



ARTICLE



EMPLOYEE DIRECTORS AS INTERNAL COMPETITIVE INTELLIGENCE MECHANISMS: EVIDENCE FROM INFORMATION ASYMMETRY AND INVESTMENT EFFICIENCY IN CHINESE LISTED FIRMS

DIRETORES REPRESENTANTES DOS EMPREGADOS COMO MECANISMOS INTERNOS DE INTELIGÊNCIA COMPETITIVA: EVIDÊNCIAS DA ASSIMETRIA INFORMACIONAL E DA EFICIÊNCIA DE INVESTIMENTO EM EMPRESAS CHINEAS LISTADAS

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ABSTRACT

Purpose: This paper examines whether employee directors function as internal competitive intelligence actors in Chinese listed firms. It focuses on their role in facilitating the circulation of firm-specific information, supporting board-level decision-making, and improving the informational conditions under which investment decisions are made. The paper further explores whether information asymmetry helps explain this relationship and whether the role of employee directors is more evident in the case of underinvestment.

Methodology/approach: Using a sample of Chinese A-share listed companies, the study employs panel regression models to examine the relationship between employee directors and investment inefficiency. Mediation analysis is used to assess the role of information asymmetry, which serves as an empirical proxy for internal information conditions. Additional tests include alternative measures of investment inefficiency and propensity score matching.

Originality/Relevance: The paper brings employee directors, information asymmetry, and investment efficiency into the same empirical setting, but frames them from a competitive intelligence perspective. Rather than treating employee directors only as a board arrangement, it considers them as internal actors who may improve information flow, support intelligence dissemination, and strengthen decision support within the firm. In this way, the study shifts the focus from governance structure alone to the informational processes that underpin strategic resource allocation.

Key findings: The results show that employee directors significantly reduce investment inefficiency. Information asymmetry mediates this relationship. The effect is asymmetric: employee directors mainly alleviate underinvestment, while their influence on overinvestment is not statistically significant. The effect is also stronger in state-owned enterprises.

Theoretical/methodological contributions: The paper contributes to the literature by showing that employee directors may affect investment efficiency through their influence on internal information conditions rather than through formal board participation alone. The findings suggest that their role is closely related to information quality, internal dissemination, and opportunity recognition. More broadly, the study offers an information-based explanation of how employee directors may strengthen the internal decision conditions associated with strategic resource allocation and, indirectly, with the basis of sustainable competitive advantage.

Keywords: Employee directors. Competitive intelligence. Information asymmetry. Investment efficiency. Underinvestment. Strategic decision-making.

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RESUMO

Objetivo: Este artigo examina se os diretores representantes dos empregados atuam como agentes internos de inteligência competitiva em empresas chinesas listadas. O foco está em seu papel na facilitação da circulação de informações específicas da empresa, no apoio à tomada de decisão em nível de conselho e na melhoria das condições informacionais sob as quais as decisões de investimento são realizadas. O estudo também investiga se a assimetria informacional ajuda a explicar essa relação e se o papel dos diretores representantes dos empregados é mais evidente em situações de subinvestimento.

Metodologia/abordagem: Utilizando uma amostra de empresas chinesas listadas na bolsa A-share, o estudo emprega modelos de regressão em painel para examinar a relação entre diretores representantes dos empregados e ineficiência de investimento. A análise de mediação é utilizada para avaliar o papel da assimetria informacional, que serve como proxy empírica das condições informacionais internas. Testes adicionais incluem medidas alternativas de ineficiência de investimento e pareamento por escore de propensão (*propensity score matching*).

Originalidade/Relevância: O artigo reúne diretores representantes dos empregados, assimetria informacional e eficiência de investimento em um mesmo contexto empírico, mas os interpreta sob a perspectiva da inteligência competitiva. Em vez de considerar os diretores representantes dos empregados apenas como um arranjo de governança, o estudo os trata como agentes internos capazes de melhorar o fluxo de informações, apoiar a disseminação da inteligência e fortalecer o suporte à decisão dentro da organização. Dessa forma, a pesquisa desloca o foco da estrutura de governança para os processos informacionais que sustentam a alocação estratégica de recursos.

Principais resultados: Os resultados demonstram que os diretores representantes dos empregados reduzem significativamente a ineficiência de investimento. A assimetria informacional medeia essa relação. O efeito é assimétrico: os diretores representantes dos empregados contribuem principalmente para reduzir o subinvestimento, enquanto sua influência sobre o sobreinvestimento não apresenta significância estatística. O efeito também é mais forte em empresas estatais.

Contribuições teóricas/metodológicas: O artigo contribui para a literatura ao demonstrar que os diretores representantes dos empregados podem influenciar a eficiência dos investimentos por meio de seu impacto sobre as condições informacionais internas, e não apenas por sua participação formal no conselho. Os resultados sugerem que seu papel está intimamente relacionado à qualidade da informação, à disseminação interna do conhecimento e ao reconhecimento de oportunidades. De forma mais ampla, o estudo oferece uma explicação baseada em informação sobre como esses diretores podem fortalecer as condições internas de decisão associadas à alocação estratégica de recursos e, indiretamente, aos fundamentos da vantagem competitiva sustentável.

Palavras-chave: Diretores representantes dos empregados. Inteligência competitiva. Assimetria informacional. Eficiência de investimento. Subinvestimento. Tomada de decisão estratégica.



1 INTRODUCTION

In complex and uncertain business environments, firms need more than favorable market positions to sustain long-term competitiveness. They also need the ability to identify useful information, interpret it, circulate it internally, and use it in strategic decisions. This idea lies at the center of competitive intelligence. Competitive intelligence is not limited to collecting external market or competitor information. It also concerns how organizations govern information inside the firm, how knowledge moves across organizational levels, and how relevant information is converted into decisions. When firms are able to organize these intelligence activities effectively, they are better positioned to recognize opportunities, coordinate internal action, and allocate resources in ways that support long-term development (Barney, 1991; Cao et al., 2019; Teece et al., 1997). Investment efficiency can be understood within this broader information-based view. It reflects whether firms can identify valuable opportunities, evaluate them properly, and commit resources at the right time. When information is delayed, fragmented, or poorly communicated, firms may miss profitable projects or allocate resources to less productive uses. In this regard, investment efficiency is not only a financial outcome. It also reflects the quality of internal information use and strategic resource allocation (Biddle et al., 2009; Richardson, 2006). This makes internal governance arrangements especially relevant when they influence how operational knowledge reaches decision makers and how boards evaluate strategic choices.

Employee directors have received growing attention in recent years (Gregorič & Poulsen, 2020; Huang & Huang, 2022; Xu & Duan, 2026). As employees who serve on the board of directors, they connect daily operations with board-level deliberation. This position may allow them to contribute beyond formal representation or compliance. They may bring operational knowledge, workforce information, and project-related insights to the board. Such information can support internal intelligence circulation and improve the quality of decision support available to directors. In China, the employee director system has evolved alongside broader corporate governance reform (Xinhua News Agency, 2023). As the relevant legal rules have evolved, a larger number of Chinese listed firms have established employee director positions. This development raises an important question: do employee directors create value only through representation, or can they also support internal intelligence processes that improve strategic decision-making?

Current research generally suggests that employee representation correlates with favorable governance outcomes (Huang & Huang, 2022; Jiang et al., 2021; Li & Ren, 2025). Evidence from both foreign and Chinese settings indicates that employee directors may decrease agency costs (Ginglinger et al., 2011; Lin et al., 2018), enhance corporate value (Fauver & Fuerst, 2006), and influence a range of firm outcomes, including investment behavior (Huang & Huang, 2022), financing decisions (Quan et al., 2025), and audit-related performance (Li & Ren, 2025). Even so, less is known about the informational route through which employee directors affect investment decisions. Specifically, limited focus has been directed into the role of information asymmetry in this relationship. This issue is important because employee directors may have access to operationally grounded information that helps the board better understand investment needs, evaluate project feasibility, and recognize strategic opportunities in time. Another unresolved issue is whether their influence operates to the same extent in cases of overinvestment and underinvestment.



This paper addresses these issues by examining whether employee directors improve investment efficiency in Chinese listed firms and whether information asymmetry helps explain this relationship. Employing panel data from 2015 to 2024, it also considers whether the effect of employee directors is more evident in reducing underinvestment. The paper contributes to the literature in three ways. First, it considers employee directors as organizational participants who may improve internal information flow and board-level decision support. Second, it shows information asymmetry helps explain the relationship between employee directors and investment efficiency, which sheds light on how internal information conditions shape firms' strategic resource allocation. Third, the results suggest that employee directors are especially relevant in alleviating underinvestment, as they may help firms identify and support valuable opportunities that could otherwise be missed. In this sense, the study offers an information-based explanation of how employee directors may strengthen the organizational conditions associated with long-term competitiveness.

The rest of the paper is arranged as follows. Section 2 reviews the relevant literature and sets out the hypotheses from a competitive intelligence perspective. Section 3 describes the methodology, including the sample, variables, and empirical models. Section 4 reports the empirical results, including the baseline findings, mediation analysis, robustness checks, and additional analyses. Section 5 concludes with the main findings, implications, limitations, and directions for future research.

2 LITERATURE REVIEW AND HYPOTHESIS

2.1 Employee Directors, Competitive Intelligence, and Investment Efficiency

Sustainable competitive advantage is shaped by market opportunities and by a firm's ability to acquire, interpret, and use information in ways that support effective resource allocation (Barney, 1991; Cao et al., 2019; Teece et al., 1997). Competitive intelligence refers to the organizational process through which relevant information is collected, analyzed, disseminated, and used to support strategic decisions (Calof & Wright, 2008; Prescott, 2001). From this perspective, firms are more likely to maintain long-term competitiveness when relevant information is identified in time, circulated within the organization, and translated into sound strategic choices (Cavallo et al., 2021; Madureira et al., 2021). Dynamic capabilities research similarly suggests that firms need to sense opportunities, seize them, and reconfigure resources in response to environmental change (Teece, 2007). This logic is closely connected to strategic foresight, because firms must not only respond to existing information, but also anticipate emerging opportunities and risks before investment decisions are made. In this context, investment efficiency can be viewed as one indication of how well a firm uses information to allocate resources to value-enhancing projects rather than deviating from its optimal investment level. When firms depart from optimal investment, they may either overinvest in low-value projects or underinvest in profitable opportunities. Both forms of investment inefficiency reduce the quality of resource allocation and can weaken long-term competitiveness (Biddle et al., 2009; Chen et al., 2011; Franzoni, 2009; Richardson, 2006). Seen in this way, investment efficiency is more than a financial outcome. It also reflects whether firms are able to recognize worthwhile opportunities, assess them properly, and commit resources in a timely manner. For this reason, investment efficiency can be interpreted as an



observable outcome of how well internal intelligence is converted into resource allocation decisions.

Prior research has linked investment inefficiency to agency conflicts, information asymmetry, managerial self-interest, and weak internal governance (Almutairi et al., 2025; Chaidir et al., 2025; Yadav & Yadav, 2025; Zhang et al., 2024). Seen from this angle, governance arrangements that enhance information flows and limit decision distortions are expected to contribute to better investment outcomes. However, this study does not treat governance only as a monitoring device. It also views governance as part of an internal intelligence architecture that determines how operational knowledge is collected, filtered, communicated, and used by decision makers. The board of directors is central to this process. It monitors managerial behavior, evaluates major corporate choices, and helps firms respond to emerging opportunities (De Haas et al., 2021; Neckebrouck & Schulze, 2025; Thys et al., 2024). Its effectiveness depends not only on monitoring, but also on whether directors can bring firm-specific information and informed judgment into the decision process. This is where employee directors may matter in a distinctive way. The literature on employee representation generally suggests that employee participation can improve governance outcomes. Existing studies indicate that employee directors may reduce agency costs (Ginglinger et al., 2011; Lin et al., 2018), enhance corporate value (Fauver & Fuerst, 2006), and affect a range of economic corporate outcomes, including investment behavior (Huang & Huang, 2022), financing decisions (Quan et al., 2025), and audit-related performance (Li & Ren, 2025). Given their position within the firm, they are more familiar with operating conditions, production processes, and organizational needs than many outside directors (Huang & Huang, 2022). Their participation may therefore improve the circulation of internal information to the board, strengthen the board's understanding of firms' actual investment needs, and support more informed investment decisions. In terms of competitive intelligence, employee directors may act as internal intelligence nodes that connect operational information sources with board-level decision arenas.

From this perspective, employee directors may improve investment efficiency through the board's monitoring role and through the quality of information available for decision-making. By narrowing internal information gaps, they may strengthen the board's ability to assess investment proposals. Their firm-specific knowledge may also improve the flow of relevant information to directors, making it easier for firms to identify valuable opportunities and allocate resources more effectively. Thus, the expected effect of employee directors is not based only on agency control, but also on their role in the intelligence cycle: sensing operational signals, communicating them to the board, and supporting their use in investment decisions. As a result, employee directors may help strengthen the informational conditions that support higher investment efficiency.

Hypothesis 1. Employee directors improve corporate investment efficiency.

2.2 Information Asymmetry as a Mediating Channel of Internal Competitive Intelligence

Information asymmetry is an important source of inefficient investment because it weakens firms' ability to evaluate opportunities and allocate resources effectively (Salhi, 2020). From the perspective of internal competitive intelligence, this problem also points to limits in how information is generated, circulated, and used within the firm. Since competitive intelligence depends on the movement of information from collection and interpretation to



dissemination and decision use, lower information asymmetry may indicate a more effective internal information environment (Calof & Wright, 2008; Madureira et al., 2021). When relevant information is unevenly distributed within the firm, the board may find it more difficult to assess project quality, distinguish valuable opportunities from less profitable ones, and make timely investment decisions. Under such conditions, firms are more inclined to deviate from their ideal investment level (Biddle et al., 2009; Richardson, 2006). Prior research therefore suggests that a better information environment is closely associated with more efficient investment and better resource allocation (Menshawy et al., 2023).

The literature has long emphasized that information asymmetry affects investment behavior (Khan et al., 2024; H.-F. Yu et al., 2020). Firms facing greater informational frictions often experience more serious investment distortions because profitable opportunities are harder to identify and evaluate, while weak information environments may also allow inefficient projects to pass internal scrutiny. As a result, reducing information asymmetry is important not only for financial efficiency, but also for improving the internal information conditions that support strategic decision-making. From a competitive intelligence standpoint, better information quality and more effective intelligence dissemination should make it easier for firms to recognize opportunities and commit resources in a timely way (Cavallo et al., 2021; Madureira et al., 2021). This view links information asymmetry to the intelligence cycle: information must be collected, interpreted, disseminated, and incorporated into decisions before it can support strategic resource allocation.

Employee directors may play an important role in this process. Because they are embedded in the firm's internal operations, they have access to firm-specific knowledge that is often less visible to outside directors (Huang & Huang, 2022). Their participation in board deliberations may improve the transmission of operational information, reduce informational frictions between management and directors, and strengthen the board's understanding of firms' actual investment needs. They may therefore contribute to intelligence governance by creating an additional channel through which operational knowledge enters board-level discussion. In this way, employee directors may contribute not only to monitoring, but also to the internal circulation of information and the quality of decision support available to the board.

If employee directors improve firms' internal information conditions, and if lower information asymmetry in turn supports more efficient investment decisions, then information asymmetry should serve as an important channel linking employee directors to investment efficiency. Put differently, employee directors may influence investment efficiency not only through governance oversight and through their contribution to information quality, intelligence dissemination, and board-level decision support. This mediating logic places information asymmetry within an internal competitive intelligence system, where the key issue is whether relevant knowledge can move from operational settings to strategic decision-making arenas.

Hypothesis 2. Information asymmetry mediates the association between employee directors and corporate investment efficiency.

2.3 Employee Directors, Opportunity Recognition, and Underinvestment

Investment inefficiency generally takes two main forms: overinvestment and underinvestment (Biddle et al., 2009; Chen et al., 2011; Yu, 2023). Although prior studies suggest that employee directors enhance corporate investment efficiency by constraining overinvestment and alleviating underinvestment (Huang & Huang, 2022), their influence may



not be equally strong across the two forms of inefficient investment.

Existing research indicates that employee directors perform both supervisory and advisory roles (Huang & Huang, 2022). As board members, they may strengthen internal monitoring and reduce managerial opportunism (Li & Ren, 2025). At the same time, they may provide the board with valuable first-hand information that outside directors are less likely to obtain (Huang & Huang, 2022). This informational advantage can improve the board's understanding of the firm's operating environment and support more informed investment decisions. From the perspective of competitive intelligence, this role is especially relevant because operational information can serve as an early signal of emerging investment needs and strategic opportunities.

The distinction between overinvestment and underinvestment matters because the governance role of employee directors is not all the same in these two situations. Overinvestment is usually linked to managerial self-interest, overconfidence, or weak monitoring (Kang et al., 2022; Silverstein, 2020). Underinvestment, by contrast, is more likely to arise when firms fail to undertake valuable projects because financing constraints, excessive caution, or informational frictions make it difficult for decision makers to recognize or support worthwhile opportunities (Albagli et al., 2023; Jin, 2025). In this respect, employee directors may have a stronger advantage in improving internal information quality and communication than in restraining overinvestment. This argument shifts the focus from discipline alone to opportunity recognition, strategic foresight, and the timely use of internal intelligence.

This advantage becomes especially relevant when firms face underinvestment. When profitable investments are at risk of being overlooked, employee directors may help reduce that risk by improving the internal flow of firm-specific information and strengthening the board's understanding of actual investment needs. In this way, employee directors may help firms identify and undertake projects that are important for long-term development. Their role can therefore be understood as part of the sensing and dissemination stages of the intelligence cycle, where operational signals are recognized and transferred to those responsible for strategic decisions.

From a competitive intelligence perspective, underinvestment is closely related to the failure to recognize, communicate, and act on valuable opportunities in time. Competitive intelligence research emphasizes that information becomes strategically useful only when it is transformed into actionable knowledge for decision-making (Cavallo et al., 2021). Employee directors may be particularly valuable when they help operational information reach the board before profitable opportunities are overlooked. Their contribution therefore appears to be more closely related to opportunity recognition and timely action than to constraining managerial expansion. This is also where dynamic capabilities and competitive intelligence intersect: firms need to sense opportunities, interpret their value, and mobilize resources before those opportunities are lost.

Reducing overinvestment usually requires stronger discipline and closer control over managerial expansion incentives. Employee directors may take part in monitoring, but this is unlikely to be their main strength (Huang & Huang, 2022). Their more distinctive role lies in information provision, internal coordination, and strategic communication. For this reason, if employee directors improve investment efficiency, their influence is likely to be stronger in reducing underinvestment than in limiting overinvestment. This interpretation is also consistent with the view that long-term competitiveness depends not only on avoiding wasteful investment, but also on recognizing valuable opportunities and acting on them in a timely way (Du et al.,



2025). Employee directors are therefore expected to be more effective in mitigating underinvestment than overinvestment. In other words, their value is expected to be greater when the firm's main problem is weak opportunity recognition rather than excessive managerial expansion.

Hypothesis 3. If employee directors improve investment efficiency, this effect is more pronounced in reducing underinvestment.

2.4 Conceptual Framework

The conceptual framework draws on competitive intelligence literature, which views intelligence as a process involving information collection, analysis, dissemination, and decision use (Calof & Wright, 2008; Prescott, 2001). In this study, employee directors are positioned as internal actors who may support this process by connecting operational information sources with board-level decision-making. This does not mean that competitive intelligence capability is directly measured. Instead, the framework uses information asymmetry as an indirect proxy for the quality of internal information flow and decision support.

The framework further distinguishes among total investment inefficiency, overinvestment, and underinvestment. This distinction is important because the informational role of employee directors is expected to be more relevant when firms risk missing valuable opportunities than when they need to restrain excessive expansion. Ownership structure is also included as a contextual condition, since decision structures and internal communication channels may differ between state-owned and non-state-owned enterprises.

Overall, the framework moves beyond a narrow agency-theory interpretation. It treats employee directors as part of an internal intelligence governance arrangement that may shape how firms sense opportunities, disseminate information, and make strategic investment decisions. The conceptual framework is integrated in figure 1.

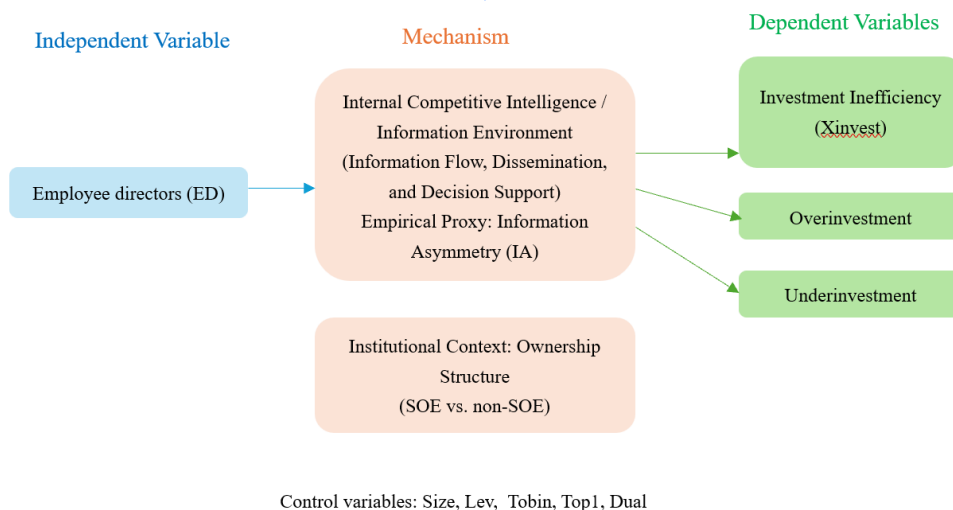


Figure 1. Conceptual framework linking employee directors, internal competitive intelligence, and investment efficiency.



3 METHODOLOGY

3.1 Data and Sample

This study utilizes A-share listed companies located in China spanning the years 2015-2024, omitting the financial and insurance industries, as preliminary samples. The data of employee directors are manually gathered from the announcements in the annual report of all A-share listed companies based on Wind databases. If a company is listed and delisted in the same year, this study drops out the samples of these companies. Additional empirical data, including stock returns and price, financial data and other needed data, will be obtained from CSMAR Database and Wind Database. This study reduces all continuous variables to the 1 percent level to lessen the influence of extreme values in chosen samples. The empirical design does not directly measure competitive intelligence capability as a latent construct. Instead, it examines whether the presence of employee directors is associated with observable improvements in firms' information conditions and investment outcomes.

3.2 Measurement of Variables

The dependent variable in this paper is investment inefficiency, the independent variable is employee directors, and the mediating variable is information asymmetry. From a competitive intelligence perspective, the study focuses on the internal movement and use of firm-specific information. This study uses information asymmetry as an indirect proxy for internal information conditions associated with competitive intelligence. The detailed measurements of these variables are listed in Table 1.

Table 1 – The definitions of the variables

| No | Variables | Definitions | Source(s) |
|----|--|--|------------------------------|
| 1 | Xinvest-investment inefficiency (dependent variable) | the degree of inefficient investment of companies, including both overinvestment and underinvestment of companies (Huang & Huang, 2022; Richardson, 2006) | CSMAR |
| 2 | ED-employee directors (independent variable) | Dummy variable, if employee directors are appointed to the board in a given year, ED is 1, if not, ED is 0 (Huang & Huang, 2022; Li & Ren, 2025) | Annual report, Wind Database |
| 3 | IA (mediating variable) | disclosure assessment score as an indirect proxy for firms' information environment (Song et al., 2026) | CSMAR |
| | Control variables | | |
| 4 | Size (firm size) | The natural logarithm of total assets (Zhao et al., 2025) | CSMAR |
| 5 | Lev (firm asset-liability ratio) | Entire liabilities split by entire assets (Gong et al., 2023) | CSMAR |
| 6 | Tobin (firm growth opportunity) | (market value of equity plus net debt) divided by the current value of tangible assets, with non-tradable shares at stock market value approximated as net assets per share (Richardson, 2006) | CSMAR |
| 7 | Top1 (the largest ownership) | the ownership percentage of the predominant shareholder (Jiang et al., 2018) | CSMAR |



| | | |
|-------------|--------------------|--|
| percentage) | | |
| 8 | Dual (CEO duality) | Dummy variable, if the chair also serves as CEO (or general manager) it equals to 1, and 0 otherwise (Huang & Huang, 2022) |
| 9 | SOE (state-owned) | Dummy variable, if the firm is state-owned firm it equals to 1, 0 otherwise (Xu & Duan, 2026) |

Source: Created by authors

Referring to Richardson (2006), this research developed Equation 3.1 as model to evaluate the level of corporate investment inefficiency. This study employs multiple regression by industry and year. Listed in model 3.1 investment inefficiency $Xinvest_{i,t}$ is the absolute value of the residual, with higher values indicating lower investment efficiency of enterprises. This model is presented specifically below:

$$Inv_{i,t} = \partial_0 + \partial_1 Size_{i,t-1} + \partial_2 Leverage_{i,t-1} + \partial_3 TobinQ_{i,t-1} + \partial_4 Cash_{i,t-1} + \partial_5 Ret_{i,t-1} + \partial_6 Age_{i,t-1} + \partial_7 Inv_{i,t-1} + \varepsilon_{i,t} \quad \text{Equation 3.1}$$

There are two measurements to evaluate employee directors. Following Huang and Huang (2022), this study first utilizes a dummy variable ED to represent whether listed companies set up employee directors. If there are employee directors in a given year, ED equals 1, if not, ED equals 0. Second, because the dummy variable can not reflect so much information, this study uses the percentage of employee directors (EDP), calculated as the count of employee directors divided by total board seats.

This study adopts the measurement as proxy for information asymmetry. In this research, the information asymmetry is the mediator. We use CSMAR data to get disclosure assessment score as an indicator for the degree of corporate information asymmetry. The better a company's information disclosure practices, the more high-quality information minority shareholders can obtain, thereby reducing the degree of information asymmetry between them and the company. Therefore, using the exchange's disclosure assessment score to calculate the degree of information asymmetry indicates that a higher score corresponds to a lower degree of information asymmetry.

3.3 Research Models

For the sake of exploring the influence of employee director system on enterprise investment efficiency, drawing inspiration from Huang and Huang (2022), the explanatory variable in this research, is investment inefficiency named $Xinvest_{i,t}$ as Equation 3.2 is outlined below:

$$Xinvest_{i,t} = \partial_0 + \partial_1 ED_{i,t} + \sum Controls_{i,t} + \varepsilon_{i,t} \quad \text{Equation 3.2}$$

To test the mediating effect of information asymmetry, this study followed the three steps approach introduced by Baron and Kenny (1986), and used by Torchia et al. (2011) and Sarang et al. (2024). And we set model 3.3 (second step) and model 3.4 (third step) as follows:

$$IA_{i,t} = \beta_0 + \beta_1 ED_{i,t} + \sum Controls_{i,t} + \varepsilon_{i,t} \quad \text{Equation 3.3}$$

$$Xinvest_{i,t} = \gamma_1 + \gamma_2 ED_{i,t} + \gamma_3 IA_{i,t} + \sum Controls_{i,t} + \varepsilon_{i,t} \quad \text{Equation 3.4}$$



4 RESULTS AND ANALYSIS

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics of the main variables. Overall, the mean value of investment inefficiency (Xinvest) is 0.0343, and the standard deviation is 0.0401, ranging from 0.0004 to 0.2547, showing substantial variation in investment efficiency across firms. The key explanatory variable, employee directors (ED), has a mean value of 0.0399, suggesting that approximately 3.99% of companies in the sample have employee directors, indicating a relatively low adoption rate. The mean value of EDP is 0.0049, implying that employee directors account for a small proportion of board composition. This relatively low adoption rate indicates that employee directors remain a limited but potentially meaningful governance arrangement in the Chinese listed-firm context.

Regarding the mediating variable, the mean of information asymmetry (IA) is 14.4356, and the standard deviation is 10.8064. Values span 2 to 44, which shows considerable heterogeneity in firms' information environments. In this study, IA is interpreted as an indirect archival proxy for information conditions rather than as a direct measure of competitive intelligence capability. The large variation in IA suggests that firms differ considerably in disclosure quality, information accessibility, and the conditions under which information may support board-level decision-making.

It should be noted that the number of observations for IA (28,117) is slightly lower than that for the other variables (28,217). Because IA is a constructed variable based on specific sources, and this results in 100 missing values. Since IA is not included in the baseline regression, descriptive statistics are reported based on all available observations for each variable. In subsequent analyses involving IA, observations with missing IA values are excluded. The minimal number of missing observations suggests that this approach is unlikely to significantly impact the empirical results.

Tabela 2 – Descriptive statistics

| Variables | Obs | Mean | Std. dev. | Min | Max | Variables |
|-----------|--------|-----------|-----------|-----------|-----------|-----------|
| Xinvest | 28,217 | 0.0342873 | 0.0400787 | 0.0004308 | 0.2546878 | Xinvest |
| ED | 28,217 | 0.039905 | 0.1957395 | 0 | 1 | ED |
| EDP | 28,217 | 0.0049215 | 0.0257451 | 0 | 0.5 | EDP |
| IA | 28,117 | 14.43564 | 10.8064 | 0 | 44 | IA |
| Size | 28,217 | 22.4557 | 1.278654 | 18.4434 | 26.43536 | Size |
| Lev | 28,217 | 0.4265386 | 0.1986804 | 0.0487301 | 0.9265226 | Lev |
| Tobin | 28,217 | 2.021582 | 1.350889 | 0.794597 | 17.67593 | Tobin |
| Bsize | 28,217 | 2.104152 | 0.196081 | 1.609438 | 2.639057 | Bsize |
| Outdir | 28,217 | 37.81064 | 5.320222 | 33.33 | 57.14 | Outdir |
| Top1 | 28,217 | 33.1298 | 14.36539 | 8.86 | 72.8 | Top1 |
| Dual | 28,217 | 0.3003509 | 0.4584187 | 0 | 1 | Dual |
| SOE | 28,217 | 0.3351171 | 0.4720398 | 0 | 1 | SOE |

Source: Created by authors



4.2 Correlation coefficient analysis

Table 3 presents the Pearson correlation coefficients for the primary variables. The correlation coefficients fall within an acceptable range, and no significant multi-collinearity problems are seen.

Focusing on the key variables, employee directors (ED) are negatively and significantly correlated with investment inefficiency. This suggests that the presence of employee directors is associated with lower investment inefficiency. And this finding is consistent with the theoretical expectations.

Regarding the mediating variable, information asymmetry (IA) has a substantial correlation with investment inefficiency at 1% level (coefficient = -0.0745). This result indicates that lower information asymmetry correlated with improved investment efficiency. In addition, ED has a positive association with IA (coefficient = 0.0817) at 1% level, implying that employee directors can enhance the information environment and mitigate information asymmetry. These relationships provide preliminary support for the mediation hypothesis.

These correlations are only preliminary and should not be interpreted as causal evidence. Still, they are consistent with the theoretical argument that employee directors may contribute to investment efficiency through internal information conditions. From a competitive intelligence perspective, the results provide an initial indication that board-level employee representation may be related to the circulation and accessibility of firm-specific information.



Tabela 3 – Descriptive statistics

| | Xinvest | ED | EDP | IA | Size | Lev | Tobin | Bsize | Outdir | Top1 | Dual | SOE |
|---------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| Xinvest | 1.0000 | | | | | | | | | | | |
| ED | -0.0304*** | 1.0000 | | | | | | | | | | |
| EDP | -0.0284*** | 0.9377*** | 1.0000 | | | | | | | | | |
| IA | -0.0745*** | 0.0817*** | 0.0719*** | 1.0000 | | | | | | | | |
| Size | -0.0881*** | 0.1461*** | 0.1236*** | 0.4132*** | 1.0000 | | | | | | | |
| Lev | -0.0434*** | 0.0905*** | 0.0881*** | 0.1443*** | 0.4621*** | 1.0000 | | | | | | |
| Tobin | 0.1159*** | -0.0727*** | -0.0614*** | -0.1645*** | -0.3860*** | -0.2574*** | 1.0000 | | | | | |
| Bsize | -0.0393*** | 0.0874*** | 0.0497*** | 0.0970*** | 0.2664*** | 0.1271*** | -0.1065*** | 1.0000 | | | | |
| Outdir | 0.0115* | -0.0241*** | -0.0106* | 0.0014 | -0.0195*** | -0.0120** | 0.0404*** | -0.573*** | 1.0000 | | | |
| Top1 | -0.0060 | 0.0885*** | 0.0695*** | 0.0988*** | 0.2067*** | 0.0285*** | -0.0778*** | 0.0331*** | 0.0366*** | 1.0000 | | |
| Dual | 0.0519*** | -0.0750*** | -0.0630*** | -0.0572*** | -0.1811*** | -0.1076*** | 0.0833*** | -0.2019*** | 0.1239*** | -0.0626*** | 1.0000 | |
| SOE | -0.1224*** | 0.2130*** | 0.1843*** | 0.1577*** | 0.3556*** | 0.2376*** | -0.1526*** | 0.2871*** | -0.0664*** | 0.2396*** | -0.3146*** | 1.0000 |

*** p<0.01, ** p<0.05, * p<0.1

4.3 Regression results

4.3.1 Employee directors and corporate investment efficiency

Table 4 presents the baseline regression results examining the relationship between employee directors and corporate investment efficiency. Column (1) uses the presence of employee directors (ED) as the key independent variable, whereas Column (2) replaces it with the percentage of employee directors (EDP).

Table 4 – Regression results of employee directors and corporate investment inefficiency

| Variables | (1) Xinvest | (2) Xinvest |
|---------------------|---------------------|---------------------|
| ED | -0.0056**(-2.1513) | |
| EDP | | -0.0480***(-2.8534) |
| Size | -0.0007(-0.6605) | -0.0007(-0.6514) |
| Lev | -0.0082*(-1.7992) | -0.0082*(-1.7907) |
| Tobin | 0.0028*** (8.1399) | 0.0028*** (8.1338) |
| Bsize | 0.0087** (2.2099) | 0.0084** (2.1294) |
| Outdir | -0.0002*(-1.7494) | -0.0002*(-1.7673) |
| Top1 | 0.0007*** (9.0439) | 0.0007*** (9.0391) |
| Dual | -0.0002(-0.1867) | -0.0002(-0.1820) |
| SOE | -0.0102***(-4.4387) | -0.0102***(-4.4349) |
| cons | 0.0178(0.6684) | 0.0183(0.6873) |
| N | 28217 | 28217 |
| adj. R ² | 0.019 | 0.019 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

According to the regression results of Table 4, the coefficient of ED is -0.0056 and statistically significant at the 5% level, suggesting that the presence of employee directors significantly reduces investment inefficiency. This result suggests that employee directors contribute to more efficient investment decisions.

When ED is replaced with EDP, the coefficient remains negative and significant. This indicates that both the existence of employee directors and the intensity of their participation are associated with better investment efficiency. These findings support Hypothesis 1.

Beyond the statistical result, the finding has a strategic interpretation. Employee directors may improve investment decisions because they are closer to internal operations and may bring firm-specific knowledge into board discussions. Their value therefore lies not only in formal governance participation, but also in the informational support they may provide for board-level decision-making. This interpretation is consistent with the view that internal information flow is important for strategic resource allocation.

4.3.2 The mediation of information asymmetry

This study uses three step approaches to examine the mediation of information asymmetry (Baron & Kenny, 1986; Sarang et al., 2024; Torchia et al., 2011). Table 5 presents the mediation regression results examining the role of IA in the relationship between employee

directors and investment efficiency.

Tabela 5 – Mediation regression results of information asymmetry

| Variables | (1) Xinvest | (2) IA | (3) Xinvest |
|---------------------|---------------------|-----------------------|----------------------|
| EDP | -0.0479***(-2.8349) | 28.4502***(5.8388) | -0.0329*(-1.9044) |
| IA | | | -0.0005***(-13.5113) |
| Size | -0.0009(-0.8627) | 9.8917*** (37.3001) | 0.0043*** (3.5456) |
| Lev | -0.0074(-1.6214) | -4.0533***(-4.2148) | -0.0096**(-2.1230) |
| Tobin | 0.0028*** (8.0177) | 0.3162*** (4.5799) | 0.0030*** (8.6919) |
| Bsize | 0.0083** (2.1240) | -4.1223***(-4.5693) | 0.0061 (1.5879) |
| Outdir | -0.0002*(-1.7242) | 0.0282 (1.0248) | -0.0002 (-1.5999) |
| Top1 | 0.0007*** (8.9838) | -0.1460***(-8.8071) | 0.0006*** (8.1307) |
| Dual | -0.0002(-0.1878) | 0.0554 (0.2316) | -0.0002 (-0.1647) |
| SOE | -0.0107***(-4.6337) | 4.7108*** (9.0551) | -0.0082***(-3.5947) |
| _cons | 0.0232 (0.8722) | -2.0e+02***(-29.8985) | -0.0798***(-2.7833) |
| N | 28117 | 28117 | 28117 |
| adj. R ² | 0.019 | 0.236 | 0.029 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

Column (1) demonstrates that the percentage of employee directors (EDP) is negatively and significantly associated with investment inefficiency (Xinvest) (coefficient = -0.0479, $p < 0.01$), suggesting that employee directors enhance investment efficiency. IA is used as the dependent variable in column (2). At the 1% level, the EDP coefficient of 28.4502 is statistically significant. This indicates that employee directors significantly improve the firm's information environment. This provides evidence for the first stage of the mediation effect. Column (3) includes both EDP and IA. The coefficient of IA is -0.0005 and is also significant at the 1% level, suggesting that better information environments correlate with enhanced investment efficiency. Meanwhile, the EDP coefficient decreases in magnitude from -0.0479 to -0.0329 and becomes less significant (from 1% to 10%), suggesting that part of the effect of employee directors operates through information asymmetry.

Overall, the results indicate that employee directors affect investment efficiency both directly and indirectly through improving information asymmetry. Therefore, information asymmetry serves as a mediating factor in this relationship.

Tabela 6 – Indirect, Direct, and Total Effects

| | Est | Std_err | z value | P>z |
|---------------------|--------|---------|---------|-------|
| a_coefficient | 8.686 | 2.317 | 3.749 | 0 |
| b_coefficient | 0 | 0 | -6.732 | 0 |
| Indirect_effect_a×b | -0.001 | 0 | -3.275 | 0.001 |
| Direct_effect_c' | -0.003 | 0.009 | -0.305 | 0.761 |
| Total_effect_c | -0.004 | 0.009 | -0.455 | 0.649 |

Source: Created by authors

Table 6 reports the decomposition of effects. The coefficient for path a is 8.686 ($p < 0.01$), indicating that employee directors significantly affect information asymmetry. Because

a higher IA value represents lower information asymmetry, this result suggests that employee directors help reduce information asymmetry within firms. The coefficient of path b is also statistically significant ($z = -6.732$, $p < 0.01$), and this shows lower information asymmetry is associated with higher investment efficiency, as a larger Xinvest value indicates lower efficiency.

The indirect effect is -0.001 and remains statistically significant at the 1% level, while the direct effect ($c' = -0.003$) and the total effect ($c = -0.004$) are not significant. This indicates that the association between employee directors and investment efficiency operates mainly through the mediating role of information asymmetry.

To further verify this result, a non-parametric bootstrap test with 1,000 replications is conducted. As shown in Table 7, the indirect effect remains significant (coefficient = -0.0014 , $z = -3.14$, $p = 0.002$), while the direct effect remains insignificant (coefficient = -0.0028 , $p = 0.723$). The bootstrap results therefore provide further support for the mediating role of information asymmetry.

Tabela 7 – Bootstrap Test for Mediation of Information Asymmetry

| Effect Type | Coefficient | z | P-value |
|-----------------------|-------------|-------|---------|
| Indirect Effect (a×b) | -0.0014 | -3.14 | 0.002 |
| Direct Effect (c') | -0.0028 | -0.35 | 0.723 |

Source: Created by authors

In summary, the mediation result is important for the competitive intelligence argument of this paper. It suggests that employee directors affect investment efficiency mainly through improvements in the firm's information environment. More specifically, employee directors may help firm-specific information circulate more effectively, reduce informational frictions, and improve the quality of decision support available to the board.

At the same time, this interpretation should be treated carefully. IA is not a direct measure of competitive intelligence capability, intelligence governance, or a complete intelligence system. Rather, it is used here as an indirect proxy for firms' information conditions. The results therefore provide evidence of an information-based channel, but they do not directly measure the full intelligence cycle or internal intelligence capability. This clarification is important because the study relies on archival data rather than interviews, case evidence, or direct observation of organizational intelligence processes. Compared with Huang and Huang (2022), which mainly focus on the direct association between employee directors and investment efficiency, the present study extends the analysis by identifying information asymmetry as an important channel in this relationship. This suggests that the value of employee directors lies in governance participation, and also in improving the informational conditions that shape strategic resource allocation. The result is also consistent with earlier studies that underline the importance of information conditions in investment decisions and corporate outcomes (Arab et al., 2020; Ayagi, 2026).

4.3.3 Employee directors and corporate overinvestment and underinvestment

Table 8 presents the regression results examining the effects of employee directors on overinvestment and underinvestment. The coefficient of ED on overinvestment is negative but

not statistically significant. This indicates that employee directors do not have a clear effect on reducing overinvestment. In contrast, ED has a significantly negative effect on underinvestment, suggesting that employee directors help alleviate underinvestment.

Tabela 8 – Regression results of employee directors and corporate overinvestment and underinvestment

| Variables | (1) Overinvestment | (2) Underinvestment |
|----------------------------|---------------------|---------------------|
| ED | -0.0050(-0.8902) | -0.0058***(-3.1556) |
| Size | -0.0026(-1.1225) | -0.0016*(-1.9060) |
| Lev | 0.0048(0.4532) | -0.0099***(-3.1103) |
| Tobin | 0.0031*** (2.9218) | 0.0027*** (9.7576) |
| Bsize | 0.0047(0.5236) | 0.0071** (2.4071) |
| Outdir | -0.0007***(-2.7266) | -0.0001(-0.5949) |
| Top1 | 0.0012*** (7.0519) | 0.0003*** (5.5557) |
| Dual | -0.0003(-0.1128) | -0.0004(-0.4998) |
| SOE | -0.0132**(-2.1014) | -0.0068***(-4.0528) |
| cons | 0.0751(1.3032) | 0.0412** (2.0334) |
| <i>N</i> | 11053 | 17164 |
| adj. <i>R</i> ² | 0.021 | 0.028 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

This asymmetric result is central to the paper's interpretation. Employee directors appear to be more effective when firms risk missing valuable investment opportunities than when firms need to constrain excessive expansion. From a competitive intelligence perspective, underinvestment can be understood partly as a failure of opportunity recognition, information circulation, and timely decision support. Employee directors may help reduce this problem because they are closer to operations and may communicate project needs, production constraints, and investment opportunities to the board more effectively.

The result does not mean that employee directors have no monitoring function. Rather, it suggests that their comparative value may lie more in information provision and opportunity recognition than in disciplining managerial expansion. This finding supports Hypothesis 3 and provides a more strategic interpretation of the role of employee directors in investment decisions.

4.4 Robustness Tests

4.4.1 Endogeneity test

Since employee directors and corporate investment efficiency may be jointly affected by unobserved factors, reverse causality cannot be ruled out. Following Huang and Huang (2022), this study addresses this issue by adding two further control variables: lagged investment efficiency in year $t-1$ $LagXinvest_{i,t}$ and next-period investment efficiency in year $t+1$ $XinvestNext_{i,t}$. Table 9 reports the empirical results. Across the three model specifications, the coefficient of ED remains negative and statistically significant. This indicates that the relationship between employee directors and investment inefficiency is not driven solely by

reverse causality or unobserved time-related patterns.

Tabela 9 – Endogeneity tests

| Variables | (1) Xinvest | (2) Xinvest | (3) Xinvest |
|----------------------------|---------------------|--------------------|--------------------|
| ED | -0.0048**(-1.9660) | -0.0060**(-2.0034) | -0.0050*(-1.8467) |
| LagXinvest | 0.1046*** (10.3479) | | 0.0913*** (7.7210) |
| XinvestNext | | 0.1176*** (9.0329) | 0.1313*** (8.6868) |
| Controls | Control | Control | Control |
| _cons | 0.0124(0.4727) | -0.0592**(-2.0216) | -0.0676**(-2.3129) |
| <i>N</i> | 25120 | 23601 | 20993 |
| adj. <i>R</i> ² | 0.031 | 0.026 | 0.036 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

These results strengthen the baseline findings. They suggest that employee directors are consistently associated with lower investment inefficiency even after controlling for past and future investment conditions. From the perspective of this study, the result provides further support for the argument that employee directors may contribute to better internal information use and investment decision-making.

4.4.2 Alternative Measurements of Investment Inefficiency

Table 10 reports the results using alternative measures of investment inefficiency based on the Biddle and Chen models (Biddle et al., 2009; Chen et al., 2011). The coefficient of ED remains negative and significant for overall investment inefficiency under both models. This confirms that the main result is not dependent on a single measurement approach.

Tabela 10 – Regression Results of Alternative Measures of Investment Inefficiency

| | (1) | (2) | (3) | (4) | (5) | (6) |
|----------------------------|------------------------|----------------------|-------------------------|------------------------|----------------------|------------------------|
| | Biddle model | | | Chen model | | |
| | Xinvest | Overin_vestment | Underin_vestment | Xinvest | Over_investment | Underin_vestment |
| ED | -0.0060** (-2.1639) | -0.0050 (-0.4434) | -0.0051*** (-3.2008) | -0.0066** (-2.3429) | -0.0107 (-0.9986) | -0.0040** (-2.5462) |
| Controls | Control | Control | Control | Control | Control | Control |
| _cons | 0.0777*** (2.6719) | 0.0244 (0.2959) | 0.1698*** (9.7239) | 0.0682** (2.2689) | 0.0294 (0.3535) | 0.1576*** (8.6622) |
| <i>N</i> | 27320 | 9067 | 18253 | 27320 | 9244 | 18076 |
| adj. <i>R</i> ² | 0.015 | 0.016 | 0.036 | 0.015 | 0.019 | 0.032 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

The decomposition results are also consistent with the main analysis. Employee directors do not significantly reduce overinvestment, but they significantly reduce underinvestment under both alternative measurements. This reinforces the earlier interpretation that employee directors are especially relevant when firms need to identify and support valuable

opportunities that might otherwise be overlooked.

Overall, the robustness tests confirm that employee directors improve investment efficiency mainly by alleviating underinvestment rather than by restraining overinvestment. This pattern supports the opportunity-recognition interpretation developed in the theoretical framework.

4.4.3 Propensity Score Matching

To further mitigate potential selection bias, this study re-estimates the relationship between employee directors and investment efficiency using the matched sample obtained from the propensity score matching (PSM) procedure. And the results are presented in Table 11. Both ED and EDP remain negatively and significantly associated with investment inefficiency in the matched sample. This indicates that the main finding continues to hold after controlling for observable differences between firms with and without employee directors.

Tabela 11 – Regression Results of Employee Directors and Investment efficiency after PSM

| Variables | (1) Xinvest | (2) Xinvest |
|----------------------------|--------------------|--------------------|
| ED | -0.0096**(-2.0754) | |
| EDP | | -0.1070**(-2.2341) |
| Controls | Control | Control |
| cons | -0.0548(-0.5595) | -0.0332(-0.3366) |
| <i>N</i> | 1987 | 1987 |
| adj. <i>R</i> ² | 0.005 | 0.010 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

The results broadly align with the baseline estimates in Table 4. The coefficients remain negative and significant, and their magnitude increases slightly, suggesting that the effect of employee directors is still robust after accounting for selection bias.

4.5 Additional analysis

Table 12 reports the results for state-owned enterprises and non-state-owned enterprises. The effect of employee directors on overall investment inefficiency is more evident in SOEs. For overinvestment, the coefficients are insignificant in both SOEs and non-SOEs. For underinvestment, the effect is strongest in SOEs, where employee directors significantly reduce underinvestment.

This ownership-based difference provides an important contextual interpretation. In SOEs, decision structures are often more complex, and internal communication may involve more organizational layers. Under such conditions, employee directors may become more valuable because they help connect operational knowledge with board-level decisions. Their role may therefore be especially important when information needs to move across hierarchical levels before investment decisions are made.

The weaker and insignificant results in non-SOEs suggest that the role of employee directors is not uniform across ownership contexts. In firms where market pressures and decision structures differ, employee directors may not play the same information-support role.



These findings indicate that the value of employee directors depends partly on the institutional and organizational context in which they operate.

Tabela 12 – Ownership Structure Affect on the Relationship between Employee Directors and Investment Inefficiency

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---------------------|-----------|-----------|----------------|-----------|-----------------|-----------|
| | Xinvest | | Overinvestment | | Underinvestment | |
| | SOE=1 | SOE=0 | SOE=1 | SOE=0 | SOE=1 | SOE=0 |
| ED | -0.0046* | -0.0086 | -0.0044 | -0.0068 | -0.0060*** | -0.0047 |
| | (-1.7997) | (-1.3518) | (-0.9021) | (-0.6565) | (-2.9160) | (-1.1789) |
| Controls | Control | Control | Control | Control | Control | Control |
| cons | 0.0103 | -0.0031 | 0.0188 | 0.0743 | 0.0569** | 0.0116 |
| | (0.2899) | (-0.0816) | (0.2387) | (0.9131) | (2.0101) | (0.4047) |
| N | 9456 | 18761 | 3873 | 7180 | 5583 | 11581 |
| adj. R ² | 0.007 | 0.024 | 0.001 | 0.028 | 0.024 | 0.028 |

Note: t-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

5 DISCUSSION

The results suggest that employee directors matter for more than board representation. Their presence is associated with lower investment inefficiency, which indicates that they may improve the quality of firms' investment decisions. A plausible explanation is that employee directors bring operationally grounded knowledge into board discussions. Because they are closer to day-to-day activities, production conditions, and workforce realities, they may help the board evaluate investment proposals in a way that is more closely aligned with the firm's actual needs.

The mediating role of information asymmetry adds an important layer to this interpretation. The results show that employee directors are linked to investment efficiency mainly through improvements in the firm's information environment. This means that their role is not limited to monitoring. They may also help internal information circulate more effectively, reduce informational frictions, and improve the quality of decision support available to the board.

From the perspective of competitive intelligence, this finding points to the importance of internal information flow in strategic resource allocation. Employee directors may operate as internal carriers of firm-specific knowledge, helping operational information reach the board and become useful for decision-making. However, this interpretation remains indirect. The study measures information asymmetry and investment efficiency, not intelligence capability, intelligence governance, or intelligence quality as direct constructs.

The decomposition results provide further insight. Employee directors mainly reduce underinvestment, while their effect on overinvestment is not statistically significant. This pattern suggests that their comparative value lies less in constraining excessive expansion and more in helping firms recognize and support worthwhile opportunities that might otherwise be missed. In other words, employee directors seem to be more useful when the problem is weak opportunity recognition rather than weak discipline.

The stronger effect observed in state-owned enterprises points to the importance of

context. In organizations with more complex structures and more layered communication, internal information may travel less efficiently. Under such conditions, employee directors may become more useful because they help connect operational knowledge with board-level decisions. Their role therefore appears to depend not only on formal governance structure, but also on the informational demands of the organization.

These findings also have managerial relevance. For firms, the results suggest that employee directors may be valuable when they are treated as active contributors to information exchange rather than symbolic representatives. For boards, the evidence points to the importance of internal information flow in evaluating projects and responding to emerging opportunities. For research on competitive intelligence, the study offers indirect evidence that internal information support and decision quality matter for investment outcomes, even when organizational intelligence systems are not directly observed.

At the same time, the interpretation should remain cautious. This study does not directly measure competitive intelligence capability, intelligence governance, or sustainable competitive advantage. What the results show is that employee directors are associated with lower information asymmetry and better investment efficiency, especially in the case of underinvestment. The broader strategic meaning of these findings should therefore be understood as inferential rather than definitive.

Future research could address these limitations by using direct indicators of competitive intelligence capability, such as intelligence governance practices, information dissemination routines, strategic foresight activities, or board-level decision processes. Qualitative approaches, including interviews and case studies, could also help explain how employee directors actually participate in information exchange and opportunity recognition inside firms.

6 CONCLUSIONS

This paper investigates whether employee directors improve corporate investment efficiency in Chinese listed firms and whether information asymmetry helps explain this relationship, using panel data from 2015 to 2024. The results show that employee directors significantly reduce investment inefficiency. The mediation results further indicate that this relationship operates mainly through information asymmetry, suggesting that employee directors may improve investment decisions by facilitating the flow of firm-specific information and reducing informational frictions. When investment inefficiency is decomposed, employee directors are found to play a stronger role in reducing underinvestment than overinvestment, with the effect being more evident in state-owned enterprises. This result suggests that employee directors are particularly relevant when firms risk overlooking valuable investment opportunities. The main contribution of the paper is to reposition employee directors as more than a formal board governance arrangement. The findings suggest that employee directors may act as internal carriers of operational information that support board-level decision-making and strategic resource allocation. However, these implications should be interpreted cautiously. This study does not directly measure sustainable competitive advantage, organizational intelligence, or competitive intelligence capability. Instead, it provides indirect evidence that employee directors are related to better information conditions and more efficient investment decisions. Future research could use direct indicators, interviews, or case studies to examine how employee directors participate in intelligence dissemination and strategic decision processes within firms.



Data Availability Statement

The data in this paper come from the China Stock Market & Accounting Research (CSMAR) Data-base and Wind Database.

Ethics Statement

This study uses secondary, publicly disclosed financial and governance data from listed companies. It involves no human or animal subjects, no personal identifiers, and no contact with individuals. Ethics-committee approval was therefore not required under standard research-ethics guidelines for studies based on anonymized, publicly available archival data.

Informed Consent Statement

Informed consent is not applicable because the study does not involve human participants. All data are aggregated firm-level information disclosed publicly by listed firms in accordance with the disclosure rules of the Shanghai and Shenzhen Stock Exchanges.

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The authors declare no conflicts of interest related to this work, financial or otherwise.

Author Contributions

Conceptualization: all authors. Methodology: all authors. Software: all authors. Validation: all authors. Formal analysis: all authors. Investigation: all authors. Data curation: all authors. Writing—original draft preparation: all authors. Writing—review and editing: all authors. Visualization: all authors. Supervision: all authors. Project administration: all authors. All authors have read and approved the final version of the manuscript.

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Generative AI tools were used solely for language refinement, formatting assistance, and figure preparation. All conceptual framing, methodological design, statistical analysis, interpretation of results, and scholarly judgments are the responsibility of the authors. No content was generated by AI without subsequent verification and editing by the authors. References were cross-checked through Crossref and publisher websites.

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