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The association between the mandatory adoption of XBRL and the performance of listed state-owned enterprises and non-state-owned enterprises in China

Tawei Wang [a], Ching Yao Wen [b], Jia-Lang Seng [c,*]

[a] School of Accountancy, Shidler College of Business, University of Hawaii at Manoa, USA
[b] Yuanta Financial Holdings, Taipei, Taiwan
[c] Department and Graduate School of Accounting, College of Commerce, National Chengchi University, Taipei, Taiwan

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ABSTRACT

This paper investigates the impact of the mandatory adoption of the eXtensible Business Reporting Language (XBRL) on the performance of listed state-owned enterprises (SOEs) and non-SOEs. Building on institutional theory, we hypothesize and determine that non-SOEs benefit from the adoption of XBRL by operating more effectively, which results in better performance. Due to the institutional factors, for SOEs, financial report users still need much more information in addition to financial reports before they can make appropriate decisions. Implications on the use of XBRL-formatted financial reporting information for international business with the existence of SOEs in China are discussed herein.

1. Introduction

The use of financial reporting information is often limited even with the advancement of information technology. To improve the re-usability and integration of financial reporting information, the eXtensible Business Reporting Language (XBRL), a standard XML reporting language, was developed to electronically communicate business information [38,82]. XBRL is expected to make financial reports more understandable and more accurately represent the underlying economics of the business (including financial reporting choices and assumptions) [38,69,70]. It also has the potential to be a global standard for financial and non-financial data that facilitates information exchange across countries [16]. Given the expected benefits, the U.S. as well as European and Asian countries have started to mandatorily adopt XBRL for financial reporting for all listed firms. This is the first time that most of the countries in the world have mandatorily adopted the same financial reporting technology.

XBRL is expected to facilitate the accessing and processing of firms' financial reporting information [38]. The improved transparency helps external users of a firm's financial reporting information better understand the firm's decisions, which may potentially serve as an external monitoring function to cause the firm to make decisions more appropriately and consequently may then improve the firm's performance. However, prior literature suggests that the ownership structure, and state-owned enterprises (SOEs) in particular, can be an important factor that may affect a firm's performance [42]. Many prior studies, such as [11], show that state-owned firms are inefficient. For example, Dewenter and Malatesta [27] demonstrate that public offerings of state-owned firms are significantly underpriced as these firms are directed not by social welfare improvement, but by political interests and objectives including creating jobs, promoting industrialization, and subsidizing underdeveloped areas of the country [30,42]. In a multi-country setting, La Porta et al. [49] show that state ownership is related to lower economic growth, while Barth et al. [8] show that state ownership of banks are associated with a less developed banking system and security market. Compared with non-SOEs, the boards of SOEs are less independent, and SOEs are often characterized with complicated shareholding structure as well as different governance systems [41]. In this vein, the benefits of improved transparency and firm performance through XBRL adoption may be different for SOEs and non-SOEs.

In this paper, we investigate whether the mandatory adoption of XBRL in China would lead to more effective business operations

* Corresponding author. Tel.: +886 2 2939 3091x81213.
E-mail addresses: twwang@hawaii.edu (T. Wang), blaine362@gmail.com (C.Y. Wen), seng@nccu.edu.tw (J.-L. Seng).

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due to the transparency of financial reports and the ease of access of such information. We focus on China as China is the first country that officially adopted XBRL and is still leading the development of XBRL with other countries. In addition, SOEs are playing a critical role in China's economy. We also examine whether the impact is different between SOEs and non-SOEs. Institutional theory provides us a framework to understand the mandatory adoption of XBRL. In particular, the coercive force and the regulatory pressure seem to ensure the conformity of its adoption. Such conformity may bring the potential benefits of using XBRL-formatted information, which, in turn, results in more effective business operations, as reflected by better performance. However, although prior studies, such as Refs. [78] and [61], have highlighted how the characteristics of SOEs and non-SOEs affect business decisions, it is not clear from institutional theory how different ownership structure, especially its political affiliation or ties to the government, would affect the mandatory adoption of a new technology. Given the characteristics of SOEs, we provide arguments that may supplement institutional theory in understanding the effectiveness of the adoption of a new technology, XBRL in particular. To determine whether a firm is more effective after the adoption of XBRL, we use two performance measurements in our analysis: one is accounting-based (return-on-assets, *ROA*) and the other one is market-based (market-to-book ratio, *MB*). We collect our data from the China Security Market and Accounting Research (CSMAR) database during the period from 2003 to 2010. Our findings show that overall, firm performance (both *ROA* and *MB*) is better in the post-mandatory-adoption period compared to the pre-mandatory-adoption period. However, when we split the firms into SOEs and non-SOEs, non-SOEs show a better improvement in both *ROA* and *MB* in the post-mandatory-adoption period compared to SOEs.

Our paper contributes to the literature and sheds lights on the use of financial reporting information for international business in the following ways. Our paper fills in the gaps of the literature when applying institutional theory to the mandatory adoption of information technology. Although prior studies have emphasized the importance of SOEs in business decisions (e.g., [61,78]), the prior literature does not emphasize how the ownership structure, SOE in particular, would affect the effectiveness of the mandatory adoption of an information technology. These findings also supplement the literature regarding how political affiliations may affect the mandatory adoption of a new technology.

The rest of the paper is organized as follows. In Section 2, we discuss the institutional background and develop our hypotheses. We present our research methodology in Section 3. Our main results and additional tests are provided in Section 4. We conclude with a discussion of the limitations of the study and possible future research in Section 5.

2. Institutional background and hypothesis development

2.1. Institutional background in China

SOEs are business entities that are *de facto* controlled by the government [73] and have a long history in China. In the past, they dominated the market and created approximately 75% of the national industrial output value [18]. China underwent a reform starting in the late 70s, which was originally set to make SOEs more efficient [10,52,65], but has transformed the economy into a market economy with private ownership. Private firms began to emerge in the market. The privatization of firms caused the non-state-owned firms to obtain more control apart from the government/central planning (e.g., [72]). As the liberalization continued, some SOEs were sold or dissolved, while other SOEs were encouraged to merge into business groups [45] or become joint stock firms [76]. It seems that the private firms became a major player in the market, and China became an economy with less central planning and more market competition. However, the government simultaneously imposed certain restrictions and set protection policies in certain so-called strategic industries, such as telecommunication, petrochemical, civil aviation, and shipping. In its latest five-year plan, these restrictions and policies were also applied to emerging industries, such as health care, energy, and technology [73]. Furthermore, although banking is not explicitly included in the list of strategic or emerging industries, it is tightly controlled by SOEs (75% of China's bank assets and 11 out of 13 major joint stock commercial banks) [73]. SOEs still play an important role in the market, and this role has been strengthened by the subsidies and preferential financing, taxes and regulations for SOEs [15]. Not surprisingly, currently, 70% of the ultimate owners of the listed firms in China are SOEs [50], and SOEs directly or indirectly control approximately 50% of non-agriculture GDP [73].

Nevertheless, on the road to liberalization and privatization, the Chinese government has noticed that China needs to develop new strategies not only to modernize its financial market but also to improve its SOE operations. In addition to the marketization and the involvement of professional managers, the transparency of financial reporting is one of the elements that the government would like to promote [41]. In particular, a more reliable financial reporting system can improve the transparency of firms, which can help the market better oversee the firms, attract foreign investors, and link the China market to the global economy. To achieve its goal, the Chinese authority has decided to adopt a new technique, the eXtensible Business Reporting Language (XBRL), to potentially streamline and standardize the business information supply chain and to make financial reporting information more accessible and transparent.

2.2. eXtensible Business Reporting Language (XBRL)

The eXtensible Business Reporting Language (XBRL) is an XML-based technique proposed in the late 90s to early 2000s in the U.S. with the expectation of increasing the re-usability and integration of financial reporting information [24,25,63,64]. XBRL was later developed by XBRL International (XII) with more than 600 members from different countries and constituencies of the business information value chain. This consortium consists of regulatory bodies, public audit firms, financial institutions, and software vendors as well as international and national standard setters and public entities. XBRL is considered a global revolutionary technology for the electronic communication of business and financial data that transforms business reporting intra- and inter-organizationally around the world [14,35].

XBRL provides an identifying tag for financial facts, such as earnings per share, to help financial report users more precisely obtain the information they need [39]. As all the financial reporting elements are standardized through a widely accepted taxonomy (i.e., a dictionary of terms used in financial reports) and are separated from its format, XBRL-formatted business data are computer-readable and searchable so that users can download it directly into analytical software [4,5,33,75,83]. Accordingly, it is expected to improve accessibility and transparency for the adopting organizations [19,57,68,75,83]. In addition, XBRL is expected to facilitate the integration of different items in financial reports even in the case when such a link(s) does not exist explicitly and could not be found easily before [38]. Due to this integration of information, it becomes easier for users to observe management's disclosure decisions as well as the motivation for such decisions [37,38]. XBRL can also potentially reduce the

professional users' (e.g., analysts) cognitive costs and non-professional users' information processing costs [38]. Liu Shiping, the vice chairman of the executive committee of XBRL China, stated that "...Credit Suisse HOLT has used XBRL to expand its coverage of the Chinese A-share market from 300 firms...to well over 1000...automatically" [23]. Similarly, Liu et al. [53] show that analyst followings and forecast accuracy are positively associated with the adoption of XBRL. Kim et al. [47] and Yoon et al. [82] show that disclosure quality improves (e.g., decreased information asymmetry and decreased information risk) with XBRL adoption as well. Last, XBRL has made information more readily accessible across countries based on its multi-language and multi-GAAP (Generally Accepted Accounting Principles) converting capabilities [63]. International organizations view XBRL as a key enabling financial-reporting technology to help them differentiate themselves from their competition in the global capital markets [3,64].

Given the potential benefits of XBRL, China was the first country that formally and mandatorily adopted XBRL for its capital market in 2004 [46]. China is now leading the development of XBRL with the U.S. and Europe [23]. China's central planning strategy in adopting and developing the XBRL application and techniques has cast away many of the main concerns, such as the cost of implementation, which was faced by the U.S. [79]. China has also rapidly leveraged the knowledge from U.S. and Europe to develop its own taxonomies and applications. In particular, supported by the China Securities Regulatory Commission (CSRC), the Shanghai Security Exchange (SSE) began the electronic reporting program in early 2003 for its listed firms' financial reports based on XBRL standards. Based on the information on http://www.xbrl-cn.org, initially, 50 listed pilot firms in SSE were chosen to use XBRL at the beginning of 2004. In addition, although the firms were called pilot firms, in the same quarter of 2004, approximately 90% of the other firms filed their quarterly reports based on XBRL. The remaining firms also filed their half-year financial reports in XBRL format before August. There was no obvious time lag between the pilot firms and the other firms in terms of adoption. However, none of these filings (both the pilot and the others) were publicly available for unknown reasons. After three years, in 2006, all SSE listed XBRL-formatted financial reports became available through the standard reporting system. This regulation change provides us a natural experiment context to study the firms' pre- and post-adoption performance as detailed in Section 3. That is, after the XBRL-formatted information became publicly available (i.e., 2006), investors may have started to benefit from the easy access and analysis of financial reporting information, which, in turn, may have potentially affected a firm's decisions and subsequent performance.

However, as stated earlier, China is quite different from other countries in terms of the uniqueness of its institutional context. Its unique characteristic consists of its state-owned enterprises (SOEs). SOEs are enterprises that are *de facto* controlled by the central or local government(s) in China. Although firms in many countries, such as France, Australia, and Singapore, have an ownership structure similar to SOEs, such ownership structure is more prominent in China. For example, a recent Wall Street Journal article states that "it is the omnipresence and girth of its SOEs that distinguish China. Supported by large state subsidies and preferential financing, taxes and regulations, the SOEs (state-owned enterprises) are at the center of China's drive for 'indigenous innovation'" [15]. Specifically, different from non-SOEs, SOEs operate based on the institutions' interests by whom they are controlled. In addition, even today, SOEs still lack professional management and an appropriate (in effect) corporate governance mechanism [41]. As reflected by the quote, with China's engagement in the international economy [54,60], SOEs have imposed a significant influence on investment decisions (e.g., listed SOEs in the U.S.) and affected firms that operate or trade in China. For example, Shanghai Volkswagen is a joint venture between Volkswagen and SAIC Motor (an SOE in China), which may affect Volkswagen's global strategic decisions. It is this unique ownership structure (i.e., SOEs and non-SOEs) that makes the expected benefits of mandatorily implementing XBRL unclear *ex ante*.

2.3. Hypothesis development

Institutional theory provides us a framework to understand the mandatory adoption of XBRL. Institutions are social structures based on taken-for-granted, formal or informal rules that affect social behavior [9]. Scott [66] defines institutions as being "comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" (p.48). Each element corresponds with three different mechanisms of isomorphism: coercive, normative and mimetic [28,29,56,66]. First, regulatory rules and laws are the basis of coercive isomorphism to control organizational behaviors through enforcement activities and compliance, such as environmental regulations [28]. The impact of coercive force on a firm's decision has been investigated in different contexts in prior literature, such as in environmental practices [43], the Health Insurance Portability and Accountability Act (HIPPA) [6], and the Sarbanes Oxley Act [7]. Second, normative isomorphism is associated with the compliance of a set of norms and values or social obligations in a social system [28,66]. Last, cultural-cognitive belief also affects organizational actions. That is, the mimetic mechanism can help organizations in achieving cultural-cognitive legitimacy by imitating the structure or actions of other organizations. The above forces would result in similar practices across organizations that share a common organization field [29], which is defined as "those organizations that...constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products" (p.148).

As stated earlier, the time lag between the early filers and the majority of other filers is approximately two months, and all the filings at that time are not publicly available. Such conditions rule out the possibility of learning from peers (or the mimetic effect). In this vein, the mandatory adoption of XBRL is mainly based on the coercive force of the regulation changes that apply to all listed firms (both SOEs and non-SOEs) in the SSE. How strong is this force? The Chinese government promotes the use of XBRL in a planned manner. The official document shows that the SSE organized a task force in October 2003 and determined the first 50 pilot firms on December 30, 2003 (http://www.xbrl-cn/org). On April 30, 2004, approximately 90% of the listed firms on the SSE had their quarterly reports in XBRL format, although such information was not publicly available until 2006. From task force to adoption, the SSE reached a conformity ratio of 90% in approximately 7 months. To further expedite the adoption process, the SSE designed the system that the firms need to use. Specifically, the firms only needed to fill out the pertinent forms and the XBRL-formatted financial reports were generated accordingly. Consistent with prior literature [29,34,66], a strong regulatory pressure can induce conformity. This conformity is not just in the structure. The regulator in this case makes sure that all the requirements are met by setting up the tools "as planned". Accordingly, not only the firms but also the users can reap the benefits of this system, i.e., they can more efficiently and effectively use information, which, in turn, ensures that firms will make strategic decisions more appropriately. Such decisions may result in more effective business operations, which would be

reflected by better performance. Formally, we state our first hypothesis as follows:

Hypothesis 1. Firm performance is better in the post-mandatory-adoption period than in the pre-mandatory-adoption period of XBRL.

However, Hypothesis 1 does not take the ownership forms into consideration, namely, SOEs and non-SOEs. As discussed by Cui and Jiang [22], SOEs are not motivated by self-interest. Instead, SOEs' interests are tied to the institutions by whom they are directly or indirectly controlled. They can be asked to follow policies without considering their own interests (e.g., [66]). Their behavior is different from other "active agents" (i.e., non-SOEs), as discussed in prior literature [22]. Compared with non-SOEs, SOEs are characterized by the lack of the independence of the board, complicated shareholding structure (through tunneling and propping), professional decision makings, different evaluation and governance systems, etc. [41]. SOEs also have subsidies and different tax protections [15]. In light of all these differences between SOEs and non-SOEs, although institutional theory does not provide clear guidance on firms that have political affiliations [22] regarding the mandatory adoption of a new technology, the theory does suggest that different organization fields (SOEs and non-SOEs are different in terms of the shareholder structure, resources and regulatory regimes) might result in different practices. In addition, Tan and Litschert [74] show that the state regulatory regime is the most influential and complex factor that affects firm performance. In our context, it is expected that the real value of XBRL obtained by SOEs and non-SOEs might vary. Specifically, although the adoption of XBRL seems to be going smoothly because everything has been arranged by the government, such strong coercive pressure will affect the form or structure, but might not affect the value or the meaning of the practice that will be adopted (e.g., [43]). This can be especially true for SOEs. When the firm is dependent on the institution that exerts the pressure, it will conform to the pressure [58]. Following the government's policy is part of their operational goals. However, SOEs do not really consider how the use of XBRL will affect the information supply chain or how the firm can leverage XBRL; they simply consider it as another mandated reporting tool. Furthermore, SOEs' characteristics make it difficult for the market to understand what happens in the firm, not to mention its future, even after digitizing all the information in financial reports. Therefore, although XBRL helps the market obtain easy access to financial reporting information and analyze such information efficiently and effectively, this monitoring effect of the market through financial reporting can be less likely to force a firm to be a more effective SOE. Accordingly,

Hypothesis 2. Firm performance is better in the post-mandatory-adoption period than in the pre-mandatory-adoption period of XBRL for non-SOEs in comparison to SOEs.

SOEs are controlled under different jurisdiction levels; they are controlled either by the central or local government. Through the reform, the central government decentralized to local government, which changed the control right of a local government's fiscal activities [65]. Instead of negotiating the budget with the central government, a local government can now increase its revenues (taxes) by attracting businesses, seemingly providing great incentives for the local government to boost the performance of the firms in its jurisdiction. In addition, local officials can have great influential power over local SOEs [65]. The local officials' main incentives are not about the profit maximization of the firm but about his/her political career and the local government's performance [81]. As long as the local government has good performance in his/her tenure period (generally in the short-run), all the concerns or problems of the firms "should" be delayed until the official gets promoted [81]. From this point of view, it seems that the performance will be better for SOEs under the jurisdiction of local government after the adoption of XBRL in the short-run because of the interests of the local officials and the fiscal performance of the local government. More formally,

Hypothesis 3a. Firm performance is worse in the post-mandatory-adoption period than in the pre-mandatory-adoption period of XBRL for SOEs under the jurisdiction of central government, in comparison to SOEs under the jurisdiction of local government.

In opposition to this statement, Leung and Hu [51] suggest that centrally controlled SOEs have better market supervision than locally controlled SOEs, which may affect the effectiveness of the adoption. The involvement of unprofessional management styles from local officials could worsen the operational effectiveness of a firm as well as the complex transaction arrangements. In this vein, it is expected that firm performance is better for SOEs under the jurisdiction of the central government after the adoption of XBRL than for local SOEs:

Hypothesis 3b. Firm performance is better in the post-mandatory-adoption period than in the pre-mandatory-adoption period of XBRL for SOEs under the jurisdiction of the central government compared to SOEs under the jurisdiction of local government.

In summary, on one hand, local government officials have career and revenue-increasing incentives that may positively affect the firm's performance under the jurisdiction of local government after the adoption of XBRL. On the other hand, firms controlled by local government may have unprofessional managers that may negatively affect the performance in comparison to those controlled by the central government, which usually has better governance mechanisms. It seems that the net impact from the above two arguments is not clear. Accordingly, we consider these arguments as an empirical question regarding whether local SOEs outperform central SOEs with the adoption of XBRL.

3. Research methodology

3.1. Data and variables

For this research, we gather data from the China Security Market and Accounting Research (CSMAR) database. The CSMAR database is the world's largest and leading provider of the Chinese financial market data as well as the Chinese industrial and economic data for international financial and educational institutions. CSMAR provides 11 modules of historical data and 77 databases including data from the stock market, corporate profiles, the fund market, the bond market, the derivatives market, the money market, economy and industry. For the purpose of this study, we collect data from the following databases: the Chinese stock market financial database, China listed firm's shareholders research database, and China listed firm's corporate governance research database.

Our initial sample includes all the A-share-listed firms in the Shanghai Stock Exchange (SSE) until the end of 2010, with the exception of financial institutions and early pilot filers, following prior studies (e.g., [53,71]). We exclude financial institutions because given the unique characteristics of financial institutions, their accounting performance is not comparable with that of firms in other industries. For example, financing and investing activities are included in the calculation of return-on-assets for financial institutions while financing activities are generally considered liabilities for other industries. In addition, we exclude early pilot

Table 1
Variable definitions.

Variables	Definition
ROA	Return on assets for firm i at time t, which is defined as earnings before interests and taxes (EBIT) divided by the average total assets (i.e., EBIT/average total assets). We adjust the measurement by subtracting industry j's median *ROA* at time t from firm i's *ROA*, where firm i is a member of industry j (i.e., $ROA_{it} - ROA_{jt}$).
MB	Market-to-book ratio for firm i at time t, which is defined as the closing price times the number of outstanding shares divided by the book value of stockholders' equity (i.e., (closing price × number of outstanding shares)/book value of stockholders' equity). We adjust the measurement by subtracting industry j's median *MB* at time t from firm i's *MB* where firm i is a member of industry j (i.e., $MB_{it} - MB_{jt}$).
LAGROA	*ROA* at time $t-1$.
LAGMB	*MB* at time $t-1$.
DXBRL	A dummy variable indicating the adoption of XBRL, which equals 1 if a firm in a certain year in our sample period adopts XBRL and 0 otherwise.
DSOE	A dummy variable indicating the type of the firm, which equals 1 if a firm is *always* controlled by the government in our sample period and 0 otherwise.
SIZE	The logarithm of firm i's total assets at time $t-1$.
LEVERAGE	Firm i's total liabilities to total assets ratio at time $t-1$.
AGE	The number of years firm i is listed at time $t-1$.
GROWTH	Firm i's sales revenues at time $t-1$ minus the sales revenues at time $t-2$ divided by the sales revenues at time $t-2$.
BOARDSIZE	The logarithm of firm i's number of board members at time $t-1$.
IBOARDSIZE	Firm i's number of independent directors as the percentage of the size of the board at time $t-1$.
DUALITY	A dummy variable indicating whether a firm's CEO is also the chairman at time $t-1$, which equals 1 if the CEO is the chairman and 0 otherwise.
CAPITALINT	Firm i's fixed assets to total assets ratio at time $t-1$.

filers in our sample as these filers are "chosen" by the government as illustrative examples because of their outstanding performance, which may potentially affect the results. Given that the information regarding the ultimate owner of a firm is not available until 2003, we collect the corresponding variables from 2003 to 2010 as detailed below. To approach our research question, we consider two performance measures commonly used in prior literature (e.g., [31,36]): return on assets (*ROA*, an accounting-based measure) (e.g., [26,32]) and market-to-book ratio (*MB*, a market-based measure) [80]. Accounting-based measures capture a firm's historical performance but have been criticized of being unable to reflect the firm's future performance (e.g., [13]). However, stock market-based measures can incorporate the market's perception regarding a firm's future prospects [67]. We use accounting- and the market-based measures to capture both the historical performance and the market's perception. *ROA* is calculated by dividing the earnings before interests and tax (EBIT) by the average total assets for firm i at time t (i.e., EBIT/average total assets). *MB* is a ratio used to compare a stock's market value for firm i to its book value. It is calculated by dividing the closing price of the stock times the outstanding shares by the book value of stockholders' equity for firm i at time t (i.e., closing price*outstanding shares/book value). We adjust the above two measurements by subtracting industry j's median *ROA* or *MB* at time t from firm i's *ROA* or *MB* where firm i is a member of industry j (i.e., $ROA_{it} - ROA_{jt}$ or $MB_{it} - MB_{jt}$), as defined by Hochberg and Lindsey [36], Holthausen and Larcker [40], and Siegel and Hambrick [67] (see Table 1 for variable definitions).

We use a dummy variable, *DXBRL*, to capture the adoption year of XBRL, which helps us to distinguish the performance before and after XBRL adoption. In particular, our earlier argument states that the adoption of XBRL can help users more efficiently and effectively use information, which, in turn, ensures firms make strategic decisions more appropriately as reflected by better performance. Although China adopted XBRL in 2004, such information was not publicly available until 2006. In this vein, the users were unable to easily access such information until 2006, which could not result in any external monitoring impact on the firm's decisions. Accordingly, we define *DXBRL* to be 0 if the period is between 2003 and 2005, and 1 if the period is after 2006. For Hypothesis 2, we use another dummy variable to indicate whether a firm is a Chinese state-owned enterprise (SOE) or not. This variable, *DSOE*, equals 1 when the company is *always* controlled by the government (i.e., the ultimate owner is the government) before 2010 and 0 otherwise.[1]

[1] In our sample, we do not observe any change between SOEs and non-SOEs.

To further consider the authority level of the SOEs, to examine in Hypothesis 3, we split the sample into SOEs controlled by the central or local government. Note that we do not use the number of shares controlled by SOEs (or by central/local government) because such data are not disclosed or publicly available, as discussed earlier regarding the transparency of SOEs.

We also control for the following variables that may affect a firm's performance, as indicated in prior literature. First, we control for the firm performance at time $t-1$ (namely, *LAGROA* and *LAGMB*), which has been shown to be highly related to performance at time t [1,36]. Furthermore, we control for firm characteristics associated with performance [1,26,32,48,81]: firm size (*SIZE*, the logarithm of total assets for firm i at time $t-1$), financial leverage (*LEVERAGE*, total liabilities divided by total assets for firm i at time $t-1$), number of years a firm was listed (*AGE*, year $t-1$ minus the year the company was listed and plus one), sales growth rate (*GROWTH*, the sales revenue at year $t-1$ minus the sales revenue at year $t-2$ divided by the sales revenue at year $t-2$). Third, we control for the size of the board (*BOARDSIZE*), percentage of independent directors (*IBOARDSIZE*), and CEO duality (*DUALITY*) as proxies of a firm's corporate governance environment [12,44,77]. *BOARDSIZE* is calculated as the logarithm of the number of board members for firm i at year $t-1$. *IBOARDSIZE* is the percentage of independent directors on the board for firm i at year $t-1$. *DUALITY* is a dummy variable. It equals 1 if the CEO is also the chairman for firm i at year $t-1$ and 0 otherwise. Finally, we control for a firm's complexity and the possible additional capital investments as the economy grew [81]. Capital intensity (*CAPITALINT*) is calculated by dividing the total fixed assets by the total assets for firm i at time $t-1$.

The industry and year distributions are given in Table 2. Our sample is distributed across 12 different major industries (see Table 2 Panel A) based on the China Securities Regulatory Commission (CSRC) Guidelines on Industry Classification of Listed Companies in 2001. As shown in Table 2 Panel A, approximately 57% of the firms are in the manufacturing industry. We perform a robustness test on this industry effect in Section 4.2. The year breakdown of the sample is given in Table 2 Panel B. The increase in the number of firm-year observations may reflect the government's policy toward a more efficient financial market, as discussed in Section 2.

The descriptive statistics of variables are given in Table 3. Table 3 Panel A shows the descriptive statistics for all observations. In Table 3 Panel A, we show that the average *ROA* is close to zero indicating that, on average, our sample firms' *ROA* is close to the industry's median *ROA*. Overall, approximately 67% of the sample

Table 2
Breakdown of the sample.

Panel A. Industry breakdown[a]			
Name	Code	# of obs.	%
Agriculture, forestry, livestock farming, fishery	A	105	2.21
Mining	B	106	2.23
Manufacturing	C	2714	57.08
Electric power, gas and water production and supply	D	250	5.26
Construction	E	114	2.4
Transportation and storage	F	248	5.22
Information Technology	G	292	6.14
Wholesale and retail trade	H	383	8.05
Real estate	J	140	2.94
Social service	K	142	2.99
Communication and Cultural Industry	L	34	0.72
Comprehensive	M	227	4.77
Total		4755	100.00

Panel B. Year breakdown		
Year	# of observations	%
2003	472	9.93
2004	521	10.96
2005	569	11.97
2006	630	13.25
2007	607	12.77
2008	631	13.27
2009	657	13.82
2010	668	14.05
Total	4755	100.00

[a] See "http://www.csrc.gov.cn/pub/csrc_en/newsfacts/release/200708/t20070816_69104.htm" for detailed information.

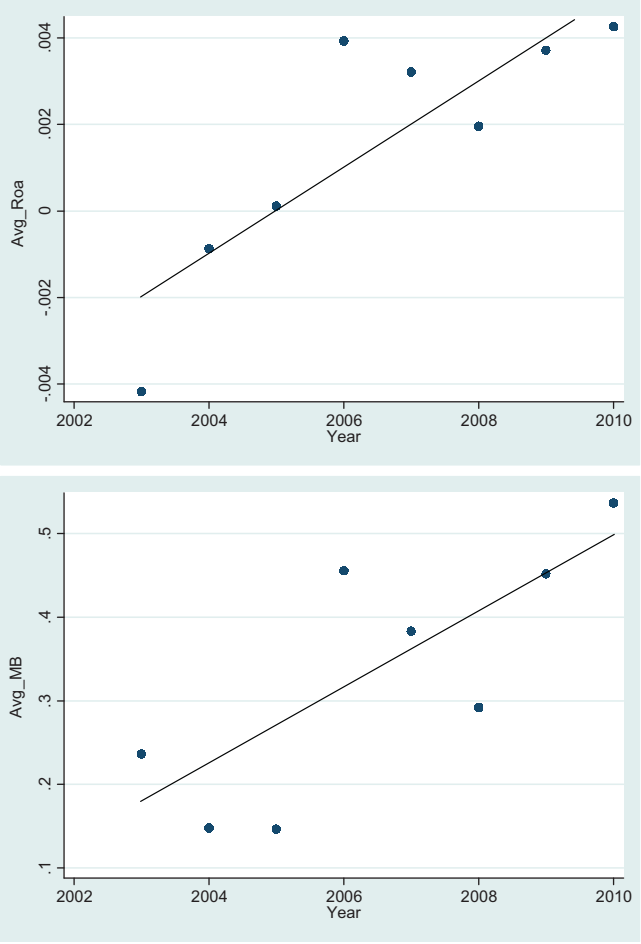

Fig. 1. Illustration of average *ROA* and average *MB* across years.

data are obtained from after 2006 (*DXBRL*). In addition, the variable *DSOE* suggests that approximately 67% of the observations are state-owned enterprises (SOEs). The average size (*SIZE*) is approximately 21 million RMB (after log transformation) and has an average sales growth rate (*GROWTH*) of approximately 89%. We then compare the descriptive statistics between SOEs and non-SOEs, as given in Table 3 Panel B and Panel C. Table 3 Panel B and Panel C show that, on average, non-SOEs have larger *MB* values ($p < 0.01$) but not significantly different *ROA* values ($p > 0.10$) in comparison to SOEs. Furthermore, we examine whether the two performance measures change significantly in the pre- and post-adoption period based on the value of *DXBRL*. Our univariate findings (not tabulated) suggest that for mandatory filers, both *ROA* and *MB* are larger ($p < 0.01$) in the post-adoption period. For SOEs, only *MB* is significantly larger ($p < 0.01$), but both *ROA* and *MB* are larger ($p < 0.01$) in comparison to non-SOEs in the post-adoption period. To illustrate this point, we plot the trend of the average *ROA* and average *MB* values based on the full sample, as shown in Fig. 1. The first figure in Fig. 1 shows the average *ROA* across years. The

Table 3
Descriptive statistics.

Variables	*N*	Mean	Std. dev.	Quartiles		
				25	50	75
Panel A: all observations						
ROA	4755	0.001	0.047	−0.246	−0.021	0.000
MB	4755	0.329	1.879	−9.312	−0.552	0.000
SIZE (millions)	4755	21.566	1.118	18.827	20.803	21.406
LEVERAGE	4755	0.494	0.176	0.023	0.369	0.504
AGE (years)	4755	9.232	3.978	2.000	6.000	9.000
GROWTH	4755	0.885	28.872	−0.973	0.010	0.159
BOARDSIZE (persons)	4751	2.603	0.206	1.099	2.485	2.639
IBOARDSIZE	4751	0.237	0.047	0.000	0.214	0.250
CAPITALINT	4755	0.306	0.189	−0.206	0.161	0.278
Dummy variables						
DXBRL	4751	0.671	0.470			
DSOE	4749	0.669	0.471			
DCENTRAL	4749	0.160	0.367			
DUALITY	4755	0.099	0.299			
Panel B: SOE						
ROA	3176	0.001	0.045	−0.246	−0.020	0.000
MB	3176	0.207	1.744	−5.387	−0.580	−0.029
SIZE (millions)	3176	21.734	1.175	19.116	20.917	21.533
LEVERAGE	3176	0.488	0.177	0.023	0.361	0.497
AGE (years)	3176	9.334	4.030	2.000	6.000	9.000
GROWTH	3176	0.341	3.117	−0.867	0.023	0.161
BOARDSIZE (persons)	3174	2.636	0.207	1.099	2.485	2.639
IBOARDSIZE	3174	0.234	0.047	0.000	0.214	0.250
CAPITALINT	3176	0.320	0.196	0.001	0.165	0.292
Dummy variables						
DXBRL	3174	0.673	0.469			
DSOE	3176	1.000	0.000			
DCENTRAL	3176	0.223	0.416			
DUALITY	3176	0.077	0.266			
Panel C: non-SOE						
ROA	1573	0.001	0.051	−0.227	−0.021	0.000
MB	1573	0.578	2.099	−9.312	−0.486	0.010
SIZE (millions)	1573	21.219	0.887	18.827	20.592	21.127
LEVERAGE	1573	0.505	0.174	0.035	0.386	0.515
AGE (years)	1573	9.001	3.848	2.000	6.000	9.000
GROWTH	1573	1.976	49.993	−0.973	−0.015	0.155
BOARDSIZE (persons)	1571	2.536	0.187	1.099	2.485	2.485
IBOARDSIZE	1571	0.243	0.046	0.000	0.214	0.250
CAPITALINT	1573	0.279	0.171	−0.206	0.152	0.252
Dummy variables						
DXBRL	1571	0.668	0.471			
DSOE	1573	0.000	0.000			
DCENTRAL	1573	0.034	0.180			
DUALITY	1573	0.146	0.353			

Table 4
Pearson correlation.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. *DXBRL*	1.000											
2. *DSOE*	0.006	1.000										
3. *ROA*	0.049*	0.005	1.000									
4. *MB*	0.062*	−0.093*	0.070*	1.000								
5. *SIZE*	0.203*	0.218*	0.071*	−0.236*	1.000							
6. *LEVERAGE*	0.147*	−0.045*	−0.177*	0.145*	0.281*	1.000						
7. *AGE*	0.335*	0.040*	−0.042*	0.041*	0.153*	0.196*	1.000					
8. *GROWTH*	0.008	−0.027	0.013	0.026	−0.003	0.030*	0.021	1.000				
9. *BOARDSIZE*	−0.082*	0.230*	−0.032*	−0.072*	0.236*	0.033*	−0.083*	−0.050*	1.000			
10. *IBOARDSIZE*	0.325*	−0.085*	0.056*	0.017	0.110*	0.093*	0.071*	0.017	−0.225*	1.000		
11. *CAPITALINT*	−0.001	−0.109*	0.028	0.039*	−0.074*	−0.026	−0.032*	−0.005	−0.064*	0.012	1.000	
12. *DUALITY*	−0.019	0.102*	0.016	−0.045*	0.145*	−0.068*	−0.114*	−0.029*	0.167*	−0.072*	−0.023	1.000

* Significant at 5%.

second figure in Fig. 1 demonstrates the average *MB* across years. As shown in these two figures, overall, firm performance is better after XBRL information became publicly available (i.e., year 2006), in comparison to the period when such information was unavailable. These figures preliminarily (or at the univariate level) support our argument that upon the adoption of XBRL, users are able to more efficiently and effectively use information, which, in turn, ensures that firms make strategic decisions more appropriately, as reflected by better performance.

The correlation of variables is presented in Table 4. As expected, *ROA* and *LAGROA*, *MB* and *LAGMB* are positively correlated. *ROA* and *MB* are also positively associated with *DXBRL*. We do not observe any high correlations that may affect our regression results.

Table 5
Results for *ROA* (dependent variable: *ROA*).

Variables	All Obs.	All Obs. with *DSOE*	Central SOE	Local SOE
Intercept	−0.031	−0.038*	−0.027	−0.063**
	(−1.46)	(−1.78)	(−0.82)	(−2.38)
LAGROA	0.319***	0.318***	0.246***	0.300***
	(5.54)	(5.52)	(4.36)	(5.13)
DXBRL	0.004**	0.008***	0.012***	0.009***
	(2.41)	(3.06)	(4.49)	(3.34)
DSOE		0.003	0.007*	0.003
		(1.27)	(1.75)	(1.17)
DSOE_DXBRL		−0.007**	−0.012***	−0.007**
		(−2.35)	(−2.83)	(−2.58)
SIZE	0.002**	0.003**	0.003**	0.003**
	(2.35)	(2.51)	(2.00)	(2.55)
LEVERAGE	−0.025***	−0.025***	−0.018**	−0.025***
	(−3.59)	(−3.59)	(−1.99)	(−3.37)
AGE	−0.000**	−0.000**	−0.001***	−0.000*
	(−2.20)	(−2.15)	(−3.48)	(−1.95)
GROWTH	0.000	0.000	0.000	0.000
	(0.40)	(0.31)	(0.47)	(0.51)
BOARDSIZE	−0.006	−0.005	−0.005	−0.003
	(−1.43)	(−1.22)	(−0.63)	(−0.66)
IBOARDSIZE	0.021	0.020	−0.017	0.037**
	(1.22)	(1.18)	(−0.57)	(2.01)
DUALITY	0.004*	0.003*	0.004	0.004*
	(1.91)	(1.73)	(1.54)	(1.75)
CAPITALINT	0.005	0.005	−0.011*	0.009**
	(1.45)	(1.42)	(−1.84)	(2.57)
N	4751	4745	2343	4099
Adj. R^2	0.23	0.23	0.19	0.23

t-Statistics are in parentheses and are calculated based on clustered (by firm-year) standard errors as suggested by Petersen [62]. All models also control for industry fixed effects. For the column labeled as "Central SOE", we considered central SOEs and non-SOEs. For the column labeled as "Local SOE", we focused on local SOEs and non-SOEs.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

3.2. Econometric model

We use the following regression models to test our hypotheses with the aforementioned variables, as shown in Eqs. (1) and (2).

$$\begin{aligned} Performance_{i,t} = {} & \beta_0 + \beta_1 LAGPerformance_{i,t-1} + \beta_2 DXBRL_{i,t} \\ & + \beta_3 SIZE_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 AGE_{i,t-1} \\ & + \beta_6 GROWTH_{i,t-1} + \beta_7 BOARDSIZE_{i,t-1} \\ & + \beta_8 IBOARDSIZE_{i,t-1} + \beta_9 DUALITY_{i,t-1} \\ & + \beta_{10} CAPITALINT_{i,t-1} + \Sigma Industry + \epsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} Performance_{i,t} = {} & \beta_0 + \beta_1 LAGPerformance_{i,t-1} + \beta_2 DXBRL_{i,t} \\ & + \beta_3 DSOE_{i,t-1} + \beta_4 DSOE\_DXBRL_{i,t-1} \\ & + \beta_5 SIZE_{i,t-1} + \beta_6 LEVERAGE_{i,t-1} + \beta_7 AGE_{i,t-1} \\ & + \beta_8 GROWTH_{i,t-1} + \beta_9 BOARDSIZE_{i,t-1} \\ & + \beta_{10} IBOARDSIZE_{i,t-1} + \beta_{11} DUALITY_{i,t-1} \\ & + \beta_{12} CAPITALINT_{i,t-1} + \Sigma Industry + \epsilon_{i,t} \end{aligned} \quad (2)$$

$Performance_{i,t}$ is one of the two performance measures: *ROA* or *MB*. $LAGPerformance_{i,t-1}$ is one of the two performance measures at time $t-1$: $LAGROA_{i,-1t}$ or $LAGMB_{i,t-1}$. We further control for the industry fixed effects based on the classification scheme provided by SSE as shown in Table 2. All models are estimated by controlling for the firm-year effect as demonstrated in Petersen [62]. β_2 is expected to be positive, as discussed in Hypothesis 1. In addition, Eq. (2) is used to test both Hypothesis 2 and Hypothesis 3. According to Hypothesis 2, we expect to observe a significantly negative β_4 in Eq. (2). We further explore the effect of SOE given the jurisdiction or authority level by using Eq. (2) to test Hypothesis 3. We define SOEs as central SOEs or local SOEs and re-perform the analysis based on central SOEs and non-SOEs as well as local SOEs and non-SOEs. From Hypotheses 3a and 3b, we expect to observe a significantly different β_4 for the model based on central SOEs in comparison to local SOEs.

4. Empirical results

4.1. Main results

Our results are given in Tables 5 and 6. Tables 5 and 6 show the results when the dependent variables are *ROA* and *MB*, respectively. Each table has four columns: the first column presents the results for Hypothesis 1, the second column shows the results for Hypothesis 2, and the last two columns provide the results for Hypothesis 3.

Table 5 consistently shows that the coefficients of *DXBRL* are significantly and economically positive (0.004, $p < 0.05$; 0.008,

Table 6
Results for *MB* (dependent variable: *MB*).

Variables	All obs.	All obs. with *DSOE*	Central SOE	Local SOE
Intercept	7.296***	7.007***	9.643***	8.152***
	(9.37)	(8.97)	(9.16)	(8.58)
LAGMB	0.260***	0.259***	0.187***	0.233***
	(3.52)	(3.50)	(2.77)	(3.29)
DXBRL	0.296***	0.480***	0.492***	0.487***
	(6.57)	(6.21)	(5.83)	(6.27)
DSOE		0.127***	0.336***	0.098**
		(2.70)	(4.24)	(2.02)
DSOE_DXBRL		−0.272***	0.096	−0.418***
		(−3.17)	(0.75)	(−4.65)
SIZE	−0.386***	−0.380***	−0.549***	−0.433***
	(−10.40)	(−10.24)	(−11.26)	(−9.20)
LEVERAGE	1.496***	1.486***	1.900***	1.581***
	(7.11)	(7.05)	(6.35)	(7.03)
AGE	0.006	0.005	0.017	0.015**
	(0.87)	(0.79)	(1.62)	(2.09)
GROWTH	0.001***	0.001***	0.001***	0.001***
	(2.93)	(2.87)	(2.79)	(2.76)
BOARDSIZE	0.109	0.141	0.302	0.097
	(0.92)	(1.17)	(1.37)	(0.77)
IBOARDSIZE	−0.141	−0.184	1.158	−0.311
	(−0.29)	(−0.38)	(1.31)	(−0.61)
DUALITY	0.105	0.093	0.220	0.105
	(1.20)	(1.07)	(1.61)	(1.21)
CAPITALINT	0.202	0.205	0.215	0.316**
	(1.57)	(1.58)	(1.00)	(2.24)
N	4751	4745	2343	4099
Adj. R^2	0.25	0.25	0.24	0.25

t-Statistics are in parentheses and are calculated based on clustered (by firm-year) standard errors as suggested by Petersen [62]. All models also control for industry fixed effects. For the column labeled as "Central SOE", we considered central SOEs and non-SOEs. For the column labeled as "Local SOE", we focused on local SOEs and non-SOEs.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

0.012 and 0.009, $p < 0.01$). That is, in comparison to the *ROA* before the mandatory adoption of XBRL, the post-adoption *ROA* is at least 0.4% higher, which supports our first hypothesis. This finding suggests that the increased transparency of financial reporting information may serve as an external monitoring function that forces the firm to select their strategies more appropriately, which, in turn, improves their operational performance. The results for other variables shown in Table 5 are largely similar to those in prior literature (e.g., [2,17,36,55,59,81]), with the exception of the board-related variables (*BOARDSIZE* and *IBOARDSIZE*). As discussed by Hu [41], the board in China does not have the real decision-making power, and over 90% of the independent directors lack independence. Accordingly, the board may not be related to a firm's operating performance.

We further examine the impact of SOEs and non-SOEs on the association between pre/post adoption and firm performance, as stated in Hypothesis 2. The second column in Table 5 demonstrates that the coefficient of interaction of *DSOE* and *DXBRL* is significantly negative (i.e., the coefficient of *DSOE_DXBRL* is -0.007, $p < 0.05$). The net effect of *DSOE* and *DSOE_DXBRL* is also significantly negative ($p < 0.05$). That is, in comparison to the pre-adoption period, *ROA* is lower for SOEs relative to non-SOEs in the post-adoption period. This finding suggests that, as expected, SOEs' operations are tied to political institutions and do not act based upon their best interests. Instead, they act in accordance with the institutions' interests with whom they are affiliated. Such an association makes the additional market's monitoring effect less obvious in a more transparent financial report. Therefore, although the adoption of XBRL can increase the transparency level of a firm's financial reporting information via easy access and integration, it does not really improve the performance as measured by *ROA*, in comparison to non-SOEs.

For Hypothesis 3, we split the SOEs into centrally controlled SOEs and locally controlled SOEs. The results are presented in the last two columns of Table 5. The column labeled as "Central SOE" includes both central SOEs and non-SOEs. The column labeled as "Local SOE" includes both local SOEs and non-SOEs. These results show that, again, in comparison to the pre-adoption period, *ROA* is smaller for both central and local SOEs relative to non-SOEs in the post-adoption period (i.e., −0.012, $p < 0.01$; −0.007, $p < 0.05$). However, the coefficient of *DSOE_DXBRL* for central SOEs is significantly smaller ($p < 0.01$) than that of local SOEs. From our discussion of Hypothesis 3a, it seems that local SOEs may have better *ROA* than central SOEs due to a better understanding of the businesses and the incentive to show better performance by local officials.

Table 6 also demonstrates that the coefficients of *DXBRL* are consistently and significantly positive. (The coefficients were 0.296, 0.480, 0.492 and 0.487, $p < 0.01$). Similar to Table 5, the results in Table 6 show that, in comparison to the *MB* before the mandatory adoption of XBRL, the post-adoption *MB* is higher for the mandatory filers. Different from *ROA*, *MB* captures the market's expectation about a firm's future. This finding indicates that from the market's perspective, the external monitoring function imposed by the increased transparency would affect SOEs' future performance.

As expected from Hypothesis 2, Table 6 demonstrates that in comparison to the pre-adoption period, *MB* is consistently smaller for SOEs relative to non-SOEs in the post-adoption period, with the exception of central SOEs (the coefficients are −0.272 and −0.418, $p < 0.01$; 0.096, *n.s.*). From our earlier discussion of the market, given the decision characteristics of SOEs, the easiness of access and integration of financial reporting information does not seem to affect SOEs' future operations. Nevertheless, this effect is only observed for local SOEs and not for central SOEs, which is different from the data presented in Table 5. That is, from the market's perspective, XBRL may improve the integration of the information in financial reports, which would help the market to disentangle local SOEs' operations but would not help in the case of central SOEs. Last, the findings in Table 6 support Hypothesis 3b in that local SOEs have smaller *MB* after the adoption of XBRL ($p < 0.01$). The result suggests that the market may perceive that with better governance mechanisms, central SOEs may perform better in comparison to local SOEs after the adoption of XBRL.

In summary, our overall findings suggest an improvement in both *ROA* and *MB* after the mandatory adoption of XBRL in China. These improvements may have resulted from the improved transparency that functions as an external monitoring mechanism. However, these improvements are different for SOEs and non-SOEs. Specifically, the observed improvements are mainly concentrated in non-SOEs, as the complicated nature and the arranged transactions of SOEs may hinder the realization of the potential benefits of using XBRL. Last, when we further explore the differences between central and local SOEs, the results are mixed. Although the market perceives that local SOEs would be more profoundly affected by the characteristics of SOEs as reflected by *MB*, the incentives of local officials indeed improve the *ROA* of the local SOEs in the short-run.

4.2. Additional analyses

We perform the following analyses to further validate our main results. For brevity, we do not tabulate the results of additional analyses. First, we control for the GDP change as a proxy of the overall macroeconomic conditions and for the change between outstanding and non-outstanding shares as a proxy of the

Table 7
Summary table of robustness tests.

Panel A. Different sub-groups of the sample										
	Control for change of GDP		Manufacturing		Non-manufacturing		Non-cross listed		Non-fortune/forbes	
	ROA	*MB*	*ROA*	*MB*	*ROA*	*MB*	*ROA*	*MB*	*ROA*	*MB*
DXBRL	0.004**	0.296***	0.00**	0.26***	0.00**	0.31***	0.00***	0.31***	0.00***	0.30***
	(2.41)	(6.57)	(1.99)	(4.60)	(2.12)	(4.54)	(2.99)	(6.78)	(3.07)	(6.62)
N	4751	4751	2836	2836	2236	2236	4855	4855	4935	4935
Adj. R^2	0.23	0.25	0.22	0.22	0.29	0.22	0.24	0.25	0.24	0.26

Panel B. Different year group									
	Not including 2004–2005		Not including 2008–2009	2005 vs. 2006		2005 vs. 2006–2008		2005 vs. 2006–2010	
	ROA	*MB*	*MB*	*ROA*	*MB*	*ROA*	*MB*	*ROA*	*MB*
DXBRL	0.00**	0.23***	0.29***	0.004*	0.178***	0.003*	0.110**	0.004*	0.255***
	(1.96)	(2.69)	(5.52)	(1.73)	(3.41)	(1.69)	(2.15)	(1.84)	(4.41)
N	3903	3903	3710	1122	1122	1198	1198	1198	1198
Adj. R^2	0.24	0.24	0.25	0.41	0.49	0.36	0.49	0.39	0.49

t-Statistics are in parentheses and are calculated based on clustered (by firm-year) standard errors as suggested by Petersen [62]. All models also control for industry fixed effects. All the other variables are included as in our main model, but the results are not reported.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

liberalization of the market. Our results remain largely similar. Second, as shown in the descriptive statistics, approximately 56% of our sample firms are in the manufacturing industry. To verify whether our results are mainly affected by manufacturing firms, we split our sample into manufacturing and non-manufacturing firms. Our main results hold for both groups. Third, as mentioned earlier, although approximately 90% of the firms have started to file with XBRL, the filings were not available till 2006. In consideration of this gray period, we exclude observations in 2004 and 2005 and re-perform our analyses. Our results remain qualitatively similar. Furthermore, the market-to-book ratio (*MB*) could be significantly affected by the global economic downturn in 2008 and 2009. That is, the stock market performance during the economic crisis could have potentially altered our results. Our results remain similar after these periods are excluded. Fifth, many firms in SSE are in the Fortune and Forbes list or are cross-listed in Hong Kong, Singapore, New York, and London. These firms have great reputations and need to follow the rules in the developed stock market. Accordingly, they might operate more effectively than other firms inherently. Our results remain similar when these firms are excluded from the analysis. Last, we re-perform our analyses by focusing only on one period before and one period(s) after the adoption. That is, there are two observations for each firm: one from the period before the adoption and the other from the period(s) after the adoption by calculating the average values of our variables. Specifically, we use the samples (1) in 2005 and 2006, (2) in 2005 and from 2006 to 2008, and (3) in 2005 and from 2006 to 2010. For (2) and (3), we calculate the average values from 2006 to 2008 and from 2006 to 2010 for all the variables, respectively. Then, we re-perform our analyses by using the averaged values. Our results are largely similar. The above results are summarized in Table 7 Panel A and Panel B.

5. Conclusions and discussions

XBRL is expected to improve the re-usability of financial reporting information by improving the accessibility and transparency of the adopting organizations. In light of the potential benefits of XBRL, China was the first country in the world that mandated the publicly traded firms to file in compliance with XBRL [20,21]. However, the majority of the firms in China are characterized by intensive government control, i.e., state-owned enterprises (SOEs), which may affect the potential benefits of XBRL. Based on a sample of all the listed firms in the Shanghai Stock Exchange between 2003 and 2010 (excluding financial institutions and early pilot filers), our results show that the mandatory adoption of XBRL increases both *ROA* and *MB* for mandatory filers. However, this positive impact is larger for non-SOEs in comparison to SOEs. When we investigate the effects in different levels of authority, our findings suggest that, in comparison to locally controlled SOEs, centrally controlled SOEs can benefit more by adopting XBRL in terms of *MB* but not *ROA*.

For managers, after the adoption of XBRL, China indeed attracted more foreign investors and drew more attention from foreign analysts due to a lowered barrier of accessing financial reporting information. However, SOEs do not change as fast as other non-SOEs under the pressure of transparency. The shareholder structure and interest alignments among different political institutions are far more complicated than what XBRL can solve at the current stage. Therefore, even though we have observed the benefits of adopting XBRL in the U.S. or Europe, market participants still need to be aware of the limitations of adopting XBRL in China, especially for SOEs when competing or collaborating with them. Second, our findings suggest that the market still expects to observe growth or lower uncertainties, as reflected by a higher *MB* in the post-adoption period. However, as SOEs do not act based on their own interests and can obtain subsidies and low-interest loans from the government, their performance and uncertainties do not mainly result from their operations but instead from politics. A high *MB* in the post-adoption period must be interpreted with caution especially for international investors because XBRL does not really result in expected benefits as reflected by the post-adoption period *ROA*. Last, our study shows how XBRL has been adopted in an emerging capital market. The steps it takes focus on how to use the "tool" in the shortest time through a strong force from the authority. We have observed similar patterns in other emerging markets, such as Taiwan. Our results can shed light on the potential benefits/drawbacks on its adoption in this type of situation. When everything is set by the government, the conformity rate will be high; however, the real essence of connecting the players in the business information supply chain (e.g., auditors, financial institutions, government, software

vendors, etc.) might be forgotten. It may take another round of implementation to link all the pieces in the business information supply chain together and with potentially higher costs.

Our study has several limitations. First, as mentioned in Section 3, although we can observe the ultimate owner of a firm, we are not able to collect the data for the shares held by different government agents or government controlled organizations. The complexity of the shareholder structure could also affect a firm's operational effectiveness, which we do not consider in the analyses. Second, for SOEs in China, there are non-outstanding shares and outstanding shares. The former is held by the government and is not publicly traded in the market. The latter can be traded in the market. We can observe the shares change of these two categories, which might be a proxy for the openness of an SOE. Nevertheless, as discussed in the first point, we do not have the information regarding whether other government-affiliated institutions hold the shares through the market, which would lower the appropriateness of the proxy. Third, another outside monitoring function that would affect a firm's performance is the shares held by foreign institutions. However, such data are not considered in these analyses. Fourth, although we observe a significant improvement in performance after the adoption of XBRL, we are not able to clearly determine how long it takes for the potential benefits to be realized. Last, because the adoption was mandatory and the adoption process until full adoption was in a short period of time, we are not able to form a control group without XBRL adoption.

There are several possible future research studies. As stated by the government in China, the potential benefits they would expect to observe by implementing XBRL have been attracting foreign investors and increasing the visibility of firms in China, for example. Accordingly, possible future research studies could consider the association between the adoption of XBRL and foreign investors' interests or analysts' forecast behaviors. It may also be beneficial to investigate how the adoption of XBRL would affect the quality of financial reports and the cost of capital in China's capital market.

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