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Independent director interlocks: effects and boundary on the earnings persistence of the firm

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ABSTRACT

This article first analyses the impact of independent director interlocks on firms' earnings persistence in China, an emerging market from 2007 to 2017. Using the independent director network data and the unique internal control index, this article investigates the association between independent director interlocks and earnings persistence, and the roles of firms' outside director interlocks and firms' inside internal control playing in earnings persistence. Our results reveal a significant and positive association between independent director interlocks and earnings persistence, and in the context, there is a clear mediation effect of internal control in relationship of independent director interlocks and earnings persistence. Further analyses on the scope and stability of independent director interlocks effects show that independent director interlocks can both improve accrual earnings persistence and cash flow persistence. Meanwhile, the effect of independent director interlocks differentiates under the influence of firms' strategy, only playing a significant role in defensive ones. Moreover, we find that independent director interlocks can relieve the 'accrual anomalies' in the securities market. Our results are robust to the various measure of earnings persistence and alternative methodological techniques.

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1. Introduction

The board of directors is expected to provide advice to and monitor management (Fama & Jensen, 1983). To which extent boards fulfill these duties is widely debated and may depend largely on the traits and skills of the directors (Adams et al., 2010; Giannetti et al., 2015). It seems that board composition plays an especially important role in emerging markets like Turkey, India, China, etc. (García Martín & Herrero, 2018). Because of poor management and weak investor protections, firms' ability to sustain profitability is restricted (Syverson, 2011). After decades of rapid economic growth in China, the linkage among major economic indicators has witnessed

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divergence, which can be attributed to the firms' poor sustained profitability (Anderson et al., 2003) as the result of weak corporate governance and outside investor protections (Liao et al., 2019) and poor management (Han et al., 2018). Our study proposes a link between Independent director interlocks (IDI) and Earnings persistence (EP) to explore whether IDI could play a positive role and where is its boundary on firms' sustainable profitability.

Independent directors, exercise the important right of monitoring and advising the performance in the listed companies where they take a position (Kim et al., 2014). However, after the introduction into the regulatory system for China's listed companies as a foreign product, the independent director system fails to perform as expected. China Securities Regulatory Commission (CSRC) has made corresponding regulations for independent directors in Article 1, paragraph 3 of the 'Guiding Opinions on the Establishment of Independent Director System in Listed Companies' (hereinafter referred to as the 'Guiding Opinions'). By 30 June 2003, listed companies' board of directors was required to include at least 1/3 independent directors. The root cause of the 'scarecrow' phenomenon in practice lies in that the Guiding Opinions incompletely transplants the system to the Chinese situation. The proportion of independent directors in the board of directors, the procedures for nominating independent directors, and the responsibilities and operating methods of independent directors in China are all somewhat different from those in the United States. In the academia, the proportion and professional background of listed companies tend to assimilate following the mandatory transition toward the independent director system, casting doubts about whether independent directors have the same role and whether there are other factors that determine the value of independent directors, hence generating the 'mystery of the role of independent directors' (Nguyen & Nielsen, 2010).

As a key source of inter-firm social networks, Director Interlocks (DI) exists widely in capital market. When a director is on the boards of several firms, there is an interlocking directorate (Mizruchi, 1996; Zhong et al., 2017). Similar to the definition of DI, IDI occur if an independent director is in the boards of different firms. In 2007, at least one interlocking independent director was on the boards of about 27.42% of the companies listed on the Shanghai and Shenzhen stock exchanges.¹ The phenomenon of interdependent DI is widely existed among Chinese listed firms, which could provide us sufficient observations. Meanwhile, China is a unique market where the influence of IDI is tested. It is still in the transition to a market economy from a planned economy. Chinese firms are faced with unprecedented profit challenges because of government intervention and management self-interest behaviours (Syverson, 2011). In this situation, whether IDI could improve EP or not is remaining an empirical issue. Furthermore, the existing literature has conducted abundant research on EP from the perspective of internal control, and concluded that internal control may be an important factor affecting EP. However, it is still an empirical question to be tested as to what's the role of IDIs and internal control in EP.

IDI leads to the connection of firms, which may become a channel for the dissemination of information, knowledge and resources. Director networks allow for the spread of business practices. Interlock networks of the boards can help to explain

options backdating (Bizjak et al., 2009), stock option expensing (Reppenhagen, 2010), tax shelters (Brown, 2011), etc. This study mainly explores whether EP can be improved by IDI. Different from existing literature, this study mainly focuses on the spillover not only of information sharing, but also of monitoring. IDI is an inter-firm governance mechanism that combines ‘general character’ of interlocking and ‘individual character’ of independent directors, as quasi-exogenous shocks. The ‘general character’ reflect the part-time nature that directors make themselves exposed to more heterogeneous knowledge, providing richer resources and information for the firms’ governance and management practices (Chiu et al., 2013). Moreover, the ‘individual character’ in fact is the major difference of IDI from internal DI and affiliated DI. The relationship between independent directors and the firms is far from intimate compared with the other two interlocks.

The reputation effect of independent director has been discussed in many literatures. As stated by Fama and Jensen (1983), as a diligent management monitor, reputation has direct influence on the possibility of gaining future directorships and the value of human capital, thus motivating directors. Consistent with the literature above, the reputation of independent directors who are on the boards of several firms can be enhanced, and there are greater risks of losing potential reputation. In order to get risk from the potential huge reputation cost, interlocked independent directors may be more diligent to participate in monitoring and management. In a word, IDI integrates the ‘general character’ of interlocking and the ‘individual character’ of independent directors, thus enhancing the competency and willingness of independent directors to participate in corporate decision-making.

Three variables are measured, namely, IDI, EP and IC. Director characteristics data are collected from CSMAR individual profile, so that independent directors in multiple seats can be identified. EP is measured by dividing the year-end net profit by average of total assets. The asset and profit data are also obtained from the research subsample database of CSMAR. The ‘Internal Control Index of Chinese Listed Companies’ constructed and released by H. Chen et al. (2017) is used to comprehensively evaluate and quantitatively measure internal control of Chinese firms according to the Internal Control Integrated Framework of the Committee of Sponsoring Organizations of the Treadway Commission (COSO). The research on internal control has widely adopted the index which has been validated (Akwa-Sekyi & Gené, 2016; J. Chen et al., 2017).

Based on the panel of listed firms from 2007 to 2017 in China, the association between IDI and EP, and the roles of IDI and IC with EP are empirically tested to understand the promotion effect of inter-firm IDI and its effect mechanism on EP. Results reveal that there should be a positive correlation between IDI and EP, and in the context, there is a clear mediation effect of internal control in relationship of IDIs and EP. According to our finding, firms have IDI has more benefit on information sharing and monitoring, improving firms’ management practice and profitability. Meanwhile, corporate internal control acts as the mediating mechanism of the positive relationship between IDIs and EP. Further analyses on the scope and stability of IDI mechanism show that IDI can both improve accrual EP and cash flow persistence. Meanwhile, IDI effect differentiates under the influence of firms’ strategy, only

playing a significant role in defensive ones. Moreover, we find that IDI can relieve the ‘accrual anomalies’ in the securities market. Therefore, the main hypothesis is proved by empirically verifying the correlation between IDI and EP, and the expectation is verified by the empirical verification results. In other words, it is by internal control that IDIs improve corporate EP.

This article makes some contributions. First, this article expands the application of social network theory. The literature about DIs, which is an important aspect of board structure, mainly focuses on such exceptional cases as financial fraud and financial restatement. The relationship between corporate governance and earnings is an eternal topic that is of great significance to the firms’ healthy development. Dechow et al. (2004) hold that high-quality earnings can effectively reflect the operation performance and intrinsic value of enterprises and help predict their future operation performance as well; the research regarding earnings quality mainly revolves around two aspects, earnings truthfulness and EP. Shi et al. (2013) firstly targeted at earnings truthfulness and explored the influence of IDIs on it from the perspectives of the accounting background and employment history in institutions of interlocking auditors and interlocking directors. Zhong et al. (2017) studied the promotion of IDIs to accrued earning quality and financial information transparency from the angle of firms that underwent the punishment of China Securities Regulatory Commission. The above researches have taken the first step for studying earnings quality from the perspective of IDIs. The purpose of this article is to advance the research from the perspective of director networks, to explore the association between IDIs and EP, focus on the firms’ persistent profitability.

In addition, the spillover effect of IDIs in the context of Chinese culture is studied from the perspective of EP, while considering the moderating effect of corporate internal control on the association between inter-enterprise IDIs and EP. On one hand, China is witnessing the transformation from a planned economy to a market economy, and our findings could provide suggestions for firms’ governance construction in other emerging markets like India, Turkey, Malaysia, etc., which is a response to Giannetti et al. (2015). On the other hand, Redding (2002) states that in China, social relations are a cultural feature and an important basis for transitional economic behaviours. Consequently, our findings not only answering the question whether establishing IDIs is of special economic significance, but also helps us understand the economic consequences possibly arising out of the interlocks’ establishment. China’s unique advantage as a relational society provides a rare ‘natural experiment’ platform for the studies on the impact of social network on enterprises’ persistent profitability, thus enhancing the reliability of the conclusions to some extent.

Moreover, based on verifying that IDIs can improve corporate EP, this article further clarifies the transmission mechanism between them, that is, it is by internal control that IDIs improve corporate EP. Meanwhile, this article explores the effectiveness boundary of IDIs. A series of regulatory effect tests conduce to understanding how IDI and corporate internal control jointly improve EP from enterprises’ external and internal aspects respectively. This article also studies the breadth and stability of the effectiveness of IDI, that is, whether or not IDI plays a role in both accrual persistence and cash flow persistence, discusses the performance of IDI mechanism under

different company strategies, and relieves the ‘accrual anomalies’, answering the question whether any corporate governance mechanism can help improve the pricing efficiency of the securities market, which is raised by Sloan (1996).

2. Literature review and hypothesis development

Earnings persistence (EP) refers to the possibility that a company’s earnings level will reappear in the future (Dechow et al., 2010). As stated by Fairfield et al. (2003), the principle of accrual accounting conservatism would lead to ‘permanent accounting distortion’, and this seems to mean the continuous decline in accrual earnings is inevitable. However, there are also many scholars holding that the decline in EP is temporary, or that the temporary estimation error of accruals makes the accrual component of earnings have poor persistence (Dechow & Dichev, 2002), or accrual anomalies (Sloan, 1996) are mainly caused by the excess accruals that management can arbitrarily decide, thereby possibly reflecting more about measurement errors and arbitrariness of management (Xie, 2001). Apart from exploring accounting estimation errors, existing literature also make efforts to study the relations between corporate characteristics and EP, but fail to reach consensus on them. For example, Baginski et al. (1999) believes that company size is unrelated to EP, while Xiao and Zhang (2013) hold they are negatively correlated. Different from them, more literatures only take firm size as a control variable for next-period earnings (Dichev & Tang, 2009; Rountree et al., 2008). The above discussions on accounting estimation error and enterprise characteristics have shed new lights on our study of the relationship between governance mechanism and EP.

Independent directors play the main roles of strengthening the supervision capability of the boards, exerting influence over a firm’s choice of policies and accounting methods, affecting the information quality. For example, enhance information transparency (Armstrong, Core, & Guay, 2014), and provide valuable advises for management (Giannetti et al., 2015). Many researches around the relations of DIs with corporate behaviour, suggesting that DIs can be the information bridge through the following two mechanisms. Firstly, it facilitates the communication, mutual trust and cooperation between different firms, reducing transaction costs between them, and learning the organisational structure of successful firms (Cronin, 2011). Secondly, it can be used as a prism to deliver the signal of a firm’s legitimacy to the outside world, thereby serving as an external modification of the company’s behaviours (Podolny, 2001). In terms of company performance, literature argues that DIs provide valuable and rare market information, reduce transaction costs between enterprises, and lower the impact of market uncertainty (Keister, 2009). However, there are also scholars claiming that DIs reduce the firms’ performance. Their arguments mainly base on that interlocking directors may fail to perform their duties due to distracted attention as a result of concurrently holding too many posts (Non & Franses, 2007); and interlocking director network may turn into a small circle of closely connected corporate managers, while the managers in such a small circle may collude with each other for personal gain to damage the benefits of the shareholders of the company they serve, thereby reducing the performance of companies. Meanwhile, there are also scholars holding that DIs do not have an obvious performance

on companies, the interlocking director network within an enterprise group is mainly used to strengthen the links between member companies and redistribute its internal resources, and has no significant impact on the performance of member companies (Lincoln et al., 1996).

In order to relieve the disparities of existing literature on DI, we turn to IDIs. Inside directors and independent directors, due to their disparity in nature, play different roles in interlocking director network. To be specific, independent directors serve as a crucial node and a 'bridge' in the network composed of the interlocks of companies (Zhong et al., 2017). Different from inside directors, independent directors concurrently hold a post in multiple companies and thereby fail to devote wholly to one of them. The larger the difference of independent directors' knowledge background, the larger the heterogeneity of the information they master, the more diversified and differentiated the knowledge and information they get exposed to. It is especially true when they take a position in multiple companies. Such a characteristic brings more abundant and diversified information, knowledge and resources to the board of directors, and help interlocking independent directors play the role of bridge in the network, which is more in line with the weak tie hypothesis (Granovetter, 1983). The sociological relationship theory has long explained the relationship between strength of ties and possibility of information acquisition. For example, Palloni et al. (2001) propose that family networks did not have a significant impact on immigration decision-making, but instead some weaker relationships affect the access of residents to immigration opportunities. IDI, in nature, is a kind of 'weak tie', for independent directors who may work in multiple firms tend to possess more channels to acquire accounting policies and methods, which enhance their expertise and competence and in turn helps the enterprises to establish a smoother communication channel. Such a network relationship contributes to the more transparent generation of corporate earnings information, facilitating the supervision over managers at all levels, preventing them from abusing their authority to seek personal gains, and thus realising the goal of stabilising corporate earnings and increasing persistence of earnings. Meanwhile, multi-channel IDI provides useful information to enterprises to help their decision-making from the aspects of regulatory information, industrial policies, investment and financing information, as well as suppliers, consumers and corporate competitors, which uplifts corporate overall competitiveness and persistent profitability and contributes to the improvement of corporate efficiency and competitiveness. Moreover, independent director networks may serve as a source of innovative knowledge. This is because business practices provide reference information for companies making similar decisions in an interlocking network, thereby increasing their profitability.

Moreover, the 'individual character' of independent directors can raise the enthusiasm of independent directors for active interlocking governance. According to Fama and Jensen (1983), the main motivation of monitoring and participation is the recognition and accumulation of reputation as loyal guardians of the interest of shareholders in the job market for board posts. Compared with the independent directors who work in a single company, interlocking independent directors can get more job opportunities and wider recognition from the elite class (Lin, 2001). However, this means once one of the companies has occurred fraud or violation, interlocking independent directors may undergo tarnished reputation and shrunk actual wages. Based

on the rational theory of crime, a potential criminal is likely to commit a crime if the associated cost is lower than the benefit of crime (Becker, 1968), those interlocked independent directors could be more diligent because of greater potential reputation cost. By studying the special scenario based on enterprises with financial fraud, Kang (2008) draws the conclusion that director networks have a strong reputational penalty effect, generally leading to reduced job opportunities as a director, especially in large companies. Compared with the independent directors who work in a single company, interlocking independent directors generally have greater competence and stronger motivation to participate in governance decisions of enterprises. This promises to prevent the reduced EP caused by the accounting errors deliberately made by the management using system loopholes, or the possible accounting estimate incorrectness due to employees' poor competence. We, therefore, hypothesis:

Hypothesis 1 (H1). The enterprises with independent director interlocks are more likely to maintain earnings persistence than those without independent director interlocks under the same conditions.

Scholars pay increasing attention to internal control because firms can generate profits. Moreover, internal control lays a foundation for the steady and sustainable corporate development. To our knowledge, existing literature have reached a consensus on the impact of IC on EP. These studies generally revolve around the aspects of internal control deficiency correction (Heidarpoor & Shahrivar, 2015) and disclosure of internal control audit opinions (Doyle et al., 2007), finding that EP can be positively influenced by effective corporate internal control. Conversely, the existence of internal control deficiencies may lead to increased behaviours of earnings management and real earnings management, thus causing more earnings noises (Ashbaugh-Skaife et al., 2009) and abnormal earnings and weakening EP. Therefore, whether that be the perspective of management and production or information generation, high IC can effectively boost the possibility of corporate sustained profitability, thereby increasing EP of firms.

Considering the promotion effect of IDIs on EP, we may reasonably assume there is mediation effect of internal control in relationship of IDIs and EP. Internal control is an important part of corporate internal management and control system and has a closely relationship with corporate information generation. Therefore, it is expected to directly improve the persistence of corporate earnings. Comparing to internal control, interlocked directors' monitoring distance seems farther, and they may judge on the firms' internal control.

Specifically, IDIs affect corporate EP, and they are linked up by internal control. This path can be realised through two steps. First of all, according to the theory of weak ties proposed by Granovetter (1983), the significance of weak ties in social network lies in that they link various social circles together, thus realising the efficient information transmission. Ruef (2002) draws the conclusion that by virtue of the effective information obtained from the circles outside, the companies with weak ties in multiple social circles has an innovation ability three times higher at most than those in a single social circle. It is IDIs that make independent directors in a variety of social circles, promoting the diversification and heterogeneity of their cognitive basis and facilitating the sharing of information resources among interlocked

companies and their behavioural learning from each other. The second is that interlocking independent directors participate in board meetings or other informal communication channels. The transition from IDIs (long-distance governance) to corporate internal control (close-distance governance) helps optimise the overall corporate internal control, especially the internal control related to business operation affairs, thereby contributing to the improvement of interlocked companies' EP.

On the one hand, the governance position of IDIs is in between companies, so independent directors are generally not involved in interlocked companies' business operation affairs. For example, independent directors fail to restrain the earnings management behaviours of the companies where they work (Nguyen & Nielsen, 2010). However, as a complete internal management and control system (internal control system) of enterprises, internal control is closely associated with the generation of corporate information and corporate performance, thereby directly improving corporate EP. On the other hand, although independent directors generally don't directly participate in business operation affairs, they can indirectly get involved in the operation affairs by providing the management with appropriate internal control procedures or experience and lessons related to business operation from other interlocked companies. To be specific, with the weak ties network generated by concurrently working in several companies, independent directors may be exposed to more accounting policies and methods, which in turn help improve the effectiveness of corporate internal control to a certain extent. In case of the failure of financial statements for companies that have poor profitability, interlocking independent directors will suffer from a higher cost of loss. As such, the reputation of independent directors brought about by social networks makes them more motivated to enhance internal control. As aforesaid, given not only the information sharing effect and reputation incentive of IDIs, but also the disparity in governance distance between IDIs and internal control internal control serves as the mediating mechanism between independent interlocks and EP. We, therefore, hypothesis:

Hypothesis 2 (H2). In a situation where other conditions are the same, there is a mediation effect of internal control in relationship of independent director interlocks and earnings persistence.

3. Research design

3.1. Sample and data

The hypotheses are tested based on the panel data. The IDI, EP and internal control index, as a firm-year index, is taken as the firm-year panel data. We consider the observation period of our article for the following two main reasons. Firstly, the starting time of the constructing of internal control index, a main variable used for testing Hypothesis 2, is the year of 2007 (H. Chen et al., 2017), a time point since then Chinese companies gradually began to establish internal controls.² Therefore, the observation period of our panel is 2007–2017. The regression period is from 2007 to 2016 since the calculation of EP requires the use of the next year's net profit data. A-share firms listed on the Shanghai and Shenzhen Stock Exchange from 2007 to 2016

are taken as the initial samples, and the latest data can be collected. The samples are screened with the following exclusion criteria: (1) excluding the companies listed after 2007 (inclusive) to ensure that the data of the sample companies in 2007 reflects the results of a complete fiscal year and that the panel data used has an integrate structure; (2) excluding the companies with missing data during the research period; (3) excluding the financial companies that have been listed; and (4) excluding ST and *ST companies. A total of 9395 firm-year observations for Chinese public firms are obtained.

3.2. Variable definition and model setting

3.2.1. Earnings

We refers to the measurement methods in Sloan (1996), Oei et al. (2008), Hui et al. (2016), and use four earnings indicators including Earnings (net profit divided by average assets) in our main tests, and CROA (operating income divided by average assets), ROE (net profit divided by average net assets), CROE (operating income divided by average net assets) in the robust tests.

3.2.2. Interlock

Interlock is IDIs. In order to collect IDI data, we first identify the independent directors of each listed firm according to the independent director ID number from the CSMAR Database considering the problem of duplicate names, and then screen out the firms with IDI in the same industry-year as the research sample using C language programming. Specifically, if an independent director concurrently working in the listed company A and the listed company B in the same industry, we hold the companies A and B have IDIs.

3.2.3. ICQ

ICQ is an internal control index.³ The data about firm-year internal control proposed by H. Chen et al. (2017), which is designed based on the process-oriented view of internal control in accordance with the COSO frame. A series of sub-level standards exist at each five first-level standards level, including 144 fourth-level standards, 43 third-level standards, 24 second-level standards and five first-level standards. AHP and variation coefficient method were used to obtain the internal control index through weighting. This internal control index is suit for the real situation of transition economies like China and other emerging markets such as Turkish, and has been widely used in recent empirical research (Akwa-Sekyi & Gené, 2016; Kartal & Çelikdemir, 2018).

3.2.4. Regression model

The first hypothesis focuses on the influence of IDI on EP. To test the above hypothesis, EP can be measured with the similar method proposed by Sloan (1996) and Dichev and Tang (2009), that is, the first-order autoregressive model of earnings. Although no consensus has been made upon how to measure EP, the commonly used method so far is still the linear first-order autoregressive model. This model

predicts the earnings or their components of the next period generally based on the current earnings and their components. The specific empirical method is to compare the value of this variable of the next period to that of the current period, while the regression coefficient represents EP. Freeman et al. (1982), the developer of this method, stated that in the model, the regression coefficient value is between 0 and 1; the larger the value, the stronger the EP, and vice versa. This method predicts the earnings of the next period using the earnings data of the current period, while the regression coefficient obtained by statistical approach stands for EP. Hence, by referring to previous studies, this article builds a regression model as seen below to test the hypothesis:

$$\begin{aligned} \text{Earnings}_{i,t+1} = & \beta_0 + \beta_1 \text{Earnings}_{i,t} + \beta_2 \text{Earnings}_{i,t} \times \text{Interlock}_{i,t} + \beta_3 \text{Interlock}_{i,t} \\ & + \text{Year} + \text{Ind} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Earnings}_{i,t+1} = & \beta_0 + \beta_1 \text{Earnings}_{i,t} + \beta_2 \text{Earnings}_{i,t} \times \text{Interlock}_{i,t} + \beta_3 \text{Interlock}_{i,t} \\ & + \gamma \text{Control Variables}_{i,t} + \text{Year} + \text{Ind} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Where the dependent variable is the next-period $\text{Earnings}_{i,t+1}$; $\text{Interlock}_{i,t}$ represents IDI, and it is assigned 1 When the firm has IDI in the current year, otherwise 0. According to the definition of regression coefficient in the first-order autoregressive model of earnings, we adopt the intersection term $\text{Earnings}_{i,t} \times \text{Interlock}_{i,t}$ to show the incremental effect brought by IDI. $\text{Control Variables}_{i,t}$ is the control variables. According to mainstream research on Earnings and EP, such as Rountree et al. (2008) and Dichev and Tang (2009), we control the influence of the firm level factors, including asset-liability ratio (Lev), firm size (Size), growth (Growth) and whether it is at a loss in the year (Loss), as well as the industry (Ind) and year (Year). According to Hypothesis 1, IDI is predicted to be associated with more persistent earnings, so we predict $\beta_2 > 0$.

The key factor inside firms, internal control (IC), which may mediate the association between IDIs and EP. Based on model (1) and model (2) and by reference to the existing literature, we introduce IC, which measured by the natural logarithm of the internal control index (ICQ) and $\text{Earnings}_i \times \text{IC}$ and build models (3), (4), and (5) to check whether internal control (IC) is the intermediary mechanism between independent directors interlocks and earning persistence of enterprises, with the goal of verifying the H2.

$$\begin{aligned} \text{Earnings}_{i,t+1} = & \beta_0 + \beta_1 \text{Earnings}_{i,t} + \beta_2 \text{Earnings}_{i,t} \times \text{Interlock}_{i,t} + \beta_3 \text{Interlock}_{i,t} \\ & + \beta_4 \text{IC}_{i,t} + \beta_5 \text{IC}_{i,t} \times \text{Earnings}_{i,t} + \gamma \text{Control Variables}_{i,t} + \text{Year} \\ & + \text{Ind} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

$$IC_{i,t} = \beta_0 + \beta_1 \text{Interlock}_{i,t} + \gamma \text{Control Variables}_{i,t} + \text{Year} + \text{Ind} + \varepsilon_{i,t} \quad (4)$$

$$\begin{aligned} IC_{i,t} \times \text{Earnings}_{i,t} = & \beta_0 + \beta_1 \text{Earnings}_{i,t} \times \text{Interlock}_{i,t} + \gamma \text{Control Variables}_{i,t} + \text{Year} \\ & + \text{Ind} + \varepsilon_{i,t} \end{aligned} \quad (5)$$

Where the Control Variables_{*i,t*} in Model (3)–Model (5) are the same as Model (2). Ultimately, Model (3)–Model (5) are performed subsample regression to test the Hypothesis H2.

4. Results

4.1. Descriptive statistics

The descriptive statistics of all variables is presented in Table 1. According to Panel A, the mean of Earnings of the listed companies are quite different, and the mean values of next-period Earnings and current-period Earnings are 0.0428 and 0.045, respectively, with the maximum and minimum of next-period and current-period Earnings being -0.0989 and 0.341 and -0.0957 and 0.2281 , respectively. Our findings are basically consistent with the existing literature on China companies (Xiao & Zhang, 2013; Zhong et al., 2017). Among the sample firms, the average value of Interlock is 0.317, it suggests that 31.7% firms have IDIs, with the mean value of the IC being 3.743 and the median being 3.798, which is basically consistent with the results concluded by the relevant COSO based internal control studies (H. Chen et al., 2017; J. Chen et al., 2017). After winsorizing the first and last 1% data as outliers, the descriptive statistical data is distributed in a reasonable range. Panel B of Table 1 shows the correlation coefficient matrix. In both Pearson correlation matrix and Spearman correlation matrix, there is positive correlation between the next-period Earnings (Earnings_{*t+1*}) and the current-period Earnings (Earnings_{*t*}) at the significance level of 1%, indicating that the sample firms are of persistence in accounting earnings. Interlock_{*t*} and Earnings_{*t*} have positive correlation at the significance level of 5%, suggesting that there is a certain correlation between IDIs and current-period Earnings. IC is significantly positively correlated with Earnings_{*t*} and Earnings_{*t+1*} at the 5% and 10% level, which is in accordance with the findings of the existing literatures mentioned above.

4.2. Regression results

4.2.1. IDIs and EP

As mentioned previously, IDIs is an inter-firm measure for firms to better learning and monitoring. When firms have IDIs, their earnings will perform persistent, seemingly doing better on growing sustainably.

The regression analysis results of IDIs and EP based on Models (1) and (2) are presented in Table 2. Column (1) in Table 2 demonstrates that the coefficient of Earnings_{*t*} × Interlock_{*t*} is 0.082, which is significant at the 1% level, suggesting that IDIs

Table 1. Descriptive statistics.

Panel A: Sample descriptions						
Variables	Obs.	Mean	Median	Std.	Min	Max
Earnings _{t+1}	9395	0.0428	0.034	0.0505	-0.099	0.224
Earnings _t	9395	0.0446	0.035	0.0509	-0.096	0.228
Interlock _t	9395	0.317	0.000	0.465	0.000	1.000
IC _t	9378	3.743	3.798	0.263	2.937	4.180
Size _t	9395	15.340	15.300	1.034	12.990	18.120
Lev _t	9395	0.493	0.503	0.186	0.081	0.871
Growth _t	9395	0.160	0.097	0.382	-0.471	2.473
Loss _t	9395	0.071	0.000	0.257	0.000	1.000

Panel B: Correlation coefficient matrix.

Variables	Earnings _{t+1}	Earnings _t	Interlock _t	IC _t	Size _t	Lev _t	Growth _t
Earnings _{t+1}		0.730***	0.004	0.023**	0.187***	-0.352***	0.204***
Earnings _t	0.679***		0.0130**	0.0130	0.238***	-0.387***	0.315***
Interlock _t	0.0100	0.022**		0.113***	0.100***	0.030***	0.011
IC _t	0.025**	0.018*	0.111***		0.423***	0.040***	-0.102***
Size _t	0.208***	0.262***	0.094***	0.403***		0.018*	0.024**
Lev _t	-0.330***	-0.377***	0.031***	0.028***	0.020*		0.074***
Growth _t	0.134***	0.249***	0.001	-0.091***	0.010	0.067***	
Loss _t	-0.167***	-0.476***	-0.007	-0.020*	-0.093***	0.122***	-0.130***

Note: *, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

significantly improves EP without considering the influence of other factors. As illustrated by column (2) in Table 2, the coefficient of $\text{Earnings}_t \times \text{Interlock}_t$ is 0.061 after regression with the control variables added, and it is still significantly positive at the 1% level ($T = 2.84$). According to the regression results in Table 2, the companies with IDIs have longer EP than those without, hence suggesting that H1 is tenable. With respect to the control variables, Size has significantly positive correlation with Earnings_{t+1} , and Lev significantly negatively associated with Earnings_{t+1} . These findings from Models (2) show that larger firms generally have stronger profitability of the next period; and the higher the asset-liability ratio, the lower the profitability of the next period. These conclusions are basically consistent with the findings of the existing literature. Therefore, companies with strong debt-paying ability and abundant resources have high profitability, which is in accordance with the resource base theory. The reliability of the results is verified by the factors. In a word, H1 is supported.

4.2.2. Mediation of internal control in association between IDIs and EP

The empirical results for IDIs demonstrate that companies can improve their sustainable profitability because of better governance and sharing superior management knowledge. In addition, we expect that internal control acts as the mediating mechanism of the positive relationship between them considering the governance distance difference between IDIs and internal control. For this purpose, we introduce IC and $\text{Earnings}_t \times \text{IC}$ to examine the roles that internal and inter-firm governance mechanisms are playing. Table 3 shows the regression results. According to column (1) and (2), the coefficient of $\text{Earnings}_t \times \text{Interlock}_t$ is 0.071 and 0.054, significantly at 1% level and 5% level separately, while the coefficient of $\text{Earnings}_t \times \text{IC}$ is 0.188 and 0.138, significantly at 1% level.

Table 2. The association between independent director interlocks and earnings persistence.

Variables	Earning _{t+1}	
	(1)	(2)
Earning _t	0.635*** (47.68)	0.689*** (42.53)
Interlock _t	-0.004*** (-3.13)	-0.003** (-2.37)
Earning _t ×Interlock _t	0.082*** (3.60)	0.061*** (2.84)
SIZE		0.003*** (6.93)
Lev		-0.020*** (-7.60)
Growth		-0.002 (-1.39)
Loss		0.037*** (17.89)
_cons	0.003 (0.71)	-0.041*** (-5.50)
Ind	Yes	Yes
Year	Yes	Yes
N	9395	9395
Adjust R ²	0.484	0.519

Note: Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Meanwhile, as illustrated in column (3)–(6), when we change the dependent variable of IC and Earning_t×IC, the coefficient of Interlock_t is 0.024 and 0.014 significantly, and the coefficient of Earning_t×Interlock_t is 2.504 and 1.544, significantly at 1% level.

These results suggest that there is a certain mediation effect of internal control in relationship of IDIs and EP, helping us to explore the transmission mechanism of the effect of IDIs. Specifically, with the weak ties network generated by concurrently working in several companies, independent directors may be exposed to more accounting policies and methods, which in turn help improve the effectiveness of corporate internal control to a certain extent. Although independent directors generally don't directly participate in business operation affairs, they can indirectly get involved in the operation affairs by providing the management with appropriate internal control procedures or experience and lessons related to business operation from other interlocked companies. In a word, H2 is supported.

4.2.3. Further tests

The above results supporting Hypothesis 1 and Hypothesis 2 indicate that IDIs can improve EP, while corporate internal control acts as the mediating mechanism of the positive relationship between them. However, it remains unclear as to its effectiveness scope and stability. As mentioned above, the effect of the predictive power of earnings' various components on EP is one of the key concerns of EP (Sloan, 1996). We examine the impact of IDI on cash flow persistence and accruals persistence, and the results are shown in Table 4. For accruals persistence, the coefficient of ACC_Earning_t×Interlock_t is 0.088, which is significant at the level of 1%, and IDI has a significant positive effect on accruals persistence; while for cash flow persistence, the coefficient of CFO_Earning_t×Interlock_t is 0.076, which is significant at the

Table 3. Independent director interlocks, internal control and earnings persistence.

Variables	Earning _{t+1}		IC		Earning _t ×IC	
	(1)	(2)	(3)	(4)	(5)	(6)
Interlock _t	-0.004*** (-2.77)	-0.003** (-2.09)	0.024*** (4.91)	0.014*** (2.97)		
Earning _t ×Interlock _t	0.071*** (3.09)	0.054** (2.46)			2.504*** (54.19)	1.544*** (33.02)
IC	-0.007** (-2.32)	-0.006** (-2.17)				
Earning _t ×IC	0.188*** (4.11)	0.138*** (3.17)				
Earning _t	-0.063 (-0.37)	0.176 (1.08)				
SIZE		0.003*** (6.54)		0.063*** (25.31)		0.057*** (29.73)
Lev		-0.020*** (-7.39)		0.021* (1.67)		-0.317*** (-34.99)
Growth		-0.001 (-1.33)		-0.022*** (-3.77)		0.082*** (15.14)
Loss		0.037*** (17.84)		-0.032*** (-3.67)		-0.234*** (-43.64)
_cons	0.028*** (2.61)	-0.018 (-1.54)	3.339*** (194.69)	2.416*** (59.49)	0.145*** (10.05)	-0.543*** (-18.76)
Ind	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	9378	9378	9378	9378	9378	9378
Adjust R ²	0.486	0.520	0.362	0.406	0.260	0.550

Note: Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

level of 1%. Table 4 demonstrates that the effectiveness scope of IDIs cover both accruals persistence and cash flow persistence.

We also further test its stability. Specifically, when firms adopt aggressive strategies, the management tends to pay more attention to technology innovations rather than current performance, generally leading to more radical accounting policies and methods, otherwise, the reverse. Too prudent accounting policies may also lead to ‘permanent accounting distortions’, which in turn exacerbate the decline in EP. According to Bentley et al. (2013), we measure corporate strategies from six dimensions, scoring strategies from 0 to 4. The grouping of strategic scores (STRA) is 1, when a company with a score lower than the average is rated as one with conservative strategies, or otherwise 0. Table 5 shows the subsample regression under different companies’ strategic stratification. As illustrated, when STRA = 1, the coefficient of Earning_t×Interlock_t is 0.104 and it is positive at the significant level of 1%, while the coefficient is not significant when STRA = 0. These results suggest that enterprises with conservative strategies show the effectiveness of IDIs mechanism; IDI is prone to be affected by corporate strategy, so only when a company’s overall strategy is relatively prudent can IDIs improve EP.

4.2.4. Market pricing efficiency

Since IDI can positively influence both accrual persistence and cash flow persistence, then does IDIs affect the pricing of the securities market? After the 1980s, the securities market has witnessed frequent ‘anomalies’. As such, a growing number of

Table 4. Impact of independent director interlock on persistence in accrual earnings and cash flow.

Variables	ACC_Earning _{t+1}	CFO_Earning _{t+1}
ACC_Earning _t	0.233*** (14.84)	
ACC_Earning _t ×Interlock _t	0.088*** (3.29)	
CFO_Earning _t		0.327*** (21.23)
CFO_Earning _t ×Interlock _t		0.076*** (2.89)
Interlock _t	0.001 (0.54)	-0.004* (-1.91)
SIZE	0.003*** (4.23)	0.006*** (7.49)
Lev	-0.036*** (-8.39)	-0.022*** (-5.26)
Growth	0.011*** (4.89)	-0.002 (-1.07)
Loss	0.004 (1.46)	0.005 (1.55)
_cons	-0.067*** (-5.05)	-0.038*** (-2.82)
Ind	Yes	Yes
Year	Yes	Yes
N	9395	9395
Adjust R ²	0.152	0.224

Note: Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Table 5. Stratified test of different corporate strategies.

Variables	Earning _{t+1}	
	STRA = 0	STRA = 1
Earning _t	0.725*** (34.44)	0.633*** (24.13)
Interlock _t	-0.002 (-1.04)	-0.003** (-2.00)
Earning _t ×Interlock _t	0.032 (1.06)	0.104*** (2.94)
SIZE	0.004*** (5.31)	0.003*** (3.87)
Lev	-0.016*** (-4.24)	-0.018*** (-4.65)
Growth	-0.005*** (-3.60)	0.001 (0.78)
Loss	0.035*** (9.42)	0.036*** (12.17)
_cons	-0.047*** (-4.49)	-0.035*** (-2.80)
Ind	Yes	Yes
Year	Yes	Yes
N	3847	4032
Adjust R ²	0.603	0.431

Note: Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Table 6. Market pricing efficiency.

	All	Interlock = 1	Interlock = 0
a_1	0.575	0.625	0.552
a_2	0.676	0.712	0.659
a_1^*	0.802	0.751	0.841
a_2^*	0.847	0.739	0.916
Wald statistics			
$a_1 = a_1^*$	26.720	3.943	23.821
$a_2 = a_2^*$	17.302	0.208	21.254
Significance			
$a_1 = a_1^*$	0.000	0.047	0.000
$a_2 = a_2^*$	0.000	0.649	0.000

Source: Authors.

scholars, such as Foster et al. (1984) and Collins et al. (2003), have turned their research focus to accruals anomalies. Based on Mishkin framework (Mishkin, 1983; Thomas, 1999), we construct the Models (6) and (7) in an attempt to analyse the relationship between IDI and securities market pricing.

$$\text{Earnings}_{i,t+1} = \alpha_0 + \alpha_1 \text{ACC}_{\text{Earnings}_{i,t}} + \alpha_2 \text{CFO}_{\text{Earnings}_{i,t}} + \varepsilon_{i,t} \quad (6)$$

$$\text{Abreturn}_{i,t+1} = \delta_0 + \delta_1 (\text{Earnings}_{i,t+1} - \alpha_0^* - \alpha_1^* \text{ACC}_{\text{Earnings}_{i,t}} - \alpha_2^* \text{CFO}_{\text{Earnings}_{i,t}}) + \varepsilon_{i,t} \quad (7)$$

Equation (6) is a prediction model, and Equation (7) a pricing model, where α_j ($j=1,2$) is the persistence coefficient, α_j^* ($j=1,2$) the market pricing coefficient, and $\text{Abreturn}_{i,t+1}$ the excess return calculated by multiplication method. If investors can develop a rational expectation about a company's future earnings—distinguishing different persistence information in accruals and cash flow and thus realising correct pricing over accruals and cash flow, then $\alpha_j = \alpha_j^*$ ($j=1,2$) is established. The above process is tested using Wald statistics by nonlinear least squares regression

Table 6 presents the regression results. In the complete sample test, the Wald statistics of $\alpha_1 = \alpha_1^*$ and $\alpha_2 = \alpha_2^*$ are 26.720 and 17.302, respectively, suggesting that there are significant accruals anomalies and mispricing in China's securities market. Table 7 lists the regression results of IDI grouping in the second and third column. As illustrated, the companies without IDI show higher inclination of mispricing (For accrual earnings and cash flow, the persistence coefficients are 0.552 and 0.659, their market pricing coefficients are 0.841 and 0.916, their Wald statistics are 23.821 and 21.254, respectively, and their significant levels both are 0.000). We also find the behaviours of mispricing in the companies with IDI (For accrual earnings, the persistence coefficient is 0.625, the market valuation coefficient is 0.751, the Wald statistic is 3.943, and the significant level is 0.047). However, the companies with IDI have a lower mispricing degree than those without (For cash flow persistence, the Wald statistic is 0.208 and insignificant; while for accruals persistence, the Wald statistic is $3.943 < 23.821$ with a significance level $0.047 > 0.000$). The above findings show that IDI offers diversified and heterogeneous information channels, which contribute to enhancing the persistence of corporate earnings, reducing the degree of mispricing in the securities market.

Table 7. Firm fixed-effect regressions and PSM regressions.

Variables	Earning _{t+1}			
	Firm fixed-effect		PSM	
	(1)	(2)	(3)	(4)
Earning _t	0.430*** (18.26)	0.408*** (17.25)	0.682*** (21.95)	0.650*** (20.85)
Interlock _t	-0.004** (-2.18)	-0.002 (-1.24)	-0.003 (-1.55)	-0.003* (-1.70)
Earning _t ×Interlock _t	0.056** (2.14)	0.047* (1.86)	0.074** (1.98)	0.078** (2.16)
SIZE	-0.001 (-1.36)	0.004*** (3.68)	0.001 (1.27)	0.003*** (4.10)
Lev	-0.007 (-1.15)	-0.007 (-1.11)	-0.027*** (-6.47)	-0.027*** (-5.92)
Growth	0.003*** (2.81)	0.004*** (3.25)	-0.001 (-0.59)	-0.000 (-0.04)
Loss	0.032*** (12.74)	0.032*** (12.75)	0.040*** (10.77)	0.039*** (10.54)
_cons	0.038*** (3.73)	-0.042** (-2.50)	0.011 (1.06)	-0.030*** (-2.39)
Firm fixed	Yes	Yes	No	No
Industry fixed	Yes	Yes	No	Yes
Year fixed	No	Yes	No	Yes
N	9395	9395	3064	3064
Adjust R ²	0.163	0.192	0.507	0.526

Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

4.3. Robustness checks

4.3.1. Endogeneity

Although we control the variables that may affect the dependent variables and the influence from the industry and year, our regression models may have limitation to eliminate the differences arising out of enterprise individuality. Therefore, in order to better control the influences caused by corporate individual differences and possible endogenous problems, we re-regress Table 2 using a fixed-effect model that controls the individual effects of firms. Table 7 column (1) and (2) list the regression results. The robustness test results show that the coefficients of Earning_t×Interlock_t is 0.066, respectively, and pass the significance level of 5%, which are basically consistent with the previous test results. Moreover, propensity score matching (PSM) is used for regression of Table 2 and listed in Table 7 column (3) and (4). Following Rosenbaum and Rubin (1983), this part screens out the firms that have no IDIs but are similar to those have. After PSM, the Earning_t×Interlock_t coefficients were 0.074 (industry-year effect is not controlled) and 0.078 (industry-year effect is controlled), respectively, and both passed a significant level of 5%. This suggests that IDIs significantly influence the persistence of corporate earnings, which is basically consistent with our main conclusion. The above robustness test results, as shown in Table 7, further support and validate H1.

4.3.2. Other robustness checks

In order to ensure the robustness of the conclusions drawn, this study use other robustness checks, such as: (1) using the Sobel-Goodman mediation test model to

improve the efficiency of the test; (2) using the method of substituting measurement for Earnings; (3) controlling the slope effect; (4) increasing control variables. Specifically, we examine the mediation effect of IC on IDI and EP, using the Sobel-Goodman mediation test model (MacKinnon et al., 2002), to improve the efficiency of the test in Table 3; based on the measurement methods in Hui et al. (2016), we turn to CROA (operating income divided by average assets), ROE (net profit divided by average net assets), CROE (operating income divided by average net assets) as the alternative measurement of Earnings to retest Tables 2 and 3; we introduce the intersections (Earnings \times Control Variables, CROA \times Control Variables, ROE \times Control Variables, and CROE \times Control Variables), between each earnings indicator and control variables into the model (2), in order to re-test Table 2; we introduces the investment variable (Invest) and intersection (Earnings \times Invest, CROA \times Invest, ROE \times Invest, and CROE \times Invest) between each earnings indicator and enterprise investment, in order to re-test Table 2. The unreported results suggested that the conclusions of this study remain unchanged.

5. Conclusion and discussion

5.1. Conclusion

The role of directors on firms' sustainability is a perpetual topic, especially in those emerging and unstable markets like China, witnessing the transformation from a planned economy to a market economy. Previous researches mainly investigate the role of independent directors in supervision and consultation from the perspectives of the individual characteristics or proportion of independent directors (Ataay, 2018; Borlea et al., 2017; García Martín & Herrero, 2018; Korent et al., 2014). Stančić et al. (2014) focus on bank performance, investigating the influence of board characteristics on bank profitability. Interlocking independent directors are placed into a complex social network due to being concurrently employed in multiple companies, and their part-time nature helps develop a weak tie between each other (Granovetter, 1983). Such an information bridge role promises to enhance the sharing of information resources between interlocking companies and promote the learning from each other. Furthermore, compared with those independent directors who work only in a listed company, interlocking independent directors enjoy higher social prestige and are more eager to gain recognition in the elite circle. In summary, this article explores the influence of IDIs on the firms' EP from the perspective of director networks.

With the companies listed in Shanghai and Shenzhen stock exchanges as the samples, we explore the association between IDI and EP from the perspectives of 'general character' of director interlocking and the 'individual character' of independent directors. Our research draws conclusions that (1) IDI can significantly improve EP, while corporate IC acts as the mediating mechanism of the positive relationship between them; (2) IDI not only enhances the overall EP, but also bring both accrual EP and cash flow persistence into its scope of effectiveness; (3) the governance willingness of enterprises significantly affects the performance of IDI, and IDI generally shows a more significant promotion effect on EP in the enterprises with conservative strategies compared with those with aggressive ones; and (4) in terms of market pricing,

IDI contributes to the relieves of ‘accrual anomalies’ of companies and the optimisation of investor pricing accuracy, thereby helping enhance the vitality of the capital market.

5.2. Discussion

Previous research involving the impact of DIs on the quality of accounting information generally focuses on special cases, such as financial fraud (Fich & Shivdasani, 2007) and financial report restatement (Chiu et al., 2013). Shi et al. (2013) took earnings truthfulness as research object for the first time and explored the impact of IDIs on earnings truthfulness by starting with the interlock of directors that had work experience in accounting firms. The above research pioneered the investigation of earnings quality from the perspective of independent directors. This study is expected to further advance the exploration into IDIs and corporate earnings. Starting with the director network, this study focuses on the sustainable profitability of enterprises and aims to identify the relationship between IDIs and EP. In addition, based on the verification that IDIs indeed can improve the EP of enterprises, this study further clarifies the transmission mechanism between IDIs and EP, that is, IDIs improve corporate EP through internal control.

There are some important implications in the study. First, the influence of IDIs comes from independent directors’ reputation effect and the learning effect of DIs, so policymakers can encourage director labour market to concerning the reputation of applicants. Moreover, they should also ensure that firms should ensure internal control or high-quality independent director for sustainable profitability; for those with poor internal control, encourage enterprises to highlight and actively build IDIs and turn ‘radical’ corporate strategies to ‘prudent’ ones without prejudice to corporate development, to give play the governance effectiveness of IDIs as possible. As mentioned above, after the introduction of the independent director system into China, the ‘inadaptability’ phenomenon emerges. This mainly be ascribed to that the current regulations of China’s securities market and corporate governance structure are excessively partial to issuers rather than public investors and independent directors are impotent to protect the legal rights of small and medium shareholders. In this study, the IDI mechanism is found to exert a positive effect on EP, thereby providing inspiration for the regulatory authorities to perfect the independent director system from aspects of the composition and proportion of independent directors.

The research of this article on the relationship between IDIs and EP also provides inspiration for corporate governance in other developing countries. On the one hand, China is undergoing a transition from a planned economy to a market-oriented economy. Our findings can provide references for corporate governance in other emerging markets such as India, Turkey, and Malaysia. This is a response to the research by Giannetti et al. (2015). On the other hand, Redding (2002) considered social relations in China as a cultural feature that serves as an important foundation for economic transformation. Therefore, our research results answer the question as to whether the establishment of IDIs has special economic significance.

There are several limitations to this work. This study only focuses on the relationship between IDIs and EP as well as the transmission mechanism between them, that is, IDIs improve corporate EP through internal control. However, no attention is given to the effect strength of the interlock of independent directors at different network positions, which is to be the direction of our further research.

Notes

1. This phenomenon is observed in mature economies such as US market (Chiu et al., 2013).
2. As the SOX404 promulgated in 2002, countries around the world began to pay increasing attention to internal control. On 15 July 2006, China's five major government departments and regulatory agencies, including the Ministry of Finance, China Securities Regulatory Commission (CSRC), National Audit Office, China Banking Regulatory Commission (CBRC) and China Insurance Regulatory Commission (CIRC), jointly established an Internal Control Standards Committee. As such, internal control has been gradually established and developed in Chinese enterprises since 2007.
3. The internal control index adopted in this paper has two advantages, namely, (1) the index is built based on the COSO framework and (2) it constructs a quantitative score system for internal control using the analytic hierarchy process, rather than a dichotomous variable for internal control defects (disclosed by US SOX404), thereby making possible to evaluate whether different internal control systems affect the earnings of enterprises with weak internal control and overcoming the disadvantages of dichotomous variables.

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Appendix

Appendix A. Sobel-Goodman Mediation Tests

Panel A: MV(IC).			
	Coefficient	Standard error	Z-value (p-value)
Sobel	0.0001	0.007	2.173** (0.030)
Goodman-1(Aroian)	0.0001	0.007	2.142** (0.032)
Goodman-2	0.0001	0.007	2.207** (0.027)
<i>a</i>	0.026	0.005	5.271*** (0.000)
<i>b</i>	0.004	0.002	2.386** (0.018)
Indirect effect	0.0001	0.000	2.173** (0.028)
Direct effect	-0.000	0.001	-0.472 (0.637)
Panel B: MV(Earning _t × IC).			
	Coefficient	Standard error	Z-value (p-value)
Sobel	0.007	0.007	5.070*** (0.000)
Goodman-1(Aroian)	0.007	0.007	5.046*** (0.000)
Goodman-2	0.007	0.007	5.095*** (0.000)
<i>a</i>	0.041	0.006	7.434*** (0.000)
<i>b</i>	0.160	0.230	6.932*** (0.000)
Indirect effect	0.007	0.001	5.070*** (0.000)
Direct effect	0.022	0.012	1.781* (0.075)

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Appendix B. Alternative measurement of Earnings: CROA

Variables	CROA _{t+1} (1)	CROA _{t+1} (2)	IC (3)	CROA _t × IC (4)
Interlock _t	-0.003** (-2.11)	-0.002* (-1.80)	0.014*** (2.97)	
CROA _t × Interlock _t	0.041** (2.00)	0.034 (1.64)		1.679*** (35.29)
IC		-0.007** (-2.37)		
CROA _t × IC		0.106*** (2.68)		
CROA _t	0.716*** (51.53)	0.325** (2.20)		
SIZE	0.003*** (5.71)	0.003*** (5.62)	0.063*** (25.31)	0.070*** (30.79)
Lev	-0.020*** (-7.31)	-0.020*** (-7.17)	0.021* (1.67)	-0.381*** (-35.57)
Growth	-0.003** (-2.28)	-0.003** (-2.22)	-0.022*** (-3.77)	0.101*** (15.60)
Loss	0.034*** (15.09)	0.033*** (15.03)	-0.032*** (-3.67)	-0.237*** (-38.74)
_cons	-0.044*** (-5.41)	-0.021* (-1.74)	2.416*** (59.49)	-0.743*** (-21.36)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
<i>N</i>	9378	9378	9378	9378
Adj _{st} R ²	0.563	0.563	0.406	0.534

Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Appendix C. Alternative measurement of Earnings: ROE

Variables	ROE _{t+1} (1)	ROE _{t+1} (2)	IC (3)	ROE _t ×IC (4)
Interlock _t	−0.008*** (−2.64)	−0.007** (−2.29)	0.014*** (2.97)	
ROE _t ×Interlock _t	0.078*** (3.05)	0.068*** (2.65)		1.530*** (34.57)
IC		−0.016*** (−2.79)		
ROE _t ×IC		0.182*** (4.03)		
ROE _t	0.615*** (34.37)	−0.061 (−0.36)		
SIZE	0.008*** (7.66)	0.008*** (7.28)	0.063*** (25.31)	0.109*** (29.30)
Lev	−0.005 (−0.89)	−0.004 (−0.77)	0.021* (1.67)	−0.123*** (−7.60)
Growth	0.002 (0.77)	0.002 (0.82)	−0.022*** (−3.77)	0.167*** (15.93)
Loss	0.081*** (15.76)	0.081*** (15.74)	−0.032*** (−3.67)	−0.587*** (−47.92)
_cons	−0.123*** (−7.37)	−0.058** (−2.29)	2.416*** (59.49)	−1.268*** (−22.37)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	9378	9378	9378	9378
Adjust R ²	0.374	0.376	0.406	0.526

Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Appendix D. Alternative measurement of earnings: CROE

Variables	CROE _{t+1} (1)	CROE _{t+1} (2)	IC (3)	CROE _t ×IC (4)
Interlock _t	−0.007** (−2.30)	−0.007** (−2.02)	0.014*** (2.97)	
CROE _t ×Interlock _t	0.053** (2.14)	0.046* (1.80)		1.753*** (37.27)
IC		−0.014** (−2.15)		
CROE _t ×IC		0.118** (2.54)		
ROE _t	0.645*** (38.01)	0.206 (1.19)		
SIZE	0.008*** (6.67)	0.008*** (6.54)	0.063*** (25.31)	0.135*** (29.22)
Lev	−0.010 (−1.57)	−0.009 (−1.46)	0.021* (1.67)	−0.212*** (−10.27)
Growth	0.001 (0.37)	0.001 (0.43)	−0.022*** (−3.77)	0.209*** (16.25)
Loss	0.071*** (12.64)	0.071*** (12.59)	−0.032*** (−3.67)	−0.603*** (−41.71)
_cons	−0.139*** (−7.30)	−0.088*** (−3.05)	2.416*** (59.49)	−1.657*** (−23.43)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	9378	9378	9378	9378
Adjust R ²	0.438	0.438	0.406	0.503

Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.

Appendix E. Independent director interlocks and earnings persistence: controlling slope effect and invest

Variables	Earning _{t+1} (1)	CROA _{t+1} (2)	ROE _{t+1} (3)	CROE _{t+1} (4)
Earning _t	0.764*** (23.61)			
Interlock _t	-0.002 (-1.41)	-0.002* (-1.69)	-0.005* (-1.86)	-0.006** (-2.17)
Earning _t ×Interlock _t	0.034** (2.05)			
CROA _t		0.673*** (19.84)		
CROA _t ×Interlock _t		0.032** (2.00)		
ROE _t			0.017 (0.13)	
ROE _t ×Interlock _t			0.044** (2.24)	
CROE _t				0.182 (1.48)
CROE _t ×Interlock _t				0.039** (2.09)
SIZE	0.003*** (5.89)	0.002*** (4.57)	0.002 (1.46)	0.003** (2.20)
Lev	-0.015*** (-6.60)	-0.018*** (-6.80)	-0.002 (-0.34)	-0.002 (-0.35)
Growth	-0.001 (-1.31)	-0.002 (-1.54)	0.006* (1.80)	0.012*** (3.14)
Loss	0.007*** (3.05)	0.017*** (7.28)	0.046*** (10.95)	0.052*** (11.11)
Invest	-0.004 (-0.54)	-0.014* (-1.68)	-0.004 (-0.23)	-0.041** (-2.10)
Earning _t ×SIZE	0.000 (0.05)			
Earning _t ×Lev	-0.000* (-1.74)			
Earning _t ×Growth	-0.000 (-0.26)			
Earning _t ×Loss	-0.795*** (-17.22)			
Earning _t ×Invest	-0.301*** (-2.67)			
CROA _t ×SIZE		0.005** (2.38)		
CROA _t ×Lev		-0.000 (-0.66)		
CROA _t ×Growth		-0.001 (-0.44)		
CROA _t ×Loss		-0.332*** (-11.01)		
CROA _t ×Invest		-0.173 (-1.62)		
ROE _t ×SIZE			0.047*** (5.60)	
ROE _t ×Lev			-0.113** (-2.34)	
ROE _t ×Growth			-0.047* (-1.93)	
ROE _t ×Loss			-0.284*** (-17.87)	
ROE _t ×Invest			-0.075	

(continued)

Continued.

Variables	Earning _{t+1} (1)	CROA _{t+1} (2)	ROE _{t+1} (3)	CROE _{t+1} (4)
			(-0.57)	
CROE _t ×SIZE				0.035*** (4.58)
CROE _t ×Lev				-0.109** (-2.39)
CROE _t ×Growth				-0.085*** (-3.78)
CROE _t ×Loss				-0.135*** (-8.35)
CROE _t ×Invest				0.189 (1.53)
_cons	-0.039*** (-5.37)	-0.040*** (-4.73)	-0.037* (-1.82)	-0.070*** (-3.12)
Ind	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	9378	9378	9378	9378
Adjust R ²	0.537	0.569	0.401	0.445

Robust *t* statistic is listed in parentheses.

*, **, and *** denote the levels of significance test by 10%, 5%, and 1%, respectively.

Source: Authors.