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Firm Efficiency and Board Busyness: Empirical Evidence in Southeast and Northeast Asia

(Kecekapan Firma dan Kesibukan Lembaga Pengarah: Bukti Empririk di Asia Tenggara dan Asia Timur Laut)

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ABSTRACT

Drawing on technical efficiency concept, the production of outputs from the inputs of firms is theoretically associated with firm managerial factors. This study therefore attempts to empirically investigate the relationship between board busyness and firm efficiency in selected countries of Southeast and Northeast Asia region for seven years. This study first measures technical efficiency of firms by using non-parametric Data Envelopment Analysis (DEA). Predominantly, this study investigates the proposed relationships of board busyness and firm efficiency by performing panel regression analysis. The results from regression analysis show that the board busyness significantly reduces firm efficiency, supporting the busyness hypothesis. The significant practical implications of study include: firstly, the managers who pursue to enhance firm efficiency in achieving the goals of profit maximization are encouraged to prevent their firms from having busy boards. Secondly, the regulators and policy-makers who intend to prevent the overcommitted issue of busy boards are suggested to review and enforce the restrictions and regulations on board busyness. Thirdly, the potential investors who intend to make investment are urged to consider busy boards as an unfavourable signal.

Keywords: Board busyness; firm efficiency; data envelopment analysis; panel regression analysis; Southeast Asia; Northeast Asia

ABSTRAK

Berdasarkan konsep kecekapan teknikal, pengeluaran hasil daripada input firma secara teori adalah berkaitan dengan faktor pengurusan firma. Oleh itu, kajian ini mengkaji hubungan antara kesibukan lembaga pengarah dengan kecekapan firma dari negara yang terpilih di rantau Asia Tenggara and Asia Timur Laut untuk tempoh tujuh tahun. Permulaan kajian ini mengukur kecekapan teknikal firma dengan menggunakan Analisis Pengumpulan Data (DEA) bukan parametrik. Secara keseluruhan, kajian ini menguji hubungan di antara kesibukan lembaga pengarah dan kecekapan firma dengan menjalankan analisis regresi data panel. Keputusan kajian menunjukkan bahawa kesibukan lembaga pengarah mengurangkan kecekapan firma secara ketara dengan menyokong hipotesis kesibukan. Terdapat tiga implikasi penting daripada penemuan kajian ini. Pertama, pengurus yang berazam untuk meningkatkan kecekapan firma dalam mencapai matlamat keuntungan maksimum digalakkan untuk mengelakkan firma daripada mempunyai lembaga pengarah yang sibuk. Kedua, pengawal selia dan pembuat dasar yang berhasrat untuk mengelakkan isu komitmen yang berlebihan digalakkan untuk mengulas dan menguatkuasa peraturan dan batasan tentang kesibukan lembaga pengarah tersebut. Ketiga, pelabur berpotensi yang berhasrat untuk membuat pelaburan digalakkan untuk mempertimbangkan kesibukan lembaga pengarah sebagai isyarat yang tidak begitu baik.

Kata kunci: Kesibukan lembaga pengarah; kecekapan firma; analisis pengumpulan data; analisis panel regresi; Asia Tenggara; Asia Timur Laut

INTRODUCTION

The firm efficiency in terms of technical (managerial) efficiency plays a significant role in the achievement of profit maximization objective. Nevertheless, the issue of underperformance of firm efficiency in East Asia especially in Southeast and Northeast Asia region is prevalent throughout the years. As East Asia appears to be a fastest growing economic region (White 1988), the underperformance of firm efficiency could have negative influence to the economy as a whole. The attention towards the firm efficiency in the context of East Asia especially Southeast and Northeast Asia is therefore, worthwhile.

Additionally, directors busyness has been a debatable corporate governance issue worldwide. Due to the fact that board decision depends on an overall board (Ahn et al. 2010), the recent attention on individual director has been extended to board busyness. As drawn on busyness hypothesis (Fich & Shivdasani 2006), the busy boards can be unfavourable towards firm resulting from overcommitment. On the flip side, resource dependency perspective by Pfeffer and Salancik (1978) asserts that busy directors by having more networks and accessibility to resources can be favourable on firms. Corresponding to the theoretical arguments, the empirical evidence on the impact board busyness in previous literature are generally twofold. However, little evidence exists in a cross-country context specifically in Southeast and Northeast Asia and predominantly in the context of single country. The imposition of less stringent recommended limit on multiple directorships in Southeast and Northeast Asia region further enhances the significance of this study of board busyness emphasizing in Southeast and Northeast Asia.

The theoretical concept of technical efficiency (managerial) efficiency pinpoints the managerial factors of firms, for example board busyness, on the generation of outputs from the inputs as accordance to Isik and Hassan (2002). Nevertheless, absence of evidence occurs on managerial factor of board busyness and mostly on firms' internal and external factors as determinants of firm efficiency. Therefore, whether or not the board busyness relates to firm efficiency in Southeast and Northeast Asia becomes the main concern of this study. This study therefore attempts to investigate the relationship between board busyness and firm efficiency by selecting five core countries of Southeast and Northeast Asia region as the sample of the study, namely Hong Kong, China, Singapore, Malaysia and Thailand during a post financial crisis period of seven years.

First, the non-parametric Data Envelopment Analysis (DEA) is applied to compute the technical efficiency scores of firms. The results from DEA reveal that the overall technical efficiency of firms in these selected Southeast and Northeast Asia countries has a large room of improvement. Predominantly, this study investigates the proposed relationships of board busyness and firm efficiency (as measured by technical efficiency scores) by performing panel regression analysis. The results from regression analysis indicate that the board busyness significantly reduces firm efficiency in selected Southeast and Northeast Asia countries, supporting the busyness hypothesis (Fich & Shivdasani 2006) and agency theory (Fama & Jensen 1983) who contended the monitoring problems on busy boards resulted from overcommitment.

This study is organized as follows: Section 2 provides the review on related literature. Section 3 discusses the sample and method. Section 4 presents the results and findings, and Section 5 concludes this study.

LITERATURE REVIEW

The primary goal of a firm is the profit maximization that accompanies by the firm efficiency (Cummins & Weiss 2013; Primeaux & Stieber 1994). For firms, the efficiency generally focuses on technical or managerial efficiency. According to Farrell (1957) and Cummins and Weiss (2013), technical efficiency is defined as the ability of a firm in producing the maximum outputs from a given set of inputs subject to existing technology, or ability of a firm in employing minimum inputs to produce the same amount of outputs. Furthermore, the decomposition of technical efficiency into pure technical efficiency and scale efficiency under Data Envelopment Analysis (DEA) allows scholars, for example Kumar (2011) and Sahoo (2016) to identify source of inefficiency on a firm (Coelli et al. 1998).

To date, the overall empirical studies on efficiency have relatively less focused on firms, as compared to banks as decision-making units. Specifically, the past studies on technical efficiency of firms have been largely conducted in the context of single country; for instance, Castiglione and Infante (2014), Demirbag et al. (2016) and See (2015). Jarboui et al. (2013) is one of the few studies have examined the firm efficiency in a context of multi-country during 2000-2011. Since the firm efficiency based on cross-country context have not been extensively studied, the present study goes beyond past studies by employing a sample of multi-country emphasizing on Southeast and Northeast Asia region during a recent period. Furthermore, past scholars in their studies have demonstrated both internal factors of firm-specific characteristics (such as firm size and firm leverage) and external factors of macroeconomic factors (such as gross domestic product and inflation) as the significant determinants of firm efficiency (Bhand & Ray 2012; Castiglione & Infante 2014; Charoenrat et al. 2013; Demirbag et al. 2016; Gylfason & Herbertsson 2001; Jarboui et al. 2013; Manzur Quader & Dietrich, 2014; See 2015). Since the past studies have overlooked the factors concerning managerial of firms, the present

study introduces the managerial factor of board busyness towards firm efficiency by controlling the common determinants of firm-specific characteristics and macroeconomic factors in literature.

Concerning the past studies on board busyness, the evidence is mixed and inconclusive. Reputation hypothesis by Fama and Jensen (1983) and Ferris et al. (2003) contends the higher reputation of a director generally attracts the greater number of multiple directorships because of their higher abilities and qualities. In other words, the greater number of multiple directorships in a board enhances the reputation of a director. Accordingly, multiple directorships in a board signal favorable quality of a director (Sarkar & Sarkar 2009). Another view of resource dependency by Pfeffer and Salancik (1978) contends the directors with multiple directorships in a board typically own higher ability to involve greater networks and access more resources and thus, improve their monitoring quality and skills (Arioglu & Kaya 2015; Coles et al. 2012; Shu et al. 2015). Part of scholars have confirmed the reputation hypothesis and resource dependency view by documenting the significant positive impact of board busyness towards firm performance, For example, Sarkar and Sarkar (2009) and Lu et al. (2013) have indicated that higher firm performance is found to be experienced by those firms with greater busy directors in India and China context, respectively. Lei and Deng (2014) have similarly discovered the positive relationship between multiple directorships and firm value in Hong Kong. Accordingly, multiple directorships has been considered as good signal on directors' quality by investors (Yatim & Yusoff 2014; Yatim et al. 2014).

Essentially, the busyness hypothesis following Fich and Shivdasani (2006) postulates that the individual directors with multiple directorships are generally too busy or overcommitted on their monitoring role, due to the fact that each individual has limited time and energy. This is because multiple directorships generally required more time by a director. Moreover, agency theory by Fama and Jensen (1983) asserts the monitoring problem on directors with multiple directorships by having insufficient managerial attention. Supporting agency theory and busyness hypothesis, part of literature have demonstrated that board busyness significantly reduce firm performance. For instance, Cashman et al. (2012) and Liu and Paul (2015) have consistently found the negative relationship between board busyness and firm performance based on the sample of S&P 500 firms. Similarly, Jiraporn et al. (2008) and Lin et al. (2014) have noted the detrimental impact of directors with multiple directorships due to their busyness.

Taken collectively, the empirical studies on the impact of board busyness have emphasized towards firm performance in general. The present study is therefore significant to rectify literature gap by examining the impact of board busyness within a new framework of firm efficiency. Motivated by the significant busyness issue of boards, this study hypothesizes that the board busyness significantly reduces firm efficiency in Southeast and Northeast Asia.

METHODOLOGY

SAMPLE AND DATA SELECTION

The sample data consists of listed firms in five selected countries from East Asia, specifically in Southeast Asia and Northeast Asia region (Hong Kong, China, Singapore, Malaysia and Thailand). This study selects 100 top listed firms from each country as accordance to the respective country stock market indices that could represent the equity market of the countries (S&P Dow Jones Indices 2016), as of most recent year 2015 during this research was being conducted (refer Appendix 1). The final sample data therefore comprises 500 listed firms in Southeast and Northeast Asia. Notably, this paper omits financial, technology and utility firms due to the different restrictions on the role of board of directors. The data starts from year 2009 to 2015 for being the post financial crisis period of year 2008. The data is balanced panel because each firm has time series data of seven years. This paper employs published annual reports and OSIRIS databases to obtain the independent variables of board busyness. The annual firm level data such as inputs and output variables for DEA (e.g. capital, labor, operating expenses and sales) and firm-specific control variables (e.g. total assets, total debts, beta, return on assets and sales growth) were extracted from the Datastream databases; while the annual macroeconomic data as control variables such as GDP and inflation rate were collected from World Development Indicators (WDI) and World Economic Outlook (WEO) databases. The firm efficiency data as dependent variable are not directly available and were computed by employing DEA based on inputs and output variable.

VARIABLES MEASUREMENT

Firm Efficiency This paper employs non-parametric DEA that originally introduced by Charnes et al. (1978) to measure technical efficiency of firms. The application of DEA in this paper is motivated by several advantages (Bauer et al. 1998; Cummins & Weiss 2013). First, the DEA makes no assumptions on the production function form that prevents from specification errors. Second, the DEA provides a single efficiency score on each firm that permits the comparison to the firms with most appearance and ranking among firms in the set. Third, the DEA identifies the source of inefficiency that figures out the field that requires improvement in firms (Sufian 2007; Cummins & Xie 2008; Cummins & Weiss 2013). As accordance to Bader et al. (2008), the resulting linear

program on firm efficiency measurement under DEA is as following:

$$\textit{Maximize efficiency of unit } m = \sum_{r=1}^{s} u_r y_{rm} \qquad (1)$$

Subject to $\sum_{i=1}^{p} v_i x_{im} = 1$

$$\sum_{r=1}^{s} u_r y_{rm} - \sum_{i=1}^{p} v_i x_{im} \leq 1,\ m = 1,2,\ldots n$$

$$u_r \geq \mathcal{E},\ r = 1,2,\ldots s$$

$$v_i \geq \mathcal{E},\ i = 1,2,\ldots p$$

where v_i denotes the weight assigned to input 'i', x_{im} represents the level of input 'i' employed by unit 'm'. u_r represents the weight assigned to output 'r', y_{rm} denotes the level of output 'r' produced by unit 'm'. $\mathcal{E}$ is a small number (i.e. with order of 10-6) that ensures neither input nor output is given zero weight.

The sample decision-making units (DMUs) of this paper are mainly the firms; who generally the producer of products and service for users. Accordingly, this paper applies production approach to define the outputs and inputs variable for firm efficiency. Based on production approach, the output measure of this paper consists of sales ($y1$), while input measures denote as capital ($x1$), labor ($x2$) and operating expenses ($x3$) (refer Table 1), according to Castiglione and Infante (2014) and Demirbag et al. (2016). Even though the definition on inputs and outputs is arbitrary as noted by Ariff and Can (2008) and Sufian (2007), the set of single output and three inputs for DEA method of this paper has complied with the rules of thumb in selecting inputs and outputs by Cooper et al. (2002).

Board Busyness To define board busyness as firm level data, this paper first defines busyness of a director in the board. The first measure, mean number of external directorships (*BBMEAN*) is computed by total number of external directorships for all directors divided by total number of directors in a board for each firm. This paper then applies the computed mean directorships and rule of thumb three external directorships proposed by National Association of Corporate Directors (1996) in United States to determine whether a director is busy or not busy (refer Fich & Shivdasani 2006; Sarkar & Sarkar 2009). Specifically, this paper determines a busy director as "1" if the director holds: first, at least mean number of external directorships; or second, at least rule of thumb three external directorships; "0" if otherwise.

To capture the busyness level of an overall board, the proportion of busy directors in each board is computed by the sum of busy directors divided by total number of directors in a board (see Ferris et al. 2003; Fich & Shivdasani 2006). This paper then considers the standard rule of thumb 50 per cent to determine whether a board is busy or not busy (see Ahn et al. 2010; Fich & Shivdasani 2006; Kaczmarek et al. 2014). Finally, this paper constructs two other dummy variables for a busy board, which is equal to "1" for a busy board if the board has more than half of busy directors based on mean number of external directorships (*BBDUM1*) as second measure; and rule of thumb three external directorships (*BBDUM2*) as third measure (Ahn et al. 2010; Field et al. 2013).

Similar to Ferris et al. (2003) and Fich and Shivdasani (2006), this paper incorporates busyness of both inside and outside directors to determine board busyness during 2012 proxy season, given the data on boards and directors stand to be stable over time (Cashman et al. 2012). This paper also focuses on the external directorships solely in listed firms in measuring directors' busyness, because the job nature of external directorships by a director in listed firms could be differ from non-listed firms.

An example is provided to illustrate the measurement of board busyness. In Appendix 2 for Anhui Conch Cement Company Limited, the mean external directorships of directors amounted to 1.875; which differ from rule of thumb three external directorships by Council of Institutional Investors. Based on the definition by using mean directorships, 62.50 per cent of directors in the board are busy. Therefore, the board of Anhui Conch Cement Company Limited is considered as a busy board using definition of mean (*BBDUM1*); designated as "1". While 25 per cent of directors in the board are busy by using rule of thumb directorships. Accordingly, the board of Anhui Conch Cement Company Limited is considered as a non-busy board using definition of rule of thumb (*BBDUM2*); designated as "0".

MODEL SPECIFICATION

This study applies panel regression analysis following Fich and Shivdasani (2006), to examine the main

TABLE 1. Variables of inputs and output in DEA model

Variables	Symbol	Definition/ Measurement
Output		
Sales	$y1$	Net sales
Inputs		
Capital	$x1$	Total property, plant and equipment; namely physical assets and total intangible assets
Labor	$x2$	Total number of employees
Operating Expenses	$x3$	Total operating expenses, which represent the sum of expenses in relation to operation including cost of goods sold, selling and general maintenance and administration expenses

relationship between board busyness and firm efficiency by controlling other common influencing factors including firm-specific characteristics and macroeconomic factors (refer Table 2 for the summary on definition of main variables). Firm efficiency as measured by technical efficiency is the explained variable, while board busyness is the explaining variable. This study therefore constructs a regression model as follows,

$$\ln TE_{i,t} = \beta_0 + \beta_1 BB_{i,t} + \beta_2 \ln TA_{i,t} + \beta_3 \ln DEBTS_{i,t} + \beta_4 \ln BETA_{i,t} + \beta_5 \ln ROA_{i,t} + \beta_6 \ln SALES_{i,t} + \beta_7 \ln GDP_t + \beta_8 \ln CPI_t + n_{i+i,t} \quad (2)$$

Where BB represents the respective indicators of busy board under different measures, namely *BBMEAN*, *BBDUM1* and *BBDUM2*. *n* is an unobserved firm-specific effect. is the residual term. Subscript 'i' and 't' represents a firm and time period; 0, 1, 2, …, respectively.

Concerning the expected coefficients of variables in Table 2, firstly, the board busyness is expected to be negative on firm efficiency as drawn on busyness hypothesis (Fich & Shivdasani 2006) and agency theory (Fama & Jensen 1983). As argued by busyness hypothesis and agency theory, potential monitoring issue on busy boards as resulted from overcommitment could diminish firm efficiency. Secondly, the coefficients of firm size and firm profitability are expected to be positive; where the larger and more profitable firms are likely to experience higher level of firm efficiency by having greater access to input facilities and source of investment (Charoenrat et al. 2013; Jarboui et al. 2013). Thirdly, the coefficients of firm leverage and firm risk are expected to be negative; where the higher leveraged and riskier firms are probably less efficient due to the greater risk of financial distress (Margaritis & Psillaki 2007; Yang et al. 2013). Fourthly, the coefficient of GDP is expected to be positive, indicating the firms in higher GDP or wealthier countries are likely to generate higher level of firm efficiency by having greater investment on infrastructures and facilities (See 2015). Lastly, the coefficient of CPI is expected to be negative, revealing the firms in countries with higher inflation are probably less efficient since high inflation could distort firm efficiency that resulted from the reduced firm liquidity and increased costs of inputs (Gylfason & Herbertsson 2001).

RESULTS AND INTERPRETATION

DESCRIPTIVE STATISTICS

Table 3 summarizes the descriptive statistics of variable inputs and output for firms in DEA models. As presented in Table 3, the average value of input capital for the firms in all selected Southeast and Northeast Asia countries during period 2009 to 2015 is USD3 790.44 million; the mean value of input labor is 19 190 and the average value of input operating expenses is USD7 045.16 million. For the output sales, the mean value for firms in all selected Southeast and Northeast Asia countries is USD7 085.62 million. Among the selected Southeast and Northeast Asia countries, the firms in Hong Kong and China have the highest amount of inputs and output during the period 2009-2015, following by Singapore, Malaysia and Thailand.

TABLE 2. Definition and expected coefficients of main variables in regression model

Variables	Symbol	Variable Definition	Expected Coefficient
Explained variable: Firm efficiency			
Technical efficiency	*lnTE*	Natural logarithm of technical efficiency (TE)	NA
Explaining Variable: Board busyness			
Board busyness	*BBMEAN*	Mean number of external directorships	-
	BBDUM1	A dummy variable of "1" for busy board; "0" for non-busy board based on mean number of external directorships approach	-
	BBDUM2	A dummy variable of "1" for busy board; "0" for non-busy board based on rule of thumb three directorship approach	-
Control variables: Firm-specific characteristics			
Firm size	*lnTA*	Natural logarithm of total assets	+
Firm leverage	*lnDEBTS*	Natural logarithm of total debts	-
Firm risk	*lnBETA*	Natural logarithm of beta	-
Firm profitability	*lnROA*	Natural logarithm of the return on assets	+
	lnSALES	Natural logarithm of sales growth	+
Control variables: Macroeconomic factors			
Gross Domestic Growth	*lnGDP*	Natural logarithm of real Gross Domestic Product (GDP)	+
Inflation	*lnCPI*	Natural logarithm of Consumer Price Index (CPI)	-

TABLE 3. Descriptive statistics of variable inputs and outputs in all selected Southeast and Northeast Asia countries, 2009-2015

Inputs and Output Variables	Hong Kong		Singapore		Malaysia		Thailand		China		TOTAL	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Capital (USD million)	8575.89	1327.18	1507.12	138.47	1025.47	240.60	820.34	102.96	6853.81	936.90	3790.44	357.92
Labor	41962.00	14038.00	6322.00	1066.00	5509.00	1963.00	4663.00	1829.00	36399.00	10059.00	19190.00	3666.00
Operating Expenses (USD million)	10909.93	1873.67	6511.62	251.10	951.60	343.48	1347.15	241.47	17494.68	2519.03	7045.16	587.03
Sales (USD million)	11968.46	2096.69	6600.21	257.48	1060.45	387.52	1342.17	245.51	14414.58	1852.80	7085.62	646.81

Table 4 describes the firm efficiency scores from DEA in all selected Southeast and Northeast Asia countries from 2009 to 2015. From Panel H of Table 4 for all years, all firms in selected Southeast and Northeast Asia countries in general are moderately efficient, by experiencing the average technical efficiency of 50.90 per cent with input waste of 49.10 per cent. The results therefore suggests that there is large room of improvement in term of firm efficiency in these selected Southeast and Northeast Asia countries. As revealed by higher scores of pure technical efficiency (73 per cent) than scale efficiency (69.90 per cent), the

TABLE 4. Descriptive statistics of efficiency scores for firms in all selected Southeast and Northeast Asia countries, 2009-2015

Efficiency Measures	Hong Kong	Singapore	Malaysia	Thailand	China	TOTAL
Panel A: Year 2015						
Technical Efficiency	0.681	0.561	0.773	0.280	0.690	0.597
Pure Technical Efficiency	0.863	0.808	0.855	0.586	0.762	0.775
Scale Efficiency	0.796	0.706	0.911	0.484	0.910	0.761
Panel B: Year 2014						
Technical Efficiency	0.480	0.731	0.769	0.723	0.687	0.678
Pure Technical Efficiency	0.811	0.841	0.838	0.793	0.761	0.809
Scale Efficiency	0.596	0.876	0.923	0.909	0.908	0.843
Panel C: Year 2013						
Technical Efficiency	0.514	0.338	0.754	0.515	0.665	0.557
Pure Technical Efficiency	0.831	0.553	0.824	0.680	0.728	0.723
Scale Efficiency	0.619	0.670	0.918	0.757	0.919	0.777
Panel D: Year 2012						
Technical Efficiency	0.776	0.437	0.481	0.242	0.240	0.435
Pure Technical Efficiency	0.856	0.694	0.703	0.549	0.556	0.672
Scale Efficiency	0.913	0.645	0.708	0.496	0.472	0.647
Panel E: Year 2011						
Technical Efficiency	0.784	0.360	0.314	0.262	0.158	0.376
Pure Technical Efficiency	0.871	0.651	0.644	0.558	0.713	0.688
Scale Efficiency	0.905	0.575	0.506	0.511	0.326	0.565
Panel F: Year 2010						
Technical Efficiency	0.769	0.412	0.532	0.279	0.194	0.438
Pure Technical Efficiency	0.866	0.679	0.682	0.568	0.724	0.705
Scale Efficiency	0.890	0.616	0.807	0.515	0.391	0.645
Panel G: Year 2009						
Technical Efficiency	0.786	0.514	0.542	0.317	0.237	0.480
Pure Technical Efficiency	0.848	0.723	0.744	0.614	0.757	0.739
Scale Efficiency	0.928	0.717	0.741	0.522	0.376	0.656
Panel H: All Years						
Technical Efficiency	0.684	0.479	0.596	0.375	0.410	0.509
Pure Technical Efficiency	0.849	0.707	0.756	0.622	0.714	0.730
Scale Efficiency	0.806	0.686	0.789	0.601	0.614	0.699

source of inefficiency for overall firms is contaminated by scale inefficiency. As implied by the results, although the firms have been managerially efficient in exploiting resources, they have been mainly operated at the scale inefficient. Furthermore, the results in Table 4 seem to suggest that the mean technical efficiency for overall firms in these selected Southeast and Northeast Asia countries has been on a decreasing trend from 48 per cent to 37.60 per cent during year 2009 to 2011 which is the immediate recovery years after global financial crisis year 2008, increased 67.80 per cent during year 2014, before decreasing again to 59.70 per cent in year 2015.

By comparing the average scores of firms' technical efficiency among countries, the overall firms in Hong Kong and Malaysia have exhibited to be more efficient than other countries during all years of 2009-2015. Moreover, the dominant source of firm inefficiency has appeared to be same in Hong Kong, Singapore, Thailand and China, which is scale related. The results seem to suggest that the firms in Hong Kong, Singapore, Thailand and China could generally focus on optimal scale of operation either by expansion or downsizing of firm operation to achieve efficiency gains. Whereas in Malaysia, the source of firm inefficiency is attributed mainly to managerial. The results seem to suggest that the firms in Malaysia could improve the managerial on the utilization of resources to be efficient.

Table 5 presents the descriptive statistics of board busyness main variables and other explanatory variables for firms in all selected Southeast and Northeast Asia countries over the period 2009-2015. The average number of external directorships for firms in selected Southeast and Northeast Asia countries amounted to 1.893. In essence, the directors for firms in selected Southeast and Northeast Asia countries are considered as relatively less busy, in comparison to rule of thumb three external directorships to define directors busyness following Fich and Shivdasani (2006). Furthermore, only 24.80 per cent of the firms with busy boards based on definition of mean directorships, while only 19.80 per cent of the firms having busy boards by using definition of rule of thumb three directorships in Southeast and Northeast Asia. By comparing the level of board busyness among countries, the firms in Malaysia and Thailand generally contain the higher percentage of busy boards than the firms in Hong Kong, Singapore and China. This perhaps could be explained by the practice of greater number of directorships allowed to directors in these countries such as Malaysia (Yatim et al., 2014).

PEARSON CORRELATIONS

Table 6 shows the results of Pearson correlations. The results show the relatively low (less than 0.80) and statistically significant correlation coefficients between most of the variables, indicating low risk of multicollinearity problem among independent variables in the proposed regression models. Notably, the correlation of firm efficiency with the indicators of busy board is presented to be negative. Moreover, the indicators of busy board especially using rule of thumb three directorships definition exhibit significant positive correlation with firm size (i.e. total assets) and firm leverage (i.e. total debts).

RESIDUAL ANALYSIS

Before discussing the analysis results of board busyness and firm efficiency, this study present the results of the residual analysis. Firstly, the mean variance inflation factors (VIFs) for the proposed models (as in Table 7 and Table 8) are found to be less than ten, thereby eliminating the multicollinearity issue among the explanatory variables in the proposed regression models following Gujarati and Porter (2009). Secondly, the skewness value of -0.691, kurtosis value of 2.331 and large Jarque-Bera which is significant at 1per cent levels (refer Appendix 3), indicate that the symmetry (or normality) of the underlying distribution for the sample firms is designated to be left skewed and indeed, not normally distributed as accordance to Hogg et al. (1975) and Gujarati and Porter (2009). This study therefore further applies the trimming method on the data of sample firms to remove the outliers and enhance the data normality. Ultimately, this study yields to the number of 3 325 observations in the final sample, after asymmetric trimming on 5 per cent (i.e. 175 observations) from the lower tail of the data distribution (for left-skewed data), as recommended by Keselman et al. (2002).

Thirdly, the results of autocorrelation test on all selected Southeast and Northeast Asia countries under pooled ordinary least square (OLS) models exhibit the presence of autocorrelation problems where *d* statistics are around 1 following Gujarati and Porter (2009). Fourthly, the results of heteroscedasticity test on all selected Southeast and Northeast Asia countries under OLS models reveal the presence of heteroscedasticity problems, where the F-test results are significant at 1per cent levels and thus reject the null hypothesis. This study therefore employs the generalized least square (GLS) method to solve the autocorrelation and heteroscedasticity problems on this study panel data (Gujarati & Porter 2009).

PANEL REGRESSION ANALYSIS

In Table 7, this study presents the regression results testing hypothesis on firm efficiency and board busyness for full sampled firms of all selected Southeast and Northeast Asia countries. Concerning on the R-squared and adjusted R squared of the proposed regression models, the value amounted to around 28 per cent and

TABLE 5. Descriptive statistics of board busyness and other explanatory variables for firms in all selected Southeast and Northeast Asia countries, 2009-2015

Country	Hong Kong		Singapore		Malaysia		Thailand		China		TOTAL	
Variables	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Number of External Directorships (*BBMEAN*)	1.864	1.618	1.670	1.333	2.029	1.861	2.974	2.000	0.929	0.667	1.893	1.455
Board busyness using mean directorships (*BBDUM1*)	0.230	0.000	0.210	0.000	0.350	0.000	0.280	0.000	0.170	0.000	0.248	0.000
Board busyness using rule of thumb three directorships (*BBDUM2*)	0.190	0.000	0.170	0.000	0.280	0.000	0.340	0.000	0.010	0.000	0.198	0.000
Total assets (*TA*) (USD mil)	3.440	4.172	0.730	0.554	5.350	0.533	0.357	0.304	3.072	2.587	1.081	1.027
Total debts (*DEBTS*) (USD mil)	0.525	0.793	0.889	0.112	0.071	0.076	0.052	0.053	0.528	0.548	0.155	0.206
Beta (*BETA*)	0.987	0.987	0.905	0.855	1.174	1.055	1.157	1.150	3.138	3.138	1.472	1.090
Return on assets (*ROA*)	0.076	0.071	0.048	0.049	0.097	0.081	0.098	0.082	1.120	1.118	0.288	0.092
Sales growth rate (*SALES*)	0.224	0.114	0.090	0.030	0.113	0.075	0.115	0.077	0.501	0.490	0.209	0.111
GDP rate (*GDP*)	2.703	2.521	4.832	3.414	4.598	5.294	3.009	2.494	2.433	2.389	3.515	2.611
Inflation rate (CPI)	3.415	4.073	2.381	2.359	2.115	2.105	1.783	2.185	0.954	1.288	2.130	2.105

TABLE 6. Pearson correlations

Probability	lnTE	BBMEAN	BBDUM1	BBDUM2	lnTA	lnDEBTS	lnBETA	lnROA	lnSALES	lnGDP	lnCPI
lnTE	1.000										
	–										
BBMEAN	–0.003	1.000									
	0.859	–									
BBDUM1	–0.004	0.741	1.000								
	0.800	(<0.010)	–								
BBDUM2	–0.024	0.249	0.366	1.000							
	0.173	(<0.010)	(<0.010)	–							
lnTA	0.165	0.019	–0.027	0.090	1.000						
	(<0.010)	0.272	0.113	(<0.010)	–						
lnDEBTS	0.135	0.038	–0.011	0.077	0.846	1.000					
	(<0.010)	0.030	0.525	(<0.010)	(<0.010)	–					
lnBETA	–0.001	–0.016	–0.012	–0.006	–0.045	0.025	1.000				
	0.962	0.353	0.478	0.736	(<0.010)	0.154	–				
lnROA	0.056	–0.018	–0.026	0.032	–0.011	–0.087	–0.094	1.000			
	(<0.010)	0.288	0.136	0.063	0.514	(<0.010)	(<0.010)	–			
lnSALES	0.041	–0.032	–0.044	–0.022	0.037	0.029	0.046	0.127	1.000		
	0.019	0.067	0.011	0.210	0.034	0.097	(<0.010)	(<0.010)	–		
lnGDP	–0.181	–0.007	–0.023	–0.092	0.080	0.059	0.001	0.022	0.132	1.000	
	(<0.010)	0.688	0.186	(<0.010)	(<0.010)	(<0.010)	0.970	0.207	(<0.010)	–	
lnCPI	0.134	–0.014	–0.003	–0.044	0.156	0.112	–0.033	0.020	0.154	0.323	1.000
	(<0.010)	0.436	0.865	0.012	(<0.010)	(<0.010)	0.060	0.240	(<0.010)	(<0.010)	–

38 per cent, respectively. Before proceeding to the discussion on regression results, this study was first employed Lagrangian-Multiplier (LM) test by Breusch Pagan (BP) to determine whether the data is appropriate to be pooled or panel. Given the entire BP and LM Chi Square (x^2) for the proposed models are significant at 1 per cent levels, panel data has appeared to be suitable. Accordingly, this study runs the panel regression analysis based on GLS estimation method. Hausman test was then used to select the appropriate estimation methods between random effect model (REM) and fixed effect model (FEM) under GLS regression models. The Chi Square (x^2) of the Hausman test is significant at 1per cent levels as in the main models of Model 3 to 5 of Table 7, the justification on the regression results for all sampled full therefore are mainly based on FEM. Supporting the hypothesis of study, the coefficients of board busyness (*BBMEAN, BBDUM1* and *BBDUM2*) is negative and significant at 1 per cent levels. The results suggest that board busyness significantly reduces firm efficiency in Southeast and Northeast Asia. The findings is therefore in line with busyness hypothesis (Fich & Shivdasani 2006) and agency theory (Fama & Jensen 1983), which figures out the monitoring problems on busy boards. This is due to the finite time and insufficient managerial attention, the busy boards would be overcommitted in executing their monitoring role towards boards that could eventually reduce firm efficiency. Moreover, the findings are consistent with Sarkar and Sarkar (2009), Lei and Deng (2014), Lu et al. (2013) and Yatim and Yusoff (2014) who documented the negative impact of board busyness on firm performance. In summary, board busyness appears to be a new determinant of firm efficiency in Southeast and Northeast Asia.

As for the results for control variables as in the baseline model of Model 2, firm size (*lnTA)* and firm profitability (*lnROA* and *lnSALES*) are positively related to firm efficiency. These results is consistent with Jarboui et al. (2013) and Charoenrat et al. (2013) who have revealed that larger and profitable firms experience higher firm efficiency. While firm leverage (*lnDEBTS*) and firm risk (*lnBETA*) are insignificantly related to firm efficiency, similar to Yang et al. (2013) and Margaritis and Psillaki (2007) on insignificant impact of firm leverage and risk towards firm efficiency. Moreover, GDP growth (*lnGDP*) is positively related to firm efficiency that consistent with See (2015) who have indicated that the countries with higher GDP exhibit greater technical efficiency. Conversely, inflation (*lnCPI*) is negatively related to firm efficiency, similar to Gylfason and Herbertsson (2001) on the negative impact of inflation on corporate efficiency.

To ensure the robustness of the results from regression analysis, this study conducts panel regression analysis based on sample firms in each of the selected

TABLE 7. Regression results of firm efficiency and board busyness

	1			2			3		
Variables	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-2.494**	-1.916	-1.151	2.566**	-2.051*	-0.931	-2.558**	-2.032*	-0.952
	(1.156)	(1.348)	(1.478)	(1.113)	(1.224)	(1.509)	(1.114)	(1.225)	(1.503)
BBMEAN							-0.010	-0.036	-0.111***
							(0.052)	(0.058)	(0.039)
lnTA	0.047***	0.043***	0.043***	0.043***	0.044***	0.048***	0.043***	0.044***	0.049***
	(0.009)	(0.010)	(0.011)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)
lnDEBTS	-0.001	0.004	0.009	0.001	0.003	0.008	0.001	0.003	0.009*
	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)
lnBETA	0.223	0.047	-0.205	0.337	0.161	-0.243	0.336	0.159	-0.226
	(0.358)	(0.423)	(0.506)	(0.345)	(0.383)	(0.510)	(0.345)	(0.383)	(0.511)
lnROA	0.476***	0.447***	0.433**	0.493***	0.461***	0.445**	0.493***	0.460***	0.444**
	(0.150)	(0.141)	(0.171)	(0.144)	(0.137)	(0.176)	(0.144)	(0.137)	(0.176)
lnSALES	0.074	0.055	0.045	0.088*	0.088**	0.088**	0.088*	0.088**	0.086**
	(0.047)	(0.044)	(0.050)	(0.046)	(0.043)	(0.038)	(0.046)	(0.044)	(0.037)
lnGDP				0.208***	0.174***	0.129***	0.208***	0.174***	0.129***
				(0.014)	(0.014)	(0.032)	(0.014)	(0.014)	(0.032)
lnCPI				-0.113***	-0.077***	-0.035***	-0.113***	-0.077***	-0.034***
				(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
R-squared	0.031	0.023	0.365	0.102	0.072	0.382	0.102	0.072	0.383
Adjusted R-squared	0.030	0.021	0.258	0.100	0.070	0.278	0.100	0.070	0.278
F-statistic	21.448***	15.437***	3.418***	53.999***	36.926***	3.656***	47.240***	32.336***	3.653***
d statistics	0.975	1.276	1.488	1.065	1.246	1.507	1.065	1.246	1.508
Mean VIF	2.065	-	-	0.045	-	-	1.713	-	-
BL & LM x2	-	549.504***	-	-	317.328***	-	-	317.609***	-
Hausman x2	-	3.625	-	-	158.464***	-	-	160.469***	-
No. of Obs	3325	3325	3325	3325	3325	3325	3325	3325	3325

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 7. Regression results of firm efficiency and board busyness (continued)

	4			5		
Variables	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-2.561**	-2.041*	-1.024	-2.589**	-2.206*	-1.636
	(1.114)	(1.224)	(1.508)	(1.112)	(1.224)	(1.662)
BBDUM1	-0.003	-0.018	-0.061***			
	(0.021)	(0.023)	(0.013)			
BBDUM2				-0.075***	-0.084***	-0.120***
				(0.022)	(0.025)	(0.027)
lnTA	0.043***	0.044***	0.049***	0.044***	0.046***	0.054***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)
lnDEBTS	0.001	0.003	0.009*	0.001	0.003	0.008
	(0.006)	(0.007)	(0.005)	(0.006)	(0.007)	(0.005)
lnBETA	0.336	0.160	-0.209	0.339	0.203	-0.034
	(0.345)	(0.383)	(0.512)	(0.344)	(0.383)	(0.556)
lnROA	0.493***	0.458***	0.438**	0.512***	0.472***	0.446**
	(0.144)	(0.137)	(0.174)	(0.144)	(0.137)	(0.179)
lnSALES	0.088*	0.087**	0.085**	0.086*	0.086**	0.086**
	(0.046)	(0.043)	(0.037)	(0.046)	(0.043)	(0.036)
lnGDP	0.208***	0.174***	0.129***	0.212***	0.176***	0.130***
	(0.014)	(0.014)	(0.032)	(0.014)	(0.014)	(0.032)
lnCPI	-0.113***	-0.077***	-0.035***	-0.112***	-0.076***	-0.034***
	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
R-squared	0.102	0.072	0.383	0.105	0.075	0.384
Adjusted R-squared	0.100	0.070	0.278	0.103	0.073	0.280
F-statistic	47.238***	32.353***	3.659***	48.785***	33.650***	3.681***
d statistics	1.065	1.246	1.508	1.072	1.251	1.511
Mean VIF	0.044	-	-	1.716	-	-
BL & LM x2	-	317.635***	-	-	315.162***	-
Hausman x2	-	161.986***	-	-	158.730***	-
No. of Obs	3325	3325	3325	3325	3325	3325

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 8. Regression results of firm efficiency and board busyness by country (continued)

	Hong Kong								
Variables		1			2			3	
	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-1.715	-1.948	-5.117***	-1.758	-2.185	-6.687***	-1.573	-1.946	-6.875***
	(1.921)	(2.300)	(1.877)	(1.916)	(2.299)	(0.997)	(1.918)	(2.307)	(1.080)
BBMEAN	0.012	0.006	-0.019						
	(0.011)	(0.013)	(0.012)						
BBDUM1				-0.051**	-0.055	-0.078**			
				(0.029)	(0.034)	(0.038)			
BBDUM2							-0.005	-0.014	-0.068
							(0.031)	(0.038)	(0.044)
lnTA	0.011	0.009	0.004	0.009	0.007	-0.002	0.011	0.010	0.005
	(0.012)	(0.013)	(0.021)	(0.012)	(0.013)	(0.017)	(0.012)	(0.013)	(0.020)
lnDEBTS	0.376	0.487	1.579***	0.409	0.579	2.099***	0.335	0.487	2.133***
	(0.600)	(0.727)	(0.583)	(0.600)	(0.728)	(0.304)	(0.599)	(0.729)	(0.387)
lnBETA	-0.008	-0.009	-0.015	-0.007	-0.009	-0.012	-0.007	-0.009	-0.015
	(0.009)	(0.010)	(0.011)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.011)
lnROA	0.326***	0.273***	0.200	0.322***	0.268***	0.196	0.326***	0.272***	0.200
	(0.105)	(0.098)	(0.140)	(0.105)	(0.098)	(0.139)	(0.105)	(0.098)	(0.140)
lnSALES	0.221***	0.214***	0.208***	0.203***	0.202***	0.198**	0.215***	0.212***	0.206***
	(0.054)	(0.051)	(0.076)	(0.054)	(0.051)	(0.087)	(0.054)	(0.051)	(0.076)
lnGDP	0.049**	0.050**	0.050	0.051**	0.051**	0.050	0.050**	0.050**	0.050
	(0.023)	(0.021)	(0.092)	(0.023)	(0.021)	(0.032)	(0.023)	(0.021)	(0.092)
lnCPI	-0.269***	-0.266***	-0.257	-0.270***	-0.266***	-0.256**	-0.270***	-0.266***	-0.257
	(0.048)	(0.043)	(0.195)	(0.047)	(0.043)	(0.119)	(0.048)	(0.043)	(0.195)
R-squared	0.108	0.116	0.377	0.111	0.119	0.379	0.107	0.116	0.377
Adjusted R-squared	0.098	0.105	0.264	0.100	0.108	0.266	0.096	0.105	0.265
F-statistic	10.433***	11.263***	3.338***	10.723***	11.598***	3.360***	10.285***	11.267***	3.344***
d statistics	1.108	1.317	1.568	1.108	1.319	1.569	1.104	1.318	1.567
Mean VIF	1.121		-	1.125	-	-	1.119	-	-
BL & LM x2	-	271.242***	-	-	276.487***	-	-	274.802***	-
Hausman x2	-	24.384***	-	-	23.601***	-	-	23.776***	-
No. of Obs	698	698	698	698	698	698	698	698	698

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 8. Regression results of firm efficiency and board busyness by country (continued)

	Singapore								
Variables	4			5			6		
	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-4.005**	-4.142*	-4.430***	-3.924**	-3.999*	-4.404***	-3.498*	-3.554	-4.308***
	(1.895)	(2.224)	(1.528)	(1.891)	(2.220)	(1.433)	(1.907)	(2.214)	(1.304)
BBMEAN	0.126	0.141	0.149						
	(0.121)	(0.142)	(0.095)						
BBDUM1				0.035	-0.023	-0.099***			
				(0.043)	(0.056)	(0.022)			
BBDUM2							-0.057	-0.162**	-0.311***
							(0.050)	(0.065)	(0.071)
lnTA	0.078***	0.081***	0.095***	0.080***	0.087***	0.107***	0.089***	0.103***	0.129***
	(0.018)	(0.023)	(0.025)	(0.018)	(0.023)	(0.025)	(0.018)	(0.023)	(0.021)
lnDEBTS	-0.016	-0.012	-0.009	-0.017	-0.014	-0.013	-0.019*	-0.017	-0.018
	(0.011)	(0.013)	(0.012)	(0.011)	(0.013)	(0.013)	(0.011)	(0.013)	(0.011)
lnBETA	0.783	0.854	0.899*	0.771	0.812	0.879*	0.598	0.595	0.749*
	(0.591)	(0.705)	(0.494)	(0.591)	(0.704)	(0.470)	(0.601)	(0.706)	(0.406)
lnROA	0.237	0.071	0.007	0.224	0.060	0.013	0.257	0.136	0.104
	(0.355)	(0.329)	(0.405)	(0.354)	(0.329)	(0.392)	(0.356)	(0.327)	(0.391)
lnSALES	0.239***	0.261***	0.265***	0.242***	0.262***	0.268***	0.241***	0.264***	0.269***
	(0.078)	(0.069)	(0.058)	(0.078)	(0.069)	(0.058)	(0.078)	(0.068)	(0.059)
lnGDP	-0.032	-0.032	-0.034	-0.032	-0.033	-0.036	-0.033	-0.035	-0.039
	(0.037)	(0.031)	(0.040)	(0.037)	(0.031)	(0.040)	(0.037)	(0.031)	(0.039)
lnCPI	-0.290***	-0.295***	-0.296***	-0.290***	-0.295***	-0.296***	-0.290***	-0.295***	-0.295***
	(0.035)	(0.029)	(0.028)	(0.035)	(0.029)	(0.028)	(0.035)	(0.029)	(0.027)
R-squared	0.197	0.235	0.516	0.196	0.234	0.516	0.197	0.241	0.525
Adjusted R-squared	0.187	0.226	0.427	0.187	0.225	0.428	0.188	0.232	0.439
F-statistic	20.444***	25.626***	5.844***	20.378***	25.485***	5.863***	20.474***	26.525***	6.075***
d statistics	1.226	1.748	2.029	1.227	1.744	2.028	1.222	1.752	2.048
Mean VIF	1.630	-	-	1.617	-	-	1.673	-	-
BL & LM x2	-	171.024***	-	-	168.056***	-	-	175.349***	-
Hausman x2	-	4.313	-	-	6.387	-	-	10.664	-
No. of Obs	676	676	676	676	676	676	676	676	676

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 8. Regression results of firm efficiency and board busyness by country (continued)

	Malaysia								
Variables		7			8			9	
	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-4.980***	-4.839**	-3.224*	-3.809	-3.693*	-2.021	-4.195**	-4.018	-2.611*
	(1.807)	(2.018)	(1.667)	(1.783)	(1.987)	(1.631)	(1.778)	(1.986)	(1.442)
BBMEAN	-0.039**	-0.049***	-0.076***						
	(0.016)	(0.019)	(0.027)						
BBDUM1				-0.053	-0.046	-0.023			
				(0.034)	(0.038)	(0.024)			
BBDUM2							-0.036	-0.066	-0.150***
							(0.038)	(0.044)	(0.047)
lnTA	-0.007	0.000	0.033**	-0.023	-0.019	0.017	-0.019	-0.013	0.014
	(0.017)	(0.018)	(0.016)	(0.016)	(0.017)	(0.021)	(0.016)	(0.017)	(0.020)
lnDEBTS	0.017	0.021*	0.031**	0.017	0.019	0.028**	0.015	0.019	0.029**
	(0.011)	(0.012)	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
lnBETA	0.024	-0.047	-0.707**	-0.213	-0.281	-1.056***	-0.153	-0.233	-0.791***
	(0.509)	(0.573)	(0.336)	(0.505)	(0.567)	(0.338)	(0.505)	(0.567)	(0.279)
lnROA	3.818***	3.808***	3.803***	-3.809	3.591***	3.790***	3.702***	3.689	3.625**
	(0.536)	(0.575)	(0.570)	(0.539)	(0.580)	(0.583)	(0.535)	(0.574)	(0.584)
lnSALES	0.063	0.048	0.031	0.059	0.047	0.030	0.062	0.046	0.022
	(0.107)	(0.104)	(0.081)	(0.107)	(0.105)	(0.085)	(0.107)	(0.104)	(0.084)
lnGDP	-0.039	-0.039	-0.037	-0.040	-0.039	-0.039	-0.040	-0.039	-0.037
	(0.042)	(0.039)	(0.057)	(0.042)	(0.040)	(0.058)	(0.042)	(0.040)	(0.056)
lnCPI	0.179**	0.169**	0.144	0.189	0.181**	0.158	0.186**	0.176	0.152
	(0.087)	(0.082)	(0.142)	(0.087)	(0.082)	(0.143)	(0.087)	(0.082)	(0.141)
R-squared	0.088	0.079	0.311	0.084	0.072	0.303	0.082	0.073	0.308
Adjusted R-squared	0.078	0.068	0.185	0.073	0.061	0.176	0.071	0.062	0.181
F-statistic	8.154***	7.251***	2.473***	7.713***	6.560***	2.381***	7.497***	6.647***	2.437***
d statistics	1.030	1.152	1.343	1.033	1.150	1.343	1.028	1.149	1.342
Mean VIF	1.097	-	-	1.092	-	-	1.089	-	-
BL & LM x2	-	25.990***	-	-	23.373***	-	-	26.080***	-
Hausman x2	-	12.456	-	-	12.382	-	-	14.669	-
No. of Obs	682	682	682	682	682	682	682	682	682

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 8. Regression results of firm efficiency and board busyness by country (continued)

	Thailand								
Variables		10			11			12	
	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	-4.020	0.817	7.464	-4.057	1.071	8.094**	-0.157***	0.192	8.738***
	(2.695)	(3.396)	(3.998)	(2.697)	(3.394)	(3.205)	(0.047)	(3.357)	(3.311)
BBMEAN	0.068	-0.150	-0.418**						
	(0.139)	(0.168)	(0.170)						
BBDUM1				0.006	-0.065	-0.151**			
				(0.050)	(0.060)	(0.063)			
BBDUM2							0.031	-0.098*	0.006
							(0.023)	(0.058)	(0.048)
lnTA	0.026	0.030	0.034	0.025	0.031	0.032	0.037**	0.035	0.034
	(0.023)	(0.025)	(0.027)	(0.023)	(0.025)	(0.036)	(0.016)	(0.025)	(0.037)
lnDEBTS	0.037**	0.021	0.008	0.038**	0.020	0.006	0.413	0.020	0.006
	(0.016)	(0.017)	(0.017)	(0.016)	(0.017)	(0.020)	(0.779)	(0.017)	(0.019)
lnBETA	0.199	-1.058	-2.978**	0.221	-1.157	-3.205***	2.078***	-0.877	-3.391***
	(0.784)	(1.020)	(1.215)	(0.785)	(1.019)	(0.901)	(0.710)	(1.007)	(0.963)
lnROA	2.097***	1.500**	1.134*	2.090***	1.522**	1.141**	0.062	1.478**	1.021**
	(0.716)	(0.708)	(0.678)	(0.717)	(0.709)	(0.520)	(0.140)	(0.706)	(0.484)
lnSALES	0.044	0.013	0.004	0.045	0.016	0.013	-0.405***	0.018	0.015
	(0.141)	(0.127)	(0.113)	(0.141)	(0.127)	(0.093)	(0.051)	(0.127)	(0.091)
lnGDP	0.404***	0.404***	0.404***	0.404***	0.404***	0.403***	0.123***	0.404***	0.403***
	(0.051)	(0.043)	(0.069)	(0.051)	(0.043)	(0.064)	(0.018)	(0.044)	(0.063)
lnCPI	-0.123***	-0.124***	-0.124***	-0.123***	-0.124***	-0.124***	-4.667*	-0.124***	-0.124***
	(0.018)	(0.015)	(0.044)	(0.018)	(0.015)	(0.028)	(2.678)	(0.015)	(0.027)
R-squared	0.155	0.164	0.482	0.155	0.165	0.482	0.170	0.166	0.478
Adjusted R-squared	0.145	0.154	0.387	0.144	0.154	0.388	0.159	0.156	0.383
F-statistic	14.547***	15.561***	5.093***	14.514***	15.625***	5.096***	16.151***	15.798***	5.021***
d statistics	0.927	1.261	1.491	0.927	1.261	1.484	0.942	1.252	1.481
Mean VIF	1.759	-	-	1.743	-	-	1.746	-	-
BL & LM x2	-	128.233***	-	-	129.825***	-	-	114.038***	-
Hausman x2	-	16.307**	-	-	15.362*	-	-	16.880**	-
No. of Obs	642	642	642	642	642	642	642	642	642

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

TABLE 8. Regression results of firm efficiency and board busyness by country (continued)

	China								
Variables	21			22			23		
	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM	Pooled OLS	REM	FEM
Constant	5.910	6.953	8.417	5.783	6.694	8.390	5.940	6.768	7.764
	(5.761)	(6.382)	(6.456)	(5.734)	(6.337)	(6.520)	(5.733)	(6.350)	(6.298)
BBMEAN	-0.020	-0.038	-0.088						
	(0.087)	(0.099)	(0.062)						
BBDUM1				0.001	-0.014	-0.062			
				(0.052)	(0.059)	(0.056)			
BBDUM2							-0.135	-0.065	0.116
							(0.183)	(0.204)	(0.087)
lnTA	0.079***	0.075***	0.070***	0.079***	0.076***	0.069***	0.079***	0.076***	0.069***
	(0.023)	(0.025)	(0.022)	(0.023)	(0.025)	(0.021)	(0.023)	(0.025)	(0.021)
lnDEBTS	-0.037**	-0.033*	-0.024*	-0.037**	-0.033*	-0.024**	-0.037**	-0.033*	-0.024*
	(0.017)	(0.018)	(0.013)	(0.017)	(0.018)	(0.012)	(0.017)	(0.018)	(0.013)
lnBETA	0.913	0.644	0.225	0.959	0.728	0.230	0.916	0.714	0.453
	(1.675)	(1.894)	(2.057)	(1.662)	(1.876)	(2.092)	(1.662)	(1.880)	(1.999)
lnROA	-1.282	-1.352	-1.422	-1.302	-1.363	-1.421	-1.333	-1.400	-1.483
	(1.255)	(1.292)	(0.914)	(1.256)	(1.291)	(0.921)	(1.253)	(1.290)	(0.968)
lnSALES	0.396***	0.348***	0.291***	0.397***	0.348***	0.289***	0.393***	0.348***	0.291***
	(0.119)	(0.116)	(0.033)	(0.119)	(0.116)	(0.035)	(0.119)	(0.116)	(0.033)
lnGDP	3.716***	3.752***	3.773***	3.717***	3.752***	3.772***	3.711***	3.750***	3.777***
	(0.205)	(0.196)	(0.247)	(0.205)	(0.196)	(0.247)	(0.205)	(0.197)	(0.244)
lnCPI	-0.007	-0.008	-0.008	-0.007	-0.007	-0.008	-0.007	-0.007	-0.008
	(0.022)	(0.021)	(0.019)	(0.022)	(0.021)	(0.020)	(0.022)	(0.021)	(0.020)
R-squared	0.392	0.422	0.550	0.392	0.422	0.550	0.392	0.422	0.549
Adjusted R-squared	0.384	0.415	0.467	0.384	0.414	0.467	0.384	0.415	0.467
F-statistic	49.712***	56.463***	6.653***	49.702***	56.394***	6.656***	49.813***	56.436***	6.647***
d statistics	1.369	1.580	1.860	1.369	1.578	1.860	1.370	1.580	1.863
Mean VIF	1.963	-	-	1.973	-	-	1.957	-	-
BL & LM x2	-	33.150***	-	-	33.028***	-	-	32.185***	-
Hausman x2	-	10.855	-	-	11.731	-	-	10.839	-
No. of Obs	627	627	627	627	627	627	627	627	627

Note: The parenthesis contains the standard error. ***, ** and * denote statistical significance at 1, 5 and 10per cent levels, respectively.

Southeast and Northeast Asia countries, namely Hong Kong, Singapore, Malaysia, Thailand and China as in Table 8. The main results of board busyness are basically consistent. In Hong Kong, the board busyness (*BBDUM1*) is negatively and significantly related to firm efficiency within the FEM framework, given Chi Square (x^2) of the Hausman test is significant (refer Model 1 to 3). Similarly in Thailand, within FEM framework, the relationship between board busyness (*BBMEAN* and *BBDUM1*) and firm efficiency is significant negative (refer Model 10 to 12). While in Singapore and Malaysia, within the REM framework as Chi Square (x^2) of the Hausman test is insignificant, the board busyness (*BBDUM2* and *BBMEAN*) is negatively and significantly related to firm efficiency (refer Model 4 to 9). However in China, within REM framework, the relationship between board busyness (*BBMEAN*, *BBDUM1* and *BBDUM2*) and firm efficiency is insignificant (refer Model 13 to 15).

CONCLUSIONS

This study proposes a logical relationship between board busyness and firm efficiency, building on the concept of technical efficiency. To recap, previous studies overlook the managerial factors and mostly on internal and external factors of firms within the framework of firm efficiency. Concerning on board busyness literature, past scholars also neglect the impact of board busyness towards firm efficiency and mostly on firm performance in general. Motivated by the prevailing issue of underperformance of firm efficiency in East Asia especially in Southeast and Northeast Asia region, this study selects a sample of five core countries of Southeast and Northeast Asia, especially Hong Kong, China, Singapore, Malaysia and Thailand over the recent period of 2009-2015. Panel regression analysis based on GLS estimation method was carried out to investigate the relationship between board busyness and firm efficiency by controlling common firm-specific and macroeconomic factors.

The results from DEA indicate that the firms in the selected Southeast and Northeast Asia countries overall, is moderately efficient throughout 2009-2015. The results suggest the necessity of improving efficiency for firms in Southeast and Northeast Asia. The results from regression analysis are consistent with busyness hypothesis and agency theory for such the busy boards reduce the firm efficiency, significantly. The results provide evidence that board busyness is a potential new determinant of firm efficiency from the perspective of firms' managerial in Southeast and Northeast Asia. Furthermore, the regression results show that the firm size, firm profitability, GDP and inflation are among the significant and consistent determinants of firm efficiency in Southeast and Northeast Asia.

The empirical findings of the study highlight several practical implications. Firstly, the managers of firms may account for board busyness that determines firm efficiency to achieve primary goal of firms. In essence, the managers are encouraged to prevent from having busy boards to sustain firm efficiency in attaining the goal of profit maximization. Secondly, the regulators and policy-makers may regard board busyness that determines firm efficiency to mandate the corporate governance. It is particularly important in East Asia especially in Southeast and Northeast Asia region with prevalence of underperformance of firm efficiency. Specifically, the regulators and policy-makers are urged to review and enforce the current less stringent restrictions on board busyness subject to multiple directorships to facilitate firm efficiency. Thirdly, the potential investors may consider board busyness that influences firm efficiency (in turn firm profitability) in their investment decision-making process. The investors are suggested to serve board busyness as an unfavourable signal and avoid from investing in firms with busy boards.

This study provides important contribution to firm efficiency and board busyness research. Firstly, unlike previous studies on firm efficiency that emphasizes internal and external factors of firms, this study establishes a starting point for introducing board busyness as a new determinant of firm efficiency in line with technical (managerial) efficiency. Secondly, this study enriches the literature related to board busyness by integrating insights from busyness hypothesis to explain the relationship between board busyness and firm efficiency in a significant context of East Asia especially in Southeast and Northeast Asia region.

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APPENDIX 1. List of stock market indices for all selected Southeast and Northeast Asia countries

Country	Stock Market Indices
Hong Kong	Hang Seng Indices (HSI)
China	SSE 180 Index
Singapore	Straits Times Indexes (STI) & FTSE ST All Share Index
Malaysia	FTSE Bursa Malaysia Top 100 Index
Thailand	SET 100 Indexes

**Source:* https://www.bloomberg.com/markets/stocks/world-indexes/asia-pacific

APPENDIX 2. Board busyness and external directorships by directors

Anhui Conch Cement Company Limited, HK– Directors 2012	
Executive	
Guo Wensan	1
Guo Jingbin	2
Ji Qinying	4
Zhang Mingjing	4
Wu Jianping	2
Non-executive	
Kang Woon	0
Ding Meicai	0
Wong Kun Kau	2
Total External Directorships	15
Approaches to Define Busy Director(s)	
I. Using Mean Directorships	
Mean external directorships of directors (*BBMEAN*)	1.875
Percentage with mean external directorships or more than mean external directorships?	5/8 = 0.625 or 62.50 per cent
Is the board busy? (No = 0, Yes = 1) (*BBDUM1*)	No = 1
II. Using Rule of Thumb Directorships	
Rule of thumb three external directorships of directors	3.000
Percentage with three or more external directorships?	2/8 = 0.250 or 25.00per cent
Is the board busy? (No = 0, Yes = 1) (*BBDUM2*)	Yes = 0

APPENDIX 3. Normality test statistics on firms in all selected Southeast and Northeast Asia countries