

# **TECHNICAL INEFFICIENCY EFFECTS OF CORPORATE GOVERNANCE ON GOVERNMENT LINKED COMPANIES IN MALAYSIA**

**Jennifer Tunga Janang\***  
*Universiti Teknologi MARA*

**Michael Tinggi**  
*Universiti Malaysia Sarawak*

**Ambi Kun**  
*Universiti Teknologi MARA*

## **ABSTRACT**

Voluminous studies have examined corporate governance mechanisms and their effects on firms' performance. However, studies on their nexus with productive efficiency are still minimal. Our study uses the stochastic frontier analysis (SFA) with technical inefficiency effects model to examine ownership, board structure and independence, and directors' incentive, with technical efficiency. We use a panel dataset of 31 listed Malaysian government linked companies (GLCs) covering a period from year 2001 through 2012. The findings highlighted a gradual but slow improvement on the firm efficiency levels, while exhibiting a labor-congested and capital-saving output generation. While incorporating corporate governance variables into the inefficiency effects model, and controlling for firm sector and size, the results reveal government ownership, board remuneration, board change, board size and independence, and independence of the audit committee tend to significantly influence efficiency. Thus, this study recommends further investigation on the government continual stake, remuneration package and the effective role of the board to address the long-term economic growth of the GLCs.

**Keywords:** Corporate governance; Technical efficiency; Government-linked companies; Stochastic Frontier Analysis

## **1. INTRODUCTION**

Modern business and investment require corporate governance to check and balance the way the company is run. In the case of privatizing public entities, the alleged argument is to enhance their efficiency (Arocena & Oliveros, 2012). Privatization policies attempt to justify the sale of public entities to private owners since state owned entities are assumed to perform poorer than their private counterparts. However, studies have shown governments, particularly those in the Asian countries, did not totally relinquish their control (Boubakri, Cosset & Guedhami, 2004). Ownership

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\* Corresponding author: Jennifer Tunga Janang, Faculty of Business and Management, Universiti Teknologi MARA Malaysia, 94300, Kota Samarahan, Sarawak, Malaysia. Tel: +60 82 677646 Email: [jennifer@sarawak.uitm.edu.my](mailto:jennifer@sarawak.uitm.edu.my)

and control are considered separate in a corporate entity although ownership is largely in the hands of the government as far as GLCs are concerned. In the case of Malaysian GLCs, the board of directors is mostly appointed by the government of the day and its wholly owned government linked investment companies (GLICs)<sup>1</sup>.

Corporate governance mechanism has been extensively investigated on particularly on how it effects firms' performance. However, the literature commonly measured firm performance by firms' value (e.g. Tobin's Q), financial ratios (e.g. return on assets, return on equity, assets per employee), and other accounting measures (e.g. financial reporting and disclosure). Studies linking corporate governance mechanisms to firm performance have also received a lot of attention even on government-controlled firms in Malaysia. There is no known study that attempt to connect corporate governance with GLCs efficiency from the economic view point. Examining efficiency from this point of reference involves seeking answers on how efficient the firm utilizes its input and maximize its output in the production process. It also seeks to explore how corporate governance mechanisms can explain the increase in the firms' output while maintaining their current level of inputs. Since the implementation of the privatization programs, the GLCs continue to participate in commercial activities particularly in the key economic sectors. Their monopolistic status is also in almost all industries, where GLCs controlled about a third of the stock market value (PCG, 2015). Their performances and how they are managed, however, received a lot of public and political scrutiny. Previous studies have reported that government-controlled firms tend to underperform the non-GLCs in terms of financial and market performances (e.g. Boycko, Shleifer, & Vishny, 1996; Boardman & Vining, 1989; Boubakri, Cosset, Debat, & Valéry, 2013; Venkat & Raghuvanshi, 2014).

Our study focused on listed GLCs in Malaysia. These firms represent a major component in the benchmarked FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI) and account for 35 percent of the total stock market capitalization (PCG, 2012). GLCs are also the country's major employment providers. They provide key services to the economy involving oil and gas, properties, electricity, and other utilities companies whose shares are traded in Bursa Malaysia. This gives the scenario that if GLCs continue to dominate in the country's economy, they owe the taxpayers and the shareholders alike, to operate in the most efficient and competitive manner. The GLCs' seemingly diverse objectives between maximizing shareholders' return and fulfilling the country's social and national interest, raise the issue of how economically and financially sustainable they are amidst global trade deregulation and contestable environment. Their performance is expected to be sustainable as it would significantly affect the country's economic growth.

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<sup>1</sup> Telekom Malaysia Berhad, in its 2012 Annual Report has 13 directors plus 1 alternate director. Out of these, 8 have either held government positions, executive positions in other GLCs and GLICs, and a member of parliament of the ruling political coalition.

## 2. LITERATURE REVIEW

### 2.1. *Theoretical Review*

Property rights theory is related to privatizing public entities. It postulates that if firm ownership is transferred to private owners, they would perform better (Alchian 1965). Transferring the state properties to private investors or a group of legal owners can improve the management of these resources. However, Shleifer and Vishny (1997) argued that privatizing government entities, can again lead to agency problem where the investors' goals may be compromised due to the management conflict of interest. Corporate governance, hence, involves the mechanisms in which investors' interests are protected and ensuring them of getting a return on their investment. Several studies argued that corporate governance does affect the performance of privatized firms (e.g., Shleifer & Vishny, 1997; Dyck, 2001) and that higher gains in performance are expected when the government gives up control (Boycko, Shleifer, & Vishny, 1996).

### 2.2. *Government-Linked Companies in Malaysia*

Malaysia's era of privatization began in the early 1980s when the government launched its privatization master plan in 1983. The plan's main thrust was to create entities that could engage in business concerns, mainly through the transfer of state ownership to private investors. It also aimed to reduce the number of SOEs, and to increase productivity and efficiency (Fifth Malaysia Plan [5MP] Mid-Term Review, 1989). These privatized firms, however experience minimal ownership private transfer where highly concentrated equity shareholdings are owned by the state, normally through its institutional investors, nominees or wholly owned subsidiaries. The government continue to control business activities by having equity shareholdings in several other private firms, thus creating GLCs as well<sup>2</sup>.

### 2.3. *Corporate Governance and Firm Performance*

Shleifer and Vishny's (1997) highlighted the importance of legal protection for investors particularly in firms with highly concentrated share ownership. Although concentrated ownership through shareholdings (in the case of the state controlled GLCs), takeovers and bank financing can be effective in solving the agency problem; they may also inefficiently redistribute wealth from other investors to themselves. It was argued that privatization of firms itself, involves changes in corporate governance due to changes in ownership and further re-shuffles government structure by providing ownership to employees and foreigners (D'Souza et al, 2007). It was also suggested that good corporate governance practices should be based on identifying the framework that works best in defined countries, discerning what broad principles can be derived from these experiences, and examining the conditions for transferability of these practices to other countries (Maher & Anderson, 2000).

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<sup>2</sup> Malayan Banking Bhd (Maybank) started as a private entity in May 1960 and was later listed in the KLSE in 1962. It became a GLC with more than 60 percent of its shareholders comprising of GLC investment companies (GLICs), namely *Permodalan Nasional Berhad*, for its *Amanah Saham Bumiputera* unit trust scheme holders.

Studies on corporate governance in emerging markets found that better corporate governance practices tend to benefit companies through greater access to financing, lower cost of capital, better performance, and more favorable treatment towards all stakeholders. Voluntary and market corporate governance mechanisms are also found to be less effective amongst emerging nations with weak governance system. As a country rapidly develops into becoming a market-based economy and attracts investor confidence, regular updates on its new trade rules and regulations would constantly change the corporate governance landscape (Jiang & Kim, 2015).

#### **2.4. Firm Ownership and Firm Performance**

A key influence on a firm's corporate governance system is its ownership structure. Past literatures have documented mixed evidences on how share ownership affect firm performance and depending on how this performance is measured. When a public entity is privatized, it involves changes in corporate governance due to the change in ownership and further re-shuffles government structure by providing ownership to private owners, employees and foreigners (D'Souza et al, 2007). Government control through substantial share ownership or through the appointment of politically connected managers is perceived to distort investment behavior and harms investment efficiency (Chen, Sun, Tang & Wu, 2011). Government ownership in private firms is large and pervasive, and higher in countries with backward financial systems, interventionist and inefficient governments, and poor protection of property rights (La Porta et al., 2002). The role of state-owned investment institution that controlled the GLCs also serves as a useful institution to mitigate the agency problem, where it involves the government as the principal and the GLCs as the agents (Sam, 2008). The Malaysian government is currently having several GLICs which makes the quality and style of corporate governance practices may tend to be diverse and largely distributed amongst the different GLICs (Bin-Muhamed, 2013). Although government ownership is found to have a significant positive association with financial and market performances, Malaysian GLCs tend to perform lower than the non-GLCs (Najid & Rahman, 2011). In China, meanwhile, saw the State-Owned Assets Supervision and Administration Commission (SASAC) assumes the dual role as both the shareholder of privatised SOEs (or SOH) and a regulatory authority of the corporate sector (Sam, 2013). This political-economic interest tends to override the commercial interest as it exercises both the shareholder and regulatory roles.

In a market where, corporate ownership is highly concentrated, having independent directors in the board is not a sufficient corporate governance mechanism to protect the interest of the minority shareholders. There is a pertinent need to focus attention on the block holders (substantial shareholders), and to segregate independent directors from the total group of outside directors (Fraile & Fradejas, 2014). Highly concentrated ownership is common among Malaysian listed firms while institutional investors' shareholdings is relatively high although it is considered low compared to that at developed countries (Abdul Wahab & How, 2007; Sulong & Mat Nor, 2008). However, increasing ownership concentration amongst the GLICs tend to lower performance, thus, government divestment efforts must be made through reduction in its GLICs equity stakes (Fauzi & Musallam, 2015). GLICs in Malaysia also have differing objectives and control structures, thus, their monitoring roles would have different impact on the GLCs performance (Bin-Muhamed, 2013). GLCs' performances are also observed to be positively related to the GLICs ownership, but negatively related to state ownership, which suggests while direct state ownership leads to lower firm values, government ownership through GLICs leads to better monitoring (Taufil-Mohd, Md-Rus, & Musallam, 2013).

### **2.5. *Directors' Incentive and Firm Performance***

Another form of corporate governance mechanism that can induce the manager to act in the investor's interest in through incentive and rewards, although such a contract may be expensive (Shleifer & Vishny, 1997). Issues on directors' incentive schemes are closely linked to corporate governance. As an effective corporate governance mechanism to mitigate agency problem. Abdullah (2006) argued that excessive remuneration payments made to directors should be constrained and that it should be largely determined by the firm's performance. In theory, directors' incentives are positively related to firm performance. However, empirical studies have shown mixed results. For instance, a study conducted by Conyon and He (2011) on China's publicly traded firms, found executive compensation to be positively correlated to firm performance although executive and chief executive officer (CEO) incentives were found to be lower in state controlled firms and amongst firms with concentrated ownership structures. Meanwhile, dedicated or long-horizon UK institutions are found to restrain the level of director pay and strengthen pay-performance, depicting these firms are more involved in corporate governance and serve a better monitoring and disciplining role than the short-horizon institutions (Dong & Ozkan, 2008). Previous studies have also highlighted the need for higher incentives and rewards for highly talented directors, as a significant determinant for firm performance. Lee and Isa (2015) revealed that directors' remuneration among banks in Malaysia, is positively related to performance (as measured by return on asset (ROA) and return on equity (ROE)) and that it Granger-cause performance. The study not only highlighted the positive remuneration-performance relationships, but it also suggested that directors' reward determines its effectiveness in monitoring the management to perform better. Firth, Leung, Rui, and Na (2015) revealed that top executive pay is positively associated to a firm's productivity (measured by total factor productivity) and efficiency (measured by sales per employee).

### **2.6. *Board Effectiveness, Audit Committee and Firm Performance***

Effective board of directors (BOD) is another key mechanism in corporate governance. In a modern corporation, the shareholders' confidence on how the directors discharge their stewardship roles is a key measure of a firm's performance. An effective board is also central to the agency theory's prescription of minimizing agency costs, protecting shareholders' interests, and ensuring that principal-agent interests are aligned (Conheady, McIlkenny, Opong, & Pignatel, 2014). Since firm's ownership and control are separated, Jensen and Meckling (1976) and Fama and Jensen (1983) highlighted the need for board monitoring to ensure managers are not driven to earning manipulations and self-serving personal interest. Empirical evidences argued that more non-executive directors should be sitting as board members to monitor and control executive managers effectively (Fama & Jensen, 1983). In a market with highly concentrated corporate ownership, Fraile and Fradejas (2014) suggested that other mechanisms be established other than board independence since studies have indicated that by having high proportion of independent members on the board, it is still not sufficient to protect the small shareholders' interest. Board structure is also associated with ownership variations. For instance, a study by Munisi, Hermes, and Randøy (2014) on listed firms in twelve Sub-Saharan countries revealed that government ownership is positively related to proportion of independent directors. The study thus suggested that the government stake holding in emerging market firms can be another way to improve corporate

governance practices particularly in enhancing board effectiveness. The study, however, found the proportion of outside directors is negatively linked with ownership concentration. Liu, Miletkov, Wei and Yang (2015), meanwhile found that board independence is positively and significantly associated with performance of Chinese publicly traded firms. Stronger firm performance is found among government-controlled firms, which suggest the ability of the independent directors to prevent self-dealing and to improve investment efficiency. The study also observed that most listed firms are former SOEs are still having highly concentrated government shareholding.

Meanwhile, a study by Conheady et al. (2014) on Canada's listed firms found that certain aspects of board effectiveness, most notably independence, are found to be unrelated to firm performance. There are arguments that shareholders may prefer an insider-controlled board and that an outside (or independent) board control can in fact, be value-reducing (Harris and Raviv, 2010). The results of their study are contrary to conventional wisdom which has it that outside control of boards, or at least of key committees such as the audit committee, is always preferred. The code which emphasized on more outside directors and independence of the board and audit committee hence need further examination. The need to frequently change the upper management of a firm is another mechanism to exercise governance and there are studies that found positive relationship between a change in the CEO and the market value of the firm (Lopez-de-Silanes, 1997), and between changes in top management and efficiency gains (Megginson et al, 1994). Boukhari et al. (2005a) noted that privatized firms in developing countries with higher CEO turnover tend to exhibit higher profitability and efficiency.

The number of directors sitting on the board and their composition can also influence a firm's major decisions and thus determine its performance. The issue of having small or substantial number of board members depends on how they function effectively. Jensen (1993) argued that a size beyond seven and eight members may result in disagreements and is easier for the CEO to control. Likewise, larger board size may include more members that can exhibit diverse ideas and experiences. In examining the relationship between board size and firm performance, previous empirical researches have proven mixed results. Board size and board independence were also found to be positively related to measures of operational level, such as firm size, firm age and leverage (Germain et al., 2014). In the case of Malaysia, Shukeri, Shin, and Shaari (2012) provided evidence of a significant positive association between board size and performance (ROE), and a significant negative association between board independence and ROE.

The issue on changes in the board of directors have been studied on and that it can have an effect on firm performance. The change in upper management may contribute to improvements in the financial performance and replacing politically appointed managers of former state-owned enterprises (SOEs) with a professional businessperson should also lead to performance improvements (D'Souza et al., 2007). It is also suggested that the sensitivity of CEO turnover and stock performance is related to shareholder ownership and board independence (Kaplan & Minton, 2012). The quality of the audit committee also exhibits how independent the directors are in the BAC and the overall internal control disclosure. Paragraph 15.09 of Bursa Malaysia's Listing Requirements mandates all listed companies to appoint an audit committee comprising no fewer than 3 members; should comprise non-executive directors with a majority being independent. Although many corporate governance reforms have been adopted to improve financial disclosure, Woidtke and Yeh (2013) noted that audit committee independence alone may not be enough to enhance earnings informativeness. Instead, they argue that by focusing on both complete

independence and the financial or legal expertise of independent directors appointed to the audit committee may be more significant to increase investor confidence in accounting information, especially when ownership is concentrated.

## **2.7. Corporate Governance and Technical Efficiency**

As an internal control mechanism, corporate governance can be designed to achieve efficient operation of a firm on behalf of the stakeholders (John & Senbet, 1998). Studies on corporate governance and its impact on productive efficiency are growing in number even though it is relatively small as compared to the voluminous studies that relate it to other commonly used performance measures. Previous studies on corporate governance and economic efficiency of privatized firms tend to give mixed results. For instance, Lin, Ma, and Su (2009) confirmed a negative relationship between firm efficiency and state ownership. While privatizing public entities together with corporate governance reforms, will significantly improve firm efficiency, partially privatized firms having high government ownership and control remains a key impact factor of firm inefficiency. Su and He (2012), meanwhile, argued that restructuring of SOEs through the improvement in corporate governance reforms can enhance firm efficiency.

Studies have also concurred that corporate governance does contribute to a better technical efficiency (as estimated using the Data envelopment analysis (DEA) approach) by increasing the shares of large external shareholders who have signaled credibly against expropriation of minority investors and using small insider-dominated or balanced boards with unified leadership (Nanka-Bruce, 2011). In a developed and efficient market, such as among the European Union (EU) countries, there exists managerial discipline amongst firms to protect the interest of minority shareholders (Hanousek, Kočenda, & Shamshur, 2015).

Directors' incentive as another form of internal corporate governance mechanism is also relevant in explaining firm technical efficiency and economic performance. For instance, Baek and Pagan (2002) found that the level of CEO total compensation is positively associated to technical efficiency. Both the level and the structure of CEO compensation are important factors when assessing the technical efficiency and firm economic performance. Meanwhile, Habib and Ljungqvist (2005) found most firms have values which are below the frontier (value-maximisation benchmark), and that the shortfall is explained by inadequate provisions of internal incentives. Meanwhile, studies to determine the impact that board effectiveness has firm technical efficiency are growing. Using the DEA approach to estimate efficiency, García-sánchez (2010) found no strong evidence to relate the negative association between board size and firm performance or on the uncertain impact board independence have on firm efficiency. By setting board size limit and increasing the number of independent directors is not effective enough, particularly in a market setting which is characterized by weak internal control mechanisms. In the case of Malaysia, the issue on associating privatization and efficiency needs further investigation as there are studies tend to provide mixed results. For instance, Hon, Boon and Lee (2014), revealed there still more room for efficiency improvement for privatized water industry firms.

Based on the arguments and the review of the literature above, we develop several hypotheses as below:

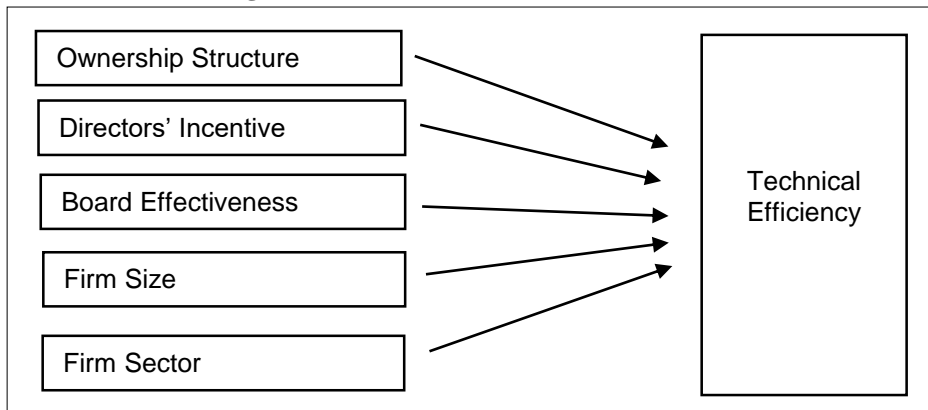
- Ho1 Ownership concentration, government ownership and board ownership do not have significant impact on technical efficiency.
- Ho2 Directors' Incentive does not significantly improve technical efficiency.
- Ho3 Board and Audit Committee Effectiveness do not affect technical efficiency

### 3. RESEARCH METHODOLOGY AND FINDINGS

We employed the Stochastic Frontier Analysis (SFA) methodology in examining the effects of corporate governance mechanism on the productive efficiency performance of government linked companies (GLCs) in Malaysia. Our study uses unbalanced panel data from publicly listed GLCs covering a period from year 2001 until 2012 (12 years). The year 2001 marked the year the Malaysian Code of Corporate Governance (MCCG) was implemented. Putrajaya Committee for GLC High Performance (PCG) reported a total of 33 listed GLCs as at March 2009. The number include the top GLCs selected for the 10-year GLC Transformation (GLCT) programme and their subsidiaries. However, due to missing data and recently listed GLC (as in TH Plantations Holdings Berhad), and the merger and later demerger of GLCs (as in TMI Berhad and Axiata Holding Berhad), we used only 31 firms to represent GLCs. The technical inefficiency effects model is used to examine for inefficiency effects linked to corporate governance. The study uses three latent firm level characteristics drawn directly from the literature, namely, ownership concentration and structure, directors' incentives, and board and audit committee effectiveness. The research framework extends previous study, where a stochastic frontier with inefficiency effects is fitted simultaneously to an unbalanced panel data set, (Khatri, Leruth, and Piesse, 2002 and Su and He, 2012) that examine corporate governance and productive efficiency.

Drawing from the theories of Corporate Governance, Privatization, and Production, the research framework is summarized as below

**Figure 1:** Structure of Research Framework





### 3.1. Models Specification

The general stochastic production function with panel data is presented as below:

$$Y_{it} = X_{it}\beta + (V_{it} - U_{it}). \quad (1)$$

where,

$i$  and  $t$  denotes the  $i$ -th firm and the  $t$ -th year of observation;

$Y$  represents the dependent output variable;

$X$  represents a ( $k \times 1$ ) vector of inputs; and

$\beta$  is a ( $k \times 1$ ) vector of unknown parameters to be estimated.

$V_{it}$  are the stochastic variables which are beyond the firm's control and are assumed to be independent and identically distributed random errors which have normal distribution and mean zero and unknown variance; i.i.d.  $\sim N(0, \sigma_v^2)$ . It also accounts for errors in  $Y_{it}$  or omitted variables and are assumed to be independent of the  $U_{it}$ ; and

$U_{it}$  are the non-negative unobservable random variables  $U_{it} \geq 0$  (measures the distance from the frontier for firm  $i$  at time  $t$ ), associated with the technical inefficiency in production and assumed to be independently, but not identically distributed.

The technical inefficiency effect,  $U_{it}$ , in the stochastic frontier model (1) could be specified in equation (2) below:

$$U_{it} = Z_{it}^\delta + W_{it}. \quad (2)$$

where,

$Z_{it}$  is a ( $1 \times M$ ) vector of explanatory variables associated with the technical inefficiency effects;

$\delta$  is a ( $M \times 1$ ) vector of unknown parameters to be estimated; and

$W_{it}$ s are unobservable random variables, which are assumed to be independently distributed, obtained by truncation of normal distribution with mean zero and unknown variance,  $\sigma^2$ , such that  $U_{it}$  is non-negative (i.e.,  $W_{it} \geq -Z_{it}^\delta$ ).

Alternatively, the technical inefficiency effects are assumed to be independent nonnegative truncations of normal distributions with unknown variance,  $\sigma^2$ , and means,  $Z_{it}^\delta$ ,  $i = 1; 2; \dots; N$ ; and  $t = 1; 2; \dots; T$ . Thus, the means may be different for different firms and time periods, but the variances are assumed to be the same.

In this study, the technical inefficiency effects are modelled in terms of various corporate governance mechanisms which include the constructs for ownership concentration and structure, directors' incentive, and the effectiveness of the board. The general frontier model may include intercept parameters and period of observations in both the frontier and the model for the inefficiency effects, provided the inefficiency effects are stochastic and not merely a deterministic function of relevant explanatory variables (i.e.,  $U_{it} = Z_{it}^\delta$  is not estimable for all choices of  $Z_{it}^\delta$  and  $X_{it}$ ).

Given this specifications, the null hypothesis that the technical inefficiency effects are not random is expressed by  $H_0: y = 0$ , where  $y = \frac{\sigma_v^2}{\sigma_v^2 + \sigma^2}$ . Further, the null hypothesis that the technical

inefficiency effects are not influenced by the level of the explanatory variables in (2) is expressed by  $H_0: \delta' = 0$ , where  $\delta'$  denotes the vector,  $\delta$ , with the constant term,  $\delta_0$ , omitted, given that it is included in the expression,  $Z_{it}^{\delta}$ .

Before the model in equation (1) and equation (2) are applied, a suitable production function form must be specified which is estimated from the sample data. We used the Cobb-Douglas and the translog functional forms as these forms are more prevalent in many studies. The Cobb-Douglas form is considered first-order flexible to have enough parameters to provide a first-order differential approximation to an arbitrary function at a single form (Coelli et al., 2005). The translog form is said to be second-order flexible form that provides some degree of generality as it is a second order approximation to an arbitrary functional form. Unlike the Cobb-Douglas function, the translog function assumes the elasticity of substitution need not equal to one and no (sample wide) restriction upon returns to scale is imposed. It also does not necessarily satisfy concavity, monotonicity, or other important axioms of production. This functional form is relatively well behaved in panel data studies although it is more complex than the Cobb-Douglas functional form.

To test if the null hypothesis that the Cobb-Douglas functional form is an adequate representation of the data, given the specification of the translog model, the generalized Likelihood ratio (LR) test,  $\lambda = -2\{\log [\text{Likelihood} (H_0)] - \log(H_1)\}$  is used and followed by a chi-squared ( $\chi^2$ ) distribution. Given the degrees of freedom (df) and if the LR test result is larger than the critical value of the  $\chi_{df}^2$  distribution, the null hypothesis can be confidently rejected. The production equation for Cobb-Douglas and Translog functional forms are laid out in equation (3) and equation (4) respectively below:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 t + \beta_4 D + (V_{it} - U_{it}). \tag{3}$$

$$\ln Y_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 t + \beta_4 \frac{1}{2} (\ln L_{it})^2 + \beta_5 \frac{1}{2} (\ln K_{it})^2 + \beta_6 \frac{1}{2} (t)^2 + \beta_7 \ln L_{it} \ln K_{it} + \beta_8 \ln L_{it} t + \beta_9 \ln K_{it} t + \beta_{10} + (V_{it} - U_{it}). \tag{4}$$

where,

$\ln$  denotes natural logarithm; and

$D$  is a dummy variable to control for the differences in the sector the firms belong to.

The stochastic frontier models in equations (3) and (4) account for both technical change and time-varying inefficiency effects. The models include the year of observation to specify non-neutral technological change. A firm’s production frontier may improve from one-time period to the next, but it may not be due to efficiency improvement alone. The improvement could be due to advances in technology that a firm has developed. This neutral technical change is present if the coefficients of the interactions between the year of observation and the input variables: labour and capital, are zero, i.e.,  $\beta_{i3} = 0, i = 1, 2$ , and there would be no technological change among the firms if the coefficients of all variables involving year of observation were zero, i.e.,  $\beta_{i3} = 0, i = 1, 2, 3$ . The year variable to be presented in in the inefficiency model in equation (5), on the other hand, specifies that the inefficiency effects may change linearly with respect to time.

The Cobb-Douglas frontier model in equation (3) is a special case of the translog frontier in which the coefficients of the second-order terms are zero, i.e  $\beta_{jk} = 0, j \leq k = 1, 2, 3$ . The technological

change index in the translog equation (4) is based on the coefficients of time, half time squared and the interaction of time with the inputs  $L$  and  $K$ , which is data dependent. This allows fully for the non-linear effects that are to be expected during the 12-year period understudy. To test the null hypothesis that there is no technical change, the generalized Likelihood Ratio (LR) test is also used and followed by a chi-squared distribution.

The method of maximum likelihood (ML) is used to simultaneously estimate the parameters in the stochastic frontier with inefficiency effects model (Coelli et al., 2005; Khatri et al., 2002). The ML estimates are obtained using FRONTIER 4.1 software program which is freely downloadable from the Centre of Efficiency and Productivity Analysis (CEPA), University of Queensland.

To model for technical (in) efficiency effects directly linked to corporate governance internal mechanisms, we used firm level characteristics drawn directly from the literature, namely, ownership structure, directors' incentive, and board and audit committee effectiveness.

In the inefficiency model, controlled variables and variables explaining corporate governance are added as  $Z_{it}$  variables as presented below:

$$U_{it} = Z_{it}^{\delta} = \delta_0 + \delta_1 SZ_{it} + \delta_2 t + \delta_3 OC_{it} + \delta_4 GO_{it} + \delta_5 BR_{it} + \delta_6 BI_{it} + \delta_7 BC_{it} + \delta_8 BS_{it} + \delta_9 ACI_{it} + W_{it} \quad (5)$$

where,

$SZ$  and  $t$  denote the control variables represented by firm size and year of observations respectively;

$OC$  denotes ownership concentration;

$GO$  represents proportion of government ownership;

$BR$  denotes board remuneration;

$BI$  denotes board independence;

$BC$  denotes any change in the board members;

$BS$  represents board size, and

$ACI$  denotes audit committee independence.

Many of SF analysis is directed towards predicting the inefficiency effects  $\exp(-U_{it})$ . The technical efficiency (TE) of production is defined in equation (3.6) below:

$$TE_{it} = \frac{Y_{it}}{\exp(X_{it}^1 \beta + V_{it})} = \frac{\exp(X_{it}^1 \beta + V_{it} - U_{it})}{\exp(X_{it}^1 \beta + V_{it})} = \exp(-U_{it}) = \exp(-Z_{it}^{\delta} - W_{it}) \quad (6)$$

so that  $0 \leq TE_{it} \leq 1$ .

The TE scores are also estimated for individual GLC by each year of observations, using the FRONTIER 4.1 software.

Data that we used for this study are mostly hand extracted and computed from the sample firms' respective annual reports. The data for the output, labour input and capital input variables were

extracted from the online database<sup>3</sup>. Data for  $Z_{it}^s$ , the controlled and explanatory variables that explain technical inefficiency, were hand collected from the firms’ annual reports, and computed accordingly. Table 1 describes the variables used in this study.

**Table 1:** Descriptions of the Variables

Variables:	:	Measurements
<b>Production Function in the Efficiency Model</b>		
Output, $\ln Y$	:	net revenue in RM million per year
Labour Input, $\ln L$	:	staff cost and other personnel expenses in RM million per year
Capital Input, $\ln K$	:	total assets (in RM million) per year
Time trend, $T$	:	year of observations. To capture for technological change (progress), the production function is allowed to vary over time. Hence, the time trend is included
Industry, $D$	:	dummy variable for industry; “1” for financial industry and “0” for non-financial industry
<b>Inefficiency Effect Model</b>		
Firm Size, $SZ$	:	measured by market capitalization (in natural logarithm of RM million). Market capitalization are generally used to proxy for firm size as control variables in past studies that examine firm performance and corporate governance
Time Trend, $t$	:	Year of observations to account for time-varying inefficiency effect
Ownership Concentration, $OC$	:	logistic transformation (log) to $(L5 / (1-L5))$ , where L5 refers to the cumulative percentage shares held by shareholders with 5 percent ownership or more.
Government Ownership, $GO$	:	Direct shares held by the federal government, through its GLICs, their nominees and wholly owned subsidiaries. Computed based on top 30 shareholders.
Board Remuneration, $BR$	:	Annual board remunerations received by board directors (in RM million)
Board Independence, $BI$	:	proportion of independent directors sitting as board members
Board Change, $BC$	:	board change is represented by dummy “1” if there is any change in the board members; otherwise “0”
Board Size, $BS$	:	Number of board members
Audit Independence, $ACI$	:	Proportion of independent directors in the Board Audit Committee

### 3.2. Technical Inefficiency Effects on Corporate Governance

Table 2 reports the efficiency estimates specified by the preferred translog with no technical change model. For the efficiency estimate, the two-production elasticity of labour  $\ln Y$  and capital  $\ln K$  is -0.643 and 1.557 respectively. This shows very mild decreasing returns to scale at the sample mean point over the 12-year period. We find a significant and negative coefficient for labor input, suggesting over investment in labor input that could affect technical efficiency. Likewise, the

<sup>3</sup> The data can be downloadable from World Scope Fundamentals, which is provided through ThomsonOne.com Investment Banking database. The researcher is very grateful to UiTM for providing this database in its library portal.

coefficient of the capital input shows investment in assets has generated revenue positively. The results of the finance sector,  $D$  coefficient is negative but insignificant, suggesting no convincing evidence that the sector the GLCs belong top can strongly contribute towards revenue generation. This study's main interest is the estimated coefficients in the inefficiency model which highlights the internal corporate governance reforms. A positive coefficient in the inefficiency model indicates a positive association with inefficiency (or negative efficiency), and vice versa. Firm size,  $SZ$  coefficient is -0.254 and significant at 5 percent level. The negative firm  $SZ$  value signifies that larger firms, as proxied by their net worth, tend to be less inefficient (more efficient) over time. The time trend,  $t$  coefficient is positive but insignificant. The variables that represent corporate governance include ownership structure (ownership concentration  $OC$ , government ownership  $GO$ ), director's incentive (board remuneration  $BR$ ), and board effectiveness (board independence  $BI$ , board change  $BC$ , board size  $BZ$ , and board audit committee independence  $AIC$ ). The  $OC$  reports insignificant results whereas  $GO$  indicate significant negative results suggesting share concentration and government ownership are relevant in explaining inefficiency for the latter. The board remuneration  $BR$  coefficient, however, is negative and significant at 1 percent level; depicting increasing board remuneration and other short-term incentives can lead to lower inefficiency (or higher efficiency). In terms of the board effectiveness construct, board independent  $BI$  shows negative but significant results and board size  $BS$ , reveal significant and positive coefficients. Thus, frequent changes in the board members and increasing board size tend to increase revenue inefficiency (or reduce output efficiency). In the case of the audit committee independence  $ACI$ , the result shows a significant but low negative coefficient, implying higher proportion of independence tend to reduce inefficiency (increase efficiency).

**Table 2:** Maximum Likelihood Estimates for Production Frontier with Inefficiency Effects

Parameter (n=31)	Translog SFA Inefficiency model with Technical Change	CD SFA Inefficiency model with No Technical Change	Translog SFA <b>Inefficiency model with No Technical Change †</b>
$\beta_0$ intercept	0.868(1.058)	1.159**(1.704)	1.732**(2.320)
$\beta_1$ $\ln L$	-0.625**(-2.228)	0.481*** (7.228)	-0.643***(-2.559)
$\beta_2$ $\ln K$	1.615*** (5.903)	0.484*** (8.754)	1.557*** (6.300)
$\beta_3$ $(t)$	0.169*** (2.440)	-	-
$\beta_4$ $\frac{1}{2} (\ln L^2)$	-0.111**(-1.915)	-	-0.139***(-2.458)
$\beta_5$ $\frac{1}{2} (\ln K^2)$	-0.315***(-5.357)	-	-0.316***(-5.560)
$\beta_6$ $\frac{1}{2} (t^2)$	-0.001(-0.224)	-	-
$\beta_7$ $\ln L \ln K$	0.220*** (4.119)	-	0.230*** (4.416)
$\beta_8$ $\ln L t$	-0.001*(-1.373)	-	-
$\beta_9$ $\ln K t$	-0.004(-0.376)	-	-
$B_{10}$ Finance Sector $D$	0.011(0.077)	-0.998***(-7.997)	-0.027(-0.194)
<b>Inefficiency components</b>			
$\delta_0$ intercept	2.885*** (5.342)	0.033*** (3.993)	3.107*** (5.429)
$\delta_1$ Firm Size $SZ$	-0.273*** (-5.718)	0.001(0.011)	-0.254** (-5.379)
$\delta_2$ $t$	0.078*** (3.347)	-0.018(-0.572)	0.013(0.969)
$\delta_3$ Ownership concentration $OC$	0.070(0.448)	-0.090(-0.249)	0.025(0.159)

Parameter (n=31)	Translog SFA Inefficiency model with Technical Change	CD SFA Inefficiency model with No Technical Change	Translog SFA Inefficiency model with No Technical Change †
δ <sub>4</sub> Government ownership <i>GO</i>	-0.010(-5.506)	-0.008***(-2.966)	-0.010(-5.413)
δ <sub>5</sub> Board Remuneration <i>BR</i>	-0.128***(-3.492)	-0.123(-0.403)	-0.103***(-3.752)
δ <sub>6</sub> Board Independence <i>BI</i>	0.002(0.421)	0.007(0.661)	-0.002***(-3.795)
δ <sub>7</sub> Board Change <i>BC</i>	0.084(1.019)	0.083(0.298)	0.103*(1.295)
δ <sub>8</sub> Board Size <i>BS</i>	0.090**(4.045)	0.035(0.540)	0.081***(-2.637)
δ <sub>9</sub> BAC Independence <i>ACI</i>	-0.006(-1.218)	0.002(0.306)	-0.005*(-1.333)
σ <sup>2</sup> variance of inefficiency	0.298***(12.175)	0.459***(-3.592)	0.302***(-13.172)
gamma $\gamma = \frac{\sigma_u^2}{\sigma^2}$	0.178**(1.658)	0.130(0.348)	0.124**(1.708)
No of observations	362	362	362
Log Likelihood	-289.227	-349.972	-292.778
LR test of one-sided error	98.451	19.575	98.387
Mean TE scores	0.481	0.818	0.501

Note: T-statistics are in parenthesis. \*, \*\* and \*\*\* denote statistically significant at 10%, 5% and 1% confidence level. †Given the specifications of the SFA model, the translog model with no technical change is the preferred frontier.

### 3.3. GLCs Efficiency Levels

Table 3 summaries the trend of the GLCs efficiency scores over the 12-year period. The average efficiency level stands at 50.10 percent, which is just average. The average efficiency is expected as output prices of government-controlled firms are normally low or subsidized and for other reasons which are beyond their control. The average efficiency score however has gradually increased over the years, except for a slight decline in 2002 and 2011. The yearly dispersions (as measured by standard deviations) have lower values that the average scores indicating no wide variability in the efficiency scores. However, this trend increases slightly over time, suggesting a widening in the average efficiency range, and that efficiency improvement is relatively slow.

**Table 3: Firm-Level Efficiency Estimates (2001 – 2012)**

	Year												Panel
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
N=31													
Annual Average	0.43	0.42	0.443	0.478	0.467	0.491	0.511	0.536	0.543	0.564	0.549	0.568	0.501
Standard	0.23	0.25	0.245	0.258	0.269	0.269	0.269	0.283	0.275	0.286	0.287	0.291	0.269

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Deviation

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#### **4. DISCUSSION AND CONCLUSION**

This paper managed to gauge the link between several identified internal corporate governance mechanisms and technical efficiency. We applied the SFA methodology, specifically to estimate efficiency and associating it to ownership, incentive and board effectiveness of government linked companies in Malaysia. The SFA model with inefficiency effects allow us to link to good productive practices amidst different technology, and that efficient use of resources can be related to GLCs long term economic growth.

The results of the SFA model highlighted the over investment in labor input which are normally found in SOEs and government-controlled firms. This can be addressed by formulating a policy of retaining productive employees and effective management of personnel expenses. While the government has its national and social interest to take care of, GLCs should be seen and encouraged to recruit and retain staff that are productive and talented. Formulating strategies on human development, automation and innovation would improve production processes and ultimately efficiency or returns to scale, particularly among the financial and services firms. Further study on labor productivity amongst GLCs employees may help to understand further the high staff cost and other personnel expenses.

The technical inefficiency effects model results, that associate ownership concentration to technical inefficiency are positive but insignificant. Earlier studies on Malaysian firms also concurred ownership concentration provide insignificant effect to firm value (Sulong & Mat Nor, 2008). While our study focuses on the firm ability to maximize output generation, it is well known that improvement on efficiency will have a positive effect on the firm's profitability and market value. Although insignificant, our study concurs with several studies regarding ownership concentration of GLICs (Fauzi & Musallam, 2015) in Malaysia. The results imply ownership concentration, does not serve as an effective monitoring mechanism to improve GLCs efficiency performance.

Our study also shows no strong evidence to link government ownership with deterioration in technical inefficiency over time. Previous literatures (Shleifer & Vishny, 1997; La Porta et al., 2002; Boubakri et al., 2004; D'Souza et al., 2007; Su & He, 2012) asserts government should relinquish their control in privatized firms although there are studies that found stronger profitability and output gains amongst firms with higher state ownership and in countries with faster growing economies (D'Souza et al., 2001). It was also argued that large government share ownership can ensure higher performance and better standards of corporate governance (Sulong & Mat Nor, 2008; Najid & Rahman, 2011) although government ownership alone is not enough in monitoring earnings management (Abdul Jalil & Abdul Rahman, 2010). Government ownership thus, to a certain extent helps to monitor and ensure GLCs deliver significant performance outcomes for all stakeholders.

The study also reveals board remuneration, as a form of short term incentive, is very significant and negatively linked to inefficiency (positively linked to efficiency). This form of compensation does ensure that the board discharges their role to monitor the operational performance of the GLCs. The result concurs with few known literatures although firm performances are measured differently (Baek & Pagan., 2002; Conyon & He, 2011; Lee & Isa, 2015). The issue of how effective the board

is in mitigating agency problem and ensuring sustainable performance of the firms remain a relevant discussion in many empirical researches. The importance of independent (outside) directors sitting in the board was very much emphasized in the revised Malaysian Code of Corporate Governance (MCCG, 2007; 2012) where impartiality in the monitoring of firm performance will convince shareholders that firms that they hold interest in are well managed and can lead to sustainable growth.

The board of directors for GLCs is mostly appointed by the government of the day and they represent the government and its GLICs<sup>4</sup>. All the independent directors are non-executive top management and are free from any business or other relationships that could materially interfere with the exercise of their independent judgment. They should have the caliber to ensure the strategies proposed by the management are fully deliberated and examined in the long-term interest of the firm and its shareholders. Our study finds a significant negative association between board independence and technical inefficiency, suggesting that independent directors of government-controlled firms have the ability to effectively improve governance reforms particularly in a weak investor protection legal.

Our study also reveals that the larger board size tends to increase inefficiency (reduce efficiency), suggesting that larger board size would tend to make decision-making slow and impede effective monitoring of the firms' operations (Mashayekhi & Bazaz, 2008). Although larger board size can exhibit diverse ideas and experiences, it is suggested that a board size of more than 7 members may result in disagreements and are easier for the CEO to control (Jensen, 1993). The findings of our study also highlight a strong link between the change in the board and the independence of the audit committee with inefficiency. While frequent change in the board members tend to increase inefficiency (reduce efficiency), audit independence is vice versa. We believe that the performance of the firm should precede the need to remove the directors that are considered ineffective. Board change also implies governance reforms are in place especially in replacing politically appointed directors with more talented and professional directors (D'Souza et al., 2007). The uptrend in the estimated TE scores shows GLCs can be sustainable. However, there is still room for further improvement and the need for GLCs to remain resilient since they make up a third of the market capitalization and are the key driving force in almost all sectors of the economy. With continual GLCs divestment and the government concerted effort to reform corporate governance mechanisms, the need to focus on the directors' role and their ability to independently monitor the GLCs are crucial.

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<sup>4</sup> Telekom Malaysia Berhad, in its 2012 Annual Report has 13 directors plus 1 alternate director. Out of these, 8 have either held government positions, executive positions in other GLCs and GLICs, and also a member of parliament of the ruling political coalition.



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