Does employee representation affect corporate investment efficiency? Evidence from China’s capital market

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ABSTRACT
This paper is the first empirical study of the economic consequences of the adoption of the employee director system in China from the perspective of the investment efficiency of enterprises, that is, based on empirical study of China’s capital market in order to test the relationship between employee directors and the investment efficiency of listed companies. The results show that employee directors can improve the investment efficiency of listed companies effectively, and this relationship is more significant for state-owned enterprises and enterprises in product markets with low levels of competition. Further research shows that employee directors can restrain not only overinvestment but can also reduce underinvestment. Employee directors can restrain the overinvestment behaviour of state-owned enterprises effectively and reduce underinvestment by non-state-owned enterprises. In product markets with low levels of competition, employee directors can restrain overinvestment, while in product markets with high levels of competition, employee directors can reduce underinvestment.

KEYWORDS
Employee director; investment efficiency; consulting function; supervisory function; employee participation

1. Introduction
The guiding principle of the Chinese Communist Party (CPC)’s 19th National Congress, “Decision on some major issues concerning how to uphold and improve the system of socialism with Chinese characteristics and advance the modernisation of China’s system and capacity for governance”, was debated and adopted at the Fourth Plenary Session of the 19th Central Committee of the CPC, with implementation as the next step in the process. The decision stressed the need to wholeheartedly rely on the working class and to improve the democratic management of enterprises and public institutions in order to ensure their employees’ right to remain informed about, participate in, express views on and oversee their organisation’s affairs. As a valuable mechanism for the democratic management of enterprises and an organic component of corporate governance structure, the employee director system is an important exploration of effective ways for employees to participate in the management of enterprises in China, and has drawn the attention of the Party and the state in recent years. President Xi Jinping pointed out at
the national state-owned enterprise work conference in 2016 that we need to perfect the
democratic management of enterprises and public institutions and emphasised that
companies need to ‘stick to and improve the system of employees serving as board
directors and board supervisors and encourage employee representatives in order to
participate in corporate governance’. In China, the employee director system has been
implemented mainly in large state-owned enterprises and institutions, and is closely
related to the ownership structure of those companies. With development of and
improvements in relevant legislation, more and more listed companies in China’s capital
market have established the position of employee director, including many non-state-
owned enterprises. The question to be answered is then: what role do employee repre-
sentation on boards of directors, namely employee directors, play in the governance of
listed companies in China? It is very important to clarify the economic consequences of
establishing employee directors in Chinese listed companies, which is also the primary
intention of this paper.

The employee director system elects employee representatives to join the board of
a company to participate in decision-making, which is not only a form of direct demo-
ocratic participation but is also a special mechanism of corporate governance. Research on
the employee director system has made some progress in other countries. In relation to
codetermination legislation in Germany, researchers have discussed the institutional
functions of employee directors. According to the results of most studies, codetermi-
nation plays a positive role in foreign corporate governance. Employee directors help
increase shareholder value (Fauver & Fuerst, 2006) and reduce agency costs (Gingliger
et al., 2011; Lin et al., 2018). Domestic research on employee directors, however, is still in
its infancy. Previous normative analyses have focused on the introduction and operation
of, the problems associated with, and legislative recommendations for enhancing the
employee director system. Few domestic studies have discussed the mechanism and
economic effects of such a system, let alone have carried out empirical analysis. In
addition, investment efficiency, as an important standard for measuring whether an
enterprise’s investment behaviour is effective, not only provides a reference for current
investment decisions but also affects subsequent enterprise operations and financing
activities and plays a crucial role in the realisation of enterprise value. Therefore, this paper
focuses on the empirical study of the economic consequences of the adoption of the
employee director system in China from the perspective of enterprise investment effi-
ciency, that is, by manually collecting employee director data from the announcements of
A-share listed companies from the Wind Economic Database and empirically testing the
relationship between employee directors and enterprise investment efficiency for
selected sample companies between 2008 and 2017. In addition, the effect of property
rights and product market competition on the relationship is investigated. The results
show that employee directors can improve the investment efficiency of listed companies
effectively, and this relationship is more significant in state-owned enterprises and
companies in product markets with low levels of competition. Further research shows
that employee directors can restrain not only overinvestment but can also reduce under-
investment. Employee directors can restrain the overinvestment behaviour of state-
owned enterprises effectively and can reduce underinvestment in non-state-owned
enterprises. In product markets with low levels of competition, employee directors can restrain overinvestment, while in product markets with high levels of competition, they can reduce underinvestment.

The contributions this paper makes to academic research are as follows: (1) this study is the first empirical evidence relating to the adoption of the employee director system in China. Based on the country’s institutional background, our study of the economic consequences of the employee director system enriches the existing literature and fills in, to a certain extent, the gap in domestic empirical research on this subject, and also provides a theoretical basis for improving the employee director system. (2) Our study augments the current state of theoretical research on investment efficiency and the literature on ‘labor and finance’. Compared with indirect forms of democratic participation, such as labour unions and employee supervisors, employee directors participate directly on the boards of companies and take part in the affairs of the enterprise. By affirming the value of employee participation, this paper provides a novel perspective on labour participation in corporate governance. (3) The conclusions of this paper provide policy guidance for government and enterprises. In practice, it is generally believed that, as one form of democratic management, employee directors find it difficult to play an effective role due to their lack of independence in right and salary (Zhang, 2015). This study helps break down many persistent negative views of how employee directors operate in practice, and has important policy implications for strengthening and improving the employee director system, which is valuable for promoting the board-level reform and development of state-owned enterprises.

The rest of this paper is organised as follows: Section 2 briefly reviews the literature on employee directors and investment efficiency; Section 3 provides the institutional background and develops three hypotheses; Section 4 outlines the study design; Section 5 presents the empirical results and analysis; finally, Section 6 lists our conclusions and policy implications.

2. Literature review

2.1. Studies of employee directors

Studies of employee directors belong to the category of employee participation. The existing literature on employee participation focuses mainly on indirect participation forms such as trade unions and employee stock ownership plans. As a form of direct employee participation, the employee director system began to attract researchers’ attention following the promulgation of codetermination legislation in Germany in 1976. Since then, studies of codetermination have focused mainly on shareholder value. Researchers have not reached agreement on the relationship between employee directors and shareholder value. Supporters of the employee director system argue that codetermination legislation strengthens the voice of employees in resisting restructuring and reducing layoffs, which makes the company deviate from the goal of maximising shareholder value. Shareholders take on debt in response, and thus increases a company’s costs, which ultimately damages shareholder value (Gorton & Schmid, 2004). Supporters of the system find that codetermination may promote information exchange between employees and the board of directors, motivate employees to work hard, and reduce the
possibility of strikes, which is conducive to improving company value (Fauver & Fuerst, 2006; Ginglinger et al., 2011). In recent years, some researchers have begun to explore the effects of employee directors on agency costs, financing constraints, labour protection and investment behaviour. Fauver and Fuerst (2006) found that German employee directors provided valuable first-hand operational information for board decisions and that the greater the internal demand for coordination, the more significant the improvement in governance effectiveness. From the perspective of labour protection, Kim et al. (2018) empirically tested the impact of codetermination legislation on layoffs and wage levels under industry shocks. Lin et al. (2018) studied the impact of employee directors on agency costs between companies and creditors. The results showed that an implicit alliance between employees and debtors can reduce agency costs between companies and creditors, thus reducing debt financing constraints. According to most studies, the information advantage enjoyed by employee directors helps them play a positive role in corporate governance. Compared with the positive views held in other countries, the employee director system in China has been subject to controversy ever since its establishment. The analysis of the problems it has suffered has focused on the conflict between employee directors’ representative interests and those of management, dependence caused by ‘amphibious directors’ whose rights include monitoring the management while they are managed by the management daily at the same time, insufficient ability to perform duties and differences in understanding system functions (Dong, 2011; Zhang, 2015). However, these studies conducted mainly normative analyses from the perspective of legal theory and democratic management. Until now, there have been no empirical studies of the economic effects of the employee director system.

2.2. Studies of investment efficiency

There are numerous studies of investment efficiency and abundant researches covering the aspects of corporate governance, such as shareholder control, board governance and executive incentives (Biddle et al., 2009; Liu et al., 2014; Pan et al., 2020; X.D. Chen et al., 2016), but few studies of employee participation, let alone of employee directors and investment efficiency. Given that the role of an employee director is an organic combination of board governance and employee participation, we review the relevant literature on investment efficiency from these two perspectives.

2.2.1. Board governance and investment efficiency

Relevant studies of this subject can be divided into supervisory and advisory categories, according to the fundamental roles of the directors (Ferreira & Laux, 2007; G.G. Sun & Guo, 2015; Song & Thakor, 2006; Yang et al., 2011). From the perspective of the supervisory function, an efficient and independent board can supervise management effectively, reduce agency costs and improve the investment efficiency of enterprises. From this point of view, researchers discuss how directors supervise management by focusing on the scale, independence and types of directors, and how to restrain their motivation to build business empires or seek personal gains to improve investment efficiency (He & Liu, 2017; Hu & Lu, 2015). The view of researchers of the advisory function have stressed that the information advantage enjoyed by directors helps companies make optimal decisions. Chen and Xie (2011) studied the promoting effect of an independent directors’ network
on investment efficiency. Cao and Lin (2017) empirically tested the effect of the mechanism acting between nonlocal independent directors and investment efficiency. Although they failed to prove the advisory effectiveness of nonlocal independent directors, they detailed the theoretical logic that directors have information advantage. Others who have affirmed the advisory function of directors include L. Sun and Liu (2014) and Alam et al. (2014). They believe that the advisory function of directors has become ever more obvious at key points in the decision-making process, such as the acquisition of a new company, the divestment of a department or the negotiation of acquisition offers.

2.2.2. Employee participation and investment efficiency
Related studies have been mainly from the perspective of labour unions and employee stock ownership. There are two views on this relationship. One is based mainly on the theory of negotiation and rent-seeking. As rent-seekers, trade unions are motivated to grab quasi-rents through strikes and other activities, which leads to serious underinvestment and lower investment efficiency (Bronars & Deere, 1993). Given that management takes corresponding measures to deal with employee benefit negotiation, the theory of the labour–management alliance comes into being (Pagano & Volpin, 2005). The labour–management alliance is a situation in which management teams up with employees to protect their positions because employees help fend off outside takeovers. In return, management gives employees benefits such as longer work contracts and higher wages and benefits. Under the protection of the labour–management alliance, the risk of management being fired is reduced, which may increase the incentive for management to seek private interests, and thus reduce investment efficiency (Masulis et al., 2007, 2020). On the other hand, employee participation can improve investment efficiency by playing a supervisory role. Cho et al. (2016) believe that employees have the same demand of fixed interest return as creditors, so they pay more attention to the long-term stability and development of the company. This tendency towards risk avoidance enables labour unions to supervise the investment behaviour of the company more effectively and thus restrain inefficient investment. His further study found that, in enterprises with serious second agency problems, the supervisory role of unions is more significant.

3. Institutional background and research hypotheses
3.1. Institutional background
The employee director system in China has arisen out of a realistic need for domestic reform and development, and continues to develop under the ever-increasing need for deeper reform. In the 1990s, state-owned enterprises began to carry out corporate reform. Non-public sector companies participated in the operation of state-owned enterprises, making labour status in the public economy an urgent problem to be solved. In contrast, the reform of state-owned enterprises in order to increase efficiency by downsizing staff levels and laying off staff intensified the conflict between labour and capital. Stabilising labour–capital relations is particularly urgent for promoting enterprise reform. In 1993, as a direct result of the passing of the Company Law of the People’s Republic of China, according to which ‘the members of the board of directors shall include employee directors elected by employees if it is a wholly state-owned company or limited liability
company whose initiators are two or more state-owned enterprises or entities’, the employee director system was launched. With the deepening of the reform of state-owned enterprises, the state has actively explored various ways to realise public ownership, especially state ownership, by, for example, introducing the joint stock system, developing mixed ownership economic entities, and improving the governance structure of enterprises by diversifying equity rights and reforming boards of directors. The Company Law of the People’s Republic of China of 2005 added the provision that ‘the board of directors of other limited liability companies and joint stock limited companies may also include representatives of employees of the company’, extending the scope of employee directors to all forms of companies. With the development of western stakeholder theory, China began to pay attention to the role of employees in corporate governance. On 30 March 2009, the ‘Measures for Management of Employee Directors to Perform Duties in State-owned Trials’ was issued by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council. This rule emphasised two special duties involving the resolution and notification parts of employee directors’ roles. The resolution part includes the formulation and modification of regulations concerning the interests of employees, such as employment, salaries, labour protection, rest and vacation, production safety, training and education, and welfare. The notification part includes mainly appeals, opinions and suggestions of democratic management and supervision concerning the interests of employees. This regulation not only confirms the information advantage of the employee director but also reflects the development of the employee director system towards improving the efficiency of decision-making, reducing agency costs and avoiding insider control.

In 2002, Qiantyre A (stock code 000589) announced the establishment of the position of employee director, becoming the first company to do so in the A-share market. Figure 1 shows the number of companies with employee directors and the proportion of them in

![Figure 1](image-url). Statistics relating to employee directors and A-share listed companies in China between 2002 and 2017.
capital market companies. It can be seen from Figure 1 that, following the amendment of the Company Law in 2005, the number of companies with employee directors increased, exceeding 30 for the first time in 2008. In 2009, due to the introduction of the Measures of SASAC, the proportion of employee director companies in all A-share listed companies reached a peak. Following that, more and more listed companies in China established the position of employee director. By the end of 2017, there were 106 listed companies with employee directors, accounting for 3.06% of all A-share listed companies, of which 80 were state-owned, accounting for 76% of the total. This reflects the path dependency on and importance for state-owned companies of the employee director system. At the same time, the number of employee directors was also increasing. From 2008 to 2017, the total number of employee directors grew to be 911. By 2017, the ratio of the number of employee directors to the number of companies reached 1.18, indicating that some companies had two or more employee directors. In 2017, there were 125 employee directors of A-share listed companies, with an average age of 49. As for educational background, 41 employee directors were educated to master’s degree level or above, accounting for 33% of the total, reflecting the high educational level of employee directors. As for positions, there were 26 employee directors who were also members of trade unions, accounting for 20.8% of the total, while 27 were senior executives (including general manager, deputy general manager and secretary of the board), accounting for 21.6% of the total. It can be seen from Figure 1 that there was no serious ‘amphibious director’ problem in companies with employee directors. As for professional background, there were 32 directors with economic and financial backgrounds, accounting for 25.6% of the total, there were 47 directors with technical backgrounds (having served as technical engineers), accounting for 37.6% of the total, and the proportion of those with professional qualifications (finance/technology) exceeded 60%.

3.2. Research hypotheses

Employee directors have the incentive and ability to improve the investment efficiency of the company they work for. On the one hand, employees have a fixed interest return request, to focus on the long-term stability and development of the company (Cho et al., 2016). Such a risk aversion tendency gives employees an incentive to report to the board when they identify bad behaviours in relation to the long-term interests of the company. Such action could help strengthen the supervision of shareholders and management, thereby reducing the cost of agency problems and improving investment efficiency. On the other hand, employee directors possess more first-hand valuable information than other directors. Resource dependency theory shows that information is an important resource affecting the decision-making ability of boards of directors (Ferreira & Laux, 2007). Compared with management, employees have advantages in daily communication with customers, suppliers and competitors, such as information based on customer demand for future products, judgements about the likelihood of success of new technologies, perception of supply chain bargaining power and competitor trends (Fauver & Fuest, 2006). This improves the level of professionalism of the board and its scientific cognition of the external environment, helps them identify investment decisions effectively, and thus promotes their advisory and supervisory functions (Ferreira & Laux, 2007; G.G. Sun & Guo, 2015), which also improves investment efficiency.
Employee directors may also reduce investment efficiency by strengthening the labour–management alliance. Pagano and Volpin (2005) first proposed the theory of the labour–management alliance. A labour–management alliance exists when management teams up with employees to protect their positions because employees help fend off outside takeovers. In return, management gives employees ‘perks’ such as longer work contracts and higher wages and benefits. Under the protection of a labour–management alliance, managers are less likely to be fired, thus increasing their incentive to seek personal gains and thus reducing investment efficiency. Masulis et al. (2007) proved that managers protected by anti-takeover clauses are more addicted to empire-building acquisitions because of weaker market institutional control. Masulis et al. (2020) found that management used employee stock ownership plans as a defence strategy to resist external acquisition, which strengthened the labour–management alliance and intensified agency problems. In practice, shareholders cannot decide employee directors’ appointment and dismissal, because they are elected by employee representatives. By increasing the number of employee directors, existing shareholders or management can maintain control over the board in the short term. As a result, employee directors acting as ‘shark repellent’ may strengthen labour–management alliances, thus reducing investment efficiency.

This paper argues that the labour–management alliance mechanism is limited for the following reasons. (1) A solid labour–management alliance depends on the strong negotiating power of employees (Atanassov & Kim, 2009), but the theory of employee negotiation and rent-seeking has not been proved in China. Z.W. Sun and He (2012) found in their empirical study that Chinese unions play a ‘straw man’ mechanism which means it exist in name only and has no actual function and cannot realise labour monopolies or participate in collective bargaining. (2) Employee directors have the right to participate on the board and can directly influence decisions related to employees, so they lack the motivation to ally with management (Cho et al., 2016). (3) A labour–management alliance often occurs when a company is faced with the threat of external merger and acquisition (Masulis et al., 2020), for example, when management is newly appointed or is dismissed due to worsening financial conditions. Therefore, whether the labour–management alliance plays a role in daily operation in China still needs to be demonstrated. Hence, we believe that the first mechanism above of employee directors for improving investment efficiency plays an active role, and we therefore present the first of three research hypotheses:

H1: Other things being equal, employee directors significantly improve the investment efficiency of enterprises.

Against a background of past institutional transformation and weak governance, Chinese state-owned enterprises have serious agency problems. Firstly, the problem of ‘insider control’ is common in state-owned enterprises, and management often have excessive control rights (Quan et al., 2010). In order to pursue power and political performance, executives of state-owned enterprises have a stronger empire-building desire than those of private companies, which ultimately leads to excessive investment (Xin et al., 2007). Compared with state-owned enterprises, non-state-owned enterprises have fewer agency problems (Kong et al., 2014). Therefore, we expect that in state-owned enterprises with prominent agency problems, employee directors will be more active
(Cho et al., 2016). Secondly, compared with non-state-owned enterprises, state-owned enterprises have a stronger cultural atmosphere of ‘employee voice’, which is conducive to the role of employee directors. Q. Zhang and Li (2015) pointed out that the culture of state-owned enterprises includes distinct political consciousness, democratic consciousness and a sense of ownership. These strengthen the political skills, interactions and collectivist tendencies of employees, which is important for employee voice (Wang & Duan, 2015). A study by Zhu et al. (2015) shows that state-owned enterprises have a higher level of family-like exchange, which has a significant positive impact on employee voice. Taking advantage of this voice, employee directors in state-owned enterprises may display better advisory and monitoring performance in investment decision-making. Finally, compared with non-state-owned enterprises, state-owned companies have clearer regulation in order to ensure that employee directors perform their duties. For example, state-owned companies often design meeting rules governing employee representatives’ attendance, such as party committee meetings, president’s office meetings, job congress meetings and union meetings, which ensures the right of employee directors to be kept informed about important company affairs. The relatively organised unions in state-owned enterprises also help to strengthen communication between employee directors and employees. This provides sufficient information to support scientific decision-making and the supervision of employee directors. Therefore, we propose the following second research hypothesis:

H2: Compared with non-state-owned enterprises, employee directors in state-owned enterprises significantly improve investment efficiency.

Product market competition has an information improvement effect. This suggests that, in the competitive environment of a product market, shareholders have more reliable information, and the information asymmetry of shareholders and managers is reduced. By restricting executives’ blind expansionist or individualist behaviour, investment efficiency is improved (C.C. Zhang & Chen, 2017). This information improvement effect will also affect the advantage that employee directors have. For example, Xavier and Holger (2011) found that, in an environment where product market competition is not fierce, companies with weaker corporate governance perform worse financially. Yi et al. (2010) pointed out that there is a complete substitution relationship between product market competition and board governance. Therefore, product market competition probably affects the supervisory and advisory functions by weakening the information advantage of employee directors. On the one hand, in a highly competitive product market, market supervision replaces the supervisory function of directors, and the information advantage of employee directors is weakened. On the other hand, in a highly competitive product market, directors can obtain external information over time, so that the information made available by employee directors to the board is less valuable. Both factors weaken the effect of employee directors on enterprise investment efficiency. Therefore, we propose the following third research hypothesis:

H3: Compared with enterprises experiencing fierce product market competition, employee directors of enterprises in a less fierce product market significantly improve investment efficiency.
4. Study design

4.1. Sample selection

This study selected all A-share listed companies in China between 2008 and 2017, excluding the financial and insurance industries, as initial samples. Of these, the company samples of employee directors were collected manually from all A-share listed companies’ announcements in the Wind Economic Database, and the samples of employee directors who were listed and delisted in the same year were excluded. Other empirical data, such as basic company information, corporate governance data and financial data, were collected from the China Stock Market and Accounting Research Database (CSMAR). In order to ensure sufficient samples and obtain more accurate estimated results, this study supplemented the missing data of companies setting up employee directors by using the Wind database. On the basis of the initial sample, the following processing was carried out. In order to eliminate the effect of extreme values, all continuous variables were winsorised by means of 1% quantile adjustment. The investment efficiency data for all A-share listed companies were then estimated according to the investment efficiency model described in Section 4.2.1. Furthermore, to control reverse causality and selective bias, this study used the propensity score matching method (PSM) to conduct one-to-one neighbour matching for the samples of employee directors and non-employee directors in the same year, and 1458 company years were obtained as the final sample to test the research hypotheses.

4.2. Variable design

4.2.1. Dependent variables

Referring to Richardson (2006) and Wang et al. (2018), this study constructed the following model of enterprise investment efficiency. Multiple regression was conducted by industry and year, and the absolute value of the residual of model 1 was taken to measure enterprise investment efficiency (\(Xinvest\)). \(Xinvest\) reflects the degree of inefficient investment of enterprises, and the higher the value, the lower the investment efficiency. The specific model is as follows:

\[
Inv_{it} = \beta_0 + \beta_1 Size_{it-1} + \beta_2 Lev_{it-1} + \beta_3 Tobin_{it-1} + \beta_4 Cash_{it-1} + \beta_5 Ret_{it-1} + \beta_6 Age_{it-1} + \epsilon_{it}
\]

In Model 1, \(Inv_{it}\) represents the new investment of company \(i\) in year \(t\), which is equal to: (cash flow of construction of fixed assets, intangible assets and other long-term assets – disposal of fixed assets, intangible assets and other long-term assets of earnings)/initial total assets; \(Size_{it-1}\) represents company size in year \(t-1\), which equals the natural logarithm of the company’s year-end total assets; \(Lev_{it-1}\) represents the asset-liability ratio in year \(t-1\); \(Tobin_{it-1}\) represents year \(t-1\) growth opportunity of company \(i\), which is equal to: (stock market value + net debt)/current value of tangible assets, where non-tradable shares at stock market value are calculated as net assets per share; \(Cash_{it-1}\) represents the cash holdings in year \(t-1\), which are equal to the cash and cash equivalent
of the previous year/total assets; \( \text{Ret}_{t-1} \) represents the stock return in year \( t - 1 \); and \( \text{Age}_{t-1} \) represents the listing age of year \( t - 1 \), which is equal to the natural logarithm of the number of listing years plus 1.

### 4.2.2. Explanatory variables

This paper uses dummy variable \( ER \) to indicate whether there are employee directors. If the listed company has employee directors in the current year, \( ER \) is 1, otherwise, \( ER \) is 0.

### 4.2.3. Group variables

In this paper, grouping regression was conducted using the following indicators to test research hypotheses H2 and H3.

1. **Nature of property rights**: The nature of property rights was taken as a grouping variable by setting the dummy variable \( SOE \). If the actual controller of a company is the SASAC or a government department, the value is 1; otherwise, the value is 0 for non-state-owned enterprises (including private enterprises, foreign-funded enterprises and public enterprises).

2. **Degree of product market competition**: The Herfindahl–Hirschmann index (HHI) was used to represent the intensity of product market competition. The model is as follows: \( HHI = \sum \left( \frac{x_i}{X} \right)^2 \), where \( X \) is the sum of the main business income of all listed companies in different industries and \( x_i \) is the operating income of enterprise \( i \) in the industry. The higher the HHI value, the fewer similar companies with scale in the industry and the less fierce the competition. In contrast, the lower the HHI value, the greater the competition. In this study, the final sample was sorted according to the HHI from largest to smallest. After removing the middle 10 samples, the first 50\% were divided into a low competition group with a dummy HHI (DHHI) variable of 1, and the remaining 50\% were divided into a high competition group, with a DHHI of 0.

### 4.2.4. Control variables

Based on the relevant studies of Han et al. (2014) and Wang et al. (2018), this study selected the basic characteristics, financial performance and governance of enterprises as control variables, including enterprise size (Size), asset–liability ratio (Lev), return on total assets (Roa), dual position (Dual), proportion of independent directors (Outdir), board size (Bsize), operating cash flow (Cfo), ownership concentration (Top1), growth (Sg) and listing years (Age). Year (Year) and industry (Ind) dummy variables were introduced to control year and industry effects. The specific variable definitions are listed in Table 1.

### 4.3. PSM matching and model construction

Propensity score matching (PSM), proposed by Rosenbaum and Rubin (1983), was used to control for reverse causality and selective bias in a sample with obtained investment efficiency data. The following Model 2 was used to conduct one-to-one neighbour matching between the samples of employee directors and non-employee directors in the same year.
Table 1. Variable definitions.

| Type of variable | Variable symbol | Variable definition |
|------------------|-----------------|---------------------|
| Dependent variable | Xinvest | Absolute value of the residual estimated from Model 1 (referring to Richardson (2006)). |
| Explanatory variable | ER | Dummy variable for employee director, with a value of 1 if there is an employee director; otherwise, the value is 0. |
| Grouping variable | SOE | Dummy variable for the nature of property rights, with a value of 1 if it is a state-owned enterprise; otherwise, the value is 0. |
| Grouping variable | DHHI | Dummy variable for the intensity of product market competition. Ranking the Herfindahl–Hirschman Index (HHI) from largest to smallest. After removing the middle 10 samples, the top 50% were classified as the low competition group, with a dummy HHI (DHHI) value of 1. The lower 50% were classified as the highly competitive group, with a DHHI value of 0. |
| Control variable | Size | The size of the company is equal to the natural logarithm of its total assets. |
| Control variable | Leverage | Asset–liability ratio, equal to the ratio of the company’s total liabilities to total assets. |
| Control variable | Roa | Return on total assets is the ratio of net profits to total assets. |
| Control variable | Dual | If the chairman also holds the position of general manager, the value is 1; otherwise, the value is 0. |
| Control variable | Outdir | Proportion of independent directors is the ratio of independent directors to the total number of directors. |
| Control variable | Bsize | The size of the board is equal to the natural logarithm of the number of people on the board. |
| Control variable | Cfo | Net cash flow from operation divided by total assets. |
| Control variable | Top1 | Proportion of shares owned by the largest shareholder. |
| Control variable | Sg | Growth rate of sales. |
| Control variable | Age | Listing years is equal to the natural logarithm of listing years plus 1. |
| Control variable | Ind | Industry dummy variable. According to the classification of the China Securities Regulatory Commission in 2012, manufacturing industry takes the first two codes and other industries take the first code. |
| Control variable | Year | Annual dummy variable. |

\[
\text{Logit}(ER) = \beta_0 + \beta_1 \text{Size}_{t-1} + \beta_2 \text{Lev}_{t-1} + \beta_3 \text{Tobin}_{t-1} + \beta_4 \text{Cash}_{t-1} + \beta_5 \text{Ret}_{t-1} + \\
+ \beta_6 \text{Age}_{t-1} + \beta_7 \text{Inv}_{t-1} + \beta_8 \text{Roai}_{t-1} + \beta_9 \text{SOE}_i + \sum \beta_j \text{Industry} + \epsilon_{i,t} \tag{2}
\]

According to Tong and Lu (2005), H.H. Zhang and Wang (2010) and others, the model contains factors that affect capital investment and whether to establish employee directors of listed companies. Specifically, variables include size (Size), asset–liability ratio (Lev), growth (Tobin), cash holding level (Cash), stock return of the company (Ret), listing years (Age), investment level in year \( t - 1 \) (Inv), return on total assets (Roai), property rights (SOE) and industry dummy variable (Ind). After matching, we get 1458 samples, which are listed in Table 2.

In order to investigate the impact of employee directors on the investment efficiency of enterprises, this study, inspired by the research of Han et al. (2014) and Wang et al. (2018), adopted the investment inefficiency variable \( Xinvest \) as the dependent variable. Model 3 is described as follows:

Table 2. Results of sample matching.

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|------|------|------|
| Number of initial samples | 33 | 43 | 51 | 65 | 80 | 87 | 91 | 94 | 93 | 97 |
| Failure number | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 1 |
| Number of employee directors | 33 | 43 | 49 | 65 | 80 | 87 | 91 | 92 | 93 | 96 |
| Number of final samples | 66 | 86 | 98 | 130 | 160 | 174 | 182 | 184 | 186 | 192 |
| Total | 1458 |
\[ \text{Xinvest}_{it} = \beta_0 + \beta_1 \text{ERP}_{it} + \beta_2 \text{Size}_{i,t-1} + \beta_3 \text{Lev}_{i,t-1} + \beta_4 \text{RoA}_{i,t-1} + \beta_5 \text{Dual}_{i,t-1} + \beta_6 \text{Outdir}_{i,t-1} \\
+ \beta_7 \text{Bsize}_{i,t-1} + \beta_8 \text{Cfo}_{i,t-1} + \text{Top1}_{i,t-1} + \beta_9 \text{Sg}_{i,t-1} + \beta_{10} \text{Age}_{i,t-1} + \beta_{11} \text{SOE}_{i,t-1} + \sum \beta_i \text{Industry} + \sum \beta_i \text{Year} + \varepsilon_{it} \]

(3)

If the coefficient of \( \beta \) is expected to be negative, this indicates that employee directors can significantly improve the investment efficiency of listed companies. Thus, research hypothesis H1 is supported. For hypotheses H2 and H3, grouping samples in Model 3 were tested. In addition, to avoid the effect of aggregation at the company level on the standard error, cluster processing on the standard error was conducted on all regressions at the company level.

5. Empirical results and analysis

5.1. Descriptive statistics

Table 3 lists descriptive statistics for the different variables. For the \( \text{Xinvest} \) proxy, the mean and median values were 0.0397 and 0.0255, respectively, while the minimum and maximum values were 0.0001 and 0.3820, respectively. This indicates that companies generally have an investment inefficiency problem and that there are large differences among the samples. In order to reflect the situation of employee directors of listed companies comprehensively, we also investigated the statistical characteristics of employee director proportion (ERP) (i.e. the ratio of employee directors to the total number of board directors). Since the samples were matched by PSM, the mean and median values of ERP were both 0.5000. The mean and median values of ERP were 0.0623 and 0.0278, respectively. In companies with employee directors, the minimum value of ERP was 0.0556 and the maximum value was 0.40. The mean of SOE was 0.4030, indicating that 40.30% of companies in the sample were state-owned. This indicates that most of the sample companies matching the listed companies with employee directors were non-state-owned companies. DHHI is the result of sorting by the HHII after eliminating the middle 10 samples, so the observed value was 1448, and the mean and median values were both 0.5000.

| Variable | Obs | Mean   | Std. Dev | Median | Min  | Max   |
|----------|-----|--------|----------|--------|------|-------|
| Xinvest  | 1458| 0.0397 | 0.0475   | 0.0255 | 0.0001 | 0.3820 |
| ER       | 1458| 0.5000 | 0.5000   | 0.5000 | 0.0000 | 1.0000 |
| ERP      | 1458| 0.0623 | 0.0716   | 0.0278 | 0.0000 | 0.4000 |
| SOE      | 1458| 0.4030 | 0.4910   | 0.0000 | 0.0000 | 1.0000 |
| DHHI     | 1448| 0.5000 | 0.0000   | 0.5000 | 0.0000 | 1.0000 |
| Size     | 1458| 21.8900| 1.4460   | 21.5600| 19.2900| 26.7300|
| Lev      | 1458| 0.4240 | 0.2220   | 0.4210 | 0.0530 | 0.9950 |
| Roa      | 1458| 0.0468 | 0.0601   | 0.0435 | 0.0200 | 0.2130 |
| Dual     | 1458| 0.2370 | 0.4260   | 0.0000 | 0.0000 | 1.0000 |
| Outdir   | 1458| 0.3730 | 0.0574   | 0.3330 | 0.3000 | 0.5710 |
| Bsize    | 1458| 2.1690 | 0.1910   | 2.1970 | 1.6090 | 2.7080 |
| Cfo      | 1458| 0.0480 | 0.0762   | 0.0470 | 0.1990 | 0.2610 |
| Top1     | 1458| 0.3594 | 0.1608   | 0.3313 | 0.0879 | 0.7498 |
| Sg       | 1458| 0.1830 | 0.4400   | 0.1200 | 0.5930 | 3.3150 |
| Age      | 1458| 2.0993 | 0.7261   | 2.0794 | 1.0986 | 3.3322 |
5.2. Correlation coefficient analysis

Table 4 lists the analysis of the correlation coefficients, which shows that employee directors were negatively correlated with investment efficiency, which is significant at the 1% significance level. This roughly indicates that employee directors had a positive impact on the investment efficiency of enterprises. The correlation coefficients of other control variables, especially the continuous variables, were small. The results imply that there was no serious multicollinearity.

|     | Xinvest | ER     | Size   | Lev     | Roa    | Dual   | Outdir | Bsize | Cfo    | Top1   | Sg     | Age   |
|-----|---------|--------|--------|---------|--------|--------|--------|-------|--------|--------|--------|-------|
| Xinvest | 1       |        |        |         |        |        |        |       |        |        |        |       |
| ER   | 0.162   |        |        |         |        |        |        |       |        |        |        |       |
| Size | 0.175   | 0.564 |        |         |        |        |        |       |        |        |        |       |
| Lev  | 0.045   | 0.560 | 0.477  | 1       |        |        |        |       |        |        |        |       |
| Roa  | 0.039   | 0.159 | 0.020  | 0.384   | 1      |        |        |       |        |        |        |       |
| Dual | 0.026   | 0.274 | 0.214  | 0.204   | 0.0160 | 1      |        |       |        |        |        |       |
| Outdir | 0.030  | 0.103 | 0.108  | 0.011   | 0.055  | 0.055  | 1      |       |        |        |        |       |
| Bsize | 0.018   | 0.311 | 0.282  | 0.220   | 0.003  | 0.223  | 0.446  | 1     |        |        |        |       |
| Cfo  | 0.041   | 0.085 | 0.099  | 0.091   | 0.388  | 0.082  | 0.047  | 0.055 | 1      |        |        |       |
| Top1 | 0.030   | 0.101 | 0.343  | 0.018   | 0.152  | 0.059  | 0.112  | 0.019 | 0.107  | 1      |        |       |
| Sg   | 0.093   | 0.055 | 0.015  | 0.011   | 0.245  | 0.010  | 0.014  | 0.020 | 0.045  | 0.042  | 1      |       |
| Age  | 0.117   | 0.695 | 0.357  | 0.488   | 0.221  | 0.219  | 0.095  | 0.220 | 0.056  | 0.159  | 0.062  | 1     |

Table 5. T-test and Wilcoxon test results.

Panel-A: Test of main variables

| Variable | Mean | Median | Wilcoxon |
|----------|------|--------|----------|
| Xinvest  | ER = 0 | 0.0474 | 0.0320 | 6.2641*** | 0.0314 | 0.0200 | 7.832*** |
| Size     | 21.0724 | 22.7039 | 26.0940*** | 20.9572 | 22.4895 | 22.709*** |
| Lev      | 0.3005 | 0.5486 | 25.7644*** | 0.2820 | 0.5521 | 21.684*** |
| Roa      | 0.0563 | 0.0372 | 6.1339*** | 0.0554 | 0.0313 | 9.126*** |
| Dual     | 0.3539 | 0.1207 | 10.8741*** | 0.0000 | 0.0000 | 10.461*** |
| Outdir   | 0.3739 | 0.3724 | 0.5076 | 0.3333 | 0.3636 | 0.990 |
| Bsize    | 2.1094 | 2.2280 | 12.5078*** | 2.1972 | 2.1972 | 11.247*** |
| Cfo      | 0.0415 | 0.0545 | 3.2574*** | 0.0422 | 0.0514 | 3.467*** |
| Top1     | 0.3431 | 0.3757 | 3.8905*** | 0.3200 | 0.3336 | 2.693*** |
| Sg       | 0.2072 | 0.1585 | 2.1160** | 0.1637 | 0.0839 | 5.527*** |
| Age      | 1.5949 | 2.6036 | 36.8666*** | 1.3863 | 2.7726 | 25.875*** |

Panel-B: Grouping by property rights

| Variable | Mean | Median |
|----------|------|--------|
| Xinvest  | SOE = 0 | 0.0378 | 0.0301 | 2.1959** | 0.0242 | 0.0190 | 2.101*** |
| SOE = 1  | 0.0301 | 0.0378 | 4.2959** | 0.0242 | 0.0190 | 2.101*** |

Panel-C: Grouping by product market competition

| Variable | Mean | Median |
|----------|------|--------|
| Xinvest  | DHHI = 0 | 0.0323 | 0.0316 | 0.2238 | 0.0230 | 0.0182 | 2.334** |
| DHHI = 1 | 0.0316 | 0.0323 | 0.2238 | 0.0230 | 0.0182 | 2.334** |
5.3. T-test and Wilcoxon test

Table 5 presents the univariate test results of relevant variables of the sample of listed companies. Panel A presents the mean T-test and median Wilcoxon test results between the employee director and non-employee director groups. For $X_{invest}$, there were significant differences in investment efficiency between the two groups. The mean and median values of $X_{invest}$ for the non-employee director group were higher than those of the employee director group, indicating that listed companies with employee directors were more efficient investors. We then divided the employee director group into further groups in order to test for differences in the nature of specific property rights and product market competition. Panel B shows that the mean or median level of inefficient investment in non-state-owned enterprises was significantly higher than that in state-owned enterprises, which roughly indicates that the nature of property rights may be an important factor affecting the role of employee directors and that employee directors in state-owned enterprises play a greater role than those in private enterprises. Panel C shows that there were no significant differences in the mean investment efficiency of enterprises in different product market competition environments, but there were significant differences in the median values. In a product market with a low level of competition, the investment efficiency of the employee director group was more efficient; however, this result needs to be tested further.

5.4. Regression analysis

5.4.1. Employee directors and enterprise investment efficiency

The regression analysis of employee directors and investment efficiency for all samples is listed in Table 6. Columns (1) and (2) present the test results of major regression. It can be seen that the coefficient of univariate regression of employee directors to inefficient investment was $-0.019$, and, after adding controls, the regression coefficient was $-0.012$, both of which are significant at the 1% significance level. This indicates that employee directors inhibited inefficient investment by enterprises effectively, and thus H1 is supported. This result shows that employee directors could provide more information for companies’ decision-making processes and enable more effective supervision for improving investment efficiency. The reason why only a few Chinese limited liability companies choose to appoint employee directors lies in their lack of understanding of how the employee director system could benefit their operations. Therefore, it is important to clarify how a system of employee participation could operate in order to motivate companies to pursue efficiency, for example, to encourage employee representatives to sit on the board or to perfect communications between directors and employees.

5.4.2. Employee directors, property rights and investment efficiency

Columns (3) and (4) of Table 6 list the regression results after dividing the samples with employee directors into state-owned and non-state-owned groups. The regression coefficient between employee directors and inefficient investment in state-owned group was $-0.02$, which is significant at the 1% significance level, while the regression coefficient for the non-state-owned group was $-0.012$. The latter is not statistically significant, indicating that, although employee directors help improve investment efficiency, the role is also affected
Table 6. Regression results of employee directors and investment efficiency.

| Xinvest | Full sample | Property rights | Product market competition |
|---------|-------------|-----------------|----------------------------|
|         |             | SOE = 1         | SOE = 0                    | DHHI = 1 | DHHI = 0 |
| ER      | 0.019***    | 0.012**         | 0.003***                   | 0.013    | 0.026**  | 0.00  |
|         | (6.23)      | (3.20)          | (2.19)                     | (1.333)  | (2.26)   | (1.28) |
| Size    | 0.008***    | 0.003***        | 0.007***                   | 0.004**  | 0.004*** | 0.00  |
|         | (3.20)      | (2.19)          | (2.261)                    | (2.06)   | (2.7)    |      |
| Lev     | 0.022*      | 0.022           | 0.019                      | 0.013    | 0.029**  | 0.00  |
|         | (1.86)      | (1.518)         | (1.180)                    | (0.84)   | (2)      |      |
| Roa     | 0.000       | 0.044           | 0.021                      | 0.022    | 0.043    |      |
|         | (0.02)      | (0.939)         | (0.543)                    | (0.54)   | (1.17)   |      |
| Dual    | 0.003       | 0.006           | 0.002                      | 0.005    | 0.000    |      |
|         | (0.78)      | (1.281)         | (0.528)                    | (1.01)   | (0.08)   |      |
| Outdir  | 0.013       | 0.008           | 0.008                      | 0.009    | 0.011    |      |
|         | (0.58)      | (0.323)         | (0.232)                    | (0.31)   | (0.34)   |      |
| Bsize   | 0.006       | 0.014           | 0.002                      | 0.011    | 0.003    |      |
|         | (0.61)      | (1.251)         | (0.190)                    | (0.77)   | (0.27)   |      |
| Cfo     | 0.031*      | 0.039*          | 0.024                      | 0.043*   | 0.024    |      |
|         | (1.64)      | (1.671)         | (0.864)                    | (1.76)   | (0.78)   |      |
| Top1    | 0.016*      | 0.009           | 0.025**                    | 0.029*   | 0.004    |      |
|         | (1.72)      | (0.820)         | (1.965)                    | (1.89)   | (0.34)   |      |
| Sg      | 0.009**     | 0.012***        | 0.007                      | 0.006    | 0.012**  |      |
|         | (2.19)      | (2.370)         | (1.299)                    | (1.46)   | (2.02)   |      |
| Age     | 0.001       | 0.006*          | 0.003                      | 0.004    | 0.001    |      |
|         | (0.33)      | (1.721)         | (0.520)                    | (0.81)   | (0.36)   |      |
| SOE     | 0.010***    | 0.016**         | 0.016**                    | 0.004    | 0.004    |      |
|         | (2.53)      | (2.5)           | (2.5)                      | (2.74)   | (2.74)   |      |
| Cons    | 0.062***    | 0.126***        | 0.088**                    | 0.182**  | 0.133**  | 0.125*** |
|         | (8.00)      | (3.47)          | (2.408)                    | (2.566)  | (2.51)   | (2.95) |
| Ind     | control     | control         | control                    | control  | control  |      |
| Year    | control     | control         | control                    | control  | control  |      |
| N       | 1458        | 1458            | 587                        | 871      | 724      | 724   |
| R²_adj  | 0.066       | 0.089           | 0.081                      | 0.048    | 0.132    | 0.127 |

Note: T-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

by the nature of the company’s property rights. In state-owned listed companies, employee directors play a more important role, which supports H2. This can be explained by the relatively stable controller structure, solid job security (such as salary, welfare, and training) and power of the employee’s voice in state-owned enterprises, which restrain the self-interested behaviour of management effectively. We argue that their insignificant effects in non-state-owned companies could result from a lack of a democratic culture and the increased possibility of a labour–management alliance, considering that these enterprises are readily exposed to the threat of merger and changes in management. When employee directors are more focused on recruitment, compensation and labour protection, they barely exert any influence on investment decisions.

5.4.3. Employee directors, product market competition and enterprise investment efficiency

Columns (5) and (6) of Table 6 list the regression results, dividing the samples with employee directors into the two groups of low product market competition and high product market competition. In the low product market competition group, the coefficient of investment efficiency was 0.026, significant at the 5% significance level, while in the high product market competition group, the coefficient was not significant, indicating that employee directors in the lower product market competition group acted more
effectively. This is mainly because enterprises are more likely to make blind investment decisions in order to maximise market share in a low product market competition environment. In this case, the advisory opinions and supervisory feedback of employee directors play a greater role. However, when competition becomes fierce, the information advantage provided by employee directors is reduced, and their supervisory effect on management is also weakened.

5.5. Robustness test

5.5.1. Endogeneity test
Considering that there may be a reverse causality relationship between employee directors and investment efficiency caused by certain unknown factors affecting both, this paper adopts the method of Lei and Sun (2019) to eliminate their effects. In Model 3, two variables, investment efficiency in year $t-1$ ($X_{invest,i,t-1}$) and year $t+1$ ($X_{invest,i,t+1}$) were introduced as additional control variables for further empirical testing. Specific empirical results are listed in Table 7 below. The results show that the $ER$ coefficient was $-0.011$, significant at the 5% significance level. This evidence further excludes the effect of reverse causality on the results of this study, indicating that the empirical results are robust.

5.5.2. Other robustness tests
We also conducted the following robustness tests. (1) The dummy variable of employee director $ER$ was replaced by employee director proportion $ERP$. (2) The measurement of investment efficiency was changed as follows. Referring to the research of McLean et al. (2012), investment sensitivity to investment opportunities was used. (3) The samples of listed companies on the SME board and GEM in the A stock market were removed and only the sample of main boards in each model were used, considering the differences among them. (4) The data for 2009–2017 and 2010–2017 were regressed once again to

| Table 7. Test for reverse causality. |
|-------------------------------------|
| $X_{invest}$ | Coefficient | $T$ value |
| $ER$ | $-0.011**$ | $(-2.71)$ |
| $X_{invest,i,t-1}$ | $0.156***$ | $(3.76)$ |
| $X_{invest,i,t+1}$ | $0.146**$ | $(2.74)$ |
| $Size$ | $-0.005***$ | $(-2.87)$ |
| $Lev$ | $0.037***$ | $(2.69)$ |
| $Roa$ | $0.036$ | $(1.01)$ |
| $Dual$ | $0.000$ | $(0.07)$ |
| $Outdir$ | $0.017$ | $(0.72)$ |
| $Bsize$ | $0.003$ | $(0.27)$ |
| $Cfo$ | $0.030$ | $(1.45)$ |
| $Top1$ | $0.015$ | $(1.39)$ |
| $Sg$ | $0.006$ | $(1.31)$ |
| $Age$ | $-0.001$ | $(-0.26)$ |
| $Soe$ | $-0.007$ | $(-1.45)$ |
| $Cons$ | $0.122**$ | $(2.53)$ |

Note: ***, **, * indicate significance at 1%, 5%, and 10% levels respectively.
Further negative employee investment groups, we observe that the coefficient of ERP was 0.053, which is significant at the 1% significance level. At the same time, in state-owned enterprises, the improvement exerted by employee directors on enterprise investment efficiency was more significant, and the effect in different competitive product markets was consistent with the previous conclusion, which indicates that these empirical results are robust.

5.6. Further research

Investment efficiency can be further categorised as either overinvestment or underinvestment, according to previous research. We divided the samples into an overinvestment group (Overinv, if the estimated residual symbol in Model 1 was positive) and an underinvestment group (Underinv, if the estimated residual symbol in Model 1 was negative) to further observe how employee directors affect different types of enterprises. From Table 9, it can be seen that: (1) in the full sample, the regression coefficient of ER was significantly negative in both the underinvestment and overinvestment groups, indicating that employee directors can restrain not only overinvestment, but can also reduce the impact of the global financial crisis of 2007–2008 on the sample enterprises. We compared the results of our robustness test with the data in Table 6 and found the same effect in the relationship between employee directors and investment efficiency. We present the first robustness test results in Table 8. The coefficient of ERP was 0.053, which is significant at the 1% significance level. At the same time, in state-owned enterprises, the improvement exerted by employee directors on enterprise investment efficiency was more significant, and the effect in different competitive product markets was consistent with the previous conclusion, which indicates that these empirical results are robust.

Table 8. Robustness tests.

| Xinvest | Full sample | Property rights | Product market competition |
|---------|-------------|-----------------|-----------------------------|
| ERP     | 0.112*** (6.09) | 0.032*** 0.047 | 0.084*** 0.051 |
| Size    | 0.005*** (3.33) | 0.003*** 0.007*** | 0.005*** 0.005*** |
| Lev     | 0.021** (1.82) | 0.024* 0.017 | 0.013 0.029*** |
| Roa     | 0.002 (0.02) | 0.042 0.020 | 0.021 0.043 |
| Dual    | 0.009 (0.7) | 0.006 0.002 | 0.005 0.000 |
| Outdir  | 0.009 (0.44) | 0.008 0.006 | 0.004 0.010 |
| Bsize   | 0.003 (0.26) | 0.012 0.004 | 0.004 0.001 |
| Cfo     | 0.031* (1.67) | 0.040* 0.023 | 0.042* 0.026 |
| Top1    | 0.014 (1.54) | 0.010 0.024* | 0.026* 0.003 |
| Sg      | 0.000*** (2.16) | 0.012*** 0.007 | 0.006 0.012*** |
| Age     | 0.003 (0.9) | 0.006* 0.001 | 0.006 0.002 |
| SOE     | 0.011*** (3.04) | 0.019*** (2.78) | 0.005 (0.92) |
| Cons    | 0.059*** (7.36) | 0.141*** 0.095* | 0.195*** 0.157*** 0.132*** |

Note: T-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

We observed an increase in the number of directors with a degree in finance and an increase in the average age of the company at the 10% significance level. Similarly, the results of Table 9 indicate that the coefficient of ERP was 0.053, which is significant at the 1% significance level. At the same time, in state-owned enterprises, the improvement exerted by employee directors on enterprise investment efficiency was more significant, and the effect in different competitive product markets was consistent with the previous conclusion, which indicates that these empirical results are robust.

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Table 9. Grouping by investment type.

| Xinvest | Full sample | State-owned group | Non-state-owned group |
|---------|-------------|-------------------|-----------------------|
|         | Underinv | Overinv | Underinv | Overinv | Underinv | Overinv |
| ER      | 0.012**  | 0.010**  | 0.002    | 0.008*** | 0.022*** | 0.001   |
|         | (2.47)   | (2.09)   | (0.122)  | (3.462)  | (3.361)  | (0.067)  |
| Size    | 0.002*   | 0.007**  | 0.003*   | 0.003*   | 0.002    | 0.011**  |
|         | (1.8)    | (2.45)   | (1.922)  | (1.881)  | (0.660)  | (2.013)  |
| Lev     | 0.022*** | 0.023    | 0.040*** | 0.013    | 0.020*   | 0.021    |
|         | (2.68)   | (1.05)   | (2.137)  | (0.541)  | (1.899)  | (0.713)  |
| Roa     | 0.027    | 0.069    | 0.017    | 0.135    | 0.052    | 0.062    |
|         | (1.31)   | (1.19)   | (0.502)  | (1.244)  | (1.632)  | (0.895)  |
| Dual    | 0.005**  | 0.002    | 0.005    | 0.002    | 0.004    | 0.004    |
|         | (2.04)   | (0.36)   | (1.379)  | (0.216)  | (1.372)  | (0.482)  |
| Outdir  | 0.020    | 0.018    | 0.021    | 0.057    | 0.038    | 0.051    |
|         | (1.23)   | (0.38)   | (0.982)  | (0.833)  | (1.377)  | (0.754)  |
| Bsize   | 0.012*   | 0.005    | 0.001    | 0.024    | 0.012    | 0.023    |
|         | (1.92)   | (0.26)   | (0.109)  | (0.987)  | (1.412)  | (1.014)  |
| Cfo     | 0.023    | 0.063*   | 0.005    | 0.069    | 0.038    | 0.056    |
|         | (1.26)   | (1.84)   | (0.192)  | (1.580)  | (1.521)  | (1.130)  |
| Top1    | 0.002    | 0.033*   | 0.003    | 0.018    | 0.006    | 0.057**  |
|         | (0.25)   | (1.89)   | (0.198)  | (0.931)  | (0.550)  | (2.310)  |
| Sg      | 0.011*** | 0.009    | 0.014**  | 0.003    | 0.009    | 0.014    |
|         | (2.6)    | (1.06)   | (2.335)  | (0.326)  | (1.541)  | (1.074)  |
| Age     | 0.001    | 0.003    | 0.010*** | 0.002    | 0.007    | 0.005    |
|         | (0.35)   | (0.51)   | (3.509)  | (0.313)  | (1.367)  | (0.599)  |
| SOE     | 0.001    | 0.022*** | 0.009    | 0.014**  | 0.003    | 0.009    |
|         | (0.27)   | (2.75)   | (2.335)  | (0.326)  | (1.541)  | (1.074)  |
| Cons    | 0.063*** | 0.228**  | 0.136*** | 0.081    | 0.041    | 0.302**  |
|         | (2.59)   | (2.70)   | (3.520)  | (0.890)  | (0.793)  | (2.409)  |
| Ind     | control  | control  | control  | control  | control  | control  |
| Year    | control  | control  | control  | control  | control  | control  |
| N       | 783      | 675      | 327      | 166      | 456      | 415      |
| R²_adj  | 0.188    | 0.112    | 0.195    | 0.060    | 0.100    | 0.089    |

(Continued)
### Table 9. (Continued).

|                | Low product market competition |                | High product market competition |
|----------------|-------------------------------|----------------|-------------------------------|
|                | Underinv                      | Overinv        | Underinv                      | Overinv        |
| **ER**         | 0.008                         | 0.025**        | 0.015**                       | 0.005          |
|                | (1.11)                        | (2.43)         | (2.16)                        | (0.42)         |
| **Size**       | 0.003**                       | 0.007          | 0.001                         | 0.010**        |
|                | (2.05)                        | (1.62)         | (0.69)                        | (2.5)          |
| **Lev**        | 0.015                         | 0.004          | 0.025**                       | 0.051*         |
|                | (1.44)                        | (0.13)         | (2.04)                        | (1.86)         |
| **Roa**        | 0.052*                        | 0.121          | 0.002                         | 0.139*         |
|                | (1.91)                        | (1.62)         | (0.08)                        | (1.76)         |
| **Dual**       | 0.006*                        | 0.005          | 0.006                         | 0.004          |
|                | (1.7)                         | (0.47)         | (1.61)                        | (0.39)         |
| **Outdir**     | 0.009                         | 0.046          | 0.019                         | 0.010          |
|                | (0.39)                        | (0.72)         | (0.79)                        | (0.14)         |
| **Bsize**      | 0.009                         | 0.010          | 0.010                         | 0.005          |
|                | (1.07)                        | (0.35)         | (1.12)                        | (1.19)         |
| **Cfo**        | 0.006                         | 0.045          | 0.031                         | 0.076          |
|                | (0.25)                        | (1.02)         | (1.04)                        | (1.4)          |
| **Top1**       | 0.002                         | 0.064**        | 0.013                         | 0.005          |
|                | (0.17)                        | (2.19)         | (1.24)                        | (0.22)         |
| **Sg**         | 0.003                         | 0.023*         | 0.018***                      | 0.001          |
|                | (0.9)                         | (1.72)         | (2.78)                        | (0.07)         |
| **Age**        | 0.002                         | 0.005          | 0.001                         | 0.008          |
|                | (0.56)                        | (0.58)         | (0.26)                        | (0.94)         |
| **SOE**        | 0.004                         | 0.030*         | 0.000                         | 0.004          |
|                | (0.91)                        | (1.91)         | (0.07)                        | (0.5)          |
| **Cons**       | 0.108***                      | 0.155          | 0.051                         | 0.210***       |
|                | (2.76)                        | (1.56)         | (1.42)                        | (2.63)         |
| **Ind control**| control                       | control        | control                       | control        |
| **Year control**| control                      | control        | control                       | control        |
| **N**          | 365                           | 359            | 413                           | 311            |
| **R^2_adj**    | 0.216                         | 0.183          | 0.242                         | 0.166          |

Note: T-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.
underinvestment. (2) In state-owned enterprises, the coefficient of ER was significantly negative only in the overinvestment group, while in non-state-owned enterprises, the coefficient was significantly negative in the underinvestment group. This indicates that employee directors can inhibit the overinvestment behaviour of state-owned enterprises effectively and reduce underinvestment in non-state-owned enterprises. State-owned enterprises are often faced with serious agency problems, so employee directors play a significant role in restraining overinvestment, while non-state-owned enterprises are often faced with insufficient investment opportunities, so that employees’ information advantage becomes more important in reducing underinvestment. (3) In the low product market competition group, the coefficient of ER was significantly negative only in the overinvestment group, while in the high product market competition group, ER was significantly negative only in the underinvestment group. This can also be explained by the fictional role of employee directors. In environments of low product market competition, enterprises often invest blindly in order to expand their empires, and employee directors act effectively in restraining overinvestment. When competition intensifies, seizing development opportunities becomes the goal, in which case, the investment information provided by employee directors helps reduce underinvestment. In addition, we carried out the robustness tests mentioned above. The results were basically the same, but have not been included for reasons of length.

6. Conclusions and policy implications

As an important element of democratic management and an organic component of corporate governance, the employee director system is a valuable and effective mechanism for employees to participate in management. Based on China’s capital market, this study empirically tested the economic consequences of the adoption of the employee director system in China from the perspective of the investment efficiency of enterprises and drew the following conclusions from its results.

(1) Employee directors can improve the investment efficiency of listed companies effectively.

(2) The positive effect of employee directors on investment efficiency is more significant in state-owned enterprises and enterprises in low product market competition environments.

(3) Employee directors can restrain not only overinvestment but can also reduce underinvestment. Employee directors restrain the overinvestment behaviour of state-owned enterprises effectively and reduce underinvestment in non-state-owned enterprises. In low product market competition environments, employee directors can restrain overinvestment, while in high product market competition environments, they can reduce underinvestment.

This paper is the first empirical study of the economic consequences of the adoption of the employee director system in China, exploring the value of and providing a new perspective on employee participation in corporate governance. Our study also proves to be of value to the theory of labour relations by enriching the concepts of ‘employee director’ and ‘labor and finance’ and contributing to other related research topics.
The implications of this research for policymaking are as follows.

(1) Limited liability companies are encouraged to establish the position of employee director and appoint employee representatives to their boards, so that employees have greater access to information about and decision-making in relation to company affairs.

(2) In state-owned enterprises, especially in enterprises with severe problems of ‘insider control’, greater importance needs to be attached to the role of employee directors, and their increasing participation in investment decision-making should be encouraged. This will help reduce any tendency towards blind expansionism by management and improve the efficiency of state-owned capital investment. In non-state-owned enterprises, in addition to setting up the position of employee director, management should also provide institutional guarantees for them to perform their duties. Reducing the risk of dismissal and establishing an organisational culture might be important ways of giving employees an effective voice in corporate governance.

(3) The rights of employee directors should be set flexibly according to the competitive environment of the product market. In low product market competition environments, employee directors’ right to criticise and restrain the blind expansionism of enterprises should be emphasised. As competition intensifies and the need for development opportunities becomes more urgent, employee directors should be given more opportunities to participate in corporate decision-making.

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