Impact of Green Building Certificate on Firm’s Financial Performance

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Abstract. Implementation of green building (GB) practice is one of the environmental practice taken by some developers in order to overcome the loss of green space in urban area. The developers who are implement GB practice are eligible to get GB certificate. As reported by Green Building Index (GBI) on 2016, only 8% out of 2,000 developers have GB certificate. Most of them are not interested and stated that adoption of GB certificate is not a preferred investment for their business. Their perception are contradict with the previous studies which have proved that the environmental practice is positively significant with firms’ financial performance. Hence, the objective of this study is to evaluate the impact of GB certificate on the firms’ financial performance. A total of 323 developers’ financial reports for the year 2015 were collected from Bursa Saham Malaysia and Suruhanjaya Syarikat Malaysia. Using propensity score matching (PSM) technique, it was found that developers with GB certificate had higher return on asset (ROA) compared to developers without GB certificate. In conclusion, GB certificate have positive impact on firm’s financial performance. The finding of this study will motivate other developers to implement GB practice in their upcoming project development.

1. Introduction

1.1 Overview of Green Building Certificate
Green building (GB) certificate is defines as a proof that the firms are successfully reaching the standard guidelines of GB criteria fixed by GB council [1]. In 2009, GB certificate through the GB practice was launched in Malaysia. It is known as one of the efforts introduced by the government in order to solve the issue regarding the shortage of urban green space in urban area. GB practice is a practice regarding on green space and green property building by any property developers. Any of
them that implement GB practice within the specific requirement set up by GBI are qualified to apply for the GB certificate. Tony Arnel, Chairman of World Green Building Council mentioned that it is introduced as a global solution particularly for climate change and sustainable economic development issue [1].

There are four pillars of GBs [2]. There is minimisation on the environmental impact, improving the health conditions of occupants, increasing the return on investment to developers and the local community, and enhancing the healthy environment during the planning and development process. Common elements of these definitions are environmental sustainability, health issues, and impacts on the community and life cycle perspective [3].

Various assessment tools have been established to guide the GB development. It was differ among countries. The World Green Building Council has been established to coordinate the efforts of various green building councils over the world. In Malaysia, GBI is used as an assessment tool for GB certificate. The assessment is undertaken by accredited professionals that are commissioned by the green building council.

As reported in Malaysia Green Building Confederation (MGBC) in 2016, Malaysia has undergone over 50 years of rapid industrialisation, recording between 5% to 9% growth annually. Unfortunately, most of the developments are non-GB practices and there is a need for a holistic take on GB practices approach to building development. Due to this situation, MGBBC was formed to guide the local building industry in the direction of GB built.

The Malaysian government launched the Green Buildings Mission Campaign (GBMC) in 2009 as one of the Malaysian government’s commitments to addressing the environmental issues such as degradation of green space in urban areas [4]. It aims to become the main promoter of green practices and the main sustainability reference organisation within the growing construction market sector. It is well poised to lead the country’s building industry in embracing responsible measures that help them realising energy savings, water conservation, healthier indoor environment, better public connectivity, recycling of valuable resources, and provision of greenery in developments. In addition, as stated by the chairman of world green building council, GB practices can reduce operating costs of building up to 9%, rise building values by 7.5% and rise ROI by 6.6%. Thus, it can be said that green buildings do not just make a sound on environmental benefits and social benefits but able to contribute on economic benefits too [1]. By having all of these benefits, green buildings can lead to the sustainable country.

Sustainability is a broad term describing a desire to carry out activities without depleting resources or having harmful impacts [5]. Sustainability in building developments is a vast and complex subject that must be considered from the very earliest stages as the potential environmental impacts are very significant [5]. Nowadays, over half of the world’s population now lives in urban environments and it is clear that sustainable buildings have become vital cornerstones for securing long-term environmental, economic, and social viability.

1.2 Green Building Practice Issue in Malaysia

It have been proven that the implementation of GB leads to environmental, social and economic benefits. However, the implementation of GB practice is limited so far, especially in Malaysia. There are lacks of developers who are willing to do this voluntary practice. Most developers are not interested in incorporating GB in their project development [6]. In addition, Green Building Index [1] stated that less than 2% of building in Malaysia has been rated with a sustainability tool. Green Building Index [1] also highlighted that only 8% out of 2000 developers involved with green building practice. There are still many local construction businesses not adapting GB practices which are already common in neighbouring Singapore. Based on the focus group discussion with the developers who implemented GB practice, low awareness level about preserving the green environment among Malaysians and high upfront cost are what discouraging the green buildings practices among the
developers [7,8]. It seems that the GB practice is not a preferred investment for their business. They were preferring to ignore the financial benefits that may generated through GB practices which will benefits their firm financial performance.

There are some of the previous studies proved that the implementation of environmental practice in businesses is able to generate high return through property value, rental rate, and maintenance and operation cost [3,9,10]. They were proved that environmental practice is good for investment and provide positive impacts towards the firm’s financial performance. In addition, as reported in Lau et al. [11], there has been a steady growth since 2012 in the number of owners who see a 10% or greater increase in asset value for new green buildings compared with traditional one. This research was done with the collaboration from various country including United States, United Kingdom, Australia, Brasil, Hong Kong, Singapore, Mexico, Jordan and Philippine.

Having discovered that, the environmental practice including GB practice are fully capitalised into rents and asset values which give a positive financial impact on the firms. In this sense, GB practice is a smart idea for business strategies. It is more convincing if the study could prove the positive financial impact of GB practices specifically in Malaysia. This will motivate and attract more property developers to implement GB practices in their upcoming project development. Therefore, the objective of this study is to evaluate the impact of GB practice on the firm’s financial performance. The firms involved in the study is property developers.

2. Literature Review

2.1 Measurement of Firm’s Financial Performance

Firm’s performance shows the outcomes achieved by individuals or a group of individuals in an organisation, as well as the firm’s ability to gain and manage resources for their business in the future. Benjalux [12] and Lahtinen [13] opined that no decision could be made without them. Firm’s financial performance is represented by firm’s profitability, growth, and market value [14]. However, in most cases, profitability is the most common indicator to measure financial performance.

Profitability demonstrates a firm’s past ability to generate returns [15]. There are several indicators to measure profitability like returns on assets (ROA) return on sales (ROS), return on investment (ROI), and return on equity (ROE) [16]. ROS reveals how much a company earns in terms of sales, ROA explains a firm’s ability to make use of its assets, ROI is a profitability ratio that calculates the profit of an investment as a percentage of the original cost, and ROE reveals what return investors take for their investments. These financial measures are easy to calculate and are used worldwide [17].

2.2 Determinants of Financial Performance

Firm’s financial performance is influenced by firm’s characteristics, including the firm’s size, age, leverage or debt ratio, managerial experience, growth, corporate governance, and corporate social responsibility (CSR). The size of firm is known as one of the major factors affecting the firm’s financial performance. Liargovas and Skandalis [17] noticed that small firms might have less power and less competitive than large firms, which may affect a firm’s profitability. In this case, smaller firm may face difficulties to compete against larger firms. However, for firms that are exceptionally large, the firm’s financial performance could be negative due to bureaucratic and other reasons [18].

The positive relationship between firm’s age and financial performance is also significant [19]. Older firms have more knowledge, experience, abilities, and skills [17]. Next, leverage ratio denotes the proportion of debt to equity in the capital structure of a firm. It shows the degree to which a business utilises borrowed money. The most common leverage ratios are debt ratio, debt to equity, and equity multiplier. Firms that are highly leveraged have relatively higher risk of bankruptcy if they are unable to pay their debt. This in the end affects the firms’ performances. According to Liargovas and Skandalis [17], leverage is not always bad. In some cases, it can increase the shareholders’ ROI and
make good use of the tax advantages associated with borrowing. However, Popescu et al. [20] showed that financial leverage negatively affects the investment decisions and those companies with higher debts are less eager to invest in the capital assets.

Corporate governance which involves a set of legal, institutional, and cultural procedures may affect the firm performance. Andreou et al. [21] stated that corporate governance status is categorised into three dimensions, namely board structure, ownership structure, and chief executive officer (CEO)’s influence on the board. There are two different opinions in regard to the relationship between the size of a board and a firm’s performance. Vo and Phan [22] believed that a smaller board size would improve a firm’s performance. However, Klein [23] believed that a large board size contribute more to the success of a firm due to extra information.

In another study, McWilliams et al. [24] stated that the level of CSR will influence the financial performance of the firms. Jacobs et al. [25] also stated that the intervention by the firm on environmental social concern is likely to improve financial performance via the revenue gains from enhanced reputation.

As a conclusion, previous studies proved that all of the firm’s characteristics discussed play an important role in the firm’s financial performance. However, the relationship between some of the firm’s characteristics and financial performance have contradict relationship.

2.3 Adoption of Quality and Environmental Certificate: Who adopts Certificate?

The previous section discussed that the firm characteristics play an essential role in achieving firm financial performance. Instead of important for firm financial performance, it is believed that firm characteristics are also essential in influencing the company decision in adopting a certificate or any innovation programmed. However, the study on the firm characteristics influences the GB certificate adoption itself is limited. Therefore, the review of any certificate regarding the quality and environmental standard is included in this section.

Firm characteristics play an essential role in the ISO certificate adoption decision than regulatory requirements [26,27,28,29,30,31]. Firm size is recognized as a relevance indicator in the study about the adoption of the certificate due to the differences in resources strategies between large and small firms. Most of the ISO 9000 registered companies have come from the large firm [31,26,27,28,29]. Pekovic [27] stated that the quality is an important trait for both customer satisfaction and competitive positioning. It is true for all sizes of the firms. Unfortunately, resource constraints such as limited training funds and scarce managerial time have affected the quality of the smaller firm [32]. The small firms were unable to use large standards certificate due to lack of fund support and complexity [28].

Similar to larger firms, older firms often have fewer resource constraints compared to younger firms. The probability of ISO certification increases with firm age [28,29]. Ullah et al. [29] mentioned that the length of time in years shows the establishment of the firm that has been operating in the country. However, Koufopoulos et al. [30] find that small board’s size in Greek shipping companies is better in influencing the firm decision. Hudson and Orviska [28] believed that the managerial experience might affect the firm’s decision either to adopt green technologies or not in-house constructions. In their study, managerial experience is measured based on the number of the years of experience working in the firm sector as a top manager. Richerzhagen et al. [33] and Zhang et al. [34] found that the energy efficiency standard in residential buildings is low due to lack of expert managing the green technologies. They were unable to handle the complex construction process and complicated techniques induced by green technologies.

Firm leverage is also known as another factor that may influence the certificate adoption decision. By using the capital structure ratio as the ratio of debt total assets, Mokhtar and Muda [31] found that ISO 9000 registered companies have lower capital structure than non-ISO 9000 registered companies. In addition, Gupta et al. [35] stated the leverage ratios were decreased the financial structure of a manufacturing firm in American. As for working capital, Mokhtar and Muda [31] show that ISO
companies are more efficient in their working capital management where they can pay off their short-term liabilities compared to non-ISO companies.

Based on Andreou et al. [21], the adoption of quality and environmental certificate also depends on corporate governance status of firms. It is crucial in every major strategic and operational decision of the firm. [36] indicated that the corporate governance status which is CEO decision was influenced to obtain ISO 14001 certification. Hudson et al. [28] and Ullah et al. [29] found that firms with foreign ownership are more likely to adopt ISO certified. According to Ullah et al. [29] firms with foreign ownership have large managerial expertise and better access to resources. This is because firms with foreign ownership tend to face greater internal pressure to implement ISO certification [29].

However, regarding the certain dimension of corporate governance status, the association between corporate governance status and ISO certificate adoption are still ambiguous since prior literature has not definitively established whether corporate governance may influence firm decision or not [38] and [39]. Therefore, it can be concluded that the relationship between corporate governance status and ISO adoption by firms can be both (positive and negative). It depends on the dimension used.

CSR is widely considered as a major factor affecting a business image [34, 47]. Zhang et al. [34] stated that housing developers in the UK have started to grow a CSR culture by realizing the importance of building up green practice in improving their competitive advantages. Implementation of green practice shows a firm’s commitment to social responsibility. By doing this commitment, it will bring a good image of that particular firm and might provide the benefits to the social community. Clearly, it can be stated that by providing high-quality green space is showing the firm’s commitment to CSR.

As a conclusion, all of these firm characteristics which treated as the factors influencing the firm decision (implementation of GB certificate or not) are used in this study. It is believed that the finding obtained through this study is considered as a new finding related to the financial impact of GB certificate in Malaysia, which is none of the studies has done on it.

2.4 Relationship between Quality and Environmental ISO Certificate and Firm Financial Performance

The study about the impact of GB certificate on firm’s financial performance are limited. Thus, the review of any certificate on the quality and environmental standard is included in this section.

Environmental practices have environmental, social, health, and economic impacts. This study focuses on the economic impact by measuring firm’s financial performance, particularly in the aspect of profitability. Firms will seek certification if it is in their financial interests. Having said that, the firms typically agree to implement standard certificate if they can generate revenue exceeding the net costs. Empirical studies have established a strong positive effect of ISO certification on the firm’s financial performance [25,41,42,43].

Mu et al. [43] remarked that firms adopting the phenomena of green marketing could improve their market position and enhance their brand name and organisational performance. Jacobs et al. [25] stated that improved environmental practices help firms to access to new markets and gain revenue. Evolving environmentally conscious markets with an increasing desire for eco-friendly products can lead to new sales opportunities [41]. The firm’s revenue can be gained through many ways of cost reduction including reducing the amount of waste, the consumption of various production inputs such as energy and materials, and the number of components in products [45].

Even though ISO certification is good to be applying in companies, yet some studies showed that it provides negative effect to the firm’s financial performance. Aarts and Vos [42] proved that ISO 14001 registration has a statistically significant positive stock price reaction. Gleason et al. [46] found that green marketing activities lead to negative stock price reaction, suggesting that investors consider green promotional strategies to be value-destroying in nature.
Prior studies outside Malaysia proved that the adoption of ISO certificate and environmental practice have positive and negative impact on the firm’s financial performance because the culture of business operators across the world is different [25,41,46,43]. However, in the case of Malaysia, the impact of environmental practice such as GB practice is still ambiguous. Therefore, the financial impact of GB practice is evaluated in this study. Profitability dimension is used as a measurement for the firm’s financial performance.

2.5 Conceptual Framework of the Financial Impact of Green Building Certificate
Based on 2.1, 2.2, 2.3, and 2.4, it can be summarized that firm’s characteristics influence the firm’s decision towards implementing the environmental and ISO certificate. Then, the impact of the firm’s decision may affect the firm’s financial performance. The firm’s financial performance is mostly measured by profitability. This guideline is used in this study as there are limited number of studies that have been conducted specifically on GB certificate. By using propensity score matching (PSM) technique, the conceptual framework of the firm’s characteristics influenced the firm’s decision towards implementing the GB certificate and the impacts of firm’s decision on firm’s profitability are showed in Figure 1.

Figure 1. Conceptual framework of the firm’s financial performance of green building certificate

3. Methodology

3.1 Data Collection
Focus group discussion (FGD) is applied in the first stage of this study. The purpose of FGD is to get an overview of the GB practice in Malaysia from the developer’s perspective. Two property developers who implement GB practice were interviewed. There are Cyberview Sdn Bhd and Perbadanan Kemajuan Negeri Selangor (PKNS). The FGD session took about two hours between the researcher and managers of the firm. Based on the FGD session, developers expect that the GB practice will generate high return but in a long-term investment. It also will be an attraction for other people and bring the firm’s names to the national and international level. However, there are some issues highlighted by the developers such as the awareness among developers, the upfront cost involved in the early stage of the GB certificate implementation and the developers’ perception towards the GB certificate’s investment. These issues are the main factors that influence developers’ decision to implement GB practice.

This study analysed the firm’s financial impact of green building certificate. The firms involved in the study are property developers. The financial impact is measured using profitability. This study was undertaken in Kuala Lumpur, Selangor, Johor, Perak and Pulau Pinang. These five states were chosen because of up to 2015, the green buildings were developed by the property developers located at these
five states. All of the property developers in Kuala Lumpur, Selangor, Johor, Perak, and Pulau Pinang were treated as population. The list of them was gathered from Jabatan Perumahan Negara. Overall, the total numbers of property developers located in these five states are 2,000. Due to this number of population, the minimum number of sample size to be collected is 322 [47].

This study involves two groups of property developers known as “property developers with GB certificate” and “property developers without GB certificate”. In order to differentiate them, the property developers with GB certificate were first identified. Based on the GBI official website, the number of property developers with GB certificate is 173. However, only 150 property developers with GB certificate were included in this study due to data limitation. For the property developers without GB certificate, a total of 184 data were collected within the range of the asset of the property developers with GB certificate. In total, 334 data were used for the analysis. It is considered enough as the minimum sample size is 322.

Cross-sectional and secondary data sets were used in this study. The financial and annual reports of the property developers for 2015 were collected from Bursa Malaysia and Suruhanjaya Syarikat Malaysia (SSM). All the profits measurement and firm’s characteristics are revealed in these reports. Firm’s characteristics used in this study for data analysis include firm’s age, size, leverage ratio, managerial experience, corporate governance status (number of board of directors), and corporate social responsibility (CSR). The measures for firm’s profitability include return on asset (ROA) and returns on equity (ROE). Simple calculations for each indicator are as follows:

\[
\text{Age of firm (Year)} = \text{Base year (2015)} - \text{Registration year} \\
(3.1)
\]

\[
\text{Size of firm (RM)} = \text{Total Asset of firm} \\
(3.2)
\]

\[
\text{Leverage Ratio (RM)} = \frac{\text{total debt} + \text{total liabilities}}{\text{total income}} \\
(3.3)
\]

Managerial Experience (Year) = Number of year being a manager at particular firm
(3.4)

Corporate governance status = Size of board director (number of board director)
(3.5)

CSR status = Existence of CSR (Dummy Variable: 1 for the firm that has CSR; 0 for the firm that not has CSR)
(3.6)

\[
\text{ROA (RM)} = \frac{\text{Net Income (income after tax)}}{\text{Total asset}} \\
(3.7)
\]

\[
\text{ROE (RM)} = \frac{\text{Net Income}}{\text{Total Equity}} \\
(3.8)
\]

All of these measurements were derived based on previous literature and the availability of data. In this study, the propensity score matching technique and the parametric model were applied in order to analyse the firm financial performance of green building certificate.

3.2 Implementation of Propensity Score Matching (PSM) Technique

The standard framework of this evaluation analysis is the potential outcome approach or Roy-Rubin-model [48] and [49]. The main pillars of this model are individual, treatment, and potential outcome. In this study, an individual is the firm (property developers), treatment is the firm with GB certificate,
and the potential outcome is firm’s financial performance (ROA and ROE). According to [49], the treatment effect is defined in terms of potential outcomes. Each firm only received the control or active treatment. Let \( Y \) be an indicator variable denoting the actual treatment received (\( Y = 0 \) for control treatment (not have green building certificate) and \( Y = 1 \) for active treatment (have green building certificate)). \( ROA_i \) is defined to be equal to \( ROA_i(0) \) if \( Y_i = 0 \) and to be equal to \( ROA_i(1) \) if \( Y_i = 1 \). Alternatively, ROA is defined as:

\[
ROA = Y \cdot ROA(1) + (1 - Y) \cdot ROA(0)
\]  

(3.9)

According to [50], the average treatment effect of treatment on those firms with GB certificate is defined as:

\[
E[ROA(1) - ROA(0) | Y = 1]
\]  

(3.10)

Firm’s characteristics may substantially differ between firms with GB certificate and firms without GB certificate. Due to this issue, insufficient overlap in covariates between the treatment (firms with GB certificate) and control group (firms without GB certificate) exist. Hence, the resulting treatment effect estimates relied heavily on the extrapolation traditional regression model. Due to this assumption, a propensity score matching technique was employed for primary analysis to balance the covariates of firm’s characteristic between these two groups. Figure 2 summarises the steps involved in this study.

![Figure 2. Steps of propensity score matching technique, Source [52]](image)

There are two things need to be concerned when estimating the propensity score. The first one concerns on the model to be used for the estimation and the second one the variable to be included in the model. In this study, logistic regression model was employed to estimate propensity score. The outcome was measured with a dichotomous variable (1 for developers that have GB certificate; 0 for developers that do not GB certificate). The predictors for the adoption of GB certificate are the firm’s characteristic. Following [53], the true propensity score is assumed bounded away from 0 and 1. As adopted by [54], the logistic regression model for \( Y \) can be written as follows:

\[
\logit(Y_i) = \ln \left( \frac{\pi_i}{1 - \pi_i} \right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n
\]  

(3.11)
In this study, $Y_i$ is a binary treatment. Note that, if $Y_i = 1\text{(developers with GB certificate)}$, we obtain $\pi_i$, and if $Y_i = 0\text{(developers without GB certificate)}$, we obtain $1 - \pi_i$. Taking the antilog of equation (3.11) on both sides, the propensity score can be measured as follows:

$$
\pi_i = \frac{e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k}}{1 + e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k}}
$$

(3.12)

Hence, the propensity score in this study was evaluated based on the following formulation:

$$
\pi_i = \frac{e^{\alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR}}{1 + e^{\alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR}}
$$

(3.13)

where $\pi_i$ is the propensity score for each firm, $\alpha$ is the $Y$ intercept, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and $\beta_6$ are regression coefficients of $S$, $DR$, $A$, $ME$, $NBD$, and $CSR$ and $e = 2.71828$ is the base of the system of natural logarithm. In this equation, $A$ represents age of firms, $DR$ represents leverage ratio, $S$ represents size of firm, $ME$ represents managerial experience, $NBD$ represents number of board director, and $CSR$ represents Corporate Social Responsibility.

By using Stata software, nearest neighbour method, kernel method, and radius matching technique were employed. Particularly, any sample of developers without GB certificate should be matched with each developers with GB certificate according to the similar propensity score. The mechanism of matching is determined based on similar characteristic of the data. The matching goal was to balance the sample over all covariates between developers with green building certificate and developers without green building certificate. Any propensity score of control group fall within that range of treated group was chosen as a final sample of control group. The further analysis is based on this final sample chosen.

The financial performance of each developers from propensity score matched sample was evaluated by using linear regression model. In this step, $ROA_i(0)$ and $ROE_i(0)$ from the ‘control’ subsample and $ROA_i(1), ROE_i(1)$ from the ‘treated’ subsample were measured. By using linear regression model, the mathematical formulations for the financial impact of green building certificate are written as follow:

$$
ROA_i(1) = \alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR + \varepsilon_i
$$

(3.14)

$$
ROA_i(0) = \alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR + \varepsilon_i
$$

(3.15)

$$
ROE_i(1) = \alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR + \varepsilon_i
$$

(3.16)

$$
ROE_i(0) = \alpha + \beta_1 S + \beta_2 DR + \beta_3 A + \beta_4 ME + \beta_5 NBD + \beta_6 CSR + \varepsilon_i
$$

(3.17)

The financial impact (ROA and ROE) of GB certificate were evaluated. By using parametric approach that is statistical t-test, the difference in the means of financial performance between developers with GB certificate and developers without GB certificate are revealed. The null hypothesis states that there is no difference between two subsample means. From the equation (3.14) to (3.17), the
potential difference of financial performance between developers with GB certificate and developers without GB certificate is written as follows:

\[ \Delta ROA_i = ROA_i(1) - ROA_i(0) \]  \tag{3.18}
\[ \Delta ROE_i = ROE_i(1) - ROE_i(0) \]  \tag{3.19}

Based on equation (3.18) and (3.19), Average of Financial Impact of GB Certificate (AFIGBC) is formulated as:

\[ AFIGBC = E[\Delta ROA_i] = \frac{\sum_{i=1}^{N} \Delta ROA_i}{N} \]  \tag{3.20}
\[ AFIGBC = E[\Delta ROE_i] = \frac{\sum_{i=1}^{N} \Delta ROE_i}{N} \]  \tag{3.21}

The positive and negative value of equation (3.20) and (3.21) indicates that the GB certificate have a positive financial impact and negative financial impact respectively.

4. Results and Discussions

4.1 PSM Results

As presented in Table 1, the logit results suggest those developers that have large size, older age, and implement CSR are more likely to adopt GB certificate. These are the main observable variables that drive the participation in GB certificate. Based on the FGD, developers also agreed that CSR is the main factor that influences them to implement GB. Although other variables which are debt ratio, managerial experience, and number of board director show insignificant coefficient but it possesses the expected sign. [33] and [34] argued that the lack of experts focusing on managing the green technologies affect them to handle the construction process and techniques induced by green technologies.

Table 2, Table 3, and Table 4 present the nonparametric matching estimates of the average treatment effect of GB certificate (ATT) based on three types of matching technique. These tables revealed the impact of GB certificate on ROA and ROE. It found that average ROA for developers with GB certificate was increased by 7.3%, 4.7%, and 5.3% after matching based on the nearest neighbour method, kernel method, and radius matching method respectively. For the impact of GB certificate on ROE, these three tables indicate that developers with GB certificate receive lower ROE than developers without GB certificate. The finding revealed that ROE for the developers with GB certificate decreased by 1.79%, 0.89%, and 0.59% based on the nearest neighbour method, kernel method, and radius matching method respectively.

This result suggests that GB certificate relatively has positive impact on ROA. This finding is consistent with prior studies by stating that the implementation of green practice such as GB certificate tends to achieve higher financial gains [55], [56], [43], and [11]. GB certificate is able to increase the assets value to developers through innovation. In terms of the impact on ROE, this study found contradicts findings from previous studies. The result of ROE reveals that GB certificate has negative effect on developers’ financial performance. However, even though ROE of developers with GB certificate shows decreasing in percentage but it possesses the expected finding. This result does not come as a surprise as [20] and [8] stated that the implementation of GB certificate introduced in 2009 is noted as a long run investment. ROE is about the return investors take for their investment. Therefore, it makes sense ROE decreased within five years period of implementation of GB certificate by the developers starting from 2010 to 2015 (this is assumed as a short period). Since this study is subjected to the developer’s financial statement in 2015, therefore the findings are considered relevant for the analysis.
Based on the FGD, [8] predicted that the return on their investment in GB practice would take about ten years period. The return on the investment towards GB practice is a matter of time since it involves high upfront cost compared to the developers without GB practice. Within the ten years of GB certificate adoption, it is considered bringing the firm’s names to the community by claiming that their firms implement environmental practices in the construction firm. In the short run period, they also do not focus much on the profit. They are willing to take risk by facing loss in their business in order to gain a good reputation. By doing this, they would have a high chance to get a green building project from public or private investors in the future. In the long run period, it is believed that GB certificate would be able to provide a positively significant result towards ROE.

Table 5 shows the correlation matrix between all of the variables used in the study. The values indicate that the level of correlation for all variable tested is reasonable because all the values are below the benchmark of 0.80 for the rule of thumb [57]. In addition, the VIF test indicates that the maximum VIF value for variables tested is 4.9, which is less than 10. It indicates no multi-collinearity problem [58]. Intrinsically, the estimates could be considered free from the multi-collinearity problem.

Table 1. Logit result for the PSM approach

| Variable | Parameter Estimate |
|----------|--------------------|
| ln S_i   | 0.166***           |
| ln DR_i  | -0.094             |
| ln A_i   | 0.002*             |
| ln ME_i  | 0.004              |
| ln NBD_i | 0.016              |
| CSR_i    | 0.535***           |
| Log-likelihood | -199.163 |
| Pseudo-R² | 0.133              |

Notes: *, **, and *** indicate significant at 10%, 5% and 1% respectively. S is firm size, DR is debt ratio, A is firm age, ME is managerial experience (years), NBD is number of board director, CSR is corporate social responsibility, i and ln are firm and natural logarithm, respectively.

Table 2. Average treatment effect on the treated (Nearest neighbour approach)

| Variable | Sample | Treated | Control | Diff | SE  | t-value |
|----------|--------|---------|---------|------|-----|---------|
| ln ROA   | Unmatched | 5.5717 | 5.4946 | 0.0771 | 0.0412 | 1.87 |
|          | ATT    | 5.5717 | 5.5187 | 0.0530 | 0.0544 | 0.97 |
| ln ROE   | Unmatched | 6.7123 | 6.7307 | -0.0184 | 0.0387 | -0.47 |
|          | ATT    | 6.7123 | 6.7182 | -0.0059 | 0.0422 | -0.14 |

Table 3. Average treatment effect on the treated (Kernal matching approach)

| Variable | Sample | Treated | Control | Diff | SE  | t-value |
|----------|--------|---------|---------|------|-----|---------|
| ln ROA   | Unmatched | 5.5717 | 5.4946 | 0.0771 | 0.0412 | 1.87 |
|          | ATT    | 5.5717 | 5.4983 | 0.0734 | 0.0408 | 1.80 |
| ln ROE   | Unmatched | 6.7123 | 6.7307 | -0.0184 | 0.0387 | -0.48 |
|          | ATT    | 6.7123 | 6.7302 | -0.0179 | 0.0424 | -0.42 |

Note: SE does not take into account that the propensity score is estimated. ATT = average treatment effect on the treated.

Table 4. Average treatment effect on the treated (Radius matching approach)
Table 5. Correlation Matrix

| Variable | Sample    | Treated  | Control | Diff    | SE      | t-value |
|----------|-----------|----------|---------|---------|---------|---------|
| ln ROA   | Unmatched | 5.5717   | 5.4946  | 0.0771  | 0.0412  | 1.87    |
|          | ATT       | 5.5725   | 5.5252  | 0.0473  | 0.0509  | 0.93    |
| ln ROE   | Unmatched | 6.7123   | 6.7307  | -0.0184 | 0.0387  | -0.47   |
|          | ATT       | 6.7121   | 6.7210  | -0.0089 | 0.0446  | -0.20   |

Note: ATT = average treatment effect on the treated

Note: ROA is return on asset, ROE is return on equity, S is firm size, DR is debt ratio, A is firm age, ME is managerial experience (years), NBD is number of board director, i and ln are firm and natural logarithm, respectively

5. Conclusion and Recommendations

This study evaluates the impact of GB certificate on developer’s financial performance. Employing PSM method helps the study to discover that GB certificate increases developer’s financial performance specifically their ROA. The findings indicate that GBI certificate positively affects firm’s financial performance in terms of its ROA but negatively affects its ROE due to short run period (less than 10 years). The finding of this study will be a significant guideline and motivate other developers to implement GB practice in their upcoming project development. Other than that, this finding will refute a few developers’ perception towards the positive financial impact of GB certificate. In term of policy recommendation, the government should propose a new policy by setting the GB practice as a mandatory for certain spaces such as solar panel and water harvesting on buildings. This policy is highly addressed to the developers that build development projects upon the removal of green areas in a considerably large area. Since the GB certificate negatively affect developers’ ROE, the government could introduce new policies related to the requirements of business loan such as lower interest rate to help and encourage more firms to be involved with GB practice. This action offers financial and other benefits for that particular developers, for example, as Malaysia moves forward to become developed country, the current and future generation can still live in a pleasant environment. All of the benefits gained through GB practice will create a sustainable city.

6. Limitations of Study and Recommendations for Future Research

This study only considers the ROA and ROE to evaluate the impact of GB certificate on developer’s financial performance. Due to data limitation, the impact of GB certificate on ROI and ROS cannot be performed in this study. Next, in terms of developers’ characteristics that influence the GB certificate adoption, not all of the developers’ characteristics that have been reviewed in the previous studies are used and tested in this study due to time and financial constraints. The findings would be more accurate and updated if data were collected through face-to-face interview in each developers. Other than that, the comparison of developers’s financial performance before and after GB certification...
which is closely related to the differences in the difference analysis is suggested for the future research. The new finding obtain will reveal the financial impact of GB certificate in a different angle.

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