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Does director interlock impact the diffusion of accounting method choice?

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ABSTRACT

This paper examines the influence of director interlock on firms' discrete accounting method choices from the perspective of behavior diffusion. We argue that firm managers will imitate their interlocked-partner firm's accounting method choices when choosing their own accounting methods. We find that when there is an interlock relationship between two firms, their accounting method choices, including inventory and depreciation methods, are similar to each other, indicating that accounting method choices can diffuse across firms through director interlock. In addition, such similarity is greater the longer the interlock relationship between the two firms is and as uncertainty increases. Further, the interlock effect on depreciation methods is larger for firms whose interlock directors have accounting backgrounds. Finally after considering sample selection bias, the influence of industry homogeneity, the issue of endogeneity, the influence of interlock direction, using accruals as a measurement of the aggregations of accounting method choices, and so on, our results are still robust.

1. Introduction

How the behaviors of humans or organizations can be influenced by a network of social connections is one of the key issues in social theory (Granovetter, 1985). Social embeddedness theory (Granovetter, 1985) argues that "economic action is embedded in structures of social relations." Director interlock, as one of the most important social connections among firms, has proved to be a costless and credible channel of information dissemination (Haunschild, 1993; Shropshire, 2010). Based on its information transmission function, director interlock can act as the mechanism for the diffusion of corporate practices and structures (Chiu et al., 2013; Haunschild, 1993; Hu et al., 2013).

Previous studies have investigated whether corporate practices, including accounting and finance choices, diffuse through director interlock, resulting in the similarity of corporate choices such as poison pill strategies (Davis, 1991), earnings management (Chiu et al., 2013; Shi et al., 2013), and executive compensation (Addy et al., 2014; Crespí-Cladera and Pascual-Fuster, 2015). These studies congruously conclude that corporate choices can diffuse through director interlock. However,

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none of these studies concentrates on the more routine and fundamental accounting method choices such as inventory and depreciation methods.

Actually, from an information perspective, prior literature indicates that accounting methods are selected to reveal managers' information and predictions about future cash flows of the firm (Holthausen, 1990; Holthausen and Leftwich, 1983; Watts and Zimmerman, 1990). Thus, these more routine and fundamental accounting methods, such as inventory method and depreciation method, are more relevant to firm values and impact future cash flows. In addition, Holthausen and Leftwich (1983) indicate that systematic accounting methods can cluster simply due to imitation. Given the importance of the information content of accounting method choices to a firm's future cash flows and value, we explore whether director interlock can impact the diffusion of those more routine and fundamental accounting method choices using a sample of public firms listed in the Chinese A-share Shanghai and Shenzhen Stock Exchanges.[1]

We believe data from China provides us an acceptable context (e.g., environmental uncertainty) within which to test the diffusion mechanism of interlock. According to Peng and Luo (2000) and Powell (1990), environmental uncertainty is the primary reason why firms rely on managerial ties when making decisions. First, China is an institutional transition economy characterized by weak institutional support and distorted information. Hence, it is difficult for firms in China to gain useful information from legitimate channels such as analysts and the media. In this situation, one efficient way to gain information and reduce the environmental uncertainty is to take advantage of managers' interpersonal ties (Peng and Luo, 2000). Second, prior literature has suggested that director interlock is an alternative mechanism to a weak institutional environment and may play a more essential role for firms in developing countries (Peng and Luo, 2000; Ren et al., 2009).

We find that accounting method choices (inventory and depreciation methods), indeed, diffuse across firms through networks of director interlock, and the focal firms' choices are positively related to their interlocked partner firms' previous accounting method choices.

To substantiate our results, we investigate how the age of the interlock relationship impacts the effect of director interlock on accounting method diffusion. We hypothesize that as the age of the interlock relationship increases, the information transmitted across interlock firm boundaries becomes more stable and consistent. Our results support this argument. We find that the longer the continuous interlock relationship, the more similar the accounting methods of the two firms.

We also investigate whether interlocking directors' accounting backgrounds moderate the relationship between director interlock and accounting method diffusion. We conjecture that since directors with accounting backgrounds are more likely to understand the importance of accounting choices, they are more likely to influence the accounting choices of their interlock partner firms. We find limited support for this argument. Our results show that when an interlocking director has an accounting background, the focal firm's depreciation method choice is similar to that of the interlock firm. Finally, we also investigate whether the relationship between the focal firm and the interlock firm will be strengthened when environmental uncertainty is higher. Our results indicate that, indeed, it is the case.

Our paper contributes to the current literature in three ways. First, this paper expands the influential factor of accounting method choices. Prior literature studies accounting method choices mainly from the firm-characteristic level. We find that the interlock relationship of managers can also impact firms' accounting method choices. In addition, our results provide further evidence of the positive relationship between director interlock and the diffusion of firm practices. Especially for the diffusion of accounting choices, we provide evidence that inventory and depreciation methods can also diffuse among firms through director interlock. Finally, our study also provides insights on the mechanism (e.g., the age of the interlock relationship and interlocking director background) that strengthens or weakens the diffusion of accounting methods over an interlock network.

Our paper has practical policy implications as well. Regulators and some lobbyists seem to think interlock directorates are not good and have a predisposition to try to eliminate them. For instance, Mary L. Shapiro, Commissioner of the SEC, argues that discouraging interlocking boards is an idea worth exploring. The California Public Employees' Retirement System (CalPERS) suggests to the SEC that the definition of independence in directors should include any relationship, such as interlocking relationship, that may impair a director's objectivity whether in appearance or in fact. These concerns may be legitimate; however, they are naïve and incomplete. Our paper finds that interlocking directorates are a natural solution to instances of high levels of uncertainty, especially for emerging markets such as China. When firms face environmental uncertainty in making decisions, they may imitate what their interlocked partners did previously. Also, interlocking directors can diffuse not only "good" (e.g., corporate strategy) but also "bad" (e.g., financial restatement) management policy decisions. For example, the China Securities Regulatory Commission requires listed firms to disclose interlocking directors' basic information

[1] The reason why we use the discrete fundamental accounting methods but not the aggregate accrual models are: (1) On the discrete accounting method side, different accounting method choices reveal different problems managers face as well the solutions they adopt. For example, depreciation method affects the equipment replacement decision (Louis and Robinson, 2005) and inventory method affects the tax saving decision (Alam and Loh, 2004). These decisions go beyond the earnings management being revealed by accrual methods. (2) On the accruals earnings management side, results based on accrual models indicate only whether earnings management might diffuse across an interlock network. However, they cannot reveal how and what types of accounting principles cause the diffusion of the accrual method across a social network because accrual methods can be changed by various corporate practices. (3) Furthermore, which accounting method and when to adopt it is not a straight-forward question. These are things managers can learn from their peers. For example, The SEC itself has noted that accounting principles are not meant to be a straightjacket and that flexibility of accounting is essential to innovation (Arthur Levitt, the "Numbers Game" speech at the New York University Center for Law and Business (Sep. 28, 1998)). In other words, GAAP "allows" a company to manage earnings by using alternative ways to record the operations of an entity. For instance, managers can change depreciation methods from an accelerated method to a more conservative straight-line method or vice versa; managers can also choose/modify the "suitable" method of inventory valuation (LIFO, FIFO, etc.).

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and their impact on corporate operations. Therefore, strengthening the positive effects of interlocking directors and weakening the negative effects is an important work that regulators should consider, especially for firms operating in an environment with high levels of uncertainty.

The remainder of this paper is organized as follows. In Section 2, we review the related literature and develop our hypotheses. In Section 3, our research design is introduced. Section 4 presents our empirical results and Section 5 concludes.

2. Literature and hypotheses

2.1. The diffusion of corporate practices through director interlock

How does the diffusion of corporate practices occur? First, a model firm does "X." Simultaneously, the other firm is exposed to the model firm through inter-organizational links. Later, the linked firm does "X" (Haunschild, 1993). Hence, one of the most important prerequisites for diffusion to occur is an information conduit such as director interlock, which ensures that certain practices of the model firm can be diffused to the linked firm. There is strong evidence that director interlock is one of the most important information conduits because it is very common for firms (Davis, 1991), and it is credible and low-cost (Haunschild, 1993; Shropshire, 2010). Hence, director interlock plays a vital role in information diffusion of corporate practices among firms (Bizjak et al., 2009; Haunschild and Beckman, 1998). Interlock addresses one ultimate issue for behavior diffusion or imitation: environmental uncertainty or outcome ambiguity (Cyert and March 1963).

Decisions made by managers are based on two important predictions: one is the probabilistic forecasting of all possible future states of the environment and the other is the prediction of expected returns under different future environmental states (Knight, 2012). First, it is difficult to estimate the future states of the environment because environmental changes can be influenced by many complicated factors such as political issues, macro-economic policies, or institutional reforms. Owing to a lack of adequate information about these factors, managers may not precisely forecast the probabilities of all future environmental states. Second, it is very tough for managers to predict the actual outcome in various future states of the environment. Hence, environmental uncertainty or outcome ambiguity makes it difficult to estimate the results of certain decisions (Lieberman and Asaba, 2006; March et al., 1976). One efficient way for firms to reduce risks induced by ambiguity, is to take advantage of their interpersonal ties (Peng and Luo, 2000) such as using their directors' exposure to their interlocked partners' decision processes as a reference point in helping them make their own corporate decisions.

Prior studies provide sufficient evidence that, as a conduit of private information, director interlock plays an important role in the diffusion of corporate practices. For example, Davis (1991) argues that the probability of a firm's adopting a poison pill strategy increases when its interlocked partner adopts it. Palmer et al. (1993) indicate that firms are willing to adopt a multi-divisional form if their interlocked firms have also adopted it. Similar conclusions can be found in the diffusion of corporate acquisition activities (Haunschild, 1993, 1994), political behaviors (Burris, 2005), private equity transactions (Stuart and Yim, 2010), disclosure policies (Cai et al., 2014), etc.

2.2. Director interlock and accounting method diffusion

Previous research in the area of accounting and finance documents that when firms share a common director, their accounting choices in auditor selection (Davison et al., 1984), stock option expensing (Kang and Tan, 2008; Reppenhagen, 2010), stock option backdating (Bizjak et al., 2009), tax shelters (Brown, 2011; Brown and Drake, 2014) and earnings management (Chiu et al., 2013; Shi et al., 2013) will be more similar. However, until now, to the best of our knowledge, no study has investigated whether the more routine and fundamental accounting method choices including inventory and depreciation methods can diffuse through director interlock.[2]

Information perspective theory (Holthausen, 1990) suggests that if managers have a comparative advantage in accessing resources and obtaining information for their firms, they will have more power and influence over the estimation of the firms' future cash flows. This is consistent with Rogers (2003), who indicates that opinion leaders can be more powerful and influential in making decisions whether good or bad. Simultaneously, managers with a comparative advantage in providing resources and information should be compensated partly in light of their ability to predict their firms' future cash flows (Holthausen, 1990). Hence, choosing the right fundamental accounting methods is a very important decision made by managers. Managers use choices of fundamental accounting methods to signal their view on their firms' future prospects (e.g., their expectations of future cash flows, Holthausen, 1990; Holthausen and Leftwich, 1983; Watts and Zimmerman, 1990) and to improve the reliability and relevance of accounting information.

However, accounting method choices are not straight-forward, and they impact the problems managers face as well as the solutions they adopt. It is difficult for managers to decide among these accounting choices. The environmental uncertainty and outcome ambiguity might drive managers to employ heuristics when making complex accounting choice deci-

[2] There is some similarity between our study and that of Chiu et al. (2013). We both study the effect of director interlock on firms' financial reporting behavior from the perspective of diffusion. However, Chiu et al. (2013) concentrate on financial restatement as the measurement of earnings management; our paper concentrates more on a firm's fundamental accounting method choices such as inventory and depreciation methods.

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sions. Specifically, in order to deal with these uncertainties, managers might simplify their decision making by either adopting the exact accounting methods or following the accounting method decision processes of their interlock partners.

According to the resource dependence theory, interlocking directors can provide firsthand and detailed information and knowledge which are obtained from other firms and are relevant and crucial to their own firm's decisions and strategies (Shropshire, 2010). So, the interlocking directors have comparative advantages in corporate decisions, including the decision of accounting method choices, due to their ability in information acquisition and interpretation (Rao et al., 2000). Thus, it can be hypothesized that there is a positive relationship between a focal firm's accounting method choices and the accounting method choices of its interlock partners.

Hypothesis 1. A focal firm's accounting method choice (inventory method, depreciation method) is positively related to its interlock partner's accounting method choice.

Next, we investigate the conditional effect of accounting choice diffusion over an interlock network based on the characteristics of the interlock (e.g., the age of the interlock and the backgrounds of the directors). The inter-organizational tie is the prerequisite to ensuring the success of corporate practice diffusion; but, it does not mean that if two firms share an inter-organizational tie such as interlock, the diffusion of corporate practices will occur certainly and automatically. The ultimate reason behind behavior diffusion or imitation is the extent to which interlock can reduce environmental uncertainty or outcome ambiguity (Cyert and March, 1963).

We believe that, compared with a short interlock relationship, a long interlock relationship indicates a steadier and stronger relationship between the two firms, and there will be less outcome ambiguity for information transmitted over the interlock network.

First, following Lieberman and Asaba (2006), diffusion/imitation can be divided into information-based and rivalry-based perspectives. Leaders and followers competing in the same market or niche is the prerequisite of rivalry-based imitation. In our sample, about 80% of interlocked firms are from different industries; therefore, to a large extent, we believe that the diffusion over interlock in our study is motivated more by information-based imitation. From this perspective, imitation is more likely to occur in organizations which are more familiar with each other. A long interlock relationship between two firms suggests that they are more familiar with each other.

Second, as stated earlier, the accounting method choices including inventory and depreciation methods are not straightforward; managers need to know the pros and cons of certain method choices. When the interlock relationship is longer, the focal firm can not only acquire the decision/behavior information of the interlock firm about accounting method choice, but also gain insightful knowledge regarding the pros and cons of the outcomes regarding specific accounting choices adopted by the interlock firm. Such process- and outcome-related information may make the focal firm more likely to adopt similar accounting methods as those adopted by the interlock firm. In addition, Cai et al. (2014) find that the positive effect of interlock connections on the diffusion of disclosure policy is stronger for firms with interlocking directors who experienced positive outcomes from prior experience.

Hence, it can be hypothesized that longer interlock relationships can make the focal and interlock firms' accounting method choices more similar.

Hypothesis 2. The effect of director interlock on accounting method choices is stronger as the age of the interlock relationship between two firms increases.

On the director background side, prior literature (Aguilera, 2005) argues that directors' accounting backgrounds can impact firm decisions and outcomes. Because managers with accounting backgrounds understand the value implications and consequences of accounting choices better, there will be fewer outcome concerns from other directors when an interlock director with such a background recommends certain accounting methods. We believe directors with accounting backgrounds might be more likely to appreciate the importance of the different accounting method choices; hence, they are more sensitive to and are more likely to influence the accounting method decisions.

Hypothesis 3. The effect of director interlock on accounting method choices is stronger when the interlocking director has an accounting background.

3. Research design

3.1. Sample and data

Our accounting method choices are measured by inventory method choice and depreciation method choice. We manually collected the inventory and depreciation methods from notes to the financial statement. Other data are from the China Security Market & Accounting Research (CSMAR) database. All continuous variables were winsorized at both the top 99% and bottom 1%. Following Bowen et al. (1995), the "specific identification" inventory method and the "units of production" depreciation method were excluded in our analysis; hence, the final datasets for inventory method choice and depreciation method choice were different. However, regardless of the accounting method, the sample selection procedures were identical as elaborated below.

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First, we limited the initial sample to all public firms listed in the Chinese A-share Shanghai and Shenzhen Stock Exchanges that disclose accounting methods for the years 2007 to 2012. There are two reasons why we chose 2007 as the starting year of the sample. One is that China started to adopt new accounting standards for business enterprises that year. The other is that the Last in, First out (LIFO) inventory method was forbidden starting that year.

In order to identify the interlock between firm-pairs, we compared directors' backgrounds (name, age, gender, education background, and working experience) of each firm with those of all the other firms in the same year. If one firm had a common director with another firm, those firms were considered as interlocked partners. For example, assume that we compare firm A's director's background with all the other firms' directors' backgrounds in the sample. We find that firm B has a common director with firm A. We then define firm A and firm B as interlocked firm pairs. Because an interlock relationship is an undirected network (Larcker et al., 2013), when we concentrate on firm A's imitation behavior, firm A is the focal firm, and firm B is the interlock firm. Similarly, when we concentrate on firm B's imitation behavior, firm B is the focal firm and firm A is the interlock firm. For a robustness check, if firm A and firm B have a director interlock relationship, we randomly chose one firm as the focal firm and the other firm as the interlock firm. We repeated our analyses and arrived at the same conclusions.

In addition, we kept only those firm-pairs for which the focal firm's accounting methods in the current year and the interlock firm's accounting methods in both the current and the prior years were disclosed. This is because when investigating behavior diffusion, the behavior of the interlock firm should occur earlier than that of the focal firm (Haunschild, 1993).

Furthermore, for all accounting method choices, observations that satisfied one or more of the following conditions were deleted: (1) the focal firm or the interlock firm was in the financial services industry; (2) the focal firm or the interlock firm belonged to a ST firm.[3] And finally, according to prior literature (Bowen et al., 1995; Jackson et al., 2009), for the inventory method and depreciation method samples, observations where the focal firm was in a quasi-regulated industry were deleted.

After the above procedures and having deleted observations with missing values, the inventory method sample consisted of 6520 firm-year observations, 1376 distinct focal firms, and 1447 distinct interlock firms. The depreciation method sample consisted of 7875 firm-year observations, 1532 distinct focal firms, and 1613 distinct interlock firms.

In order to control for the issue of potential sample selection bias and endogeneity, we used the propensity-score matching method to construct our base model,[4] which we elaborate in detail below. The propensity-score matching method has been widely used in the accounting literature (Lawrence et al., 2011; Lennox et al., 2012; Rosenbaum and Rubin, 1983).

First, following Shi et al. (2013), we used the following probit model to predict the probability of the occurrence of *Director Interlock* for any non-financial industry firm for a given year.[5]

$$Director\_Interlock_{i,t} = \alpha_0 + \alpha_1 Size_{i,t} + \alpha_2 Boardsize_{i,t} + \alpha_3 List_{i,t} + \alpha_4 ROA_{i,t} + \alpha_5 LEV_{i,t} + \alpha_6 SOE_{i,t} + \alpha_7 Share_{i,t} + \alpha_8 Year_{i,t} + \alpha_9 Industry_{i,t} + \varepsilon \quad (1)$$

where *Director_Interlock* is an indicator variable. When the firm has an interlock relationship with other firms, it equals one and zero otherwise. Other variables are defined in the appendix.

Based on the above probit regression, we come up with the probability of the occurrence of *Director Interlock* for each firm-year, which is the estimated propensity scores (Guo and Fraser, 2010). Then, for every firm-year of the focal firm in our samples, without replacement, we try to match it with a non-interlock firm whose predicted occurrence probability of *Director_Interlock* is closest to that of the focal firm's at the maximum propensity score distance (caliper)[6] of 3% (Lawrence et al., 2011). Generally, the propensity-score matching method requires limiting the maximum distance of the matching sample to avoid a bad match. For our sample, because the number of firms with interlock relationships was greater than those without, we could not find matches meeting the 3% criteria for all focal firms. As a result, 4460 observations (68.40% of the 6520 observations in the initial sample) were matched successfully in the inventory method sample, 4873 observations (61.88% of 7875 observations in the initial sample) were matched successfully in the depreciation method sample. Therefore, the majority of the samples were successfully matched with a non-interlock firm through the propensity-score matching method.

Then, we combined the successfully matched sample with the interlock sample to form a new sample to test our hypotheses. Therefore, our final inventory method sample consists of 8920 firm-year observations, while our final depreciation method sample consists of 9746 firm-year observations. The detailed sample selection procedures are summarized in Table 1.

[3] *ST firm* refers to a firm labeled as a Special Treatment firm by the stock exchanges in China because it is in financial distress (e.g., two continuous years of financial loss).

[4] Our research question concentrates on whether a focal firm imitates their interlocked partner firm's accounting method choice. So, to a certain extent, the question is how long it takes for an event to occur after exposure, and what variables influence that time-to-event. Simultaneously, the survival analysis allows researchers to make explicit whether the probability of a time-to-event is increasing or decreasing in time-since-exposure, or somehow nonlinear. So following Cox (1972) and Guan et al. (2015), we use the Cox proportional hazard model (assuming exponential functional form) to test our hypothesis, and the untabulated results are still robust.

[5] The firms belonging to the financial services industry were excluded because their financial ratio and numbers are different from that of non-financial industry firms.

[6] The propensity score distance (caliper) is the distance between the predicted probabilities of the interlock firm (treatment) and non-interlock firm (non-treatment).

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Table 1
Sample selection procedure.

Inventory method		Depreciation method	
Distinct focal firms	Firm-years	Distinct focal firms	Firm-years
In year 2007–2012, A-share firms that disclose inventory method, depreciation method			
2256	9919	2447	11294
In year 2008–2012, firms which have interlock relationships with other firms, and at the same time, the other firms' accounting method is disclosed			
1565	7788	1781	9992
Delete if either the focal firm or the interlock firm is in the financial industry			
1565	7788	1735	9331
Delete if either the focal firm or the interlock firm is an ST firm			
1512	7414	1681	8912
Delete quasi-regulated industries			
1383	6591	1539	7945
Delete if other controls are missing			
1376	6520	1532	7875
Interlocked sample which successfully matched the non-interlocked sample through propensity-score matching method			
1182	4460	1273	4873
Total sample included interlocked sample and non-interlocked matched sample			
1182	8920	1273	9746

This table presents the sample selection procedure for each accounting method sample.

3.2. Model and variable

To investigate the effect of director interlock on accounting method diffusion, we estimated the following probit models. Models (2) and (3), respectively, test the relationship between director interlock and the diffusion of inventory method choice and depreciation method choice.

For the inventory method and depreciation method models, we follow those used by Bowen et al. (1995) and Jackson et al. (2009) by controlling R&D investment, notes payable, advertising expenses, firm performance, and so on.[7] Also, because the economic behavior and consequences of the state-owned firms can be very different from the non-state-owned firms in China (Lin et al., 1998), we added a dummy variable to control for whether a firm is controlled by the state in all of the models.

$$\begin{aligned} F\_Inventory_{i,t} = {} & \alpha_0 + \alpha_1 Inventory_{j,t-1} + \alpha_2 Interlock + \alpha_3 Inventory_{j,t-1} * Interlock + \alpha_4 R\&D_{i,t} + \alpha_5 LABOR_{i,t} \\ & + \alpha_6 MFG_{i,t} * CGS_{i,t} + \alpha_7 NMFG_{i,t} * CGS_{i,t} + \alpha_8 NPAY_{i,t} + \alpha_9 ADV_{i,t} + \alpha_{10} LEVMV_{i,t} + \alpha_{11} SALE_{i,t} \\ & + \alpha_{12} DROA_{i,t} + \alpha_{13} SOE_{i,t} + \Sigma\ Year + \Sigma\ Industry + \varepsilon \end{aligned} \tag{2}$$

$$\begin{aligned} F\_Depreciation_{i,t} = {} & \alpha_0 + \alpha_1 Depreciation_{j,t-1} + \alpha_2 Interlock + \alpha_3 Depreciation_{j,t-1} * Interlock + \alpha_4 R\&D_{i,t} + \alpha_5 LABOR_{i,t} \\ & + \alpha_6 MFG_{i,t} * CGS_{i,t} + \alpha_7 NMFG_{i,t} * CGS_{i,t} + \alpha_8 NPAY_{i,t} + \alpha_9 ADV_{i,t} + \alpha_{10} LEVMV_{i,t} + \alpha_{11} SALE_{i,t} \\ & + \alpha_{12} DROA_{i,t} + \alpha_{13} SOE_{i,t} + \Sigma\ Year + \Sigma\ Industry + \varepsilon \end{aligned} \tag{3}$$

In models (2) and (3), the dependent variable is the focal firm's accounting method choices in year *t*. Accounting method choices are proxied by inventory method and depreciation method. The inventory method of the focal firm (*F_Inventory*) is a dummy variable, when the focal firm chooses the First in, First out (FIFO) inventory method (income-increasing method) in year *t*, it equals one;

[7] Our inventory method and depreciation method models are very similar to Bowen et al. (1995), except that we do not include their control variables "*DUR*", "*DBEN*" and "*OG*SALE*". According to Bowen at al. (1995), "*DUR*" is a dummy variable that equals one for firms producing durable goods. But in China, the number of public firms producing durable goods is very small and leads to a multicollinearity concern; hence, this variable is omitted in our regressions. "*DBEN*" is also a dummy variable that equals one for firms with defined benefit pension plans. However, Chinese law requires firms must have pension plans, so we do not include "*DBEN*" in our models. Also, "*OG*" is a dummy variable that equals one for firms in the oil and gas industry. In China, the oil and gas industry is regulated, so those firms are excluded in the sample selection procedure. As a result, the interaction term "*OG*SALE*" is also omitted in our models.

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whereas, when it chooses the average cost inventory method (income-decreasing method) in year *t*, it equals zero.[8] As to the depreciation method (*F_Depreciation*), when the focal firm chooses the straight-line depreciation method (income-increasing method) in year *t*, it equals one; and when the accelerated method (income-decreasing method) is chosen in year *t*, it equals zero.[9]

In Model (2), *Inventory* refers to the interlock firm's or the matching firm's inventory method. If the FIFO method is used in year *t-1*, then it equals one. And, if the average cost method is used in year *t-1*, then it equals zero. Similarly, in Model (3), *Depreciation* refers to the interlock firm's or the matching firm's depreciation method. If the straight-line method is used in year *t-1*, then it equals one, and if the accelerated method is used in year *t-1*, then it equals zero. We defined a new indicator variable, *Interlock*, which equals one when the two firms are interlocked and zero otherwise. In the inventory method sample, we concentrate on the coefficient of the interaction term of *Inventory*∗*Interlock*, which reflects the incremental impact of the other firm's inventory method choice on the focal firm's inventory method choice when they were interlocked with each other. Also, in the depreciation method sample, we concentrate on the coefficient of the interaction term of *Depreciation*∗*Interlock*, which reflects the incremental impact of the other firm's depreciation method choice on the focal firm's depreciation method choice when they were interlocked with each other.

Furthermore, for the moderate variable, we use the length of the continuous interlock relationship between two firms to measure the age of the director interlock. Accounting background is an indicator variable; if the interlocking director has an accounting education, it equals one, and zero otherwise.

Please refer to the appendix for detailed definitions of all variables used in this study.

4. Results

4.1. Summary statistics

Table 2 presents summary statistics of all variables for each accounting method sample. Panel A shows that our inventory method sample consists of 8920 firm-year observations, with about 4.93% of firm-years using the FIFO method and about 95.07% using the average cost method in focal firms. Simultaneously, in the interlock firms and matched firms, about 5.93% of firm-years use the FIFO method and about 94.07% use the average cost method. Panel B shows that our depreciation method sample contains 9746 firm-year observations. For the focal firms, about 99.32% of firm-years use the straight-line method and about 0.68% use the accelerated method. For the interlock firms and matched firms, about 98.78% of firm-years use the straight-line method and about 1.22% use the accelerated method.

4.2. Effect of director interlock on accounting method diffusion

In this section, we use the probit regression based on propensity-score matching model to test our main hypothesis. Because in our sample one focal firm might share multiple interlock firms, the z-statistics are clustered on firm level. Model 1 in Tables 3 and 4 shows the regression results for inventory method and depreciation method, respectively.

In Model 1 of Table 3, the coefficient for the interaction term of *Inventory*∗*Interlock* (Para = 0.5193, z-value = 1.99) is positive at the 5% level of significance, which suggests that a focal firm's inventory method choice is positively related to their interlock firms' inventory method choice. Therefore, the inventory method choice can diffuse between firms through a network of director interlocks.

In Model 1 of Table 4, the coefficient for the interaction term of *Depreciation*∗*Interlock* (Para = 3.3451, z-value = 9.85) is positive and significant at the 1% level as well, which suggests that a focal firm's depreciation method choice is positively related to their interlock firms' depreciation method choice. Hence, the above results indicate that a focal firm's accounting method choice (inventory method and depreciation method) is positively related to its interlock partner's accounting method choice. In other words, firms' accounting method choices can diffuse across firms through director interlock, thereby supporting our hypothesis 1.

Fig. 1 summarizes various models we used to test the relationship between interlock and discrete accounting method choice. We started with our basic model (Model 1) by using the propensity-score matching sample to study our hypothesis 1. Then, we added the interaction between the age of the interlock, accounting choice, and interlock (Model 2); and the interaction between the background of the interlock director, accounting choice, and interlock (Model 3) to study our hypotheses 2 and 3 respectively. After that, we conducted a series of robustness checks. Following Cai et al. (2014), we used a full sample instead of the propensity-score matching sample to study our hypotheses in Model 4. Model 5 adds the interaction term *Accounting method*∗*Same_Industry* and *Accounting_Method*∗*Same_Industry*∗*Interlock* to control for the effect of industry homogeneity. Model 6 is the full change model (linking the change of interlock to the change of accounting method choice) used to address the potential endogeneity issue. Model 7 is the subset of propensity-score matching sample with the interlock direction considered. Model 8 is the propensity-score matching sample with environment uncertainty controlled.

[8] The "specific identification" inventory method cannot be classified into the income-increasing method or income-decreasing method, so according to Bowen et al. (1995), the focal firms or interlock firms using the "specific identification" inventory method were excluded.

[9] The "units of production" depreciation method cannot be classified into the income-increasing method or income-decreasing method, so according to Bowen et al. (1995), the focal firms or interlock firms using the "units of production" depreciation method were excluded.

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Table 2
Descriptive statistics.

Variable	N	Mean	Std. Dev.	Minimum	Median	Maximum
Panel A: Inventory Method Sample						
F_Inventory	8920	0.0493	0.2166	0.0000	0.0000	1.0000
Inventory	8920	0.0593	0.2362	0.0000	0.0000	1.0000
Interlock	8920	0.5000	0.5000	0.0000	0.5000	1.0000
Interlock_Age	8920	1.0942	1.5791	0.0000	1.0000	13.0000
Accounting	8920	0.2047	0.4035	0.0000	0.0000	1.0000
R&D	8920	0.0014	0.0048	0.0000	0.0000	0.0296
LABOR	8920	0.6023	0.2600	−0.1820	0.6469	0.9931
*MFG*CGS*	8920	0.5337	0.4826	0.0000	0.4970	2.2905
*NMFG*CGS*	8920	0.1938	0.4577	0.0000	0.0000	2.5184
NPAY	8920	0.0355	0.0540	0.0000	0.0116	0.2637
ADV	8920	0.0444	0.0500	0.0000	0.0280	0.2675
LEVMV	8920	37.7732	55.0956	0.0000	6.5746	162.5128
SALE	8920	20.8118	1.2891	16.4621	20.8439	24.2073
DROA	8920	0.7695	0.4212	0.0000	1.0000	1.0000
SOE	8920	0.2475	0.4316	0.0000	0.0000	1.0000
Panel B: Depreciation Method Sample						
F_Depreciation	9746	0.9932	0.0820	0.0000	1.0000	1.0000
Depreciation	9746	0.9878	0.1098	0.0000	1.0000	1.0000
Interlock	9746	0.5000	0.5000	0.0000	0.5000	1.0000
Interlock_Age	9746	1.1000	1.5736	0.0000	1.0000	13.0000
Accounting	9746	0.2040	0.4030	0.0000	0.0000	1.0000
R&D	9746	0.0014	0.0047	0.0000	0.0000	0.0297
LABOR	9746	0.6155	0.2616	−0.1672	0.6600	0.9953
*MFG*CGS*	9746	0.5011	0.4835	0.0000	0.4468	2.1745
*NMFG*CGS*	9746	0.2059	0.4545	0.0000	0.0000	2.5184
NPAY	9746	0.0327	0.0536	0.0000	0.0070	0.2779
ADV	9746	0.0444	0.0538	0.0000	0.0274	0.3010
LEVMV	9746	45.7596	69.2943	0.0000	6.8645	209.1579
SALE	9746	20.7846	1.2958	16.5784	20.8196	24.0537
DROA	9746	0.7938	0.4046	0.0000	1.0000	1.0000
SOE	9746	0.2249	0.4175	0.0000	0.0000	1.0000

This table presents summary statistics of all variables for each accounting method sample.

4.3. Conditioning effect of the age of the interlock

Although interlock enables the diffusion of accounting methods across firm boundaries, its effects could vary due to the age of the interlock. We believe the impact of interlock on accounting method diffusion is stronger in firm-pairs with longer interlock relationships. We added the interaction term of interlock dummy, the accounting method choices, and the age of the interlock to our base models to test this hypothesis. The results are presented in Model 2 of Tables 3 and 4, respectively. In Model 2 of Table 3, the coefficient for the interaction term of *Inventory*∗*Interlock* (Para = 0.4927, z-value = 1.90) remains positive at the 10% level of significance. Also, the coefficient for the interaction term of *Inventory*, *Interlock* and *Interlock_Age* (Para = 0.2903, z-value = 1.98) is still positive at the 5% level of significance. These results indicate that the positive relationship between the focal firm's inventory method choice and its interlock firm's inventory method choice is stronger the longer their continuous interlock relationship is to a certain extent. Similarly, we find the same effect on the depreciation method choice (Para = 0.5882, z-value = 1.90 for *Depreciation*∗*Interlock*∗ *Interlock_Age*) as presented in Model 2 of Table 4. Therefore, to a larger extent, we conclude that the longer two firms have been in a continuous interlock relationship, the more similar their accounting method choices, supporting our hypothesis 2.

4.4. Conditioning effect of the accounting background of interlocking director

Prior literature (Aguilera, 2005) suggests that a director's accounting background may impact the firm's decisions and outcomes. In this section, we test whether an accounting education background can moderate the relationship of director interlock and the diffusion of accounting method choices. We added the interaction terms of interlock dummy, the accounting method choice, and interlocking director's accounting background (*Accounting*) to our base models. The results are shown in the Model 3 of Tables 3 and 4. We find that the interlocking director's accounting background can lead to both firms' depreciation methods being more similar (Para = 1.2485, z-value = 2.33). However, we fail to reject the null hypothesis that accounting background does not influence the diffusion of inventory method along the director network, which is worthy of further research.

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Table 3
The effect of interlock on inventory method and the moderate effect of interlock age and accounting background.

	Model 1	Model 2	Model 3
Inventory	−0.2551	−0.1688	−0.2565
	(−1.41)	(−1.27)	(−1.41)
Interlock	−0.0349*	0.0387	−0.0217
	(−1.81)	(0.66)	(−0.98)
*Inventory*Interlock*	0.5193**	0.4927*	0.5151**
	(1.99)	(1.90)	(1.98)
Interlock_Age		−0.0204	
		(−0.74)	
*Inventory*Interlock*Interlock_Age*		0.2903**	
		(1.98)	
Accounting			−0.2451
			(−0.96)
*Inventory*Interlock*Accounting*			0.2196
			(0.42)
R&D	9.4856	9.5792	9.3730
	(0.65)	(0.66)	(0.64)
LABOR	−1.5240***	−1.5319***	−1.5274***
	(−4.60)	(−4.62)	(−4.60)
*MFG*CGS*	−1.1554***	−1.1573***	−1.1592***
	(−2.61)	(−2.60)	(−2.61)
*NMFG*CGS*	0.5559***	0.5558***	0.5577***
	(2.89)	(2.90)	(2.90)
NPAY	−2.6652	−2.6532	−2.6407
	(−1.51)	(−1.50)	(−1.50)
ADV	2.0693	2.0636	2.0609
	(1.42)	(1.42)	(1.41)
LEVMV	0.0003	0.0003	0.0003
	(0.75)	(0.74)	(0.76)
SALE	0.0118	0.0130	0.0104
	(0.15)	(0.17)	(0.14)
DROA	−0.1201	−0.1214	−0.1203
	(−1.03)	(−1.04)	(−1.03)
SOE	0.1956	0.1921	0.1895
	(1.07)	(1.05)	(1.04)
Intercept	−0.6243	−0.6449	−0.5928
	(−0.43)	(−0.45)	(−0.41)
Year and Industry	Yes	Yes	Yes
N	8920	8920	8920
Pseudo R^2	0.2297	0.2309	0.2303

The dependent variable is the focal firm's inventory method choice in year *t*, while *Inventory* is the interlock firm's or the non-interlock matched firm's inventory method in year *t-1*. All variables are defined in the appendix. Model 1 examines the effect of director interlock on inventory method diffusion. Model 2 examines the conditional effect of the age of the interlock. Model 3 examines the conditional effect of the interlocking director's accounting background. Z-statistics based on standard errors adjusted for firm clustering are reported in parentheses.

*** Indicate significance at the 0.01 levels, respectively.

** Indicate significance at the 0.05 levels, respectively.

* Indicate significance at the 0.10 levels, respectively.

4.5. Robustness analysis

In this section, we establish the robustness of our results. We mainly have the following concerns: sample selection bias, the influence of industry homogeneity, endogeneity, interlock direction, environmental uncertainty, and using accruals as the aggregation of accounting methods.

4.5.1. Sample selection bias

In our above analysis, we use the propensity-score matching method to construct our sample, and the sample selection bias can be controlled to a large extent. However, the issue of sample selection bias still needs to be carefully considered. Following Cai et al. (2014), we use the full sample to deal with the sample selection bias problem.

When Cai et al. (2014) explored the relationship between director interlock and the diffusion of disclosure policy, they used all the firms listed in the stock exchanges. Only when at least one of the interlock partner firms had the same disclosure policy as the focal firm did their interlock variable equal one. If a firm didn't have an interlock relationship with any other firms or if its disclosure policy was different from any disclosure policy of all its interlock partners, then their interlock variable equaled zero. Following the method introduced by Cai et al. (2014), we redefined our interlock variables and re-estimated our models by including all public firms regardless of whether they had interlock relationships with other firms.

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Table 4
The effect of interlock on depreciation method and the moderate effect of interlock age and accounting background.

	Model 1	Model 2	Model 3
Depreciation	−1.2483***	−1.5275***	−1.3511***
	(−8.14)	(−7.71)	(−9.66)
Interlock	−0.0293***	−0.3019***	−0.1243**
	(−5.84)	(−3.47)	(−2.42)
*Depreciation*Interlock*	3.3451***	3.3849***	3.1213***
	(9.85)	(9.51)	(10.43)
Interlock_Age		0.1431***	
		(2.79)	
*Depreciation*Interlock*Interlock_Age*		0.5882*	
		(1.90)	
Accounting			−0.3334
			(−1.54)
*Depreciation*Interlock*Accounting*			1.2485**
			(2.33)
R&D	−6.2153	−7.7126	−5.9461
	(−0.32)	(−0.40)	(−0.31)
LABOR	−0.4596	−0.4338	−0.4525
	(−1.30)	(−1.24)	(−1.28)
*MFG*CGS*	−0.0123	−0.0184	0.0061
	(−0.06)	(−0.09)	(0.03)
*NMFG*CGS*	0.2976	0.2934	0.3198
	(0.78)	(0.77)	(0.84)
NPAY	2.9031	3.1674	2.7805
	(1.32)	(1.42)	(1.30)
ADV	−0.4588	−0.4748	−0.5060
	(−0.23)	(−0.24)	(−0.25)
LEVMV	0.0021	0.0020	0.0021
	(1.44)	(1.45)	(1.45)
SALE	−0.2168**	−0.2263**	−0.2188**
	(−2.35)	(−2.41)	(−2.32)
DROA	−0.1763	−0.1572	−0.1649
	(−0.70)	(−0.63)	(−0.66)
SOE	−0.4460*	−0.4621**	−0.4370*
	(−1.89)	(−1.96)	(−1.87)
Intercept	8.7755***	9.2303***	8.8832***
	(4.68)	(4.91)	(4.63)
Year and Industry	Yes	Yes	Yes
N	9746	9746	9746
Pseudo R^2	0.2361	0.2438	0.2410

The dependent variable is the focal firm's depreciation method in year *t*, while *Depreciation* is the interlock firm's or the non-interlock matched sample's depreciation method in year *t-1*. All variables are defined in the appendix. Model 1 examines the effect of director interlock on depreciation method diffusion. Model 2 examines the conditional effect of the age of the interlock, while Model 3 examines the conditional effect of the interlocking directors' accounting backgrounds. Z-statistics based on standard errors adjusted for firm clustering are reported in parentheses.
*** Indicate significance at the 0.01 levels, respectively.
** Indicate significance at the 0.05 levels, respectively.
* Indicate significance at the 0.10 levels, respectively.

In the inventory method samples, all firms from 2008 to 2012 whose inventory method was disclosed were used to construct our initial sample. Then, we deleted observations in the financial services industry, quasi-regulated industry, or ST firms, resulting in 8562 firm-year observations. In addition, we redefined the dependent and independent variables in the new sample. The dependent variable is *FIFO*. If the FIFO inventory method was used by the firm in year *t* then it equals one, and if the average cost method is used by the firm in year *t* then it equals zero. The independent variable is *Interlock_FIFO*. If the firm was interlocked with other firms and at least one of its interlock firms used the FIFO inventory method in year *t-1*, then it equals one and zero otherwise. The results are shown in Model 4 of Table 5. As we can see, the coefficient for *Interlock_FIFO* (Para = 0.1934, z-value = 1.77) is still positive at the 10% level of significance, indicating that, even following Cai et al. (2014)'s approach, our result for inventory method choice is robust for the most part.

Next, the same sample selection procedure was used for the depreciation method, and this resulted in 8386 firm-years in the deprecation method sample. The dependent variable is *Straight*. If the straight-line method was used by the firm in year *t*, then it equals one, and if the accelerated method was used by the firm in year *t*, then it equals zero. The independent variable is *Interlock_Straight*. If the firm was interlocked with other firms and at least one of its interlock partners used the straight-line depreciation method in year *t-1*, then it equals one and zero otherwise. The results are shown in Model 4 of Table 6. Again, the coefficient for *Interlock_Straight* (Para = 0.1964, z-value = 2.29) is positive and significant at the 5% level, still indicating that depreciation method does diffuse between firms through a network of director interlocks. Hence, our results still hold following the method used by Cai et al. (2014).

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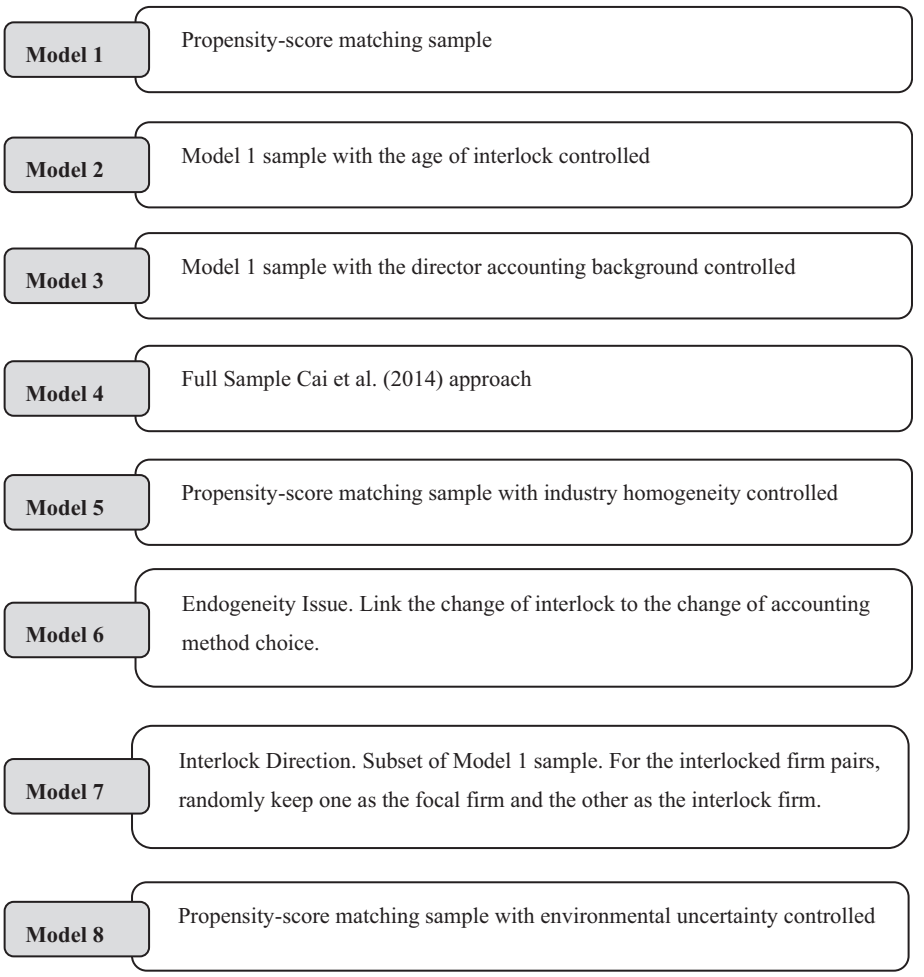

Fig. 1. Model road map.

4.5.2. The influence of same industry

Burris (2005) argued that director interlock contributes more to the similarity of corporate behavior than does industry homogeneity. This reasoning implies that if focal and interlock firms operate in the same industry, their corporate practices might be similar as well. To control for this alternative mechanism, we added the interaction term of accounting method and the indicator variable of *Same_Industry* to the propensity-score matching sample to control for the influence of industry homogeneity. We also added the interaction term of accounting method, same industry, and interlock to examine whether industry homogeneity can moderate the relationship between director interlock and accounting method diffusion. The results are shown in Model 5 of Tables 5 and 6, respectively. In Model 5 of Table 5, the coefficient for *Inventory*∗*Interlock* (Para = 0.4964, z-value = 1.90) is positive at the 10% level of significance; whereas, the coefficients for *Inventory*∗*Same_Industry* (Para = 0.2186, z-value = 0.65) and *Inventory*∗*Same_Industry*∗*Interlock* (Para = −0.6816, z-value = −1.16) are insignificant, indicating that the impact of director interlock on inventory method is still significant when controlling for the impact of industry homogeneity. But, we do not find that industry homogeneity can moderate the relationship between interlock and accounting method diffusion. And, in Model 5 of Table 6, we find the positive impact of director interlock on depreciation method diffusion is still significant. Therefore, after controlling for the influence of industry homogeneity, the impact of director interlock on the diffusion of accounting method choices is still positive.

4.5.3. The endogeneity of director interlock-the change model

According to the Director-Firm Matching Theory (Adams et al., 2010; Larcker et al., 2013), firms with similar characteristics are more likely to hire the same directors. So, to a certain extent, firm similarity contributes to the interlock relationship between firms. In addition, similar firms are more likely to choose similar accounting methods. Therefore, the behavior diffusion of accounting method choices among firms through a director interlock may be the result of firm similarity. In other words, the relationship between director interlock and the diffusion of accounting method choices may be endogenously

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Table 5
Robustness check results for interlock and inventory method choice.

	Model 4	Model 5	Model 6	Model 7	Model 8
Interlock_FIFO	0.1934*				
	(1.77)				
Inventory		−0.2282		−0.1494	−0.3187
		(−1.27)		(−0.78)	(−1.60)
Interlock		−0.0330		−0.0390	−0.0535**
		(−1.57)		(−1.54)	(−2.31)
*Inventory*Interlock*		0.4964*		0.4907*	0.7293***
		(1.90)		(1.69)	(2.59)
Same_Industry		−0.0001			
		(−0.00)			
*Inventory*Same_Industry*		0.2186			
		(0.65)			
*Inventory*Same_Industry*Interlock*		−0.6816			
		(−1.16)			
First_Interlock			0.0246		
			(0.18)		
Inventory_Change			−0.5154***		
			(−13.99)		
*Inventory_Change*First_Interlock*			1.1917**		
			(2.04)		
Uncertainty					−0.0251
					(−1.12)
*Inventory*Uncertainty*Interlock*					0.0462*
					(1.67)
R&D	15.9953***	9.6278	−75.2718**	18.1682	−41.7035
	(3.14)	(0.66)	(−2.51)	(1.13)	(−1.50)
LABOR	0.6221***	−1.5266***	−0.1586	−1.6404***	−1.7203***
	(5.93)	(−4.60)	(−0.42)	(−4.46)	(−4.86)
*MFG*CGS*	−0.2794**	−1.1544***	−0.3077	−1.0534**	−1.4846***
	(−2.17)	(−2.60)	(−0.59)	(−2.35)	(−2.74)
*NMFG*CGS*	0.2263***	0.5563***	−0.1362	0.5731***	0.4224**
	(2.75)	(2.91)	(−0.57)	(2.67)	(1.98)
NPAY	0.4741	−2.6478	0.0846	−3.3353*	−2.2087
	(0.88)	(−1.50)	(0.05)	(−1.94)	(−1.13)
ADV	1.6459***	2.0651	−4.2496**	2.1576	1.0175
	(3.06)	(1.41)	(−2.06)	(1.40)	(0.53)
LEVMV	−0.0001	0.0003	0.0002	0.0006	0.0002
	(−0.63)	(0.76)	(0.34)	(1.48)	(0.63)
SALE	−0.0654***	0.0113	−0.0963	−0.0089	0.0703
	(−2.73)	(0.15)	(−1.30)	(−0.11)	(0.77)
DROA	0.1626**	−0.1186	0.8466**	−0.1183	−0.0919
	(2.31)	(−1.01)	(2.47)	(−0.87)	(−0.68)
SOE	0.0680	0.1963	0.2673	0.2346	−0.0032
	(1.07)	(1.08)	(1.38)	(1.10)	(−0.02)
Intercept	−4.8050	−0.6171		−0.2786	−1.5392
	(−0.03)	(−0.43)		(−0.18)	(−0.90)
Cut1			0.9286		
			(0.67)		
Cut2			1.1952		
			(0.85)		
Year and Industry	Yes	Yes	Yes	Yes	Yes
N	8562	8920	7256	6138	6658
Pseudo R^2	0.2360	0.2300	0.2114	0.2286	0.2520

This table presents probit or multivariate probit regressions for the inventory method samples. All variables are defined in the appendix. Detailed model explanations are presented in Fig. 1. Z−statistics based on standard errors adjusted for firm clustering are reported in parentheses.
*** Indicate significance at the 0.01 levels, respectively.
** Indicate significance at the 0.05 levels, respectively.
* Indicate significance at the 0.10 levels, respectively.

determined. In the previous section, the issue of endogeneity was controlled to a certain extent in the propensity-score matching method. In this section, following Han et al. (2015), we adopt a change specification to address the endogeneity issue. Using multivariate probit regressions we link the change of interlock (from no interlock relationship to interlock relationship from year *t-1* to *t*) to the change of accounting method choices (the change of accounting method of the interlock firms to that of the focal firm) to study the diffusion of accounting methods.

First, we define a new variable, *First_Interlock*, to measure the change of interlock, when the focal firm and the interlock firm first interlock. That is, if these two firms connect through director interlock for the first time in year *t*, then it equals one,

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Table 6
Robustness check results for interlock and depreciation method choice.

	Model 4	Model 5	Model 6	Model 7	Model 8
Interlock_Straight	0.1964**				
	(2.29)				
Depreciation		−2.1852***		−1.1983***	−0.7481***
		(−5.72)		(−8.99)	(−3.16)
Interlock		−0.0653		−0.0253***	−0.0112
		(−1.44)		(−4.44)	(−0.81)
*Depreciation*Interlock*		4.4701***		3.2324***	3.2821***
		(20.86)		(6.92)	(6.80)
Same_Industry		0.0318			
		(0.14)			
*Depreciation*Same_Industry*		−4.4051***			
		(−4.14)			
*Depreciation*Same_Industry*Interlock*		0.1287			
		(0.42)			
First_Interlock			−0.0203		
			(−0.08)		
Depreciation_Change			−2.6612***		
			(−6.67)		
*Depreciation_Change*First_Interlock*			3.7426***		
			(3.53)		
Uncertainty					0.3122**
					(2.07)
*Depreciation*Uncertainty*Interlock*					0.7901**
					(2.07)
R&D	−1.2063	−14.7922	35.0083	−18.6561	−29.9410
	(−0.14)	(−0.38)	(1.58)	(−1.07)	(−1.58)
LABOR	−1.5155***	−0.6758*	0.2391	−0.7722**	−0.6359
	(−5.13)	(−1.73)	(0.32)	(−2.24)	(−1.24)
*MFG*CGS*	−0.1016	0.1142	−1.2566***	0.0639	0.2924
	(−0.86)	(0.45)	(−2.94)	(0.34)	(0.89)
*NMFG*CGS*	0.1089	−0.0518	0.1374	0.2194	1.8152***
	(0.45)	(−0.14)	(0.21)	(0.60)	(3.12)
NPAY	1.6548*	3.5534	1.7853	1.9883	0.5056
	(1.72)	(1.53)	(0.47)	(0.93)	(0.29)
ADV	−1.5053**	−1.1211	1.5744	−2.0852	−3.8712**
	(−2.22)	(−0.52)	(0.53)	(−1.27)	(−2.19)
LEVMV	0.0007***	0.0022	−0.0077*	0.0012	0.0018
	(3.08)	(1.48)	(−1.87)	(1.34)	(1.35)
SALE	−0.2031***	−0.2643***	0.2166	−0.1551*	−0.5831***
	(−5.08)	(−2.73)	(1.35)	(−1.73)	(−4.18)
DROA	0.1936**	−0.1710	−0.5110	−0.0119	0.2657
	(2.04)	(−0.69)	(−1.25)	(−0.05)	(0.98)
SOE	−0.4860***	−0.5321**	0.7834**	−0.3528	−0.2782
	(−5.07)	(−2.08)	(2.53)	(−1.32)	(−0.97)
Intercept	11.6461***	14.8731***		7.6215***	16.2462***
	(12.76)	(7.18)		(4.06)	(5.50)
Cut1			11.3244***		
			(4.05)		
Cut2			11.7334***		
			(4.08)		
Year and Industry	Yes	Yes	Yes	Yes	Yes
N	8386	9746	8114	6802	7298
Pseudo R^2	0.2195	0.2720	0.3423	0.2152	0.3649

This table presents probit or multivariate probit regressions for the depreciation method samples. All variables are defined in the appendix. Detailed model explanations are presented in Fig. 1. Z-statistics based on standard errors adjusted for firm clustering are reported in parentheses.
*** Indicate significance at the 0.01 levels, respectively.
** Indicate significance at the 0.05 levels, respectively.
* Indicate significance at the 0.10 levels, respectively.

otherwise it equals zero. For the inventory sample, we defined the dependent variable *F_Inventory_Change*, which equals zero when there is no change in the focal firm's inventory method from year *t-1* to year *t*, and one when it changes from the FIFO method to the average cost method from year *t-1* to year *t*, and two when it changes from the average cost method to the FIFO method from year *t-1* to year *t*. The independent variable *Inventory_Change* was defined in the same way except it was based on the change of inventory method of the interlock firm or the matched firm from year *t-2* to year *t-1*. For the depreciation method sample, again, we defined the dependent variable *F_Depreciation_Change* (based on the change of depreciation method from *t-1* to *t*) and the independent variable *Depreciation_Change* (based on the change of depreciation method

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Table 7
Accruals-based earnings management model.

	Model 1	Model 2	Model 3
Accrual	0.0046	0.0129	0.0045
	(0.72)	(1.49)	(0.71)
Interlock	−0.0004	−0.0005	−0.0003
	(−0.18)	(−0.32)	(−0.15)
*Accrual*Interlock*	0.0447***	0.0455**	0.0447***
	(2.69)	(2.17)	(2.70)
Interlock_Age		0.0001	
		(0.11)	
*Accrual*Interlock*Interlock_Age*		0.0493***	
		(3.19)	
Accounting			0.0016
			(0.75)
*Accrual*Interlock*Accounting*			0.0654*
			(1.90)
Size	−0.0046***	−0.0046	−0.0045***
	(−3.30)	(−1.27)	(−3.35)
ROA	0.0141	0.0147	0.0142
	(0.53)	(0.25)	(0.66)
LEV	0.0014**	0.0014	0.0014**
	(2.07)	(0.75)	(2.23)
BM	0.0142**	0.0142	0.0143**
	(2.19)	(0.86)	(2.23)
Turnover	−0.0023	−0.0022	−0.0023
	(−1.01)	(−0.28)	(−1.19)
Loss	0.0784***	0.0783***	0.0782***
	(17.61)	(8.41)	(18.64)
SOE	0.0181***	0.0182***	0.0181***
	(7.18)	(2.66)	(7.66)
Institutional Ownership	−0.0011***	−0.0010**	−0.0011***
	(−6.52)	(−2.54)	(−6.45)
Boardsize	0.0004	0.0005	0.0004
	(0.67)	(0.24)	(0.67)
Independence	−0.0338*	−0.0347	−0.0339*
	(−1.71)	(−0.66)	(−1.67)
Duality	−0.0103***	−0.0101	−0.0102***
	(−3.77)	(−1.58)	(−3.68)
Big4	−0.0041	−0.0041	−0.0041
	(−1.04)	(−0.34)	(−0.95)
Intercept	0.2284***	0.2293***	0.2263***
	(8.38)	(3.13)	(8.63)
Year and Industry	Yes	Yes	Yes
N	11604	11604	11604
Adjusted R^2	0.1827	0.1836	0.1829

This table presents OLS regressions for the accruals earnings management sample. The dependent variable is the focal firm's accruals in year *t*, while *Accrual* is the interlock firm's or non-interlock matched firm's accruals in year *t-1*. All variables are defined in the appendix. Model 1 examines the effect of director interlock on accrual earnings management diffusion. Model 2 examines the conditional effect of the age of the interlock; while Model 3 examines the conditional effect of the interlocking directors' accounting backgrounds. T-statistics based on standard errors adjusted for firm clustering are reported in parentheses.
*** Indicate significance at the 0.01 levels, respectively.
** Indicate significance at the 0.05 levels, respectively.
* Indicate significance at the 0.10 levels, respectively.

from *t-2* to *t-1*). They equal zero when there is no change in the depreciation method, and one when they change from the straight-line method to the accelerated method, and two when they change from the accelerated method to the straight-line method.

Because there are some firms whose accounting method choices were unavailable in the prior year, our new samples decreased to 7256 firm-year observations for inventory method and 8114 firm-year observations for depreciation method. The estimated results are consistent with our predictions. In Model 6 of Table 5, the coefficient for *Inventory_Change*First_Interlock* (Para = 1.1917, z-value = 2.04) is positive at the 5% level of significance, and in Model 6 of Table 6, the coefficient for *Depreciation_Change*First_Interlock* (Para = 3.7426, z-value = 3.53) is positive and significant at the 1% level. We can conclude that our results are robust after considering the endogeneity issue, and director interlock affects not only the diffusion of accounting method choices but also the diffusion of changes in accounting method choices.

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Table 8
The degree of similarity in the accounting method choices model.

	Model 1	Model 2	Model 3
Interlock	2.3955***	2.3846***	2.3864***
	(29.59)	(28.82)	(29.66)
Interlock_Age		0.1034**	
		(1.98)	
*Interlock*Interlock_Age*		−0.1055	
		(−1.52)	
Accounting			0.3040
			(1.64)
*Interlock*Accounting*			−0.0189
			(−0.28)
R&D	−6.4086	−6.7844	−6.1561
	(−0.97)	(−1.03)	(−0.93)
LABOR	0.4702***	0.4748***	0.4661***
	(3.57)	(3.61)	(3.51)
*MFG*CGS*	0.2921***	0.2952***	0.2931***
	(3.44)	(3.49)	(3.45)
*NMFG*CGS*	−0.2585**	−0.2624**	−0.2617**
	(−2.01)	(−2.09)	(−2.09)
NPAY	0.6144	0.6120	0.5968
	(0.97)	(0.98)	(0.96)
ADV	−0.8925	−0.8705	−0.8717
	(−1.42)	(−1.40)	(−1.40)
LEVMV	−0.0002	−0.0002	−0.0002
	(−1.16)	(−1.18)	(−1.15)
SALE	−0.0592**	−0.0616**	−0.0577**
	(−2.11)	(−2.19)	(−2.07)
DROA	0.1144**	0.1132**	0.1147**
	(2.00)	(1.98)	(2.01)
SOE	−0.0036	−0.0023	−0.0003
	(−0.05)	(−0.03)	(−0.00)
Cut1	−1.9816***	−2.0307***	−1.9490***
	(−3.56)	(−3.64)	(−3.53)
Cut2	1.1962**	1.1518**	1.2305**
	(2.16)	(2.08)	(2.24)
Year and Industry	Yes	Yes	Yes
N	8920	8920	8920
Pseudo R^2	0.4044	0.4052	0.4052

This table presents multivariate probit regressions for the degree of similarity in accounting method choices. The dependent variable is the number of the same accounting method choices between the focal firm and the interlock firm (the non-interlock matching firm). All variables are defined in the appendix. Model 1 examines the effect of director interlock on accounting method diffusion. Model 2 examines the conditional effect of the age of the interlock. Model 3 examines the conditional effect of the interlocking director's accounting background. Z-statistics based on standard errors adjusted for firm clustering are reported in parentheses.
*** Indicate significance at the 0.01 levels, respectively.
** Indicate significance at the 0.05 levels, respectively.

4.5.4. The effect of interlock direction

In our sample, the interlocking relationship between the focal firm and the interlock firm are bidirectional. One possible issue we should consider is that bidirectional interlock in an empirical test may overstate the effect of director interlock on economic decisions or outcomes. Then, following prior literature (Haunschild, 1993), we redefine our sample. For the interlocked sample, if firm A and firm B have an interlocking director relationship, we randomly keep firm A as the focal firm and firm B as the interlock firm. The observations that satisfy firm B as the focal firm and firm A as the interlock firm are excluded from the sample. Then, we append the retained interlocked sample and their matched sample to test our hypothesis. We re-estimate the model using the new samples, and the result are shown in Model 7 of Tables 5 and 6. In Model 7 of Table 5, the coefficient for *Inventory*Interlock* (Para = 0.4907, z-value = 1.69) is positive at the 10% level of significance, and in Model 7 of Table 6, the coefficient for *Depreciation*Interlock* (Para = 3.2324, z-value = 6.92) is positive and significant at the 1% level. We can conclude that our results are still robust after considering the interlock direction.

4.5.5. The effect of environmental uncertainty

As prior literature (Cyert and March, 1963) has stated, the ultimate reason behind behavior diffusion is environmental uncertainty. Though we cannot prove it directly, we find a proxy for environmental uncertainty and test whether the similarity degree between a focal firm's and an interlock firm's accounting method choice intensifies when the environment is

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more uncertain. Following a prior study, we use a variation coefficient of the focal firm's five-year continuous net sales (adjusted by industry) as the measurement of environmental uncertainty. We add the interaction term of interlock, accounting method, and environmental uncertainty to our base model, and the results are shown in Model 8 of Tables 5 and 6.

In Model 8 of Table 5, the coefficient for *Inventory*∗*Uncertainty*∗*Interlock* (Para = 0.0462, z-value = 1.67) is positive at the 10% level of significance, and in Model 8 of Table 6, the coefficient for *Depreciation*∗*Uncertainty*∗*Interlock* (Para = 0.7901, z-value = 2.07) is also positive at the 5% level. Such results indicate that as uncertainty increases, it is more likely for the focal firm to adopt the accounting method choices of the interlock firm, validating our hypotheses.

4.5.6. Accruals-Aggregations of accounting method choices

The above analysis is from the perspective of discrete accounting method choices. In this section, we continue to explore whether the aggregations of accounting method choices can diffuse through director interlock. We use the accrual-based earnings management model (adjusted Jones model) as the aggregations of accounting method choices, and then we re-estimate our hypotheses 1, 2 and 3. The results are presented in Table 7. We find that not only the discrete accounting method but also the accruals can diffuse through interlock. Furthermore, unlike the discrete accounting method case, both interlock age and director's accounting background moderate the diffusion behavior over the interlock network.

4.5.7. The degree of similarity in the accounting method choices model

So far we have considered only whether two interlocked firms have similar accounting methods; how similar their accounting method choices will be due to interlock is unknown. Hence, in this section, we define a new variable called *Samemethod* to measure the degree of similarity in the accounting method choices between a focal firm and its matched firm (interlocked firm or non-interlocked matching firm). To be more specific, *Samemethod* equals the total number of matched accounting methods between the focal firm and the matched firm. Then, we use this new variable as a dependent variable to test our hypothesis based on a propensity-score matching sample. The results are shown in Table 8. We find that compared to non-interlocked firms, interlocked firms share a large number of common accounting methods.

5. Conclusion

This paper investigates the impact of director interlock on firms' routine and fundamental accounting method choices (inventory and depreciation methods) from the perspective of behavior diffusion. We find that firms' accounting method choices diffuse through director interlock. And, when there is an interlock relationship between two firms, it is more likely for them to use the same accounting methods. After controlling sample selection bias, the influence of industry homogeneity, and the issue of endogeneity, our results are still robust. In further analysis, we find that the positive relationship of director interlock and the diffusion of accounting method choice can be moderated by the length of the interlock relationship and the accounting backgrounds of the directors.

Our findings contribute to the accounting literature as well as the social network literature by expanding the influential factor of accounting method choices and demonstrating that director interlock enables the diffusion of the more routine and fundamental accounting method choices (e.g., inventory and depreciation methods) among firms. We also add to the social network literature by demonstrating that the length of the interlock relationship and the interlocking directors' backgrounds will strengthen or weaken the diffusion of firm behavior over an interlock network.

A few limitations of this paper are worthy of future research. In our additional analyses, the results did not fully support the opinion that the interlocking director's accounting background can positively affect the similarity of the accounting method choices of the focal and interlock firms. This interesting phenomenon is worthy of future research. Also, future research should consider the demographic information of the directors to gain more insight regarding how fundamental accounting choices diffuse across interlocked social networks.

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Appendix A. Variable definitions

Variable	Definition
Panel A: Interlock Estimation Model	
Director_Interlock	An indicator variable; when the firm has an interlock relationship with other firms, it equals one and zero otherwise
Size	The natural logarithm of total assets for the firm in year *t*
Boardsize	The total number of directors on a firm's board in year *t*
List	The natural logarithm of a firm's listing days at the end of year *t*
ROA	The firm's Return On Assets in year *t*
LEV	The ratio of total debt to total equity for the firm in year *t*
SOE	An indicator variable; if the focal firm is controlled by the state in year *t*, then it equals one and zero otherwise
Share	The share ratio of the largest shareholder in the firm in year *t*
Year	Year dummies, year fixed effect
Industry	Industry dummies, industry fixed effect
Panel B: Base Model	
F_Inventory	The inventory method of the focal firm in year *t*; it equals one for focal firms that use the FIFO inventory method, and zero for focal firms that use the average cost inventory method
Inventory	The interlock firm's or the non-interlock matching firm's inventory method. If the FIFO method is used in year *t-1*, then it equals one, and if the average cost method is used in year *t-1*, then it equals zero
F_Depreciation	The depreciation method of the focal firm in year *t*, it equals one for focal firms that use the straight-line depreciation method, and zero for focal firms that use the accelerated depreciation method
Depreciation	The interlock firm's or the non-interlock matching firm's depreciation method. If the straight-line method is used in year *t-1*, then it equals one, and if the accelerated method is used in year *t-1*, then it equals zero
Interlock	An indicator variable; it equals one when the two firms are interlocked and zero otherwise
Interlock_Age	The length of the continuous interlock relationship between the focal firm and the interlock firm
Accounting	An indicator variable; if the interlocking director has an accounting education background, then it equals one and zero otherwise
Adjusted_Asset	The average adjusted assets of the focal firm in the beginning year and the end year. The adjusted assets are calculated as the sum of total assets and accumulated depreciation
R&D	The research and development expenses scaled by the average adjusted assets for the focal firm in year *t*
LABOR	The labor intensity; it equals one minus the ratio of gross property, plant, and equipment to the average adjusted assets for the focal firm in year *t*
MFG	An indicator variable; it equals one when the focal firm is in the manufacturing industry and zero otherwise
NMFG	An indicator variable; it equals one when the focal firm is in the non-manufacturing industry and zero otherwise
CGS	The cost of goods scaled by the average adjusted assets of the focal firm in year *t*
NPAY	The notes payable scaled by the average adjusted assets of the focal firm in year *t*
ADV	The advertising expense scaled by the average adjusted assets of the focal firm in year *t*
LEVMV	The ratio of the long-term debt to the market value of equity of the focal firm in year *t*
SALE	The natural logarithm of net sales for the focal firm in year *t*
DROA	An indicator variable; the focal firm's ROA in year *t* is classified into ten groups. It equals one when ranking in group 2–9 and zero otherwise
Panel C: Robustness Check Model	
FIFO	An indicator variable; if the FIFO inventory method is used by a firm in year *t*, then it equals one, and if the average cost method is used by a firm in year *t*, then it equals zero
Interlock_FIFO	An indicator variable; if one firm is interlocked with other firms and at least one of its interlock firms uses the FIFO inventory method in year *t-1*, then it equals one and zero otherwise

(*continued on next page*)

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Appendix A. (*continued*)

Variable	Definition
Straight	An indicator variable; if the straight-line depreciation method is used by a firm in year *t*, then it equals one, and if the accelerated depreciation method is used by a firm in year *t*, then it equals zero
Interlock_Straight	An indicator variable, if one firm is interlocked with other firms and at least one of its interlock partners uses the straight-line depreciation method in year *t-1*, then it equals one and zero otherwise
Same_Industry	An indicator variable; it equals one when the focal firm and the interlock firm (the non-interlock matching firm) are in the same industry and zero otherwise
First_Interlock	An indicator variable; when the focal firm and the interlock firm connect through director interlock for the first time in year *t*, it equals one, and zero otherwise
F_Inventory_Change	Focal firm's inventory method change from year *t-1* to year *t*. It equals zero when there is no change in focal firm's inventory method, one when it changes from the FIFO method to the average cost method, and two when it changes from the average cost method to the FIFO method
Inventory_Change	The interlock firm's or the non-interlock matching firm's inventory method change from year *t-2* to year *t-1*. It equals zero when there is no change in the interlock firm's inventory method, one when it changes from the FIFO method to the average cost method, and two when it changes from the average cost method to the FIFO method
F_Depreciation_Change	Focal firm's deprecation method change from year *t-1* to year *t*. It equals zero when there is no change in the depreciation method in the focal firm, one when it changes from the straight-line method to the accelerated method, and two when it changes from the accelerated method to the straight-line method.
Depreciation_Change	The interlock firm's or the non-interlock matching firm's depreciation method change from year *t-2* to year *t-1*. It equals zero when there is no change in the depreciation method in the interlock firm, one when it changes from the straight-line method to the accelerated method, and two when it changes from the accelerated method to the straight-line method
Uncertainty	The variation coefficient of the focal firm's five-year continuous net sales, where the net sales is adjusted by industry
F_Accrual	Focal firm's accrual-based earnings management in year *t*, calculated by the adjusted Jones Model
Accrual	Interlock firm's or non-interlock matching firm's accrual-based earnings management in year *t-1*, calculated by the adjusted Jones Model
BM	The ratio of book value of equity to market value of equity for the focal firm in year *t*
Turnover	The total asset turnover for the focal firm in year *t*
Loss	An indicator variable; when a loss occurs in the focal firm in year *t*, it equals one and zero otherwise
Institutional Ownership	The institutional investors' ownership of the focal firm in year *t*
Independence	The ratio of the number of independent directors in the focal firm's board in year *t*
Duality	An indicator variable; if the board chairman is also the CEO for the focal firm in year *t*, then it equals one and zero otherwise
Big4	An indicator variable; when the focal firm is audited by the big four auditing firm, it equals one and zero otherwise
Samemethod	The total number of matched accounting methods between the focal firm and the interlock firm (the non-interlock matching firm)

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