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Board leadership structure for Chinese public listed companies

Mei Yu^a and John K Ashton^b

Abstract

It is widely accepted that board leadership structure and whether the chairperson and CEO roles should be undertaken jointly or separately affects the performance of a firm. Despite this consensus, empirical evidence presents major uncertainties as to the direction and degree of this influence. This study contributes to this debate by examining the relationship between board leadership structure and firm performance and the expense ratio, using propensity-score matching methods for Chinese PLCs from 2003–2010. It is reported that while CEO duality is not related to companies' profitability ratios, it is linked to a higher expense ratio compared to matched companies with a separate board leadership structure. This indicates that a separate board leadership structure is an effective corporate governance arrangement to reduce agency costs for Chinese PLCs.

Key words: Board Leadership Structure, Firm Performance, Agency Costs, Propensity Score Matching, China

JEL classification: G32; G34; O16; P34

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1. Introduction

Following its impressive economic transformation of the past 35 years there is an urgent need for a workable corporate governance model within China (Fan, 2004). This study contributes to this policy area by examining the veracity of one of the many corporate governance principles introduced into China in the last twenty years. Specifically we scrutinize whether the western prescription for dividing the role of chairperson and CEO is appropriate in the Chinese context. To achieve this goal the study addresses three questions:

- a) Which factors determine the board leadership structure for Chinese PLCs?
- b) Does the CEO duality have implications for the performance of Chinese PLCs?
- c) Does a separate board leadership structure reduce agency costs for Chinese PLCs compared to CEO duality?

Separate board leadership structure and CEO duality encapsulates circumstances where the CEO and chairperson positions are separated and combined respectively. These questions are tested using logit regression analysis and propensity-score matching methods to examine the determinants and effects of board leadership structure for 9,371 firm-year observations of non-financial Chinese PLCs, between 2003 and 2010. Firm performance is examined using firms' profitability ratios (return on assets and return on equity; hereafter ROA and ROE) and agency costs using the expense ratio. It is reported that a board leadership structure with separate CEO and chairperson positions is an effective corporate governance arrangement for Chinese PLCs.

While it is widely acknowledged that the board of directors plays a vital role in a firms' corporate governance, board organisation is important to examine in the Chinese context. Our current comprehension of board leadership structure was developed and refined in the UK and the USA which organise, own and run firms in very different ways from China. China differs from many western nations in terms of corporate governance, law, business culture and ownership. In contrast to US companies, Chinese companies normally have a relatively concentrated ownership structure with state ownership of many firms, limited information disclosure, poor investor protection and reliance on the banking system for finance. Subsequently, Chinese companies face conflicts beyond the traditional principal-agent problem observed in western nations, with the expropriation of minority shareholders by

controlling shareholders a growing concern (e.g. Zhu & Ma, 2009; Jian & Wong, 2010; Huyghebaert & Wang, 2012). Through this examination we determine whether board leadership structure, derived from experience in the USA and Europe and often assumed to be universal in application, has a similar influence on firm performance and agency costs in a distinct Chinese corporate environment.

This study is timely as while the academic literature includes abundant studies examining the effect of board structure in respect of firm performance, only a handful of studies have examined the determinants of board structure. While these studies have focused on the determinants of board size and outside directors (e.g. Cierco, Wintoki & Yang, 2013; Guest, 2008), relatively few studies have examined the determinants of board leadership structure (e.g. Linck, Netter & Yang, 2008; Pathan & Skully, 2010; Dey, Engel & Liu, 2011) and considered these concerns within Western nations. This assessment also builds on past studies which have examined the determinants of board size and independence (see Chen & Al-Najjar, 2011; Su, Xu & Phan, 2008) and board leadership structure (e.g. Xie, 2012) for Chinese companies in earlier periods. This study differs from and extends these past contributions by examining the determinants of board leadership and the effects of board leadership structure on firm performance for Chinese PLCs between 2003 and 2010. Further we address long standing concerns that endogeneity which may influence key relationships in this debate by using propensity-score matching methods.

The paper is organized as follows. Section 2 introduces the relevant literature and empirical evidence. Section 3 describes the hypotheses, model design and variable definition. The results of the data analysis are presented in Section 4. Finally, conclusions are presented in Section 5.

2. Literature Review

Explanations of how corporate governance arrangements operate in the USA and Europe have been shaped by a literature of a considerable lineage. Concerns as to the separation of ownership and control were raised by Berle and Means (1932) and agency theory (Jensen & Meckling, 1976) arose to examine whether managers of firms would follow the maximization of the owners' wealth or pursue personal gains when facing a dispersed ownership structure. This literature assumed the agency relationship between the owners of the firm and managers gave rise to agency costs as managers may not act in the best interest of the owners (Jensen &

Meckling, 1976). These agency costs arise when the interests of the firm's managers are not aligned with those of the owners, take the form of perks, shirking, and making self-interested and entrenched decisions that reduce shareholder wealth (Ang, Cole & Lin, 2000). Building on a belief that boards of directors are one of the most efficient internal governance mechanisms to control and supervise top management (Jensen, 1993; Daily, Dalton & Cannella, 2003) many corporate governance arrangements have been developed in Western nations and introduced into China under the belief that they would enhance firm performance through alleviating these agency costs. As these corporate governance arrangements have been numerous this study focuses on the determinants and effects of board leadership structure due to both its widespread dissemination internationally and pertinence to the Chinese context.

2.1 Chinese Experience of Corporate Governance Arrangements

China is an informative case to examine the determinants and effects of board leadership structure due to the distinct ownership structure and external operating environment. Indeed many of these differences could have a significant influence on the relationship between board leadership structure and firm performance.

A critical difference between China and many European and North American nations is that state ownership of firms is significant in China. During China's economic reforms of the 1980s, the Chinese government privatized small and medium sized state owned enterprises (SOEs) and corporatized large SOEs. Though state ownership has been reduced over time, the state and other government institutions have retained a majority stake in privatized firms (Li, Moshirian, Nguyen & Tan, 2007). As property rights theory claims property rights in the private sector are more clearly defined and private ownership leads to more effective monitoring of management performance (Alchain, 1965; McCormick & Meiners, 1988), this situation could limit firm performance. Alternatively the Chinese state could play both a 'helping hand' as well as a 'grabbing hand' in its role as shareholder. The state can provide support regarding finance and resources and a higher level of state shareholding may overcome 'free rider' problems (Tian & Estrin, 2008; Yu, 2013).

Relative to many Western nations, investor protection is poor and law enforcement can be weak in China. While there is variation among European nations particularly in levels of investor protection, these concerns are amplified in China. Many Chinese PLCs have a large

controlling shareholder which enables wealth to be tunneled from smaller investors. Subsequently Chinese companies face conflicts between controlling shareholders and minority shareholders with the expropriation of minority shareholders by controlling shareholders a growing concern (e.g. Zhu & Ma, 2009; Jian & Wong, 2010; Huyghebaert & Wang, 2012).

To amend for these and other concerns arising from the process of economic reform, Chinese corporate governance rules have been revised to accentuate the role of directors, strengthen their control over managers and provide better protection for investors (Tenev & Zhang, 2002). The Chinese Company Law was implemented in 1994, marks the starting point of these corporate governance reforms. The Company Law articulates the responsibilities, rights, and liabilities of shareholders, the board of directors, managers and the board of supervisors. This system involved listed companies employing two tier-boards: a main board of directors and a supervisory board. The function of the supervisory board is to implement financial supervision of the firm and protect the best interests of the firm and its shareholders. As the published statements of supervisory boards are rarely contested with decisions made by the board of directors and by executives (Huyghebaert & Wang, 2012; Chen, Liu & Li, 2010) the supervisory board has been widely viewed to be more decorative than functional and corporate governance assessments have predominantly focused on the board of directors, rather than the board of supervisors.

These Chinese corporate governance arrangements have been extended within subsequent reforms. The Basic Norms of State Owned Large and Medium Sized Enterprises in Establishing a Modern Enterprise System and Strengthening Management (hereafter referred to as The Basic Norms) were issued by the State Economic and Trade Commission in October 2000. This extension to corporate governance arrangements stipulated amongst other recommendations, in principle the chairperson of the board of directors and the general manager (CEO) could not be the same person. As China has a weak institutional environment and investor protection is poor, CEO duality could result in higher agency costs for Chinese PLCs. In separating the two positions, it was anticipated the board could execute its supervision and monitoring roles more effectively.

Reflecting these high levels of state ownership and that the appointment of many CEOs is influenced by the government (Su, Xu & Phan, 2008) conforming with the Basic Norms

reforms provides political legitimacy for the firm. Despite these incentives the adoption of this corporate governance amendment has been torpid, reflecting the considerable autonomy of Chinese companies in determining an optimal board composition (Peng, Zhang & Li, 2007). Separating CEO and chairperson positions has therefore varied across firms and over time (Dahya & Travlos, 2000); the percentage of Chinese PLCs practising CEO duality declined gradually from approximately 60 per cent in the early 1990s, to 30 per cent by the end of the 1990s (Bai, Liu, Lu, Song & Zhang, 2004) and to approximately 10 per cent in the early 2000s.

The implementation of the Code of Corporate Governance for Listed Firms in China in 2002, serves as another milestone in the reform of Chinese corporate governance and executive incentives. These developments were largely based on the regulations and practices in Western economies. This process was advanced with the Split Share Structure Reform of 2005-06 directed at reducing non-tradable state shares and government ownership in Chinese PLCs (Jiang, Laurenceson & Tang, 2008; Tseng, 2012). Prior to the reform only about one-third of the shares in listed companies were legally tradable in markets.

Overall the institutional framework and ownership structure of Chinese firms is distinct from many western nations and particularly North America. The high levels of ownership concentration, reducing yet significant levels of state ownership and substantial legal differences, individually or in combination could reduce the efficacy of board members and leadership structures. Determining the degree to which this is the case is considered in the next section.

2.2 Effects of Board Leadership Structure

Anxieties as to the operation of CEO duality were initially raised by the UK Cadbury report (Cadbury Committee, 1992) following fears that concentrated power on the board is corrupting and reduces the effectiveness of board monitoring (Finkelstein & D'Aveni 1994; Chen, Liu & Li, 2010). This practice of separating the CEO and chairperson positions has subsequently been advocated internationally through corporate governance codes in at least 16 nations including China (Dahya, 2009). The adoption of this practice varies internationally; US companies normally have a higher percentage of companies that practice CEO duality (Coles, McWilliams, & Sen, 2001), a lower percentage of companies in the UK, Japan, Italy

and Belgium combine the two positions of CEO and chairperson (Boyd, Howard & Carroll, 1997).

Advantages of CEO duality are believed to include unity of command, clear cut leadership (Anderson & Anthony, 1986; Finkelstein & D'Aveni, 1994; Boyd, 1995) and lower information costs (Brickley, Coles & Jarrell, 1997). It is further proposed the costs of monitoring and transferring information to a single person should be lower than to two persons (Alchian & Demsetz, 1972; Brickley, Coles & Jarrell, 1997). Stewardship theorists also advocate a single person undertaking both roles benefits the firm by removing internal and external ambiguity regarding responsibility for a firm's processes and outcomes (Finkelstein & D'Aveni, 1994; Donaldson & Davis, 1991; Peng, Zhang & Li, 2007). A separate board leadership structure could therefore engender conflict between management and board, create confusion and curtail innovation (Baliga, Moyer & Rao, 1996).

CEO duality may also impose costs on firms; this practice could reduce the effectiveness of board monitoring and weaken board control (Finkelstein & D'Aveni, 1994; Boyd, 1995) ultimately reducing firm performance (Malette & Fowler, 1992; Worrell, Nemec & Davidson, 1997; Bai, Liu, Lu, Song & Zhang, 2004; He, 2008). Entrenched managers, through their high ownership may also reduce the monitoring role of the board by combining the positions of chairperson and CEO (Lasfer, 2006). Further the presence of an independent chairperson can provide balance to the board, afford a valuable 'outside' perspective and curb the power of the CEO (Stile & Taylor, 2001).

Echoing these theoretical differences, the extensive empirical literature examining the influence of CEO duality over firm performance has provided mixed results (see Dalton, Daily, Ellstrand & Johnson, 1998; Finegold, Benson & Hecht, 2007; Rhoades, Rechner & Sundaramurthy, 2001). Some empirical work has supported the arrangement of separating CEO and chairperson positions (e.g. Worrell, Nemec & Davidson, 1997; He, 2008) with other empirical work in disagreement (e.g. Donaldson and Davis, 1991). Further evidence has indicated this corporate governance arrangement has no influence on firm performance at all (e.g. Dalton, Daily, Ellstrand & Johnson, 1998; Daily & Dalton, 1992; Rechner & Dalton, 1989; Iyengar & Zampelli, 2009). This multiplicity of findings is also observed in Chinese context. CEO duality is negatively (Bai, Liu, Lu, Song & Zhang, 2004) and positively (Peng, Zhang & Li, 2007; Tian & Lau 2001) related to firm performance albeit for distinct samples,

metrics of performance and time periods. Other studies (Cheung, Jiang, Limpaphayom & Lu, 2008; You & Du 2012; Chen, Ezzamel & Cai, 2011) reported CEO duality is not related to firm performance.

This lack of clarity and subsequent decline in empirical research of CEO duality has both methodological and conceptual roots. It became apparent CEO duality is a non-random, organizational practice only adopted under certain conditions. Whether board leadership structure enhances or lowers performance depends on its fit with a firm's internal and external conditions (Kang & Zardkoohi, 2005). Subsequently researchers began to adopt a contingency (Finkelstein & D'Aveni, 1994; Boyd, 1995) and integrative approaches (Kwok, 1998) to examine these relationships. The contingency approach assumes CEO duality could enhance firm performance in certain contexts, such as low CEO informal power or low firm performance (Finkelstein & D'Aveni, 1994) and in environments with resource scarcity or high complexity (Boyd, 1995). An integrative approach (Kwok, 1998) considered the impact of agency problems and agency control mechanisms on firms' performance.

Drawing on these insights CEO duality is currently regarded to be an organisational practice adopted under appropriate or inappropriate conditions rather than a random phenomenon (Kang & Zardkoohi, 2005). Antecedents of CEO duality would include "(1) duality as a reward for a CEO's good performance, (2) duality as a solution to environmental resource-scarcity, complexity and dynamism, (3) duality as conforming to institutional pressures, (4) duality as a result of social exchange reciprocity and (5) duality as imposed by a powerful CEO" (Kang & Zardkoohi, 2005).

Evidence of these antecedents is mixed. The reward explanation of duality is based on Vancil's (1987) succession framework and Brickley, Coles & Jarrell (1997) succession planning theory. If the new CEO performs well, then he/she is rewarded with the chairperson title (Brickley, Coles & Jarrell, 1997). CEO duality may also arise as a solution to environmental resource-scarcity, complexity and dynamism such as 'scope of operations', nature, diversity and complexity of the business production process (Boone, Field, Karpoff, & Raheja, 2007; Linck, Netter & Yang, 2008). As information requirements of larger and more complex firms are higher, the information transfer costs of boards with a separate board leadership structure may become excessive. This is particularly the case when a CEO possesses firm-specific knowledge.

CEO duality might also result from institutional social exchange reciprocity and power explanations. Linck, Netter & Yang (2008) and Pathan and Skully (2010) both report the probability of CEO duality increases with CEO power measured by the shareholding percentage of directors and executives and closeness of CEOs to retirement. CEO duality also declines with increased constraints on CEO power. For example, high levels of shareholding by non-affiliated persons/institutions could restrain CEO power (Pathan & Skully, 2010). Similarly CEO duality may arise from institutional pressures, where the ownership structure (Bekiris, 2013) and specifically block holders influence firms to separate CEO and chairperson roles to enhance board independence (Mak & Li, 2001). As the largest shareholder and block shareholders have the resources and incentives to supervise the work of management, concentrated and block ownership may be an influential mechanism to mitigate the agency problem between managers and shareholders (Shleifer & Vishny, 1997; Claessens & Djankov, 1999) and the composition of the board (Essen, Oosterhout & Carney, 2012).

Results from the international empirical literature also exhibit these multiple themes. CEO duality has been reported as positively associated with firm size, CEO age and board size for US firms (Linck, Netter & Yang, 2008), with firm size, CEO ownership and CEO tenure for US banks (Pathan & Skully, 2010), with firm size and performance for Australian firms (Monem, 2013) and CEO age and tenure for UK firms (Dedman, 2000). CEO duality also appears to be negatively related with regulatory intensions in the US and UK (Pathan & Skully, 2010; Dedman, 2000) and non-affiliated block shareholding in Greece. Within China investigations of board size, composition, independence and compensation report firm complexity (Chen & Al-Najjar, 2011) and ownership concentration (Su, Xu & Phan, 2008) are significant influences.

3. Methodology

In this section we outline how the research questions are addressed. Question a) is tested using logit regression analysis and propensity-score matching methods are used to examine questions b) and c). Firm performance is examined using firms' profitability ratios (ROA and ROE) and agency costs are examined using the expense ratio. The data, the model employed and the definition of the variables are considered sequentially.

3.1 Data Employed

The data set is from the China Stock Market and Accounting Research (CSMAR) database and covers all Chinese public listed companies from 2003 to 2010, excluding financial sector companies. The CSMAR database is designed by the China Accounting and Finance Research Centre of the Hong Kong Polytechnic University and developed by Shenzhen GTA Information Technology Corporation Limited. Chinese companies may issue three types of tradable shares. Tradable 'A' shares are listed on the two domestic stock exchanges (Shanghai and Shenzhen) to domestic investors and denominated in Chinese currency Renminbi (RMB). 'B' shares are issued to foreign investors traded in either US or Hong Kong dollars. A Chinese company may also trade on the Hong Kong Stock Exchange and issue 'H' shares (Conyon & He, 2011). This study deals with Chinese PLCs that only issue 'A' shares in domestic stock exchanges; firms which issue B shares are not considered. The data of those companies with special treatment and incomplete data were deleted leaving a final sample size of 9,371 firms.

The data considers the accounting performance of Chinese firms. Accounting-based measures are chosen for the following reasons. As capital markets in China are not well developed, volatile, market-based measures may not reflect firms' true performance. The turnover ratios of the Chinese stock exchanges are approximately 700-1000 per cent, versus 67 per cent in the United States (Xu & Wang, 1999: 85). The average holding period lasts about 1-2 months in China versus 18 months in the United States. As a result, market-based measures in China tend to be less informationally efficient (Tenev & Zhang, 2002).

Notwithstanding the benefits of accounting data, the ability to manipulate accounting data has evolved with the autonomy enjoyed by management of Chinese SOEs. To overcome these concerns accounting and reporting of the publicly listed companies in China has undergone a process of standardization in recent years. The Chinese government has made substantial efforts to improve the statutory requirements for the disclosures of listed companies with Chinese PLCs required to disclose annual reports publicly.

The China Securities Regulatory Commission (CSRC) is the main security (finance) regulator which supervises the listing and trading of Chinese listed companies. The two stock exchanges operating in Shanghai and Shenzhen have also formulated certain detailed rules on information disclosures of listed companies. In addition, the governmental authority

responsible for accounting and finance (The Ministry of Finance) has formulated and enforced specific accounting regulations or standards particularly applicable to listed companies. Overall it is expected that the quality of financial account information of public listed companies is generally better compared to non-listed companies. Despite these improvements to accounting practice, it is acknowledged that outliers could exist within this data. Therefore firm performance and the expense ratio¹ are winsorized; a commonly used technique in corporate governance literature (e.g. Bebchuk, Cremers & Peyer, 2011; Erkens, Hung & Matos, 2012; Liu, Bredin, Wang & Yi, 2011). Winsorizing or winsorization is the transformation of statistics by limiting extreme values in the statistical data to reduce the effect of possibly spurious outliers. To winsorize the data, tail values are set equal to some specified percentile of the data. Winsorizing is different than simply excluding data, called trimming. Through trimming, the extreme values are discarded. Winsorized estimators are usually more robust to outliers than their unwinsorized counterparts (Yang, Xie & Goh, 2011). Descriptive statistics of the data set are presented in Table 1 and are discussed in the analysis section.

3.2 Variable Definition

Financial performance is defined as the company's ability to generate new resources from day-to-day operations over a given period of time and performance is gauged by net income and cash from operations. This study uses financial performance indicators ROA (return on assets) and ROE (return on equity) to measure profitability and the expense ratio to measure agency costs. There are theoretical reasons for examining profitability measures of performance. Agency theory predicts that managers will squander profits on excessive salaries and managerial perquisites, so leaving less available to shareholders (Jensen & Meckling, 1976; Eisenhardt, 1989; Fama, 1980). Chinese scholars, practitioners and officials also attach great importance to ROE. The China Securities Regulatory Commission (CSRC), the Chinese equivalent of the US Securities and Exchange Commission (SEC), has required that for a listed firm, its ROE has to be positive in one of every three consecutive years; otherwise, it will be delisted (Peng, Zhang, & Li, 2007). ROE is obtained by dividing net profits with average shareholders' equity. ROA is used because it is directly related to management's ability to efficiently utilise corporate assets, which are ultimately the property

¹ We winsorize ROA and ROE at 2.5% level and expenses ratio at 1% level in both tails of the distribution.

of shareholders. ROA is defined as earnings before interest and tax divided by average total assets.

The expense ratio is measured as the sum total of selling and management expenses divided by operating revenue. Expenses include travel expenses for executives, advertising and marketing costs, rent, luxury automobiles and other utilities. The ratio reflects the managerial discretion in spending company resources measuring how effectively the management of the company controls operating costs and other direct agency costs. This definition is similar to that used in other studies: be this operating expenses divided by annual sales (see Ang, Cole & Lin, 2000; Ibrahim & Samad, 2011) or the ratio of selling, general and administrative expenses to sales (Florackis, 2008; Singh & Davidson, 2003).

Although accounting ratios offer a quick and useful method of analysing the performance of a business, they inherit the limitations of the financial statements on which they are based. Furthermore, differences in accounting policies and financial year-ends contribute to problems of evaluation (Atrill & McLaney, 2001). Multiple performance measures are therefore used to ameliorate the limitations of any single financial measurement (Muth & Donaldson 1998), to capture the distinct aspects of firm performance encompassed in different metrics and engender a more precise description of performance (Rechner & Dalton, 1991; Dalton & Kesner, 1985: 752).

Corporate governance variables include a CEO duality dummy, board size, the executive's shareholding percentage, largest shareholding percentage and state ownership. CEO duality occurs when the CEO also holds a chairperson role and the CEO duality dummy equals to one when the two positions are combined and zero otherwise. Board size is the number of board directors. CEO ownership is measured by the CEO's shareholding percentage. Largest shareholding is measured by the principal shareholding percentage. State ownership is the percentage of the firm owned by the Chinese state. The variables for firm characteristics are firm age and size. Firm size is considered as monitoring and agency costs are higher in large firms (Himmelberg, Hubbard, & Palia, 1999). Following Gilson (1997) the natural log of total assets is used as a proxy of firm size. Exogenous effects are accommodated by controlling for industry and market specific factors using the China Securities Regulatory Commission (CSRC) industry classification (see Linck, Netter & Yang, 2008). The financial industry is excluded from the analysis and industry dummies are included to adjust for

industry effects. Year dummies are used to control for year effects. These variable definitions are summarised in Table 1.

Table 1: Variable Definitions

Variable name	Description
ROA	Return on assets Earnings before interest and tax / average total assets. Average total assets: (Beginning total assets + ending total assets)/2
ROE	Return on equity Net profits/ average shareholders' equity
Expennr	Expense ratio (Selling expense+ management expense) / operating revenue The sum total of selling and management expenses divided by operating revenue
Ceodua	CEO duality CEO also holds a chairperson position. The CEO duality dummy equals to one when the two positions are combined and zero otherwise.
Bsize	Board Size Number of board of directors
Ceoop	CEO's shareholding ownership The proportion of shares held by the CEO
Bigop	Largest shareholding The proportion of shares held by the largest shareholder
Stateop	State ownership The proportion of the shares held by the Chinese state
Lnasset	Firm size The natural log of total assets
Listage	Listing Age Firm's age since listing
Industry dummies	Industry The China Securities Regulatory Commission (CSRC) industry classification
Year dummies	Year dummies

Note: The data is from the China Stock Market and Accounting Research (CSMAR) database.

3.3 Model Design

To address the first research question an approach similar to that adopted by Linck, Netter & Yang (2008) using a logit model is adopted. This model is written as:

$$Ceodua = a + \beta X + \text{Industry Dummies} + \text{Year Dummies} + \varepsilon \quad (1)$$

where *Ceodua* represents the board leadership structure as the dependent variable which takes the value of one when the positions of Chairperson and CEO is combined and zero otherwise. *X* is a vector of variables including board and firm characteristics. Board and CEO characteristics include board size, CEO ownership, CEO age and CEO tenure. The variables for firm characteristics are the largest shareholding percentage, state ownership, firm performance, firms' listing age and firm size. β represents the coefficients to be estimated and

ε is the error term. Industry and year dummies are used to control for industry and year effects.

The estimation of this model is complicated by econometric challenges. The hypotheses considered can all display endogeneity where firm performance might influence board leadership structure or alternatively, board leadership structure could influence firm performance. To address this problem an array of measures are adopted. Initially, all the independent variables are lagged by one year. Secondly, robust regressions with standard errors clustered by the firm are used to control for firm effects.

When examining research questions b) and c), propensity score matching (hereafter PSM) methods are used to accommodate potential endogeneity (see Rosenbaum & Rubin, 1983; Heckman, Ichimura & Todd, 1997, 1998; Yang & Mallick, 2010; Mallick & Yang, 2011, 2013). PSM techniques enables ‘like-for-like’ comparison and is an appropriate method to examine the relationship between board leadership structure and firm performance through estimating how distinct groups adopting and not adopting corporate governance developments differ.

To apply the PSM technique, a logit model where the dependent variable is a CEO duality dummy and the regressors are the firm characteristics and industry dummies is estimated. The probability (propensity score) that each company uses CEO duality is derived and used to determine the matched treated (CEO duality) and untreated (separate board leadership structure) samples. Rather than regressing performance on board leadership structure in the whole sample of observations, the average effect of CEO duality on firm performance in the matched samples (also known as the average treatment on treated effect; hereafter ATT) is estimated. The magnitude of difference in firm performance between the treatment group (companies using CEO duality) and control groups (companies with a separate leadership structure) are then derived by estimating the following equation:

$$t_{ATT} = E[Y_{it}|p, D = 1] - E[Y_{it}|p, D = 0] \quad (2)$$

where t_{ATT} is the average performance difference between matched treatment and control companies, Y_{it} represents the performance of company i in year t and D is a dummy variable

equal to one if the board leadership structure is combined and zero otherwise. The propensity score p is equal to $\Pr[D=1|X]$ representing the probability of processing CEO duality leadership structure based on the given company characteristics X . The given company characteristics include assets, listing age, largest shareholding percentage, state ownership, CEO's share ownership, CEO age, CEO tenure and industry sector. As non-matched samples are more diverse and less comparable than matched samples, the measured effect of board leadership structure on firm performance might be higher than when a matched sample is used and hence it is important to make firms as comparable as possible during the matching process.

The PSM approach is used to adjust for pre-treatment observable differences between treated and untreated companies using three different matching methods: nearest neighbour matching, radius caliper matching and kernel matching. The benchmark results are based on kernel matching. The nearest neighbour matching procedure chooses matching partners for a treated company from the control group in terms of proximity to the propensity score. This is called 'one to one' nearest neighbour matching which is often considered as an initial step in the PSM method. The k nearest neighbour matching allows the usage of k units in control group as matching partners for a treated company (Mallick & Yang, 2011); this study uses the nearest neighbour and three nearest neighbours marching method.

Radius calliper matching imposes a propensity score distance requirement, namely, the caliper. The caliper value draws a maximum distance of matched companies in the treated and control groups that is closest in terms of the propensity score. Radius matching uses all of the comparison members within the caliper and allows the usage of extra (fewer) units when good matches are not available (Caliendo & Kopeinig, 2008). Lastly, kernel matching methods employ a kernel weighted average of the propensity score to obtain balanced matched firms. By using this method, the control (untreated) observations will be assigned more weights if they are closer in terms of propensity score to a treated firm and lower weights placed on more distant observations (Caliendo & Kopeinig, 2008). The analysis is conducted on 1,379 treatment companies and matched companies are chosen from the 7,597 companies with a separate board leadership structure.

4. Data Analysis

The data analysis includes the descriptive statistics of the data set and the outcome of the regression model (1) and equation (2) respectively. In Table 2 we outline descriptive statistics and in Table 3 correlations between model variables are forwarded. The regression model results are reported in Table 4 and PSM results are presented in Table 5.

4.1 Descriptive Statistics

Within Table 2 four panels are presented including average values in Panel A, dispersion of values in Panel B, comparative data in Panel C and the percentage of observations in different industries in Panel D. In Table 2 Panel A, the percentage of Chinese PLCs practising CEO duality has increased since 2005 with 22.5% of companies having CEO duality in 2010. The number of board directors is 10 in 2003, falling to 9 in 2010. CEO share ownership has increased overtime albeit from low levels; the average of CEO ownership was 0.2% in 2003, rising to 4.2% in 2010. The average CEO age is between 47 and 48 during 2009 and 2010. State ownership has been reduced over time from 37.5% in 2003 to 7.8% in 2010. Many Chinese PLCs also have concentrated ownership structure with the average largest shareholding percentage above 40% between 2003 and 2005. This level of concentrated ownership declines to approximately 36% between 2006 and 2010. The firm performance measured by ROA and ROE reveals firm performance also falls in 2008 due to the financial crisis, recovering in 2009. The expense ratio is approximately 17% between 2003 and 2005, falling to 15% between 2009 and 2010.

Panel B in Table 2 reports on average 15.3% of companies pursue CEO duality, the average CEO share ownership is 1.6% and average state ownership is 23.4%. The mean, median and maximum of largest shareholding percentage is 0.381, 0.362 and 0.865 respectively. The 75 percentile value of largest shareholding is 0.503 which means that the largest shareholder control more than 50% of ownership in approximately 25% of observations; a high degree of ownership concentration. The average of ROA, ROE and expense ratio are 6.5%, 7.8% and 15.3% respectively. Panel C indicates for companies displaying CEO duality, CEOs hold more shares of the firm and are older, state ownership and largest shareholding percentage are lower, company size is smaller and the companies' profitability and expense ratios are higher. CEOs which also hold chairperson positions require higher pay to align their interests with company objectives.

Panel D of Table 2 displays the sample distribution among industries grouped according to the Industry Classification of Listed Companies by CSRC (2001 version). We observe the largest concentration of firms is from the manufacturing sector (59.42%). Large differences are recorded between industry classifications for example, the information technology sector having the highest average percentage of companies that practice CEO duality (23.2%) and the lowest in the petrol, gas and mining sector (5.6%).

Table 2: Descriptive Statistics

Panel A: Descriptive data according to each year										
Year	Ceodua	Bsize	Ceoop	Ceorage	Stateop	Bigop	ROA	ROE	Expenr	Sample size
2003	0.107	9.95	0.002	45.29	0.375	0.437	0.054	0.056	0.170	845
2004	0.121	9.71	0.004	45.55	0.356	0.428	0.056	0.061	0.163	1,011
2005	0.108	9.61	0.003	45.76	0.338	0.409	0.046	0.042	0.169	1,068
2006	0.118	9.42	0.005	46.05	0.289	0.361	0.060	0.069	0.155	1,115
2007	0.155	9.30	0.013	46.25	0.247	0.359	0.080	0.104	0.133	1,194
2008	0.159	9.18	0.017	46.76	0.212	0.364	0.063	0.073	0.143	1,268
2009	0.175	9.05	0.025	47.20	0.119	0.365	0.071	0.092	0.151	1,197
2010	0.225	8.97	0.042	47.55	0.078	0.361	0.078	0.101	0.150	1,673
Panel B: Descriptive data – overall variation										
Mean	0.153	9.35	0.016	46.44	0.234	0.381	0.065	0.078	0.153	
Median	0	9	0	46	0.159	0.362	0.060	0.077	0.119	
S.D.	0.360	1.95	0.067	6.54	0.248	0.159	0.057	0.106	0.127	
Minimum	0	3	0	26	0	0.035	-0.090	-0.296	0.016	
Maximum	1	19	0.693	75	0.898	0.865	0.212	0.321	0.773	
Panel C: Descriptive data - comparison										
Ceodua	Bsize	Ceoop	Ceorage	Stateop	Bigop	Lnasset	ROA	Listage	ROE	Expenr
0	9.45	0.0058	46.02	0.250	0.385	21.50	0.063	8.82	0.075	0.149
1	8.78	0.0739	48.74	0.147	0.359	21.14	0.075	6.88	0.089	0.175
Panel D: Industry Classification										
Industry Code	Industry Type		Ceodua	Sample Size	Per cent					
A	Agriculture, forestry, grazing and fishing		0.156	211	2.25					
B	Patrol/natural gas/coal mining		0.056	144	1.54					
C	Manufacturing		0.166	5,568	59.42					
D	Electricity/gas/hot water supply		0.119	352	3.76					
E	Civil engineering/Construction		0.060	199	2.12					
F	Transportation and warehousing		0.072	349	3.72					
G	Information technology		0.232	604	6.45					
H	Wholesale and retail		0.117	606	6.47					
J	Real estate		0.135	488	5.21					
K	Public facilities service		0.117	300	3.20					
L	Media and culture		0.133	60	0.64					
M	Conglomerates		0.143	490	5.23					
Total				9,371	100					

Notes: Ceodua: CEO duality dummy equals to one when the positions of chairperson and CEO are combined and zero otherwise. Board size: the number of board directors. Ceoop: the proportion of shares held by the CEO. Ceoage; the age of CEO. Stateop: the proportion of shares held by the Chinese State. Bigop: The proportion of shares held by the largest shareholder. ROA: Earnings before interest and tax/ average total assets. ROE: Net profits/ average shareholders' equity. Expenr: (selling expense+ management expense)/operating revenue. The data is from the China Stock Market and Accounting Research (CSMAR) database.

Table 3 shows a matrix of pairwise variables' correlations. From Table 3 we observe the correlations of pairwise variables are very low, except between ROA and ROE and the largest shareholding percentage and state ownership.

Table 3: Correlation Matrix

Correlation Matrix											
	ROA	ROE	Ceodua	Bsize	Ceoop	Ceoage	Ceotenure	Stateop	Bigop	Lnasset	Listage
ROA	1										
ROE	0.886	1									
Ceodua	0.078	0.051	1								
Bsize	-0.0007	0.018	-0.127	1							
Ceoop	0.170	0.107	0.369	-0.105	1						
Ceoage	0.029	0.029	0.152	0.047	-0.0005	1					
Ceotenure	0.048	0.031	0.023	0.027	0.02	0.078	1				
Stateop	-0.079	-0.069	-0.152	0.179	-0.210	0.042	-0.017	1			
Bigop	0.092	0.095	-0.057	0.006	-0.055	0.013	-0.018	0.482	1		
Lnasset	0.098	0.191	-0.127	0.213	-0.163	0.127	0.02	0.124	0.184	1	
Listage	-0.194	-0.108	-0.160	-0.030	-0.337	0.086	-0.014	-0.037	-0.150	0.289	1

Notes: ROA: Earnings before interest and tax/ average total assets. ROE: Net profits/ average shareholders' equity. Ceodua: CEO duality dummy equals to one when the positions of chairperson and CEO are combined and zero otherwise. Board size: number of board directors. Ceoop: the proportion of shares held by the CEO. CEO age: the age of CEO. Ceotenure: the tenure of CEO. Bigop: the proportion of shares held by the largest shareholder. Stateop: the proportion of shares held by the Chinese State. Lnasset: log of the firm's assets. Listage: firm's age since listing. The data is from the China Stock Market and Accounting Research (CSMAR) database.

4.2 Logit Regression Analysis

Table 4 presents the results of the logit regression model. The dependent variable is CEO duality and independent variables are board size, CEO's share ownership, CEO age, CEO tenure, the largest shareholding percentage, state ownership, firm performance, firms' listing age and firm size. Industry and year dummies are controlled in the model and firm performance is measured by ROA and ROE respectively. As state ownership and the largest shareholding percentage are related (the correlation is 0.48) these two variables are estimated in separate models. Models 1 and 2 presents the results with largest shareholding percentage

as the main ownership variable for ROA and ROE and models 3 and 4 presents the results with state ownership as the ownership variable for ROA and ROE, respectively.

Table 4: Determinants of Board Leadership Structure 2003-2010

Independent variables	Dependent variable: Ceodua			
	Model 1	Model 2	Model 3	Model 4
ROA	0.599 (1.028)		0.265 (1.039)	
ROE		0.269 (0.517)		0.089 (0.521)
Bigop	-0.931* (0.438)	-0.929* (0.438)		
State ownership			-1.18*** (0.282)	-1.18*** (0.282)
Board size	-0.149** (0.039)	-0.149** (0.039)	-0.133** (0.037)	-0.133** (0.037)
CEO ownership	6.37*** (0.939)	6.39*** (0.936)	6.1*** (0.963)	6.11*** (0.96)
CEO age	0.062*** (0.01)	0.062*** (0.01)	0.064*** (0.01)	0.064*** (0.01)
CEO tenure	0.028 (0.039)	0.028 (0.039)	0.030 (0.039)	0.031 (0.039)
Lnasset	-0.213* (0.078)	-0.214* (0.079)	-0.208* (0.076)	-0.208* (0.077)
Listage	-0.048** (0.017)	-0.049** (0.017)	-0.042* (0.017)	-0.043* (0.017)
Year dummies	yes	yes	yes	yes
Industry dummies	yes	yes	yes	yes
Constant	1.621 (1.621)	1.66 (1.633)	1.26 (1.61)	1.26 (1.625)
N	7,242	7,242	7,242	7,242
Model P value	0.000	0.000	0.000	0.000
Pseudo R ²	0.105	0.105	0.111	0.111

*p<0.05 **p<0.01 ***p<0.001

Notes: Ceodua: CEO duality dummy equals to one when the roles of chairperson and CEO are combined and zero otherwise. ROA: Earnings before interest and tax/ average total assets. ROE: Net profits/average shareholders' equity. Bigop: the proportion of shares held by the largest shareholder. State ownership: the proportion of shares held by the Chinese State. Board size: the number of board directors. CEO ownership: the proportion of shares held by the CEO. CEO age: the age of CEO. CEO tenure: the tenure of CEO. Lnasset: log of the firm's assets. Listage: firm's age since listing. The robust standard errors are in parentheses. The data is from the China Stock Market and Accounting Research (CSMAR) database.

Both models 1 and 2 show that firm performance is not related to CEO duality, indicating rewards do not appear to be an antecedent of CEO duality for Chinese PLCs. The largest

shareholding percentage, board size, firm's listing age and log of firm's assets are negatively related to CEO duality. CEO ownership is positively related to CEO duality and CEO tenure is not related to CEO duality. In model 3 and 4 state ownership variable is added to replace the largest shareholding percentage variable. State ownership is negatively related to CEO duality. The results of other independent variables remain unchanged. The results show that companies with a high largest shareholding percentage or a high state ownership are less likely to adopt a CEO duality board leadership structure.

The corporate governance literature has identified block ownership as an influential mechanism that mitigates the agency problem between managers and shareholders (Shleifer and Vishny, 1997; Claessens and Djankov, 1999). Essen et al. (2012) did a meta-analysis of 86 studies and conclude that board structure and composition preference are influenced by the identity of the concentrated owners. The results show that the largest shareholder plays a positive role in establishing a separate board leadership structure and mitigating the agency problem between managers and shareholders for Chinese PLCs. The Basic Norms issued in 2000 stipulates that in principle the chairperson of the board of directors and the general manager (CEO) could not be the same person. As a result, the percentage of public listed companies practising CEO duality has decreased. Chinese listed companies normally have high state ownership and many of the listed firms' CEOs were appointed by the government (Su, Xu & Phan, 2008). In companies with a high state ownership structure, there is a political legitimacy to conform to the Basic Norms by separating the roles of Chairman and CEO. Within Table 4 we can consistently observe the relative importance of ownership structures in influencing board leadership structure for Chinese PLCs.

Chinese companies with a larger board and larger or older companies are less likely to employ CEO duality, probably due to legitimacy reasons. As firms grow, they become more complex in their operations and organizational structures and there is a higher need to separate the chairperson and CEO positions. CEO ownership is positively related to CEO duality, indicating that Chinese firms with a high CEO ownership are more likely to choose a board that is difficult to monitor. The finding is consistent with Lasfer (2006) and Dey et al. (2011). CEO ownership is one of the proxies for CEO power in Pathan and Skully (2010). Lasfer (2006) argue that entrenched managers, through their high ownership, reduce the monitoring role of the board by combining the positions of chairman and CEO. The finding from this study also questions the effectiveness of board leadership structure when CEO

ownership is very high. This next section examines the relationship between board leadership structure and firm performance. To address the issue of endogeneity the results are presented using propensity score matching (PSM) methods.

4.3 Propensity Score Matching (PSM) Methods

Table 5 presents average performance differences between companies using CEO duality and firms with a separate leadership structure. The first column reports the matching method used, the second column presents the average performance differences between unmatched companies while the third column conveys the results among matched companies. When the performance is measured by ROA, the unmatched result shows that for companies using CEO duality, the average ROA is 1.2% higher than for companies with a separate leadership structure; a statistically significant difference. Using the nearest neighbour matching method, the average performance difference in ROA between companies with different board leadership structures is 0.3%, a non-significant value. The analysis is conducted on 1,379 treatment companies and matched companies are chosen among 7,597 companies with a separate board leadership structure. The three nearest neighbour matching method also shows that there is no significant performance difference in ROA between companies with different board leadership structures.

To avoid the matching bias and improve matching quality some treatment observations whose propensity scores are higher than the maximum or lower than the minimum of the propensity score of untreated group are dropped. When the outcome variable is ROA using radius calliper matching, some treatment companies were dropped and only 903 observations are included in the treatment group. Kernel matching again shows consistently there is no difference for average performance in terms of ROA between companies with different board leadership structures. When the outcome variable is ROE, all methods report that after matching there is no difference for average performance between companies with different board leadership structures. These findings are consistent with Chen, Ezzamel & Cai (2011); Lam, McGuinness & Vieito (2013) and You & Du (2012). You and Du (2012) and Chen et al. (2011) document that CEO duality is not related to firm performance for Chinese PLCs during 2005-2008 and 1999-2009 respectively.

When the outcome variable is the expense ratio, the unmatched result indicates companies using CEO duality have an average expense ratio 2.8% higher than companies with a separate

board leadership structure; a statistically significant differences. For nearest neighbour matching, the mean difference of the expense ratio is reduced to 1.7%. All the other three matching methods show that for matched companies, there is a statistically significant difference for the average expense ratio among companies with different leadership structures. This indicates there is a higher agency cost for companies using CEO duality.

Table 5: Propensity Score Matching Methods: Kernel Matching, Radius and Caliper Matching, and Nearest Neighbor Matching

Matching method	Unmatched Mean difference (T ratios)	Matched mean difference (T ratios of ATT)	Treated N	Control N
	ROA			
Nearest neighbor	0.012 (7.21)	0.003 (0.68)	1,379	7,597
Three nearest neighbors		0.001 (0.29)	1,379	7,579
Radius caliper		0.002 (0.87)	903	7,597
Kernel		0.002 (0.71)	1,379	7,597
	ROE			
Nearest neighbor	0.015 (4.79)	0.009 (1.31)	1,379	7,597
Three nearest neighbors		0.004 (0.81)	1,379	7,579
Radius caliper		0.005 (1.09)	903	7,597
Kernel		0.006 (1.17)	1,379	7,597
	Expense ratio			
Nearest neighbor	0.028 (7.49)	0.017 (1.89)	1,369	7,476
Three nearest neighbors		0.020 (2.97)	1,369	7,476
Radius caliper		0.016 (2.74)	909	7,476
Kernel		0.022 (3.80)	1,369	7,476

Notes: Three different matching methods are used, including nearest neighbor matching, radius caliper matching and kernel matching. . ‘ATT’ refers to the average treatment effect for the treated in terms of outcome variables, including ROA, ROE and Expense ratio. ‘t-ratio (ATT)’ is the t-ratios of the average treatment effect. ‘Treated’ and ‘Control’ are the number of firms in the treated group and untreated group, respectively (the companies that have a CEO duality leadership structure are in the treatment group; companies that have a separate board leadership are in the untreated group). ROA: Earnings before interest and tax/ average total assets. ROE: Net profits/ average shareholders’ equity. Expense ratio: (selling expense+ management expense)/operating revenue. The data is from the China Stock Market and Accounting Research (CSMAR) database.

These results could be biased if the quality of matching is poor, therefore determining the quality of matching is an important robustness procedure. Further tests (see Yang & Mallick 2010) are therefore undertaken to determine the equality of the given firm characteristics after matching between treated and untreated groups. T-tests are conducted to check whether differences between the two groups remain large after conditioning of the propensity score. Appropriate matching is evidenced by the equality of the given firm characteristics not being different at a significant level, denoting matched treated and untreated groups have similar firm characteristics (Yang & Mallick, 2010). As reported in Appendix 1, when the outcome variable is the expense ratio, most covariates between treated and control (untreated) groups

after kernel matching are similar as the p-values are insignificant. The balancing propensities of matched companies after the nearest neighbor matching show similar results. For radius calliper matching, all covariates between treated and control groups are similar. The results indicate that each matching technique generates a control group which is similar enough to the treatment group for the ATT estimation and indicates good matching quality.

In conclusion CEO duality is not related to companies' financial ratios for Chinese PLCs. Companies using CEO duality have higher expense ratio compared to matched companies with a separate leadership structure. This indicates that a separate board leadership structure is an effective corporate governance arrangement to reduce agency costs for Chinese PLCs. It is recommended that the positions of chairperson and CEO should be separated for Chinese PLCs.

5. Conclusion

This study examines the determinants and effects of board leadership structure for Chinese PLCs from 2003–2010. The results show that the largest shareholding percentage, state ownership, board size, firm's listing age, and firm size are negatively related to CEO duality. CEO ownership and CEO age are positively related to CEO duality. These results indicate that ownership structure is an important determinant of board leadership structure for Chinese PLCs. This study also examines the relationship between board leadership structure and firm performance. Using PSM methods to address endogeneity and robust to different matching estimators, it is reported that CEO duality is not related to companies' profitability ratios, while companies adopting a CEO duality board leadership structure have a higher expense ratio compared to matched companies with a separate board leadership structure. This indicates a separate board leadership structure is an effective corporate governance arrangement to reduce agency costs for Chinese PLCs.

China has been transformed through the rapid economic growth since its Open Door Reforms of the 1980s; however great challenges lie ahead. During the economic reforms, corporate governance rules have been developed and revised to establish stable and strong institutional foundations. This study examines the efficacy of one of these corporate governance reforms; whether a separate board leadership structure is an effective corporate governance arrangement to reduce agency costs for Chinese PLCs. This question has important implications for Chinese PLCs and investors in China's stock markets. Chinese investors

need to be more cautious if they want to invest in companies employing CEO duality as on average there are greater agency costs in companies combining CEO and chairperson positions relative to firms operating a separate board leadership structure.

The findings also indicate Chinese PLCs are more likely to combine the CEO and chairperson positions when the CEO has greater power and constraints on such privilege are restricted. The largest shareholder and state shareholding have a positive influence through enhancing the independence of board leadership structure and companies with a diverse shareholding structure suffer more from ‘insider control’ problems and greater agency costs. We suppose as China’s legal institutions are quite weak and the largest shareholders have the resources to supervise the work of management, large shareholders play a positive role in mitigating the agency problems. Of course, while Chinese PLCs also suffer from these ‘principal-principal’ conflicts between majority and minority shareholders, this study shows that the largest shareholder plays a positive role in influencing the board leadership structure, not minority shareholders.

To conclude, it is important to develop legal frameworks and corporate governance rules to assist Chinese PLCs building effective corporate governance systems, to engender the healthy development of Chinese stock markets and attract investors. After 35 years of economic reforms, progress has been made in terms of economic development, however, substantial efforts are still required to address on-going corporate governance challenges. It is advocated determining the efficacy of corporate governance arrangements in the Chinese context remains a policy priority.

Appendix 1

Balancing propensities of matched companies for Chinese PLCs 2003-2010 with the expense ratio as the outcome variable: Kernel matching method

Variable	Sample	Mean		t-test	
		Treated	Control	t	p>t
State ownership	Matched	0.142	0.146	-0.53	0.599
Board size	Matched	8.7663	8.683	1.25	0.211
CEO ownership	Matched	0.075	0.064	2.11	0.035
CEO age	Matched	48.738	48.935	-0.73	0.465
CEO tenure	Matched	1.523	1.603	-1.94	0.052
Lnasset	Matched	21.141	21.108	0.94	0.347
Listage	Matched	6.806	6.800	0.03	0.977
Year=2003	Matched	0.061	0.066	-0.46	0.645
Year=2004	Matched	0.084	0.089	-0.47	0.637
Year=2005	Matched	0.077	0.080	-0.2	0.839
Year=2006	Matched	0.089	0.089	0.05	0.962
Year=2007	Matched	0.130	0.124	0.44	0.657
Year=2008	Matched	0.140	0.153	-0.96	0.34
Year=2009	Matched	0.143	0.144	-0.05	0.963
Year=2010	Matched	0.275	0.256	1.12	0.265
Industry sector A	Matched	0.024	0.018	1.07	0.284
Industry sector B	Matched	0.006	0.006	-0.21	0.831
Industry sector C	Matched	0.656	0.648	0.46	0.644
Industry sector D	Matched	0.028	0.028	0.11	0.909
Industry sector E	Matched	0.007	0.008	-0.27	0.789
Industry sector F	Matched	0.013	0.020	-1.45	0.147
Industry sector G	Matched	0.096	0.102	-0.46	0.646
Industry sector H	Matched	0.048	0.049	-0.1	0.92
Industry sector J	Matched	0.045	0.045	-0.01	0.989
Industry sector K	Matched	0.024	0.022	0.31	0.755
Industry sector L	Matched	0.006	0.006	-0.21	0.83
Industry sector M	Matched	0.046	0.047	-0.17	0.867

Notes: This table shows balancing propensities of matched companies from Kernel matching method for Chinese PLCs during 2003-2010. Lnasset: log of the firm's assets. Listage: firm's age since listing. 'Treated' and 'Control' are the treatment group and untreated group, respectively (companies with a CEO duality board leadership structure are in the treatment group; and companies with a separate board leadership structure are in the control group). 't-test' is the t-test to the equality of given firm characteristics between treated and control groups.

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