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**Mediating effect of managerial ability on the
foreign ownership–firm performance nexus:
Evidence from listed firms in Japan**

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Abstract

This study examined the ability of foreign ownership to improve the performance of Japanese listed firms through an intermediate channel of managerial ability (MA). Prior research has extensively documented the association between foreign ownership and firm value. However, the mechanism through which foreign investors enhance corporate outcomes, particularly the changes they induce inside the firm, remains insufficiently understood. Building on a mediation framework, we positioned MA as a mediator between the foreign ownership ratio and return on assets (ROA). MA was measured using the data-envelopment-analysis-based MA score. A complete-case panel of 54478 firm-year observations covering 3535 Japanese listed firms over 20 fiscal years (2006–2025) was used to estimate a three-step mediation model and assess the indirect effect with firm-block bootstrap confidence intervals (CI). Results indicated partial mediation: foreign ownership is positively associated with MA; MA is strongly associated with ROA; and the indirect effect is positive and significant ($a \times b = 2.669$; 95% CI [1.947, 3.397]), accounting for approximately 35% of the total effect, whereas a significant direct effect remains. The mediating role of MA also holds when firm performance is measured by the market-based price-to-book ratio (PBR). These findings are consistent with the interpretation that a large foreign shareholder base strengthens the discipline placed on management, prompting efficient corporate resource use, which in turn improves profitability. The study contributes to the foreign ownership and corporate governance literature by identifying managerial ability as an explicit channel linking ownership structure to firm performance in the Japanese setting.

Keywords:

Foreign ownership; Managerial ability; Firm performance; Mediation analysis; Corporate governance; Japanese listed firms

1. Introduction

The rising equity stake of institutional and foreign investors has become a worldwide phenomenon. The monitoring hypothesis that shareholder composition changes raise firm value by disciplining management has been tested for decades, mainly in U.S. and European markets (Gillan and Starks 2003; Ferreira and Matos 2008; Aggarwal et al. 2011). However, how foreign or institutional investors enhance value, particularly what changes they induce, remains insufficiently understood.

Japan offers an advantageous setting for this study. Over the past quarter century, Japan's corporate governance (CG) has shifted from a relationship-based model built on the main-bank system and cross-shareholdings to one that emphasizes market discipline and shareholder dialogue (Aoki 1990; Hoshi et al. 1991; Weinstein and Yafeh 1998; Miyajima and Kuroki 2007). The Stewardship Code (2014) and Corporate Governance Code (2015) institutionalized constructive dialogue between investors and firms. The Tokyo Stock Exchange reported that foreign ownership has risen almost continuously since the mid-1990s, reaching 32.4% in fiscal year 2024, the single largest group in Japanese firms' ownership (Tokyo Stock Exchange 2025).

These reforms have also drawn international attention. Other Asian markets have referred to Japan's experience. In 2024, South Korea launched a Corporate Value-Up Program with similarities to Japan's value-enhancement initiatives (Financial Services Commission 2024).

Studies of Japanese firms report evidence supporting the monitoring hypothesis that foreign investors discipline management and improve capital efficiency and value (Nishizaki and Kurazawa 2003; Ferris and Park 2005; Nguyen 2012; Miyajima et al.

2015; Miyajima and Ogawa 2016; Kabir et al. 2020; Yoon 2024), though they may select already-strong firms (Kang and Stulz 1997).

This ambiguity is difficult to resolve because research estimates only the two-variable link between foreign ownership and value. In response, recent work has broadened to foreign investors' effects on specific decisions, including R&D and capital investment (David et al. 2006; Arikawa et al. 2011), dividends (Baba 2009), risk-taking (Nguyen 2012; Xu 2017), cash holdings, payout, executive pay, board reform, and performance-based turnover (Ahmadjian and Robbins 2005; Yoshikawa et al. 2007; Miyajima et al. 2018). Therefore, foreign investors shape investment, financing, organizational, and governance decisions, not only supply capital.

This situation raises the question: what changes do foreign investors make that enhance value? Most existing work inferred a direct link, either from foreign investors to value or from foreign investors to a specific behavior. Few studies explicitly specified a mediator and tested the indirect effect from foreign investors, through corporate behavioral changes, to performance.

Focusing on management, a firm's ultimate decision-maker, is necessary to clarify this mechanism. Upper Echelons Theory holds that strategy and performance reflect top managers' experience, values, and cognition (Hambrick and Mason 1984), whereas agency theory holds that managers need not maximize shareholder value and require oversight (Jensen and Meckling 1976; Fama and Jensen 1983). If foreign-investor governance affects performance, that effect should operate partly through management.

This statement is difficult to verify because managerial ability (MA) is not solely captured by observable attributes and is entangled with firm-specific factors. Thus, Demerjian et al. (2012) proposed the MA score. The MA score uses data envelopment

analysis (DEA) to estimate firm efficiency and then removes the part explained by firm-specific factors, such as size, market share, and age, thus isolating efficiency attributable to management. Multiple tests have confirmed its validity.

High performance can stem from technology, brand, or market position rather than MA. Thus, the MA score conceptually separates a firm's overall efficiency from the efficiency attributable to management. Therefore, it directly tests whether foreign-investor monitoring is linked to MA exercise.

Ting et al. (2021, 2024) provided the closest antecedents. Ting et al. (2021) used mediation analysis to show that capital structure mediates the MA–performance link for Taiwanese electronics firms, and Ting et al. (2024) showed that firm efficiency mediates the controlling-shareholder–performance link for Malaysian firms. However, their firm-efficiency mediator captures overall input–output efficiency, including size, market position, and asset composition. Thus, it cannot isolate MA, and neither study examined the path from foreign-investor governance to performance through managers' exercise of ability.

Therefore, this study adopts Ting et al.'s (2021, 2024) mediation framework but uses the MA score (efficiency adjusted for firm characteristics) as the mediator to examine whether foreign investors' governance is reflected not only in overall efficiency but also in MA exercise. To our knowledge, no prior study has examined the path from foreign-investor governance to performance through MA changes.

We specify a mediation model with the foreign ownership ratio (X), firm performance (Y), and the MA score (M) as the independent, dependent, and mediator variables, respectively, estimated in both levels and changes (Δ). We also split the sample around

Japan's CG reforms to test whether the foreign-ownership monitoring effect on performance, mediated by MA, changes with the institutional reforms.

The paper proceeds as follows. Section 2 reviews prior research and derives the hypotheses. Section 3 describes the research design, data, variables, and empirical model. Section 4 presents the results, comparing periods before and after the CG reforms. Section 5 discusses the conclusion and future research recommendations.

2. Previous research

2.1 Managerial ability and corporate performance

Management plays a crucial role in a firm's strategic decisions and their outcomes. Industry structure, market conditions, resources, and organizational characteristics shape performance. Nevertheless, performance also depends on how managers perceive these conditions and allocate resources through decisions on investment, financing, R&D, business entry and exit, and organizational design. Outcomes can differ with managerial judgment, including among firms with similar environments and resources.

Hambrick and Mason's (1984) Upper Echelons Theory systematizes the view that managers interpret situations through their experience, values, and cognition rather than using complete information; thus, their characteristics are reflected in strategic choices and, ultimately, performance. Hambrick (2007) later noted that managerial influence strengthens as managerial discretion increases, implying a non-uniform effect on performance.

Early studies attributed performance differences to industry, firm, and managerial factors, showing that industry and firm conditions strongly constrain performance but leaving room for a managerial effect (Lieberson and O'Connor 1972; Weiner and

Mahoney 1981). Bertrand and Schoar (2003) tracked the same managers across firms and showed that manager-specific effects are associated with investment, financing, dividend, and organizational policies and with performance. Their finding supports the Upper Echelons view that managers shape outcomes through their actions.

Accurate estimates suggest the chief executive officer (CEO) effect may be larger than previous findings (Mackey 2008), particularly when the firm-specific context in which CEOs operate is considered (Hambrick and Quigley 2014). Quigley and Hambrick (2015) used long-run U.S. data and further found that the performance share attributable to individual CEOs has risen over time. Together, this evidence that CEO effects persist after controlling for industry, firm, and time identifies managers as a key determinant of firm performance.

MA consists of knowledge, judgment, execution, and organizational coordination. These elements are not only innate; they are also shaped by education and experience and can change through learning. Possessing ability and fully exercising it are not the same: when relating MA to firm performance, one must distinguish managers' potential capabilities from their actual capabilities demonstrated in a specific corporate environment.

Studies evaluating executive competence relatively directly found that general ability and execution skill are positively associated with subsequent performance (Kaplan et al. 2012). A firm's management practices also reflect managerial competence: across manufacturing firms in the United States, the United Kingdom, France, and Germany, those excelling in operations, target-setting, and human resource management show higher productivity, profitability, Tobin's Q, and survival (Bloom and Van Reenen 2007). Therefore, managerial knowledge becomes embedded in organizational practices.

Ability is not fixed but can be enhanced from outside the firm. For instance, a field experiment providing management guidance to Indian textile mills raised productivity by approximately 17% in the first year (Bloom et al. 2013). Randomly assigned peer meetings among Chinese business owners improved sales, profits, and management practices (Cai and Szeidl 2018). Therefore, expert advice and interaction among managers can raise executives' actual capabilities.

Although executives possess ability, outcomes depend on how they apply it. Work-diary evidence shows that firms are highly productive when their CEOs devote considerable time to cross-departmental coordination (Bandiera et al. 2020), and family firm CEOs who work few hours partly account for the performance gap relative to professional managers (Bandiera et al. 2018). Therefore, managers' effort and attention and their ability are equally significant.

MA also operates through others: capable managers raise team performance through task allocation, guidance, and motivation, and employees under effective supervisors are less likely to leave (Lazear et al. 2015).

Evidence on succession reinforces the importance of ability: firms that pass control within the founding family tend to show lower profitability and valuation than those appointing unrelated executives (Pérez-González 2006; Bennedsen et al. 2007).

Thus, these studies capture a multidimensional MA, spanning cognition, judgment, execution, method selection, learning from others, effort, and organizational leadership. It is shaped not only by education and experience but also by professional advice, peer interaction, and practice (Helfat and Martin 2015).

However, prior research does not offer a standardized measure of MA. Each study captures it from a different angle, thus limiting comparison across many listed firms over long horizons.

The MA score addresses this gap by quantifying managerial performance through a firm's resource-to-revenue conversion efficiency (Demerjian et al. 2012). First, DEA estimates firm efficiency from inputs, including cost of goods sold (COGS); selling, general, and administrative expenses (SG&A); tangible fixed assets; goodwill; other intangible assets; and R&D capital stock. Then, the MA score is the residual after removing the part explained by firm-specific factors, such as size, market share, age, and complexity. This process yields a continuous, comparable capability measure for many firms without individual manager data. Subsequent works link the MA score to earnings quality (Demerjian et al. 2013), earnings management (Huang and Sun 2017; Demerjian et al. 2020), investment efficiency (Chen et al. 2021), the cost of capital (De Franco et al. 2017; Jang et al. 2024), and firm performance and value (Ting et al. 2021; Atawnah et al. 2024).

The MA score does not measure executives' innate, fixed talent. Because it reflects a firm's resource-to-revenue conversion efficiency at a specific time, it captures not only knowledge and judgment but also fit with the firm, available resources, organizational cooperation, discretion, and effort expended. Thus, we use it as an indicator of MA demonstrated within a specific corporate environment, not of inherent potential.

2.2 Foreign investors as a governance mechanism

In firms with separate ownership and management, managers do not always deploy their ability to maximize shareholder value. Shareholders cannot fully observe managers'

effort and decisions, and their interests differ. Thus, an agency problem arises in which managers favor personal interests over those of shareholders (Jensen and Meckling 1976; Fama and Jensen 1983).

Without effective governance, managers may pursue self-interest, such as investing free cash flow in unprofitable projects rather than returning it (Jensen 1986) and self-entrenchment by allocating resources in ways that make them difficult to be replaced (Shleifer and Vishny 1989). Excessive managerial control can also blunt the discipline of turnover and takeovers, thus undermining firm value (Morck et al. 1988; Stulz 1988).

Shareholder oversight can curb these problems. Shareholders give managers an incentive to enhance firm value and utilize their ability by voting, filing proposals, electing or removing directors, and selling shares. Thus, governance not only restrains poor decisions but can also improve managerial effort, information gathering, and resource allocation.

However, monitoring is costly, whereas its benefits are shared. Thus, dispersed small shareholders have less incentive to monitor compared with large shareholders who gain from increased firm value (Shleifer and Vishny 1986, 1997). Large and institutional investors also monitor selectively: horizon, objectives, information, and business ties determine their effectiveness. Short-term traders tend to exit rather than engage. In contrast, long-term, independent institutions benefit from sustained engagement (Bushee 1998; Chen et al. 2007), and investors with business relationships may under-monitor (Pound 1988). Therefore, independence and information-gathering ability are key.

Foreign investors' governance is distinct from that of domestic stakeholders. Their cross-market experience provides them with the information and benchmarks to compare firms against international peers. Furthermore, they can evaluate managers relatively independently because they are largely free of business relationships and cross-shareholdings. Because of this international perspective and independence, they can detect resource-allocation and governance weaknesses that domestic owners often overlook (Gillan and Starks 2003).

For this study, shareholder monitoring can influence not only turnover and specific policies but also incumbent managers' discretion to exercise their ability. Under weak governance, capable managers may also hold back or act to protect their positions. In contrast, under strong monitoring by independent, informed shareholders, they have an incentive to gather information, review operations, and allocate resources efficiently. Thus, foreign investors can be positioned as external governance actors that encourage managers to exercise their ability.

2.3 Mediation studies

Foreign ownership is associated with corporate outcomes, though the ownership ratio does not generate sales or profit as internal change must mediate the relationship. Therefore, confirming a direct foreign-investor–performance link does not reveal the factors within the firm that produced such a link. Identifying the mediating variable between foreign ownership and performance, as well as analyzing the indirect path, is needed to understand how outcomes arise.

Mediation analysis examines how an independent variable relates to a dependent variable through a mediator. It distinguishes the path to and from the mediator and the

indirect (their product) and direct effects. Early works tested each path's coefficients sequentially (Baron and Kenny 1986). Recently, the standard process requires estimating the indirect effect directly and obtaining bootstrap confidence intervals (CI) (Preacher and Hayes 2008) to assess its magnitude and uncertainty without requiring a significant total effect.

Mediation analysis has spread early in marketing and strategic management. Nevertheless, accounting and finance have mostly estimated direct relationships, with explicit indirect-effect tests remaining comparatively rare. Accordingly, Ting et al. (2021, 2024) remarkably examined core governance issues within a mediation framework.

For Taiwanese electronics firms, Ting et al. (2021) found that MA and performance are positively related and capital structure partly mediates this link, though the indirect effect was only approximately 20% of the total. For Malaysian listed firms, Ting et al. (2024) showed that controlling-shareholder ownership relates to performance partly through firm efficiency. Thus, the ownership–performance link is a mediated process rather than a direct correlation.

However, the paths examined in these studies differ from ours. Ting et al. (2021) used MA and capital structure as the explanatory variable and mediator, respectively. Ting et al. (2024) resembled our design by using an ownership variable. However, their mediator (firm efficiency) does not capture MA only but the overall efficiency, including size, market position, asset composition, and experience. Thus, it cannot separate ownership effects on performance through MA only and through other firm characteristics.

Accordingly, we specify a mediation model with the foreign ownership ratio, MA score, and firm performance as the independent, mediator, and dependent variables, respectively.

2.4 Corporate governance reforms in Japan

Japanese CG was long characterized by the main-bank system and cross-shareholdings. Stable shareholders, such as banks and business partners, shielded management from short-term price pressure and hostile takeovers, leaving market discipline relatively weak (Aoki 1990; Hoshi et al. 1991; Morck and Nakamura 1999). After the late 1990s banking crisis, bank and corporate holdings fell, whereas domestic and foreign institutional ownership rose. Governance shifted from an insider-centered structure to one shaped by capital markets and external shareholders (Miyajima and Kuroki 2007; Miyajima et al. 2015).

Foreign-investor holdings also reflect selection: Japanese firms in 1975–1991 held large stakes in manufacturing, large, profitable, low-risk, low-leverage firms (Kang and Stulz 1997). Thus, the positive foreign-ownership–performance link may partly reflect their tendency to select already-strong firms rather than monitoring only.

Foreign investors influence various managerial behaviors: employment, R&D, and risk-taking (Ahmadjian and Robbins 2005; Yoshikawa et al. 2005; David et al. 2006; Arikawa et al. 2011; Nguyen 2012). For Japanese firms, enhanced foreign ownership is associated with executive pay that reflects strategy and performance and with performance-sensitive turnover, though relationships are not clearly evident for domestic shareholders (Yoshikawa et al. 2010; Miyajima et al. 2015; Miyajima and

Ogawa 2016). Therefore, foreign investors impose performance discipline on incumbents.

Following these shifts, Japan introduced the Stewardship Code (2014) and Corporate Governance Code (2015), requiring institutional investors to monitor investees, exercise voting rights, and engage in dialogue and listed firms to strengthen board oversight, disclosure, shareholder rights, and dialogue, respectively. Together, they institutionalized a shareholder-dialogue–firm-value link from both sides. Although foreign investors could discipline management, the institutionalization of voting and engagement likely expanded their scope of influence after the reforms. Rising foreign ownership, unwinding cross-shareholdings, and performance changes occurred simultaneously. As a result, post-reform changes cannot be solely attributed to the codes. Therefore, we treat the 2014–2015 reforms not as strict natural experiments but as institutional turning points at which the relationship between foreign investors and managers’ exercise of ability may have changed.

Thus, most studies examined direct relationships between foreign ownership and specific behaviors or outcomes, although foreign ownership in Japan is linked to firm value and managerial decisions. Whether foreign investor discipline improves performance through the exercise of MA, and whether this mechanism changed with the reforms, remains insufficiently examined.

2.5 Hypothesis development

Foreign shareholders are external governance actors that influence performance through voting, dialogue, board demands, and the threat of exit. Strong monitoring gives managers incentive to gather information, review the business portfolio and

operations, and allocate resources efficiently, whereas dialogue exposes them to international practices and capital-market benchmarks that can improve their knowledge and decisions. Thus, foreign shareholders not only curb private benefits but also encourage managers' efficient corporate resource use.

Prior research widely shows that MA improves performance. Capable managers demonstrate efficient resource-to-profit conversion and effective adaptation to changes (Demerjian et al. 2012). Relationships between ability and earnings quality, investment efficiency, financing terms, and firm value were also established (Demerjian et al. 2013; De Franco et al. 2017; Ting et al. 2021; Chen et al. 2021; Atawnah et al. 2024). Alternatively, field and network evidence shows that ability can be improved from outside the firm (Bloom et al. 2013; Cai and Szeidl 2018).

Similarly, foreign ownership is associated with governance practices, long-term investment, innovation, cash holdings, and disclosure (Ferreira and Matos 2008; Aggarwal et al. 2011; Bena et al. 2017; Tsang et al. 2019; Loncan 2020). For Japanese firms, it is linked with workforce adjustment, R&D, executive pay, turnover, and risk-taking (Ahmadjian and Robbins 2005; David et al. 2006; Yoshikawa et al. 2010; Nguyen 2012).

However, most of these works estimate direct relationships and do not clarify foreign shareholders' influence on performance through internal change. Studies identifying mediators found that controlling-shareholder monitoring and MA work through firm efficiency (Ting et al. 2024) and capital structure (Ting et al. 2021), respectively. However, the path from foreign-shareholder governance to improved MA and then to performance lacks explicit examination.

We argue that firms with high foreign ownership face strong oversight, thus discouraging self-benefits and complacency and encouraging managers' full exercise of their ability. As a result, information gathering, decisions, action, and resource allocation improve, which in turn raises performance. Therefore, we hypothesize the following:

Hypothesis 1 (H1): Foreign shareholders positively impact Japanese firm performance through improvements in MA.

Effective foreign-shareholder governance depends on the institutional environment supporting dialogue and voting. Japan's Stewardship Code (2014) and Corporate Governance Code (2015) require investors and firms to engage in dialogue and accountability aimed at medium- to long-term value. This requirement can widen the channels through which foreign-shareholder information and international expertise reach managerial decisions. Foreign shareholders had provided external discipline before the reforms. However, the extent to which it improved MA when their roles were less clearly defined is uncertain. Therefore, we hypothesize the following:

Hypothesis 2 (H2): The positive impact of foreign shareholders on Japanese firm performance through MA improvements has strengthened following Japan's CG reforms.

Figure 1 shows the analytical framework for this study based on the hypotheses outlined above.

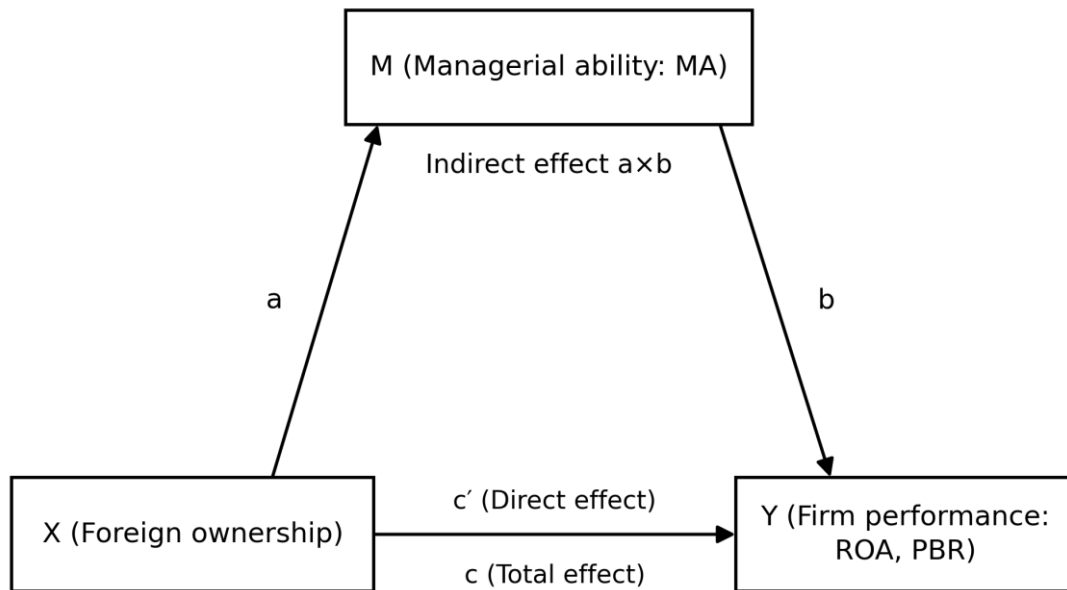


Fig. 1 Foreign ownership and firm performance with managerial ability (MA) as mediator

We treat the foreign ownership ratio, MA score, and firm performance as the independent, mediator, and dependent variables, respectively. Firm performance is measured primarily by ROA and then by the market-based PBR as a robustness check. These variables were used to examine the indirect effect of foreign shareholders on performance through MA and whether it strengthened after Japan's governance reforms.

3. Methodology and data

3.1 Research design

Using listed companies in Japan, this study examined the mechanism through which foreign shareholders influence firm performance via MA improvements. We conducted a mediation analysis using the foreign ownership ratio, MA, and firm performance as

the independent, mediator, and dependent variables, respectively. The basic analytical path in this study runs from the foreign ownership ratio to firm performance via MA as follows:

$$\text{Foreign ownership}_{i,t} \rightarrow \text{Managerial ability}_{i,t} \rightarrow \text{Firm performance}_{i,t} \quad (1)$$

Here, *Foreign ownership*_{*i,t*} represents the foreign ownership ratio of firm *i* in period *t*; *Managerial ability*_{*i,t*} represents MA in the same period *t*; and *Firm performance*_{*i,t*} represents firm performance (ROA) in period *t*. This study focuses on the indirect effect whereby the foreign ownership ratio influences MA; in turn, MA influences firm performance. We denote the path from the foreign ownership ratio to MA as path a, and that from MA to firm performance in the same period as path b. We estimate $a \times b$ as the indirect effect.

The basic framework follows Ting et al. (2021, 2024). However, in this study, we used the foreign ownership ratio and MA score as the independent and mediating variables, respectively. Thus, we can focus on the pathway through which foreign-shareholder governance leads to firm performance via MA improvements.

Furthermore, to examine the impact of CG reforms in Japan, we divided the analysis period into two segments: before and after the introduction of the Japanese Stewardship Code in 2014 and the Corporate Governance Code in 2015. We estimated the indirect effects for each period and verified whether the positive foreign-shareholder impact on firm performance, mediated by MA, has strengthened following the reforms.

3.2 Data and sample selection

This study used firm-year panel data covering Japanese listed companies from 2005 to 2025. Corporate financial and shareholder-composition data were obtained from the securities reports (Yūka Shōken Hōkokusho) filed by listed companies; specifically, shareholder-composition data were taken from the “Breakdown by Owner” section of these reports. PBR data were obtained from Bloomberg. These data were matched with the separately calculated MA scores according to fiscal year. If multiple observations are available for the same company in the same fiscal year, the observation with the most recent fiscal year-end date is retained.

The raw dataset consists of 63,348 firm-year observations. To construct the sample, we first identified companies listed on Japanese stock exchanges during the analysis period.

Next, companies belonging to the banking, securities, insurance, and other financial sectors were excluded. The ownership structure by shareholder consists of six categories: government and public entities, financial institutions, securities firms, other corporations, foreign corporations, and individuals and others. Of these categories, the ownership share held by foreign corporations and others is calculated.

The observed values were arranged by company in fiscal-year order to create panel data. The total effects model, path-*a* model, and path-*b*/direct effects model were estimated using samples that contain all necessary variables.

Following Ting et al. (2021, 2024), firm-years with missing values in any of the main or control variables were excluded from the analysis. Then, we estimated all regression equations using the same complete-case sample in which all required variables were observed. As a general rule, the main continuous variables in the analytical dataset were winsorized at the 1st and 99th percentiles of the entire sample to mitigate the impact of

outliers. For the MA score, winsorization was performed at the 0.5th and 99.5th percentiles for each combination of Tokyo Stock Exchange (TSE) industry code and fiscal year during the calculation stage. After merging the data into the analytical dataset, the same 1st and 99th percentile criteria for the entire sample were applied as for the other main continuous variables.

3.3 Variable measurement

The foreign ownership ratio is calculated by dividing the number of shares held by foreign corporations and other entities by that held by all owners across the six categories as follows:

$$\text{Foreign ownership}_{i,t} = \frac{\text{Foreign corporate ownership}_{i,t}}{\text{Total shareholdings}_{i,t}} \quad (2)$$

The foreign ownership ratio is used as a proxy variable representing the potential influence of foreign shareholders on corporate management.

MA is measured using Demerjian et al.'s (2012) MA score, calculated in two stages. In the first stage, DEA is used to estimate, by industry, each firm's sales efficiency from its input resources. DEA evaluates efficiency from the perspective of whether the same sales level can be achieved with fewer inputs (input-oriented). Furthermore, it employs the assumption of variable returns to scale (VRS) to compare firms of different sizes fairly. VRS acknowledges varying efficiency standards depending on scale. This efficiency metric is referred to as firm efficiency, where sales is the output variable, and the input variables include COGS, SG&A, tangible fixed assets, goodwill, other

intangible assets, and R&D capital stock. Of these variables, tangible fixed assets, goodwill, other intangible assets, and the R&D capital stock are measured at the most recent available observation point. Thus, firm efficiency is calculated as follows:

$$\text{Firm Efficiency}_i = \max_v \frac{\text{Sales}_i}{v_1 \text{COGS}_i + v_2 \text{SG\&A}_i + v_3 \text{PPE}_i + v_4 \text{Goodwill}_i + v_5 \text{OtherIntangibles}_i + v_6 \text{RDStock}_i} \quad (3)$$

Here, *Firm Efficiency_i* represents the efficiency score of firm *i*, and *Sales_i* represents output, that is, sales revenue. The denominators *COGS_i*, *SG&A_i*, *property, plant, and equipment (PPE)_i*, *Goodwill_i*, *OtherIntangibles_i*, and *RDStock_i* represent the six inputs: COGS; SG&A expenses; PPE; goodwill; other intangible assets; and R&D capital stock, respectively. The weights assigned to each input are denoted by *v₁–v₆* and are determined for each firm via linear programming to maximize the efficiency score. The efficiency score takes values between 0 and 1; the closer it is to 1, the higher the firm's input-resource-to-sales-revenue conversion efficiency.

Firm efficiency represents the relative efficiency with which each firm converts input resources into sales, comparing firms within the same industry. In the second stage, firm efficiency (EFF), which is bounded between 0 and 1, is regressed on firm-specific factors—including firm size, market share, free cash flow, firm age, business concentration (HHI), foreign currency translation adjustments, and year fixed effects—using a two-limit Tobit model, as follows:

$$\text{EFF}_{i,t} = \alpha + \beta_1 \ln \text{Assets}_{i,t} + \beta_2 \text{MarketShare}_{i,t} + \beta_3 \text{FCFDummy}_{i,t}$$

$$+\beta_4\ln\text{Age}_{i,t} + \beta_5\text{HHI}_{i,t} + \beta_6\text{FXDummy}_{i,t} + \lambda_t + \varepsilon_{i,t} \quad (4)$$

Here, the residual from the Tobit regression, $\varepsilon_{i,t}$, is defined as the MA score. By controlling for firm-specific factors (firm size and market position) that management cannot easily change in the short term, we isolate the resource utilization capability attributable to management.

The MA score does not directly measure an individual executive's innate or fixed abilities. Accordingly, the MA score is defined as an indicator that captures the results of an executive's managerial resource utilization through knowledge, judgment, and execution within a specific corporate environment. Therefore, "improvement in executive capabilities" in this study includes not only the enhancement of the executives' knowledge and judgment but also the effective utilization of their capabilities.

The key corporate performance indicator ROA measures business profitability and is calculated as annualized business profit divided by average total assets, multiplied by 100. As a robustness check, we used the PBR, a market-based performance measure that reflects investors' valuation and growth expectations. PBR is defined as the market value divided by the book value of equity. ROA is the main performance measure, and PBR assesses whether the results hold for market valuation and accounting profitability.

Following prior research, we treat firm size, debt ratio, and revenue growth rate as control variables. Firm size controls for the effects of a firm's available managerial resources, information environment, and foreign investors' investment selection. The debt ratio adjusts for financial constraints and profitability. Revenue growth rate controls for the firm's growth stage.

3.4 Empirical models and statistical inference

First, we estimated the overall effect of the foreign ownership ratio on firm performance in the same period as follows:

$$\text{Performance}_{i,t} = \alpha + c \text{ Foreign ownership}_{i,t} + \gamma \text{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (5)$$

Here, μ_i and λ_t represent the firm and year fixed effects, respectively.

Next, we estimated the effect of the foreign ownership ratio on MA, that is, path a, using Equation (6) below. Based on this study's argument that foreign shareholders encourage MA improvements, the coefficient a is expected to be positive.

$$\text{MA}_{i,t} = \alpha + a \text{ Foreign ownership}_{i,t} + \gamma \text{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (6)$$

Here, μ_i and λ_t represent the firm and year fixed effects, respectively.

We incorporate the foreign ownership ratio and MA simultaneously to estimate corporate performance as follows:

$$\text{Performance}_{i,t} = \alpha + c' \text{ Foreign ownership}_{i,t} + b \text{ MA}_{i,t} + \gamma \text{Controls}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (7)$$

Here, b represents the MA effect on firm performance after controlling for the foreign ownership ratio and control variables. The coefficient c' represents the direct effect of the foreign ownership ratio remaining after controlling for the MA score. The indirect

effect mediated by MA is calculated as the product of the coefficient a in Equation (6) and coefficient b in Equation (7) as follows:

$$\text{Indirect effect} = a \times b \quad (8)$$

H1 proposes that this indirect effect is positive. In this study, we do not treat the statistical significance of the total effect c or direct effect c' as a prerequisite for the mediating effect; rather, we focus primarily on testing the indirect effect $a \times b$.

To estimate the regression equation, we used a panel regression model that includes firm and year fixed effects. To account for serial correlation within the same firm and common shocks across years, the standard errors were clustered in the firm and year directions.

The product of two regression coefficients, namely, the indirect effect $a \times b$, does not necessarily follow a normal sample distribution. Therefore, its statistical significance was assessed using firm-block bootstrapping, with firms as the resampling units. The firm-level resampling allowed us to retain the time-series observations belonging to each firm as a group and preserve the correlation structure within firms. The bootstrap was repeated 2000 times, and the 2.5th and 97.5th percentiles of the empirical distribution were used as the 95% CI.

3.5 Corporate governance reform analysis

To test H2, we compared the mediating effects before and after Japan's CG reforms. The Stewardship Code was introduced in 2014 and the Corporate Governance Code in

2015. Thus, we used the effective date of the Corporate Governance Code (June 1, 2015) as the cutoff point. This date applies to various listed companies. Observations with fiscal year-end dates before and on/after that date are classified as “pre-reform” and “post-reform,” respectively.

We estimated Equations (6) and (7) separately for each subsample before and after the reform, obtained paths a and b , and calculated the indirect effect $a \times b$ using Equation (8). Furthermore, we calculated the difference between the post- and pre-reform indirect effects as follows:

$$\text{Difference} = (a \times b)_{\text{Post}} - (a \times b)_{\text{Pre}} \quad (9)$$

H2 proposes that this difference is positive. Only the post-reform indirect effect is statistically significant, whereas the pre-reform indirect effect is not. This finding cannot sufficiently conclude that the pre- and post-reform effects significantly differ. Therefore, we directly calculated the CI for the difference in indirect effects using the firm-block bootstrap method. If the 95% CI for the difference does not include 0 and the value is positive, then the mediating effect strengthened after the reform. Table 1 presents the variables used in this study and their descriptions.

Table 1. Measurement of Variables

Variables	Abbreviations	Measurements
Variables in the mediation analysis		
Foreign ownership	<i>Foreign ownership</i>	Ratio of shares held by foreign corporations and other entities to total shareholdings across the six ownership categories (Eq. 2).
MA score	<i>MA</i>	Firm-year residual obtained from the Tobit regression (Eq. 4), estimated separately for each TSE industry code. A positive value indicates efficiency above the level predicted by observable firm characteristics.

Variables	Abbreviations	Measurements
ROA	<i>ROA</i>	Annualized business profit divided by average total assets, multiplied by 100. Average total assets are calculated as the average of current- and prior-year total assets. The main performance measure (Y).
PBR	<i>PBR</i>	Market value of equity divided by book value of equity. Used as a market-based robustness check for Y.
Firm size	<i>lnAssets</i>	Natural logarithm of total assets at the end of year t. Used as <i>lnAssets</i> (Eq. 4).
Leverage	<i>Leverage</i>	Total liabilities divided by shareholders' equity, multiplied by 100.
Sales growth	<i>Sales growth</i>	Percentage change in sales from the prior fiscal year: $(Sales_t / Sales_{t-1}) - 1$.
Firm efficiency input and output		
Inputs: Cost of goods sold	<i>COGS</i>	Current-year COGS or operating costs
Selling, general, and administrative expenses	<i>SG&A</i>	Current-year SG&A expenses
Property, plant, and equipment	<i>PPE</i>	Net PPE measured at the immediately preceding available observation
Goodwill	<i>Goodwill</i>	Goodwill measured at the immediately preceding available observation. Missing values are set to 0.
Other intangible assets	<i>OtherIntangibles</i>	Intangible assets other than goodwill, measured at the immediately preceding available observation. Missing values are set to 0.
R&D capital stock	<i>RDStock</i>	R&D capital stock measured at the immediately preceding available observation. It is constructed as $RD_t + 0.8RD_{t-1} + 0.6RD_{t-2} + 0.4RD_{t-3} + 0.2RD_{t-4}$.
Output: Sales	<i>Sales</i>	Current-year sales, used as the output variable in the DEA model
Firm efficiency measure		
Firm efficiency	<i>EFF</i>	DEA efficiency score of firm <i>i</i> in year <i>t</i> . It ranges from 0 to 1, with a value closer to 1 indicating more efficient use of inputs to generate sales.
Control variables in the MA-score Tobit regression (Eq. 4)		
Firm size	<i>lnAssets</i>	Natural logarithm of total assets at the end of year t.
Market share	<i>MarketShare</i>	Firm <i>i</i> 's sales in year <i>t</i> divided by total sales of firms in the same TSE industry code and year.
Free cash flow sign dummy	<i>FCFDummy</i>	Indicator equal to 1 when free cash flow is 0 or positive and 0 otherwise. Missing free cash flow observations are coded as 0 in the empirical implementation.
Firm age	<i>lnAge</i>	Natural logarithm of the number of years between the firm's effective date of establishment and the fiscal year-end date.
Business concentration	<i>HHI</i>	Sum of squared segment sales shares, where each segment's share is the segment's sales divided by the firm's total segment sales in that year. A higher value indicates that sales are concentrated in a few business segments.
Internationalization dummy	<i>FXDummy</i>	Indicator equal to 1 when the foreign currency translation adjustment is nonzero and 0 otherwise.
Year fixed effects	<i>Year FE</i>	Year indicators controlling for macroeconomic conditions, institutional changes, and other factors common to all firms in a given year
Variables used to construct the measures		
Research and development expenditure	<i>RD</i>	R&D expenditure of firm <i>i</i> in year <i>t</i> . Missing values are set to 0, and the variable is used to construct R&D capital stock.

Table 2 presents the descriptive statistics and correlation coefficients for the input and output variables used in the first-stage DEA. The output variable *Sales* is positively correlated with all six input variables, with the highest correlation observed with COGS

(0.986). A certain degree of positive correlation is observed among the input variables. Nevertheless, the correlations among inputs do not hinder the efficiency estimation because DEA determines the weights of the inputs endogenously for each firm.

Table 2. Summary statistics and correlation analysis of DEA indicators

Variables	Summary statistics		Correlation analysis					
	Mean (JPY million)	SD (JPY million)	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6
Input 1: <i>COGS</i>	127608	356301						
Input 2: <i>SG&A</i>	31502	87587	0.833					
Input 3: <i>PPE</i>	60387	201513	0.809	0.737				
Input 4: <i>Goodwill</i>	3532	20070	0.506	0.697	0.464			
Input 5: <i>OtherIntangible</i>	8471	42263	0.598	0.771	0.583	0.942		
Input 6: <i>RDS</i> tock	8080	33119	0.632	0.731	0.533	0.534	0.599	
Output 1: <i>Sales</i>	173754	482179	0.986	0.898	0.824	0.578	0.671	0.680

Notes: N = 55832 firm-year observations. All correlation coefficients are significant at the 1% level.

COGS and SG&A are measured in the current year; PPE, goodwill, other intangible assets, and R&D capital stock are measured at the immediately preceding available observation. The sample follows the MA-score estimation criteria, including annual 1st/99th percentile winsorization and the exclusion of industry groups with fewer than 100 eligible observations.

3.6 Correlations

Table 3 shows the Pearson correlation coefficients between the key variables. ROA exhibits a statistically significant positive correlation at the 1% level with the MA score (0.308) and foreign ownership ratio (0.199). This result is consistent with the hypotheses of this study. Furthermore, the foreign ownership ratio and MA score are also positively correlated (0.066). The correlation between the MA score and firm efficiency is 0.646. Therefore, although the MA score is based on firm efficiency, it is not identical to it. Particularly, although firm efficiency and firm size are positively

correlated (0.395), the correlation between the MA score and firm size is only a small negative value (−0.007). This contrast supports the conclusion that, after adjusting for the effects of firm size and other firm-specific factors via the second-stage Tobit regression, the MA score is constructed as a capability indicator independent of firm attributes. The correlation among the explanatory variables used in the regression analysis is highest between the foreign ownership ratio and firm size (0.590). Thus, the concern that multicollinearity will seriously impact the estimation is negligible.

Table 3. Pearson correlation coefficients

Variables	1	2	3	4	5	6	7
1. ROA	1.000						
2. Firm efficiency	0.173***a	1.000					
3. Managerial ability	0.308***	0.646***a	1.000				
4. Foreign ownership	0.199***	0.174***a	0.066***	1.000			
5. Firm size	0.051***	0.395***a	−0.007	0.590***	1.000		
6. Leverage	−0.249***	0.035***a	−0.043***	−0.107***	0.050***	1.000	
7. Sales growth	0.328***	0.040***a	0.148***	0.064***	−0.043***	−0.015***	1.000

Notes: Pearson correlation coefficients on the complete-case estimation sample: N = 54478 (3535 firms, 20 fiscal years). a: Correlations involving firm efficiency use the full DEA sample of 55832 observations. Foreign ownership is normalized by the sum of the six ownership categories; firm size is the natural logarithm of total assets. All pairwise correlations among regressors are well below 0.70. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

4. Empirical results

4.1 Descriptive statistics and tests of differences in means

Table 4 presents the descriptive statistics for the key variables and the t-test results comparing the differences in means before and after CG reforms. The mean ROA is

5.778, indicating that the sample firms' annualized business profit averaged approximately 5.8% of average total assets.

The mean value for firm efficiency is 0.793, indicating that the sample firms have an average potential for improvement of approximately 20.7% in the utilization of their input resources. The MA score is calculated as the residual from the industry-specific Tobit model. Thus, by definition, its mean value is nearly 0 (−0.004). The average foreign ownership ratio is 0.102, and the average shareholding ratio of foreign corporations after normalization into six categories is 10.2%.

A comparison of the periods before and after the CG reform revealed the following three points. First, the foreign ownership ratio rose by approximately 2.0 percentage points, from 9.1% pre-reform to 11.1% post-reform (difference: 0.020; significant at the 1% level). Therefore, the presence of foreign investors increased further following the institutional reform. Second, ROA was 0.688 points higher post-reform (significant at the 1% level). Combined with a debt ratio decline and sales growth increase, this result is consistent with an overall improvement in corporate performance during the post-reform period. Third, although post-reform firm efficiency declined slightly, the average pre- and post-reform MA scores had no significant differences.

Table 4. Descriptive statistics and mean differences before and after the corporate governance reform

Variables	Full sample			Pre-CG		Post-CG		Mean difference post – pre	t-stat
	N	Mean	SD	N	Mean	N	Mean		
ROA	54478	5.778	7.087	23824	5.390	30654	6.079	0.688***	11.425
Firm efficiency	55832	0.793	0.155	24314	0.801	31518	0.787	−0.014***	−10.784

MA	54478	−0.004	0.099	23824	−0.003	30654	−0.004	−0.001	−1.017
Foreign ownership	54478	0.102	0.121	23824	0.091	30654	0.111	0.020***	19.066
Firm size	54478	10.473	1.752	23824	10.482	30654	10.466	−0.016	−1.084
Leverage	54478	139.066	164.704	23824	154.267	30654	127.251	−27.016***	−18.799
Sales growth	54478	0.050	0.173	23824	0.039	30654	0.059	0.020***	13.376

Notes: Descriptive statistics on the complete-case estimation sample (Table 5): $N = 54478$ (3535 firms, 20 fiscal years). Pre-CG (fiscal year-end before June 1, 2015): $N = 23824$; Post-CG (on or after June 1, 2015): $N = 30654$. All variables measured at t . The firm efficiency row is computed over the full DEA sample of 55832 observations as the industry-level DEA score is generated before sample matching. Firm efficiency is the input-oriented, variable-returns-to-scale DEA score by industry; MA is the industry-level Tobit residual. ROA, leverage, and sales growth are winsorized at the 1st/99th percentiles. Mean differences use Welch two-sample t -tests. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

4.2 Mediation analysis results

Table 5 presents the mediation analysis results using the foreign ownership ratio (X), MA score (M), and ROA (Y). Similar to Ting et al. (2021, 2024), we conducted the estimation in three stages: the total effect (step 1), the paths from X to the mediating variable and from the mediating variable to Y (step 2), and the direct effect (step 3). All regression equations include firm and year fixed effects and are based on standard errors clustered by firm and year. The three equations were estimated using the same 54478 firm-year observations (3535 firms, 20 fiscal years, 2006–2025) for which all required variables were available.

In step 1, the foreign ownership ratio showed positive and significant effects on ROA ($c = 7.547$, $t = 7.20$). After controlling for persistent differences across firms using firm fixed effects, ROA remained high in years with a high foreign ownership ratio within the same firm. In step 2, the foreign ownership ratio is positively associated with the MA score ($a = 0.093$, $t = 7.44$), and the MA score is positively associated with ROA (b

= 28.573, $t = 22.62$). The indirect effect ($a \times b$) is 2.669, and the 95% CI obtained via firm-block bootstrapping is [1.947, 3.397], which does not include 0. This result supports H1, which posits that foreign shareholders positively impact firm performance through MA enhancement.

In step 3, after controlling for the MA score, the direct effect remains positive and significant ($c' = 4.878$, $t = 4.85$). The persistence of a significant direct effect indicates partial rather than full mediation, consistent with the capital-structure and firm-efficiency mediations in Ting et al. (2021) and Ting et al. (2024), respectively. The indirect-effect accounts for approximately 35% of the total effect ($2.669/7.547$), that is, approximately one-third of the foreign ownership–ROA relationship. The effect is statistically robust but modest economically. This result is consistent with foreign shareholders' disciplinary role being associated with a gradual MA improvement.

This specification measures all variables in the same fiscal year. Thus, reverse causality cannot be fully ruled out, namely, foreign investors raising their holdings in response to contemporaneous improvements. Using foreign ownership lagged by one period ($t-1$) (see note to Table 5) still yields a positive, significant indirect effect (1.907, 95% CI [1.212, 2.588]) and an insignificant direct effect, thus reinforcing our interpretation.

Table 5. Mediation of foreign ownership and ROA through managerial ability

Variables	Coefficient	t-stat
<i>Step 1: total effect of X on Y (path c)</i>		
Foreign ownership (t)	7.547	7.197***

<i>Step 2: X to mediator (path a) and mediator to Y (path b)</i>		
Foreign ownership (t)	0.093	7.441***
MA (t)	28.573	22.616***
<i>Step 3: direct effect of X on Y (path c')</i>		
Foreign ownership (t)	4.878	4.848***
<i>Partial effect of control variables on Y</i>		
Firm size	1.471	5.398***
Leverage	-0.009	-13.458***
Sales growth	7.877	11.877***
Indirect effect ($a \times b$)	2.669	
Bootstrap 95% CI	[1.947, 3.397]	
Within R ² (step 1/step 2/step 3)	0.172/0.065/0.291	
Observations	54478	
Firms/years	3535/20	

Notes: N = 54478 firm-year observations (3535 firms, 20 fiscal years). The mediation path is foreign ownership (t) → MA (t) → ROA (t), all measured in the same fiscal year. X is the foreign ownership ratio, normalized by the sum of the six ownership categories; the mediator is the MA score; Y is ROA. Controls are firm size (log total assets), leverage, and sales growth, measured at t. All regressions include firm and year fixed effects; t-statistics in parentheses use standard errors two-way clustered by firm and year. The analysis uses complete cases, with all three equations estimated on a single common sample. The indirect effect $a \times b$ is computed from the original sample; its 95% CI is based on 2000 firm-block bootstrap replications resampling firms with replacement. *, **, *** denote significance at 10%, 5%, and 1%, respectively. A specification with foreign ownership at t-1 yields a positive, significant indirect effect and an insignificant direct effect.

Figure 2 summarizes the main results in Table 5 through the mediation diagram introduced in Figure 1. The estimated coefficients are shown on the corresponding paths: foreign ownership and MA (path a = 0.093, $p < 0.01$) are positively associated as well as MA and ROA (path b = 28.573, $p < 0.01$), and the direct effect remains positive and significant ($c' = 4.878$, $p < 0.01$). The indirect effect ($a \times b = 2.669$; 95% CI [1.947, 3.397]) is positive and excludes 0, visually confirming the partial mediation reported above.

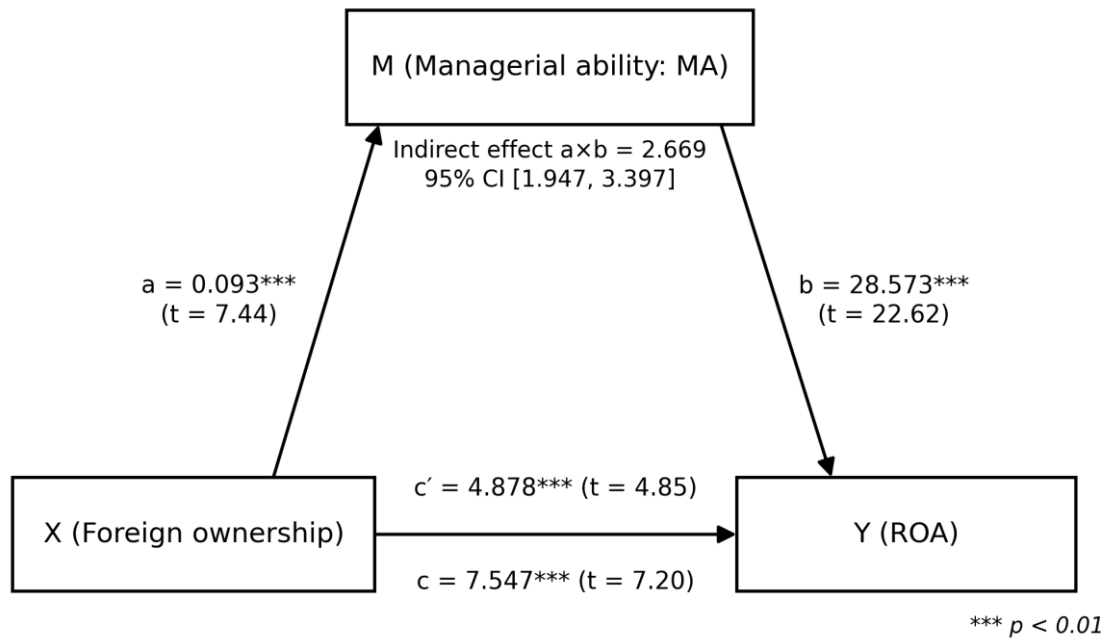


Fig. 2 Estimated mediation model for the main analysis (Table 5, $Y = \text{ROA}$)

Notes: $N = 54478$ firm-year observations (3535 firms, 20 fiscal years). Two-way (firm and year) fixed effects; two-way cluster-robust t-statistics are shown in parentheses.

4.3 Pre- and post-reform analysis

Table 6 presents the results of a mediation analysis identical to that in Table 5, conducted for each subsample pre- and post-reform. In the pre- and post-reform periods, paths a and b were positive and significant, and the pre- and post-reform indirect effects were 3.076 (95% CI [1.891, 4.365]) and 2.162 (95% CI [1.237, 3.120]), respectively, indicating that the effect was nonzero in both periods. Therefore, the foreign-shareholder–firm-performance pathway via MA is functioning in the pre- and post-reform periods.

H2 predicts that this indirect effect strengthens after the reform. However, the difference in the indirect effect between the post- and pre-reform periods is -0.914 , and the 95% CI obtained using firm-block bootstrapping is $[-2.529, 0.649]$, which includes 0. Therefore, no evidence was found that the magnitude of the indirect effect significantly increased after the reform, thus not supporting H2.

In contrast, the mediating structure has changed before and after the reform. The pre-reform direct effect c' was not significant ($2.505, t = 1.48$), and nearly the entire foreign ownership ratio–ROA relationship was explained by the path mediated by MA. In contrast, the post-reform direct effect strengthened and was significant ($6.836, t = 5.84$), and the total effect also expanded from 5.580 to 8.998 . When testing for differences by path (results not shown in the table), path a did not show a significant difference. Therefore, the pre- and post-reform influence of foreign shareholders on MA remained stable. However, path b changed, that is, the degree to which MA translates into firm performance declined significantly after the reform (difference: -4.396 , 95% CI $[-7.732, -0.771]$). The total and direct effects expanded after the reform, whereas the indirect effect contracted slightly; these results are attributable to this change in the path structure.

Table 6. Mediation analysis before and after Japan’s corporate governance reforms

Variables	Pre-CG reform		Post-CG reform	
	Coefficient	t-stat	Coefficient	t-stat
<i>Step 1: total effect of X on Y (path c)</i>				
Foreign ownership (<i>t</i>)	5.580	3.175**	8.998	7.095***
<i>Step 2: X to mediator (path a) and mediator to Y (path b)</i>				

Foreign ownership (<i>t</i>)	0.094	5.332***	0.076	4.434***
MA (<i>t</i>)	32.665	14.477***	28.269	15.579***
<i>Step 3: direct effect of X on Y (path c')</i>				
Foreign ownership (<i>t</i>)	2.505	1.476	6.836	5.836***
<i>Partial effect of control variables on Y</i>				
Firm size	1.746	3.699***	1.831	5.022***
Leverage	−0.009	−9.195***	−0.011	−10.921***
Sales growth	6.510	9.331***	7.376	7.764***
Indirect effect ($a \times b$)	3.076		2.162	
Bootstrap 95% CI	[1.891, 4.365]		[1.237, 3.120]	
Within R ² (step 1/step 2/step 3)	0.171/0.076/0.317		0.180/0.068/0.293	
Observations	23749		30649	
Firms/years	2637/10		3523/11	
Difference in indirect effects (Post – Pre)	−0.914		95% CI [−2.529, 0.649]	
Bootstrap replications	2000		2000	

Notes: Pre-CG reform (fiscal year-end before June 1, 2015) and Post-CG reform (on or after June 1, 2015, when Japan's Corporate Governance Code took effect). The mediation path, variable definitions, and estimation follow Table 5. Each subsample is a complete-case common sample; singletons are dropped (75 firm-years in the pre-reform subsample and 5 in the post-reform subsample). The 95% CIs for the indirect effects and the Post–Pre-difference use 2000 firm-block bootstrap replications, resampling firms from the pooled list and assigning them to both periods. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

4.4 Analysis using changes

Table 7 presents the mediation analysis results using the difference (Δ) from the previous fiscal year for foreign ownership ratio, MA score, and ROA, respectively. As in the level analysis, Δ Foreign ownership and Δ MA are positively associated ($a = 0.032$, $t = 3.50$) as well as Δ MA and Δ ROA ($b = 33.063$, $t = 28.28$). The indirect effect is 1.061, and the 95% CI [0.469, 1.598] does not include 0. Direct effects also remain significant ($c' = 6.269$, $t = 7.48$), and partial mediation of the same type as in the level analysis is confirmed regardless of the changes. By treating the variables as changes in addition to firm fixed effects, the influence of firm characteristics that tend to remain stable over

time is further eliminated. Therefore, these results indicate that changes in the foreign ownership ratio within the same fiscal year are linked to business performance changes through MA changes.

Interestingly, the propagation of these changes is concentrated within the same fiscal year. Under the specification where Δ Foreign ownership is lagged by one period (see note in Table 7), path a is effectively 0 (0.001, $t = 0.08$), and the indirect effect is also not significant (0.023, 95% CI $[-0.469, 0.545]$). Changes in the foreign ownership ratio are linked to MA changes within the same fiscal year; they do not propagate mechanically with a one-year lag. Therefore, either foreign-shareholder influence and management response occur within a relatively short period or the relationship is linked to a sustained increase in foreign ownership. This result justifies the adoption of the co-variate specification in the main analysis.

Table 7. Change-based mediation analysis: Δ Foreign ownership, Δ MA, and Δ ROA ($Y = \Delta$ ROA)

Variables	Coefficient	t-stat
<i>Step 1: total effect of X on Y (path c)</i>		
Δ Foreign ownership (t)	7.330	7.550***
<i>Step 2: X to mediator (path a) and mediator to Y (path b)</i>		
Δ Foreign ownership (t)	0.032	3.500***
Δ MA (t)	33.063	28.284***
<i>Step 3: direct effect of X on Y (path c')</i>		
Δ Foreign ownership (t)	6.269	7.484***
<i>Partial effect of control variables on Y</i>		
Firm size	-0.690	-5.326***
Leverage	0.001	2.508**
Sales growth	8.637	16.926***
Indirect effect ($a \times b$)	1.061	
Bootstrap 95% CI	[0.469, 1.598]	
Within R^2 (step 1/step 2/step 3)	0.201/0.126/0.320	

Observations	49933
Firms/years	3384/19

Notes: N = 49933 firm-year observations (3384 firms, 19 fiscal years). The path is $\Delta\text{Foreign ownership (t)} \rightarrow \Delta\text{MA (t)} \rightarrow \Delta\text{ROA (t)}$, where Δ is the change from the preceding firm observation. This robustness check is change-based, not a strict first-difference model: firm size, leverage, and sales growth enter in levels at t. Variable definitions and estimation otherwise follow Table 5. *, **, *** denote significance at 10%, 5%, and 1%, respectively. A specification with $\Delta\text{Foreign ownership}$ at t-1 yields an insignificant path a and indirect effect.

Table 8 presents the results of pre- and post-reform change-based mediation analyses for each subsample. The pre- and post-reform indirect effects were positive and significant: 1.437 (95% CI [0.409, 2.438]) and 0.958 (95% CI [0.245, 1.664]), respectively. The difference between the two periods is -0.479 (95% CI [-1.716, 0.786]) and is not statistically significant. Similar to the level analysis, the change-based results indicate that although the indirect effect holds true for both periods, we find no evidence that its magnitude increased after the reform.

Table 8. Change-based mediation analysis before and after Japan's corporate governance reforms

Variables	Pre-CG reform		Post-CG reform	
	Coefficient	t-stat	Coefficient	t-stat
<i>Step 1: total effect of X on Y (path c)</i>				
$\Delta\text{Foreign ownership (t)}$	7.103	6.506***	8.070	6.166***
<i>Step 2: X to mediator (path a) and mediator to Y (path b)</i>				
$\Delta\text{Foreign ownership (t)}$	0.044	3.556***	0.029	2.206*
$\Delta\text{MA (t)}$	32.785	13.892***	32.517	28.026***
<i>Step 3: direct effect of X on Y (path c')</i>				
$\Delta\text{Foreign ownership (t)}$	5.665	5.084***	7.112	6.967***
<i>Partial effect of control variables on Y</i>				

Firm size	-1.735	-4.982***	-0.748	-4.391***
Leverage	0.001	0.983	0.000	0.440
Sales growth	8.930	15.199***	9.163	11.334***
Indirect effect ($a \times b$)	1.437		0.958	
Bootstrap 95% CI	[0.409, 2.438]		[0.245, 1.664]	
Within R ² (step 1/step 2/step 3)	0.224/0.139/0.346		0.205/0.135/0.314	
Observations	20764		29112	
Firms/years	2576/9		3372/11	
Difference in indirect effects (Post – Pre)	-0.479		95% CI [-1.716, 0.786]	
Bootstrap replications	2000		2000	

Notes: Pre-CG and Post-CG periods are defined as in Table 6. The path is $\Delta\text{Foreign ownership } (t) \rightarrow \Delta\text{MA } (t) \rightarrow \Delta\text{ROA } (t)$; variable construction and estimation follow Table 7; singletons are dropped as in Table 6; and the pre/post bootstrap procedure follows Table 6. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

4.5 Robustness check using an alternative performance measure (price-to-book ratio)

As a robustness check, we re-estimated the mediation model using PBR in place of ROA. PBR is a market-based performance measure that incorporates investors' growth expectations. Table 9 reports the five key coefficients (c , a , b , c' , and the indirect effect $a \times b$) for level and change-based specifications. In the level specification, the total effect ($c = 4.238$), path a ($a = 0.099$), path b ($b = 3.305$), and direct effect ($c' = 3.912$) are all positive and significant, and the indirect effect is positive with a 95% CI that excludes 0 ($a \times b = 0.326$, 95% CI [0.228, 0.427]). The change-based specification yields the same qualitative pattern ($a \times b = 0.056$, 95% CI [0.028, 0.088]). Therefore, the mediating role of MA is not confined to accounting profitability but also holds for market valuation. PBR reflects growth expectations and other factors beyond operating efficiency. Thus, the share of the indirect effect in the total effect is smaller than in the

ROA analysis. Therefore, we treat PBR as a complementary, market-based robustness check rather than as the main outcome.

Table 9. Robustness check using PBR as an alternative performance measure

Variables	Level	Change
	Foreign $\rightarrow$ MA $\rightarrow$ PBR	Δ Foreign $\rightarrow \Delta$ MA $\rightarrow \Delta$ PBR
Total effect (c)	4.238 (10.916)***	4.767 (10.069)***
Path a ($X \rightarrow M$)	0.099 (7.560)***	0.035 (3.907)***
Path b ($M \rightarrow Y$)	3.305 (11.234)***	1.617 (5.340)***
Direct effect (c')	3.912 (10.153)***	4.711 (9.929)***
Indirect effect ($a \times b$)	0.326	0.056
Bootstrap 95% CI	[0.228, 0.427]	[0.028, 0.088]
Observations	55413	51553
Firms/years	3551/20	3422/19

Notes: The left and right columns estimate the level paths Foreign ownership (t) $\rightarrow$ MA (t) $\rightarrow$ PBR (t)

and the change-based path Δ Foreign ownership (t) $\rightarrow \Delta$ MA (t) $\rightarrow \Delta$ PBR (t), respectively. Variable

definitions, controls, and estimation follow Table 5. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

4.6 Summary of results

The results of this study can be summarized as follows. First, H1, stating that the foreign ownership ratio positively impacts firm performance via MA, was supported in all analyses: the level analysis (Table 5), change analysis (Table 7), and pre- and post-reform subsamples (Tables 6 and 8). All six estimated indirect effects were positive, and the 95% CIs obtained using the firm-block bootstrap method did not include 0. Second, because the direct effect c' remains consistently significant, the results of this study indicate partial mediation, consistent with Ting et al.'s (2021, 2024) structural model. The proportion of the indirect effect relative to the total effect was approximately 35% in the main analysis. Thus, a non-negligible portion of the

foreign-shareholder impact on firm performance is mediated through internal firm changes, specifically the MA exercise. In addition, a robustness check that replaced ROA with the market-based measure PBR (Table 9) yielded a positive and significant indirect effect in the level and change specifications. Therefore, the mediating role of MA is not limited to accounting profitability but also extends to market valuation.

Third, H2, stating that indirect effects would strengthen after the reform, was not supported by any before-and-after comparisons, whether in terms of levels or changes. The channel linking foreign shareholders to MA existed before the reform; rather, the direct relationship that was not mediated by MA expanded after the reform.

5. Conclusion

5.1 Findings and discussion

This study examined whether foreign shareholders influence firm performance through MA. Panel data covering approximately 3500 Japanese listed companies and 20 fiscal years from 2006 to 2025 were used for analysis. Following Ting et al.'s (2021, 2024) analytical framework on the relationship between MA or ownership structure and firm performance using mediation analysis, we estimated indirect effects using Preacher and Hayes's (2004, 2008) three-step approach and firm-block bootstrapping. We used the MA score (Demerjian et al., 2012) as the mediating variable; it controls for the influence of firm-specific factors based on firm efficiency.

The analysis results revealed two findings. First, H1, stating that the foreign ownership ratio positively impacts firm performance via MA, was supported in all subsamples, including level analysis, change analysis, and pre- and post-comparisons. The main analysis showed that approximately 35% of the foreign-ownership-ratio–ROA

relationship was explained by an indirect effect via MA, and a partially mediated structure with a significant direct effect was confirmed. This structure is similar to that identified by Ting et al. (2021) and Ting et al. (2024), who demonstrated a pathway from MA to capital structure and another from controlling shareholders to firm efficiency, respectively. Based on data from Japanese firms, the analysis further confirmed that the governance-actor-firm-performance relationship cannot be reduced to a single pathway.

Second, H2, stating that the indirect effect strengthens after the reforms, was not supported. The channel mediated by MA existed consistently even before the Stewardship and Corporate Governance Codes. The direct relationship, not mediated by MA, expanded afterward. One interpretation is that market-based discipline from foreign shareholders, through the threat of exit and price formation, had begun before dialogue was institutionalized. Moreover, the reforms opened channels other than the exercise of MA. Expanded payouts, cross-shareholding unwinding, and board changes were widespread after the reform and need not reflect improved MA, plausibly driving the larger direct effect.

Another fundamental interpretation is a measurement limitation: we treat foreign shareholders as one group despite their heterogeneity, from passive index investors to activists who engage through dialogue and proposals. The reform's ability-fostering effect should be strongest among active investors. Thus, pooling them likely dilutes and understates it. As foreign activism has grown in Japan, analysis restricted to active investors may reveal a strengthened mediating mechanism. Distinguishing investor types is an important task for future research.

Comparing paths clarifies that foreign-shareholder governance did not change across the reforms: no significant pre/post difference in path a (foreign ownership $\rightarrow$ MA) was noted, whereas path b (MA $\rightarrow$ profitability) declined significantly afterward. Thus, foreign-shareholder influence on management did not change, but the environment in which MA translates into performance did. Therefore, the slightly smaller post-reform indirect effect does not reflect weaker governance.

5.2 Research implications

This study has two theoretical implications. First, this study positions MA not as a given characteristic, but as an endogenous mediating variable that can change in response to governance. Previous MA research and Ting et al. (2021) have treated competence as the starting point of the mediating path. In contrast, drawing on the dynamic view of competence (Bloom et al. 2013; Cai and Szeidl 2018), this study established a pathway in which shareholder monitoring promotes the exercise of MA. The finding that intra-firm variations in the foreign ownership ratio are robustly associated with MA variations demonstrates the validity of this framework. Second, this study extended Ting et al.'s (2024) mediation framework on ownership structure, efficiency, and firm performance to include different governance actors and institutional environments. Partial mediation was consistently observed in the contrasting environments of Malaysia, characterized by concentrated ownership, and Japan, where market-based discipline has expanded. Thus, this mediation structure is not specific to any particular institutional environment. Furthermore, by using the MA score, which controls for firm-specific factors rather than firm efficiency, as the mediating variable,

we demonstrated directly that the observed channel is associated with changes in the portion attributable to management.

In terms of practical and policy implications, the results of this study suggest that dialogue with foreign shareholders is not only a source of pressure that management must avoid but can also serve as a channel for information that enhances management quality. However, this effect is gradual, and such dialogue does not lead to a short-term boost in performance but rather manifests as a cumulative improvement in management. Furthermore, the results do not support H2 and thus indicate that established frameworks for dialogue and the exercise of voting rights do not automatically link discipline from foreign shareholders to MA improvements. Although this finding does not negate the significance of institutional reform, such reform is effective not because of the framework, but rather the substance of engagement and the company's attitude toward utilizing the issues raised by shareholders to improve management.

5.3 Limitations and future research suggestions

This study has the following limitations. First, because the main analysis measured the key variables in the same fiscal year, we could not completely rule out the possibility of a reverse causality mechanism in which foreign-investor holdings increase in response to improved performance. Second, because the MA score and ROA are derived from the same financial statements, path b may partially involve a mechanical correlation; this limitation is common to Demerjian et al. (2012)-type measurements.

Third, the foreign ownership ratio serves only as a proxy for the potential influence of foreign shareholders, and the channels through which discipline is exerted likely differ depending on the breakdown of those shareholders (e.g., activists, pension funds, and

passive investors). Thus, an analysis by investor type can significantly elucidate the reasons why H2 was not supported in this study.

Fourth, comparisons between the pre- and post-reform periods did not isolate institutional reform impacts from changes in ownership structure and the macroeconomic environment that occurred during the same period. Thus, improving the accuracy of the analysis is a challenge. Fifth, the results of this study were obtained under Japan's institutional environment. Therefore, the institutional dependence of the mediating mechanisms must be examined to generalize them to other countries.

List of abbreviations

CEO: Chief executive officer

CG: Corporate governance

CI: Confidence interval

COGS: Cost of goods sold

DEA: Data envelopment analysis

EFF: Firm efficiency

FCF: Free cash flow

HHI: Herfindahl–Hirschman index

JPY: Japanese yen

MA: Managerial ability

PBR: Price-to-book ratio

PPE: Property, plant, and equipment

R&D: Research and development

ROA: Return on assets

SD: Standard deviation

SG&A: Selling, general, and administrative expenses

TSE: Tokyo Stock Exchange

VRS: Variable returns to scale

Declarations

Availability of data and materials

Most of the data used in this study were compiled by the authors from publicly available securities reports (Yūka Shōken Hōkokusho). PBR data were obtained from Bloomberg under license and are not publicly available. The processed dataset constructed for the analysis is available from the authors upon reasonable request; the Bloomberg-sourced PBR data are subject to Bloomberg's licensing terms.

Competing interests

The authors declare no competing interests.

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Consent for publication

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Code availability

The analysis code (R and Python) used to construct the sample, estimate the MA score, and run the mediation analyses is available from the corresponding author upon reasonable request.

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