., and P. H. Malatesta. 2001. "State-Owned and Privately Owned Firms: An Empirical Analysis of Profitability, Leverage, and Labor Intensity." *American Economic Review* 91, no. 1: 320–334.
- D'souza, J., and W. L. Megginson. 1999. "The Financial and Operating Performance of Privatized Firms During the 1990s." *Journal of Finance* 54, no. 4: 1397–1438.
- Dyck, A., and L. Zingales. 2004. "Private Benefits of Control: An International Comparison." *Journal of Finance* 59, no. 2: 537–600.
- Edmans, A. 2009. "Blockholder Trading, Market Efficiency, and Managerial Myopia." *Journal of Finance* 64, no. 6: 2481–2513.
- Fahlenbrach, R. 2009. "Founder-CEOs, Investment Decisions, and Stock Market Performance." *Journal of Financial and Quantitative Analysis* 44, no. 2: 439–466.
- Fang, L. H., J. Lerner, and C. Wu. 2017. "Intellectual Property Rights Protection, Ownership, and Innovation: Evidence From China." *Review of Financial Studies* 30, no. 7: 2446–2477.
- Faurel, L., Q. Li, D. Shanthikumar, and S. Teoh. 2024. "Bringing Innovation to Fuition: Insights From New Trademarks." *Journal of Financial and Quantitative Analysis* 59, no. 2: 474–520.
- Finkelstein, S. 1992. "Power in Top Management Teams: Dimensions, Measurement, and Validation." *Academy of Management Journal* 35, no. 3: 505–538.
- Flikkema, M., C. Castaldi, A.-P. de Man, and M. Seip. 2019. "Trademarks' Relatedness to Product and Service Innovation: A Branding Strategy Approach." *Research Policy* 48, no. 6: 1340–1353.
- Flikkema, M., A.-P. de Man, and C. Castaldi. 2014. "Are Trademark Counts a Valid Indicator of Innovation? Results of an In-Depth Study of New Benelux Trademarks Filed by SMEs." *Industry and Innovation* 21, no. 4: 310–331.
- Florackis, C., and A. Ozkan. 2009. "The Impact of Managerial Entrenchment on Agency Costs: An Empirical Investigation Using UK Panel Data." *European Financial Management* 15, no. 3: 497–528.
- Francis, J., and A. Smith. 1995. "Agency Costs and Innovation: Some Empirical Evidence." *Journal of Accounting and Economics* 19, no. 2–3: 383–409.
- Gaspar, J. M., M. Massa, and P. Matos. 2005. "Shareholder Investment Horizons and the Market for Corporate Control." *Journal of Financial Economics* 76, no. 1: 135–165.
- Greenwood, R., and M. Schor. 2009. "Investor Activism and Takeovers." *Journal of Financial Economics* 92, no. 3: 362–375.
- Grinstein, Y., and P. Hribar. 2004. "CEO Compensation and Incentives: Evidence From M&A Bonuses." *Journal of Financial Economics* 73, no. 1: 119–143.
- Gu, F., and W. Wang. 2005. "Intangible Assets, Information Complexity, and Analysts' Earnings Forecasts." *Journal of Business Finance and Accounting* 32, no. 9–10: 1673–1702.
- Hagedoorn, J., and M. Cloudt. 2003. "Measuring Innovative Performance: Is There an Advantage in Using Multiple Indicators?" *Research Policy* 32, no. 8: 1365–1379.
- Hay, L. M. 2015. "'The Taste of Any Public': How Intellectual Property Law Illuminates the Failings of the Miller Test." *Southwestern Law Review* 45: 165–197.
- Hermalin, B. E., and M. S. Weisbach. 1998. "Endogenously Chosen Boards of Directors and Their Monitoring of the CEO." *American Economic Review* 88, no. 1: 96–118.
- Hill, C. W., and S. A. Snell. 1988. "External Control, Corporate Strategy, and Firm Performance in Research-Intensive Industries." *Strategic Management Journal* 9, no. 6: 577–590.
- Hirshleifer, D., P.-H. Hsu, and D. Li. 2013. "Innovative Efficiency and Stock Returns." *Journal of Financial Economics* 107, no. 3: 632–654.
- Hirshleifer, D., A. Low, and S. H. Teoh. 2012. "Are Overconfident CEOs Better Innovators?" *Journal of Finance* 67, no. 4: 1457–1498.
- Hölmstrom, B. 1989. "Agency Costs and Innovation." *Journal of Economic Behavior & Organization* 12, no. 3: 305–327.
- Howell, S. T. 2017. "Financing Innovation: Evidence From R&D Grants." *American Economic Review* 107, no. 3: 1136–1164.
- Jackling, B., and S. Johl. 2009. "Board Structure and Firm Performance: Evidence From India's Top Companies." *Corporate Governance: An International Review* 17, no. 4: 492–509.
- Kothari, S. P., T. E. Laguerre, and A. J. Leone. 2002. "Capitalization Versus Expensing: Evidence on the Uncertainty of Future Earnings From Capital Expenditures Versus R&D Outlays." *Review of Accounting Studies* 7: 355–382.
- Kraft, A. G., R. Vashishtha, and M. Venkatachalam. 2018. "Frequent Financial Reporting and Managerial Myopia." *Accounting Review* 93, no. 2: 249–275.
- Lev, B., and T. Sougiannis. 1996. "The Capitalization, Amortization, and Value-Relevance of R&D." *Journal of Accounting and Economics* 21, no. 1: 107–138.
- Li, J., and L. Liu. 2023. "Common Institutional Ownership and Corporate Innovation: Synergy of Interests or Grabs of Interests." *Finance Research Letters* 52: 103512.
- Manyika, J., L. Mendonca, J. Remes, et al. 2010. "How to Compete and Grow: A Sector Guide to Policy."
- Marshall, A. 1907. "The Social Possibilities of Economic Chivalry." *Economic Journal* 17, no. 65: 7–29.
- Megginson, W. L., R. C. Nash, and M. van Randenborgh. 1994. "The Financial and Operating Performance of Newly Privatized Firms: An International Empirical Analysis." *Journal of Finance* 49, no. 2: 403–452.
- Mendonça, S., T. S. Pereira, and M. M. Godinho. 2004. "Trademarks as an Indicator of Innovation and Industrial Change." *Research Policy* 33: 1385–1404.
- Miller, S., B. Qiu, B. Wang, and T. Yang. 2022. "Monitoring Institutional Ownership and Corporate Innovation." *Journal of Empirical Finance* 69: 144–165.
- Minetti, R., P. Murro, and M. Paiella. 2015. "Ownership Structure, Governance, and Innovation." *European Economic Review* 80: 165–193.
- Morck, R., A. Shleifer, and R. W. Vishny. 1988. "Management Ownership and Market Valuation: An Empirical Analysis." *Journal of Financial Economics* 20: 293–315.
- Munari, F., and R. Oriani. 2005. "Privatization and Economic Returns to R&D." *Industrial and Corporate Change* 14, no. 1: 61–91.
- Ning, L., Z. Honglie, and L. Meng. 2025. "State-Owned Equity and Innovation Performance of Mixed-Ownership Enterprises in China: The Moderating Effect of Marketization." *Managerial and Decision Economics* 46, no. 1: 282–293.
- Parrino, R., R. Sias, and L. Starks. 2003. "Voting With Their Feet: Institutional Ownership Changes Around CEO Turnover." *Journal of Financial Economics* 68, no. 1: 3–46.
- Sandner, P. G., and J. Block. 2011. "The Market Value of R&D, Patents, and Trademarks." *Research Policy* 40, no. 7: 969–985.
- Sapra, H., A. Subramanian, and K. V. Subramanian. 2014. "Corporate Governance and Innovation: Theory and Evidence." *Journal of Financial and Quantitative Analysis* 49, no. 4: 957–1003.

- Scherer, F. M., and D. Harhoff. 2000. "Technology Policy for a World of Skew-Distributed Outcomes." *Research Policy* 29, no. 4: 559–566.
- Schmid, T., A.-K. Achleitner, M. Ampenberger, and C. Kaserer. 2014. "Family Firms and R&D Behavior – New Evidence From a Large-Scale Survey." *Research Policy* 43: 233–244.
- Shleifer, A. 1998. "State Versus Private Ownership." *Journal of Economic Perspectives* 12, no. 4: 133–150.
- Shu, T., X. Zhan, and X. Tian. 2022. "Patent Quality, Firm Value, and Investor Underreaction: Evidence From Patent Examiner Busyness." *Journal of Financial Economics* 143, no. 3: 1043–1069.
- Stein, J. C. 1988. "Takeover Threats and Managerial Myopia." *Journal of Political Economy* 96, no. 1: 61–80.
- Tang, J., M. Crossan, and W. G. Rowe. 2011. "Dominant CEO, Deviant Strategy, and Extreme Performance: The Moderating Role of a Powerful Board." *Journal of Management Studies* 48, no. 7: 1479–1503.
- Tsao, S. M., Y. W. Chang, and K. Koh. 2019. "Founding Family Ownership and Myopic R&D Investment Behavior." *Journal of Accounting, Auditing and Finance* 34, no. 3: 361–384.
- Veprauskaitė, E., and M. Adams. 2013. "Do Powerful Chief Executives Influence the Financial Performance of UK Firms?" *British Accounting Review* 45, no. 3: 229–241.
- Wang, Z., and Z. Li. 2023. "Does Minority Shareholder Activism Enhance Corporate Innovation? Evidence From China." *Finance Research Letters* 54: 103755.
- Wooldridge, J. M. 2012. *Introductory Econometrics: A Modern Approach*. 5th ed. South-Western Cengage Learning.
- Xiao, Y., N. Han, R. Li, H. Ran, S. Zhou, and T. W. Tong. 2024. "Trademarks and Firm Market Value: Evidence From New Trademark-Firm Linked Data in China." *Research Policy* 53: 104941.
- Young, M. W., M. W. Peng, D. Ahlstrom, G. D. Bruton, and Y. Jiang. 2008. "Corporate Governance in Emerging Economies: A Review of the Principal–Principal Perspective." *Journal of Management Studies* 45, no. 1: 196–220.
- Zoltan, J. A., and D. B. Audretsch. 1988. "Innovation in Large and Small Firms: An Empirical Analysis." *American Economic Review* 78, no. 4: 678–690.

Appendix A

Variable definition	
Ln(1 + Trademarks)	Natural logarithm of one plus number of registered trademarks for a firm-year
Ln(1 + Breadth)	Natural logarithm of one plus the average number of distinct industries (as defined by NICE classes) in which a trademark is registered for in a given firm-year
D(SOE)	One for state-owned enterprises, and zero otherwise
Controlling SH authority	Sum of four indicator variables reflecting authority of the controlling shareholder: whether the controlling shareholder is the founder, serves as a chairman, is the CEO, or is a family member of the founder
IV(Controlling SH Authority)	The industry-year average of controlling shareholder authority
Institutional ownership	The percentage of shares owned by institutional investor
D(LTII)	One if the mean annual change in institutional ownership is below the sample median, and zero otherwise
Ln(1 + Patents)	Natural logarithm of one plus the number of patents granted in a given firm-year
Ln(Total asset)	Natural logarithm of total assets
Book-to-market	The ratio of book value of equity to the market value of equity
Tangibility	The ratio of tangible assets to total assets
R&D	The ratio of research and development expenditure to total assets
Leverage	The ratio of total debt to total assets
Operating cash flow	The ratio of operating cash flow to total assets
Net margin	The ratio of net income to revenue
ROA	The ratio of net income to total asset
Stock return	The year-over-year percentage change in stock price, including dividends
Tobin's Q	Calculated as (Market value of equity + book value of debt) divided by the book value of total assets