# Synergistic effects of CSR practices on firm value: Evidence from Asia Pacific emerging markets

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**Abstract**

Corporate social responsibility (CSR) has several attributes that are inherently unobservable or measured with errors. This study proposes an alternative methodology to account for measurement errors in CSR proxies. In this spirit, this study considers CSR to be a latent variable measured by environmental (E), social (S), and governance (G) pillars. To overcome limitations of a single-equation regression, this study employs structural equation modeling (SEM) to investigate the relationship between CSR engagement and firm value. Based on corporate data of nine emerging markets in Asia Pacific from 2010 to 2016, this study provides a number of interesting findings. First, Thailand shows the best performance in terms of the average score of ESG pillars whereas China exhibits the worst. Second, this study demonstrates that traditional regression analysis produces inconsistent relationships between CSR and firm value depending on which CSR proxy enters the regression. By contrast, SEM provides decisive evidence in support of the positive CSR effect on firm value irrespective of which proxy is used to identify CSR latent variable. Third, this study shows that CSR strategies based on a single pillar of ESG or the equally-weighted average of ESG pillars understate the benefits of CSR practices for firm value creation. This implies that CSR initiatives through ESG pillars should not be conducted in isolation since the effective solutions to CSR problems should contain all pillars in order to gain benefit from their synergistic effects. Finally, a main channel for CSR in driving firm value is social engagement rather than environmental and governance involvement, thus suggesting that social activities should be weighted more heavily than other CSR measures. These results have implications for capital market developments in minimizing environmental and social impacts and enhancing good corporate governance practices.

**Keywords:** CSR; firm value; latent variable; ESG; structural equation modeling

## 1. Introduction

Corporate social responsibility (CSR) has received much attention among socially responsible investors and corporate managers who have focused on responsibility to other stakeholders rather than emphasized only shareholders. According to stakeholder theory, companies that diligently seek to meet the expectations of a wider group of stakeholders will create more value over time (Driver and Thompson, 2002; Harrison and Wicks, 2013). Stakeholder theory is closely related to CSR practices to the extent that it suggests how companies can develop long-term relationship with their stakeholders (Hillman and Keim, 2001; Jiao, 2010). Despite much research on CSR effects, the direction of the impact of CSR on firm value is ambiguous and no consensus exists in the empirical literature. There seems to be more support for the view that CSR is positively associated with firm value (e.g., Ammann *et al*., 2011; Fatemi *et al*., 2015; Ghoul *et al*., 2017; Harjoto and Laksmana, 2016; Servaes and Tamayo, 2013). This strand of research believes that companies investing in CSR programs are able to improve corporate image, attract more resources, and enhance operational performance. However, the other strand of thought argues that CSR is harmful to corporate value creation since companies investing in CSR activities incur unnecessary expenses and possibly weaken competitive advantage (e.g., Crisostomo *et al*., 2011; Tandry *et al*., 2014). As a consequence, CSR and firm value may have a negative relationship or no association at all.

The conflicting results in previous research raise important questions on whether CSR activities can be conducted not only to accomplish social goals but also to enhance firm value. The relationship between CSR practices and firm value is inconsistent possibly because model misspecifications and overlooking the channel through which CSR activities affect firm value (Margolis and Walsh, 2001; Ruf *et al*., 2001; Saeidi *et al*., 2015; Servaes and Tamayo, 2013). Some scholars cast doubt on assuming a direct link between

CSR measures and firm value since this relationship tends to be impacted by other intervening or immeasurable factors (e.g., Galbreath and Shum, 2012; Griffin and Mahon, 1997; Margolis and Walsh, 2003). Therefore, the investigation of relationship between CSR activities and firm value is still warrant further methodological development.

CSR is a multidimensional and complex concept that requires the use of multiple indicators (Griffin, 2000; Margolis and Walsh, 2003; Marom, 2006). The accurate measurement of CSR relies on various attributes that are inherently unobservable or measured with errors. As a result, the use of traditional regression analysis seems inappropriate for the examination of relationship between CSR and firm value because measurement errors in CSR measures may correlate with an error term in the regression model, which in turn leads to bias in the estimation of regression coefficients (Acock, 2013; Hair, *et al*., 2012; Loehlin and Beaujean, 2017). To overcome this situation, the current study treats CSR as a latent variable and employs latent variable analysis, namely structural equation modeling (SEM), to examine the effect of CSR on firm value. Different from single-equation regression analysis, SEM consists of a system of equations and explicitly takes into account measurement errors of CSR proxies by putting measurement errors and the error term into separate equations. Measurement errors are included in the measurement equations while the error term is located in the structural equation.

Extant studies usually employ Tobin's Q ratio as a measure of firm value. There is less attention on the relationship between CSR efforts and the price-earnings (PE) ratio. Although both ratios are market-based valuation measures, Tobin's Q ratio depicts the market's valuation of a company relative to its asset-in-place whereas the PE ratio measures company's market capitalization compared to its earnings. Because of its intuitive appeal and practical simplicity, the PE ratio is one of the most widely-used metrics for how investors value firms for equity investment (e.g. Kim and Ritter, 1999; Liu

*et al*., 2002). As a benchmark comparison, the PE ratio enables investors to identify firms that have deviated from their normal valuation levels and firms that are overvalued or undervalued relative to their peers. A higher PE ratio reflects greater expected future gains due to perceived growth opportunities. According to Gordon's (1962) constant growth dividend discount model (DDM), the PE ratio is positively correlated with the expected growth rate but negatively correlated to the discount rate. In addition, a number of studies show that firms conducting better CSR practices have cheaper equity financing and higher earnings growth (e.g., Ghoul and Mishra, 2011; Harjoto and Jo, 2011; Mishra and Suar, 2010). Taken together, the current study hypothesizes that companies adopting effective CSR programs would see enhanced PE ratios given more stable earnings growth and lower discount rate valuations.

This study aims to fill the aforementioned gaps in the literature by proposing an alternative methodology to explore the influence of CSR on firm value. In doing so, CSR is considered to be a latent variable and SEM with firm-fixed effects is utilized to examine the relationship between CSR and firm value. Different from traditional regression analysis, SEM directly takes into account measurement errors of CSR proxies and firm-fixed effects control for time-invariant unobservable firm-specific characteristics that may drive both CSR and firm value. Three pillar scores of environmental, social, and corporate governance from ASSET4 are used as proxies for CSR activities. Based on companies in nine emerging markets in Asia Pacific over the period of 2010 to 2016, the findings of this study reveal that traditional regression analysis produces inconsistent effects of CSR on firm value depending on which CSR proxy enters the regression model. A main channel for CSR in driving firm value is social rather than environmental and governance activities, thus suggesting that social activities should be weighted more heavily than other CSR measures. In contrast to regression analysis, when all CSR proxies are simultaneously

incorporated into SEM with firm-fixed effects, CSR is significantly positively related to firm value. These findings provide important implications for socially responsible investors and corporate managers. Investors who belittle CSR practices in valuing company may commit serious errors in making equity investment choices since CSR is a key determinant of firm value. Corporate managers should engage in all dimensions of CSR because conducting CSR programs based only on any single measure of CSR tends to understate the positive impact of CSR on firm value.

The remainder of this paper is organized as follows. Section 2 presents the literature review. Section 3 explains the analytical framework. Section 4 describes the dataset and variable construction. The empirical results are contained in Section 5. Finally, Section 6 provides concluding remarks.

## 2. Literature review

A number of studies use single-equation regression models to investigate the relationship between CSR efforts and firm value but their findings are rather mixed. In support of a positive effect of CSR on firm value, Jiao (2010) uses Kinder, Lydenberg, Domini (KLD) data to demonstrate that CSR has a positive relationship with company value, as measured by Tobin's Q, if companies meet the expectations of their non-shareholder stakeholders, such as employees, customers, communities, and environment. Harjoto and Jo (2011) find supporting evidence that CSR engagement positively impacts operating performance and firm value. In addition, CSR action is positively associated with governance characteristics and helps reduce conflict of interest between corporate managers and non-investing stakeholders. In a similar vein, Servaes and Tamayo (2013) illustrate that CSR programs enhance firm value but only under certain conditions. Specifically, CSR of firms with high customer awareness, as proxied by advertising expenses, is positively related to firm value.

However, the relation is either negative or insignificant for firms with low customer awareness. Hawn and Ioannou (2016) employ ASSET4 CSR data of 1,492 companies in 33 countries during the period of 2002 to 2008 and their results of panel regression analysis reveal that both internal and external CSR programs jointly contribute to the accumulation of intangible assets and positively affect company's market value. Using 1,718 US companies between 1998 and 2011, Harjoto and Laksmana (2016) utilize panel regression models and find that CSR activities are positively related to firm value since CSR helps reduce excessive risk taking and risk avoidance. Recently, Ghoul *et al*. (2017) use panel regression methods based on data of 2,445 companies in 53 countries from 2003 to 2010 and report that companies in weaker market institutions exhibit more positive relationship between CSR and firm value.

While the above empirical findings have significantly contributed to our knowledge of why a positive relationship between CSR and firm value may be expected, some studies find a negative relationship or no significant relationship. For instance, Soana (2011) uses the correlation methodology to examine the link between CSR measured by ethical rating and financial performance measured by market and accounting ratios in the banking sector. There is no statistically significant relationship between CSR and financial performance. Baird *et al*. (2012) investigate the relation between CSR and financial performance by estimating linear mixed models which allow for time-invariant industry and industry-interaction effects. Their findings confirm the presence of a negative relationship between CSR and financial performance. Crisostomo *et al*. (2011) utilize CSR data of 78 non-financial Brazilian firms over the period of 2001 to 2006 and their estimations of panel regression models show that CSR initiatives are detrimental to corporate value creation. Tandry *et al*. (2014) investigates the linkage between CSR and firm value for non-financial

companies listed in Indonesia Stock Exchange and their results indicate that CSR activities have no significant influence on firm value.

Several studies point out that a possible reason for the lack of consensus among prior research on the relationship between CSR and firm value is model misspecification (e.g., Margolis and Walsh, 2001; Ruf *et al*., 2001; Servaes and Tamayo, 2013). The use of traditional regression analysis that directly associates CSR proxies with firm value might be inappropriate since many factors indirectly influence this relation (Li *et al.*, 2017; Mehralian *et al.*, 2016; Saeidi *et al*., 2015). Due to measurement errors of CSR proxies, traditional regression analysis seems inappropriate for investing the link between CSR and firm value because measurement errors may lead to bias in the estimation of regression coefficients (Hair, *et al*., 2012; Loehlin and Beaujean, 2017). To tackle this problem, CSR should be considered as a latent variable within SEM framework. Unlike regression analysis, SEM uses a system of equations and directly accounts for measurement errors of CSR proxies by putting measurement errors in the measurement equations and the error term in the structural equation (Acock, 2013).

Prior studies generally use Tobin's Q ratio as a measure of firm value in investigating CSR effects (e.g., Fatemi *et al*., 2015; Ghoul *et al*., 2017; Harjoto and Laksmana, 2016; Servaes and Tamayo, 2013). Nonetheless, there is less attention on the impact of CSR activities on the PE ratio. Pietrovito (2016) points out that while Tobin's Q ratio explains the expected future earnings related to those projected by the replacement cost of the company's assets, the PE ratio describes future growth of earnings relative to the projection of current earnings. To find the determinants of the PE ratio, several studies use Gordon's (1962) constant growth dividend discount model (DDM) as a starting point (e.g., Anderson and Brooks, 2006; Huang and Wirjanto, 2012; Wu, 2014). DDM suggests that the PE ratio has a negative relationship with the required rate of return but a positive association with

the dividend payout ratio and the expected growth of dividend. In addition to these factors, the equity risk premium, the risk-free rate, the debt-to-asset ratio, the market capitalization, the market-to-book ratio, and the dividend yield are considered as determinants of the PE ratio in many studies (e.g., Chua *et al*., 2015; Jitmaneeroj, 2016b; Ramcharran, 2002; Wu, 2014). The rationales of these explanatory variables are summarized as follows.

The required rate of return can be computed as a combination of equity risk premium and risk-free rate, both of which should be negatively correlated to the PE ratio (Anderson and Brooks, 2006; Kane *et al*., 1996; Ramcharran, 2002; White, 2000). The growth rate of earnings is frequently used as a measure of company growth in stock valuation, thereby indicating that the PE ratio would be positively associated with earnings growth (Fama and French, 1998). When the dividend yield is higher, the expected return tends to be higher, which in turn could result in lower PE ratio (Fama and French, 1988; Kane *et al*., 1996). Investors require higher returns to compensate for companies with highly leveraged capital structures, thus implying a negative relationship between the debt-to-asset ratio and the PE ratio (Ramcharran, 2002). Larger companies generally have higher PE ratios than do smaller companies partly because mutual funds gravitate toward investing in larger companies (Anderson and Brooks, 2006; Huang and Wirjanto, 2012). Companies with high market-to-book ratios have low growth opportunities and hence low PE ratios (Huang and Wirjanto, 2012; Wu, 2014).

## 3. Analytical framework

The following panel regression model is first estimated to verify whether the relationship between CSR and firm value is consistent across different CSR measures.

$$PE_{it} = \alpha_i + \beta_1 DPR_{it} + \beta_2 GRO_{it} + \beta_3 RFR_{it} + \beta_4 ERP_{it} + \beta_5 MCA_{it} + \beta_6 DAR_{it} + \beta_7 MTB_{it} + \beta_8 DIY_{it} + \beta_9 CSR_{it} + \varepsilon_{it} \quad (1)$$

where $i$ denotes the $i^{th}$ firm, $t$ denotes the $t^{th}$ year, $PE$ is the price-earnings ratio representing the value of the firm, $DPR$ is the dividend payout ratio, $GRO$ is the growth rate of earnings, $RFR$ is the risk-free rate, $ERP$ is the equity risk premium proxied by stock beta, $MCA$ is the market capitalization, $DAR$ is the debt-to-asset ratio, $MTB$ is the market-to-book ratio, $DIY$ is the dividend yield, $CSR$ is the proxy for corporate social responsibility, $\alpha_i$ is the firm-fixed effects term, $\beta_1$ to $\beta_9$ are parameters representing regression relations between explanatory variables and firm value, and $\varepsilon_{it}$ is the error term.

The inclusion of firm-fixed effects ($\alpha_i$ ) in equation (1) is to control for time-invariant unobservable firm characteristics that possibly drive both CSR and firm value. The lack of such controls may result in spurious results and also may account for why traditional regression models with different CSR proxies have produced inconsistent results. This study follows prior research in specifying control variables shown to impact the PE ratio (e.g., Anderson and Brooks, 2006; Wirjanto, 2012; Wu, 2014). As outlined in the literature review, the predicted signs of these controls are as follows: $DPR$ (+), $GRO$ (+), $RFR$ (-), $ERP$ (-), $MCA$ (+), $DAR$ (-), $MTB$ (+), and $DIY$ (-). Based on ASSET4 dataset, CSR measures include three pillar scores: environmental ($ENV$), social ($SOC$), and corporate governance ($GOV$). When socially responsible investors and corporate managers are confronted by several CSR indicators, they tend to rely on an aggregate score as a whole measure of CSR performance. Following the equal weighting scheme of ASSET4, ESG aggregate score ($ESG$) computed as a simple average of three pillar scores is also used as proxies for CSR activities. In estimating equation (1), one of these four CSR proxies enters the model at a time.

Recent studies show that environmental, social, and governance practices should not be advanced in isolation (e.g., Hosseini and Kaneko, 2012; Jitmaneeroj, 2016a). The

effective solutions to CSR problems should make these three activities sustainable. Since CSR is a multidimensional concept and inherently unobservable, CSR can be regarded as a latent variable and latent variable analysis enables to provide a unidimensional measure of CSR (e.g., Edwards and MacCallum, 2013; Madueno *et al*., 2016; Nicolosi *et al*., 2014). A latent variable is not directly observed but rather inferred from other proxies that can be measured. Given several sub-varieties of latent variable analysis, this study estimates the following structural equation modeling (SEM) which integrates the interrelation effects of environmental, social, and governance pillar scores into one latent variable.

$$PE_{it} = \alpha_i + \beta_1 DPR_{it} + \beta_2 GRO_{it} + \beta_3 RFR_{it} + \beta_4 ERP_{it} + \beta_5 MCA_{it} + \beta_6 DAR_{it} + \beta_7 MTB_{it} + \beta_8 DIY_{it} + \beta_9 CSR_{it} + \varepsilon_{it} \quad (2)$$

$$ENV_{it} = \theta_1 + \omega_1 CSR_{it} + \mu_{1it} \quad (3)$$

$$SOC_{it} = \theta_2 + \omega_2 CSR_{it} + \mu_{2it} \quad (4)$$

$$GOV_{it} = \theta_3 + \omega_3 CSR_{it} + \mu_{3it} \quad (5)$$

Similar to equation (1) of panel regression analysis, equation (2) of SEM is the structural equation that represents the relationship between firm value and its explanatory variables. Equations (3) to (5) are the measurement equations that associate a latent variable with its proxies. To elaborate, $CSR$ is the latent variable measured by environmental, social, and governance pillar scores ($ENV$, $SOC$, and $GOV$). $\theta_1$ to $\theta_3$ are the constant terms, $\omega_1$ to $\omega_3$ are parameters (factor loadings) representing relations between observed proxies and the latent variable. $\mu_{1it}$ to $\mu_{3it}$ are measurement errors of CSR proxies. As designed by ASSET4, higher pillar scores are more favorable in terms of CSR performance. This implies that the expected signs of all factor loadings ($\omega_1$ to $\omega_3$) in the measurement equations should be positive.

The measurement models allow each proxy to have its own unique variance and do not reflect the shared variance of the three pillar scores. This is illustrated in equations (3) to

(5), where each pillar score has a corresponding measurement error term. Since all the pillar scores should tap CSR activities, the single-factor model is used in each of measurement equations. The CSR latent variable is what the three pillar scores share in common. The measurement models assume that the latent variable accounts for how companies engage in all pillars of CSR. By isolating the shared variance of the three pillar scores from their unique variances, the structural equation of SEM is likely to produce more reliable results than a panel regression because SEM separates measurement errors from the structural equation (Acock, 2013). The measurement error terms in equations (3) to (5) should not be confused with the structural error term in equation (2). The measurement error terms are associated with proxies of the latent variable but the structural error term reflects the unexplained variance in the dependent variable due to all unmeasured causes (Loehlin and Beaujean, 2017).

It is worth noting the advantages of SEM over traditional regression analysis. First, unlike a single-equation regression model, SEM treats CSR as a latent variable and simultaneously estimates a system of equations. Second, while a traditional regression model implicitly assumes zero measurement error, SEM explicitly separates measurement errors into the measurement equations. Isolating measurement errors from latent variable results in stronger predictive power since measurement errors are assumed to be random errors and as such have no explanatory power. As a consequence, the estimated coefficients in the structural equation (2) are unbiased by measurement errors whereas regression coefficients in equation (1) are not (Acock, 2013; Hair, *et al*., 2012; Loehlin and Beaujean, 2017). Finally, different from ordinary least squares (OLS) regression estimates, SEM usually fits the model using maximum likelihood estimation (MLE) which does not assume uncorrelated error terms.

## 4. Data

In socially responsible investment, CSR performance is frequently referred to an integration of environmental, social, and corporate governance performance as these factors are important measures for corporate sustainability (e.g., Nicolosi *et al*., 2014; Crifo *et al*., 2015). Since 2002, ASSET4 has gathered CSR data as measured by environmental (ENV), social (SOC), and corporate governance (GOV) pillar scores. The definitions of these pillar scores can be referred to the Appendix. By using z-scores to benchmark company's score against the average score of all companies, the pillar scores are normalized in a range between 0 and 100. Higher scores are more favorable in terms of CSR performance. The equally-weighted average of ENV, SOC and GOV scores, namely ESG score, is calculated in order to provide the aggregate measure of CSR performance.

This study focuses on companies in nine emerging markets in Asia Pacific where there is a wide variety of CSR data available over the period of 2010 to 2016. Following the definitions of ASSET4, these nine emerging markets include China, Hong Kong, India, Indonesia, Malaysia, Phillipines, South Korea, Taiwan, and Thailand. Table 1 reports the number of companies in each country and the medians of pillar scores as well as the aggregate ESG score.[1] Compared to the mean score, the median score is less affected by outliers and more suitable for comparing data across countries. Among three pillar scores, corporate governance tends to get the lowest scores for most countries including India, Indonesia, Philippines, South Korea, Taiwan, and Thailand. In terms of the average ESG score, Thailand shows the best performance whereas China exhibits the worst performance of all the nine emerging markets in Asia Pacific.

[Table 1 around here]

[1] As Soana (2011) pointed out, banks generally have specifics in financial performance and different CSR practices from other industries. In this regard, this study also excludes banks from the analysis but the estimated results are qualitatively similar. Therefore, this study presents the results of companies in all industries including banks in the subsequent analysis.

In addition to CSR data, corporate financial data employed to compute the PE ratio and control variables are obtained from Thomson Reuters Eikon whose data definitions are briefly summarized in the Appendix. It is noted that, among several definitions of the PE ratio, this study uses the trailing PE ratio as a main measure of firm value throughout the subsequent analysis. The trailing PE ratio is derived by dividing the total market value of stock at the end of the year by the total earnings of the current year. Observations for which earnings are negative are deleted. The negative earnings post a difficult interpretation since traditional earnings capitalization models describe that investors are willing to pay a certain multiple for current earnings (Huang and Wirjanto, 2012). After data treatment, the unbalanced panel data are composed of 3,427 firm-year observations in total. Descriptive statistics of variables are reported in Table 2. All variables in the dataset are positive and most of them are rather skewed. In the following analysis, the natural logarithm is thus applied to each variable before estimating equations. The logarithmic transformation somewhat moderates the skewness problems and makes slope coefficients comparable across all independent variables.

[Table 2 around here]

## 5. Empirical results

### 5.1 Panel regression approach

Prior to estimating equation (1), it is necessary to examine whether each variable is stationary. The Augmented Dickey-Fuller (ADF) test is used in this study because it is able to test unit roots of the unbalanced panel data. As shown in Table 2, the inverse normal (Z) and modified inverse chi-squared (Pm) statistics of the panel ADF tests show that the null hypothesis of panels containing unit roots is rejected for any variable at a highly significance level. This implies that all variables are stationary and can be used in a panel regression analysis.

[Table 3 around here]

The estimations of equation (1) in various scenarios are reported in Table 3. The PE ratio in model 1 is first estimated as a function of all explanatory variables except CSR proxies. This baseline model will constitute a building framework for examining the impact of individual CSR measures on firm value. The results of model 1 show that the estimated coefficient of any control variable is significantly different from zero at the 1% level, except for equity risk premium ($ERP$) and debt-to-asset ratio ($DAR$) whose estimated coefficient is significant at 5% and 10%, respectively. In line with a number of previous empirical studies, the PE ratio is positively correlated to dividend payout ratio ($DPR$), growth rate ($GRO$), market capitalization ($MCA$), and market-to-book ratio ($MTB$) but negatively associated with risk-free rate ($RFR$), equity risk premium ($ERP$), debt-to-asset ratio ($DAR$), and dividend yield ($DIY$) (e.g., Anderson and Brooks, 2006; Huang and Wirjanto, 2012; Jitmaneeroj, 2017; Ramcharran, 2002; White, 2000).

The baseline model is then extended by including one CSR proxy as an additional explanatory variable at a time. Proxies for CSR in models 2 to 4 are $ENV$, $SOC$, and $GOV$ pillar scores, respectively. The results of models 2 to 4 show that the estimated coefficients of all control variables display the correct signs and are broadly similar to those of the baseline model. The signs and significance levels of the estimated coefficients on CSR proxies are varied depending on which CSR proxy enters the regression model. The estimated coefficients of all CSR proxies are positive with the exception of $ENV$. In terms of significance level, only the estimated coefficient of $SOC$ is positive and statistically significant at the 5% level. This result indicates that $SOC$ is the main channel through which CSR activities affect firm value. To enhance firm value, the solutions to CSR strategies should make all of these three CSR proxies achievable (Jitmaneeroj, 2016a). The analysis is then taken a step further by simultaneously incorporating all pillar scores into

estimations as shown in model 5. It can be seen that the estimated coefficients of $ENV$, $SOC$, and $GOV$ are insignificant at any conventional level of significance. Given these mixed findings, it seems difficult to draw a clear-cut conclusion on whether CSR as a whole has a positive, negative, or neutral effect on firm value.

When socially responsible investors and corporate managers are confronted by several CSR indicators, they possibly have recourse to the aggregate score which is a single indicator that could serve as a whole measure of CSR engagement in environmental, social, and governance activities. In this respect, equation (1) is re-estimated by using the equally-weighted average score of ENV, SOC, and GOV pillar scores, namely ESG score. The estimated result of model 6 in Table 3 reveals that the link between the aggregate ESG score and firm value is positive but insignificant. This finding suggests that the important role of SOC in model 3 in driving firm value is overshadowed by the equally-weighted ESG score. In fact, social activities should be weighted more heavily than other CSR measures. A lack of explanatory power of simple average ESG score is in line with Marom (2006) who argues that the aggregate CSR score seems to provide confounded results in empirical analysis of the relationship between CSR and firm performance. The current study therefore suggests that the decision to adopt CSR orientated activities using the equally-weighted ESG score tends to understate the influence of CSR on firm value since a simple average of ENV, SOC, and GOV scores assumes each factor has an identical contribution to CSR. In other words, improving the performance of any CSR activity would equally contribute to the development of CSR as a whole. This seems untrue in real world applications since different companies may have their own strategies for improving certain CSR activities at a time.

[Table 4 around here]

### 5.2 Structural equation modeling approach

Depending on the selection of CSR proxies to enter the model, panel regression analysis in previous subsection produces diverse relationship between CSR and firm value. Since any proxy is almost absolutely an imperfect measure of CSR, this problem can be overcome by defining CSR to be a latent variable and employing SEM to examine the impact of CSR on firm value.

Allowing for interrelations among environmental, social, and governance activities of CSR, SEM is estimated by using equations (2) to (5) which contain one latent variable, $CSR$, to capture the combined effects of three pillar scores. Table 4 reports the estimations of SEM, with the results of the measurement equations in Panel A, the structural equations in Panel B, and the goodness-of-fit statistics in Panel C. The first focus is on the results of measurement equations in Panel A. To identify the variance of latent variable, the factor loading ($\omega$) of one CSR proxy in equations (3) to (5) should be fixed at 1 (e.g., Acock, 2013; Bentler and Dudgeon, 1996; Posso and Tawadros, 2013). The proxy whose factor loading equals 1 is called the reference proxy. In this regard, $ENV$, $SOC$, and $GOV$ are the reference proxies for models 7 to 9, respectively. Regardless of the reference proxies, all estimated factor loadings ($\omega_1$ to $\omega_3$) in each model are positive and statistically significant at the 1% level. The positive signs of all factor loadings imply that higher pillar scores are more favorable in terms of CSR performance.

For the results of structural equations in Panel B, it is evidently clear that the main findings across models 7 to 9 are fairly consistent. The estimated coefficients of all control variables display the expected signs and are statistically significant at the 1% level, with the exception of risk free rate ($RFR$), equity risk premium(($ERP$), and debt-to-asset ratio ($DAR$) whose estimated coefficients are statistically significant at 5%, 5%, and 10%, respectively. Independent of which proxy is chosen to identify CSR latent variable, the

estimated coefficient of $CSR$ in any model is positive and significant at the 1% level, with a larger magnitude than those of most control variables. The results from SEM strongly support the proposition that CSR activities positively affect firm value. Strikingly, the size of the CSR effect in models 7 to 9 (0.257, 0.269, and 0.240) is much larger than that of the estimated coefficient of social pillar score in model 3 (0.046). This indicates that although SOC is a main channel through which CSR affects firm value, the benefit of CSR in driving firm value is due to the integrated effect of ENV, SOC, and GOV activities, rather than any single CSR activity. In line with suggestions of Hosseini and Kaneko (2012) and Jitmaneeroj (2016a), environmental, social, and governance activities of CSR should not be advanced in isolation because enhancing firm value needs the integration of these activities.

The results for goodness-of-fit in Panel C assess how well SEM fits the data. The value of R-squared shows that 71.08% of the variance in the PE ratio is explained. The value of R-squared is higher in SEM approach than in regression analysis (R-squared ≈ 65.00% – 68.00%) possibly because pillar scores are specified as measurements of a latent variable and measurement errors in pillar scores are moved to their corresponding error term in equations (3) to (5); that is, a measurement portion of the model is included in addition to the structural equation. The comparative fit index (CFI) of 0.971 is better than the conventional target of 0.950 (Kim, 2005).[2] The root mean squared error of approximation (RMSEA) of 0.012 is well below the goal of being less than 0.050 (Browne and Cudeck, 1993).[3] Both CFI and RMSEA goodness-of-fit statistics indicate that SEM in models 7 to 9 fits the data quite well.

[2]CFI is in the range of 0 to 1. A higher value indicates a better goodness-of-fit. An acceptable fit is larger than 0.95 (Kim, 2005).

[3]RMSEA in the range of 0.00 to 0.05 indicates close fit, RMSEA between 0.05 and 0.08 indicates fair fit, and RMSEA between 0.08 and 0.10 indicates mediocre fit. RMSEA above 0.10 indicates unacceptable fit (Browne and Cudeck, 1993)

### 5.3 Robustness tests

As several studies suggested, CSR is a corporate strategy that works in the relatively long period (e.g. Campbell, 2007; Garriga and Mele, 2004; Servaes and Tamayo, 2013). A possible concern in the current study is that the results reported above do not allow for an enough time lag between CSR and firm value. To address this plausible problem, SEM in equations (2) to (5) is re-estimated by lagging CSR proxies by one year for model 10 in Table 5. This kind of robustness check reduces the number of observations that can be included in the estimations so the robustness test is limited to one-year lag effect between CSR and firm value. Qualitatively the estimation results of model 10 are very similar to those of models 7 to 9 in Table 4, with a slight reduction in the estimated coefficients of $CSR$ (0.225) and the value of R-squared (69.17%).[4] This slight weakening of the results most likely reflects the small sample size.

[Table 5 around here]

Another concern is that the trailing PE ratio is employed as a main measure of firm value throughout this study. The trailing PE ratio is usually computed using the past 12-month earnings per share. Unlike the trailing PE ratio, the forward PE ratio (FPE) is calculated by dividing the year-end closing price of stock by the forecasted earnings per share for the next 12 months. Another robustness check is conducted by re-estimating equations (2) to (5) using the FPE ratio as an alternative measure of firm value. In this study, the FPE ratio is also obtained from Thomson Reuters Eikon. Descriptive statistics and unit root tests of the FPE ratio are summarized in Table 1. Compared to those of PE ratios, the mean and median of FPE ratios are relatively lower. This suggests that the earnings per share are expected to increase in the future. For the panel ADF unit root tests, the null hypothesis that the FPE ratio has unit roots is rejected at the 1% level. Hence, the

[4] To save space, robustness checks only report the estimations of SEM using ENV as a reference proxy. Employing SOC or GOV as the reference proxy leads to the same conclusion. The complete results are available upon request.

FPE ratios can be used in the estimation of SEM. As reported in model 11 in Table 5, the estimated coefficient of $CSR$ (0.203) is slightly lower than the estimated coefficients of $CSR$ (0.240 – 0.269) in models 7 to 9 in Table 4.

The PE ratio is generally used to compare the relative values of firms in the same industry. Several scholars point to industry differences as an important determinant of the PE ratio (e.g., Bodie *et al*., 2014; Kang *et al*., 2010). However, time-invariant unobservable industry characteristics that possibly affect both CSR and the PE ratio are not controlled in the estimations of SEM in models 7 to 9. As a robustness check, SEM in equations (2) to (5) is re-estimated with the inclusion of industry-fixed effects.[5] The estimation of model 12 in Table 5 shows that the estimated coefficient of $CSR$ (0.219) is within the range of models 7 to 9 (0.240 – 0.269) and that R-squared (73.17%) is relatively higher than that of models 7 to 9 (71.08%).

In addition, the goodness-of-fit statistics of models 10 to 12 in Table 5 show that CFI is greater than 0.95 and RMSEA is lower than 0.05 for any model. These measures of fit are all acceptable, indicating that SEM is adequate. Taken altogether, even though there are some variations of the estimated results across several SEM specifications and CSR proxies, the results of robustness checks in models 10 to 12 in Table 5 are broadly consistent with the findings of models 7 to 9 in Tables 4. Therefore, it can be concluded that this study finds robust evidence of the positive CSR effect on firm value for companies in emerging markets in Asia Pacific.

[5] By the same token, the inclusion of country-fixed effects leads to the same conclusion despite some variations on the estimated coefficients.

# 6. Concluding remarks

## 6.1 Conclusions

To gain more nuanced understanding of the CSR effect on firm value, it is necessary to account for measurement errors in CSR indicators. However, many prior studies often assume a direct link between CSR proxies and firm value and employ traditional regression analysis. This may lead to unreliable results or even spurious relationships since measurement errors of CSR proxies may correlate with an error term of the regression model, which in turn causes bias in the estimation of regression coefficients. In an attempt to advance the literature in this important aspect, the current study treats CSR as a latent variable and uses structural equation modeling (SEM) to explicitly take into account measurement errors of CSR proxies. Different from a single-equation regression, SEM uses a system of equations consisting of measurement and structural equations. SEM separates measurement errors of CSR proxies from the error term of regression by putting measurement errors in measurement equations and the error term in structural equation.

In this study, CSR measures are derived from ASSET4 for companies in nine emerging markets in Asia Pacific over the period of 2010 to 2016. These CSR proxies include environmental, social, and governance pillar scores. This study empirically demonstrates that traditional regression analysis provides inconsistent relationship between CSR and firm value depending on which CSR proxy is selected to enter the model. To be more specific, only social pillar score significantly positively affects firm value. Environmental and governance have insignificant influence on firm value. When all pillar scores are simultaneously used as CSR proxies in regression analysis, CSR exhibits no relationship with firm value. Similarly, the equally-weighted aggregation of environmental, social, and governance pillar scores, namely ESG score, has insignificant association with firm value.

While regression analysis produces diverse and inconclusive results, SEM decisively shows that the combined effect of environmental, social, and governance pillar scores significantly positively impacts firm value. In other words, firms engaging in all CSR dimensions including environmental, social, and governance practices can significantly add to the value of the firm. This finding is robust to the inclusion of several control variables and a series of robustness checks. This study therefore recommends that a CSR decision-making process based only on a single measure of CSR or the equally-weighted average of CSR measures tends to understate the benefits of CSR practices for enhancing firm value

### 6.2 Policy implications

The analysis in this study has several implications for corporate managers in conducting CSR programs to enhance firm value, capital market regulators in promoting CSR campaigns, and socially responsible investors in screening stocks for investment. First, performing CSR assessment based on any single pillar score is likely to undervalue the CSR benefits for corporate value creation. Although social engagement is a main channel for corporate value creation, the ultimate influence of CSR on firm value is due to the combined effect of environmental, social, and governance activities, rather than any single CSR activity. Therefore, corporate managers should implement strategic CSR programs covering these activities in an integrated manner. However, if a company has limited resources for conducting all dimensions of CSR programs, corporate managers should give the first priority to social rather than environmental and governance activities since social engagement is a critical driver for corporate value creation. Second, to steer CSR concerns, capital market regulators may offer tax incentives to encourage companies for taking the initiatives to minimize environmental and social impact and enhance good governance

practices. Finally, as investors increasingly look beyond the traditional financial statement analysis, they can use information regarding environmental, social and governance performance when screening for potential investments and assessing potential risks. Investors who downplay the importance of CSR factors in firm valuation can lead to considerable errors in making equity investment choices as CSR is one of the key determinants of firm value.

### 6.3 Limitations of the study

While the current study provides important insights into the positive effect of CSR on firm value, its limitations suggest several directions for future research. First, although ASSET4 has more than 278 key performance indicators (KPIs) of CSR, this study limits the analysis to aggregated pillar scores of CSR due to data availability. If these KPIs are accessible in the future, SEM specifications proposed in this study can be re-estimated to verify whether the current conclusions hold true for KPIs. Second, this study only focuses on CSR data obtained from ASSET4. An obvious extension of this research would be an examination of relationship between CSR and firm value by using other CSR datasets such as KLD Research & Analytics and Bloomberg Sustainability. Finally, the findings of positive CSR effects for companies in nine emerging markets in Asia Pacific should not be generalized to firms in other emerging or developed markets due to possible differences in CSR practices. As CSR gains importance for companies around the world, the re-estimations of SEM for companies in other countries, especially developed economies, may contribute to the understanding of different CSR effects between emerging and developed economies.

## Appendix

| |
|---|
| The environmental pillar score ($ENV$): This pillar score measures corporate influences on living and non-living natural systems in order to avoid environmental risk. |
| The social pillar score ($SOC$): This pillar score measures corporate abilities to generate loyalty and trust among employees, customers, and society. |
| The governance pillar score ($GOV$): This pillar score measures corporate systems and processes to assure that the company's executives and board members perform in order to generate long-term shareholder value. |
| The price-earnings ratio ($PE$): the PE ratio of a company's current share price relative to its earnings per share (EPS). EPS is last twelve months (LTM) earnings per share from continuing operations. The PE ratio is not calculated when LTM EPS is less than or equal to zero. |
| The forward price-earnings ratio ($FPE$): The FPE ratio of a company's current share price relative to its estimated earnings per share (EPS) for the next year. The FPE ratio is not calculated when forward EPS is less than or equal to zero. |
| The dividend payout ratio ($DPR$): The dividend payout ratio is the ratio of gross dividends of common stocks for the trailing twelve months divided by income available to common stocks excluding extraordinary items for the same period and is expressed as percentage. |
| The growth rate of earnings ($GRO$): The long-term growth rate of earnings is the statistical average of all broker estimates. Long-term growth is an estimate of the compound average rate of EPS growth and analyst expects over a period of three to five years. |
| The risk-free rate ($RFR$): The risk-free rate is benchmarked by the three-month treasury bill rate. |
| The equity risk premium ($ERP$): The equity risk premium is proxies by 5-year monthly beta which is the measure of a company's common stock price volatility relative to market price volatility for a 5-year duration using a least square linear regression line. 5-year beta is calculated using monthly close price values with a minimum of 40 monthly price close points required within the 5 year trading period. |
| The market capitalization ($MCA$): Company market capitalization represents the sum of market value for all relevant issue level share types. The issue level market value is |

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| calculated by multiplying the requested shares type by latest close price. This item supports default, free float, and outstanding shares types. |
| The debt-to-asset ratio ($DAR$): The debt to asset ratio is calculated as the net debt divided by total asset. Net debt represents the sum of total debt, minority interest, redeemable and non-redeemable preferred stock less cash, cash and equivalents, and short-term investments. |
| The market-to-book ratio ($MTB$): The price to book value per share is calculated by dividing the company's latest closing price by its book value per share. Book value per share is calculated by dividing total equity by current total shares outstanding. |
| The dividend yield ($DIY$): The ratio of the annualized dividends to the price of stock. Dividends are adjusted to account for any stock splits during the 12-month period. Gross dividends are used to calculate dividend yield. The price is the closing price on the prior trading day. |

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Table 1: Sample sizes and medians of ESG scores by countries from 2010 to 2016

| Country | No. of companies (%) | ECN | SOC | GOV | ESG |
|---|---|---|---|---|---|
| China | 96 (14.93%) | 28.22 | 22.95 | 24.21 | 27.06 |
| Hong Kong | 47 (7.31%) | 18.30 | 18.23 | 39.91 | 29.15 |
| India | 103 (16.02%) | 59.83 | 55.92 | 33.86 | 54.77 |
| Indonesia | 38 (5.91%) | 46.26 | 66.39 | 22.40 | 52.51 |
| Malaysia | 52 (8.09%) | 36.86 | 53.13 | 53.61 | 51.55 |
| Philippines | 26 (4.04%) | 33.24 | 35.43 | 31.04 | 38.70 |
| South Korea | 115 (17.88%) | 80.08 | 79.37 | 29.01 | 55.90 |
| Taiwan | 130 (20.22%) | 45.99 | 32.44 | 27.64 | 35.75 |
| Thailand | 36 (5.60%) | 52.37 | 68.56 | 47.06 | 59.62 |

Notes: This table classifies a total sample of 643 companies by countries. Three pillar scores of CSR include environmental (ECN), social (SOC), and corporate governance (GOV). Following ASSET4 methodology, ESG score is computed by using the equally-weighted average of ECN, SOC, and GOV. Compared to the mean score, the median score is less affected by outliers and more suitable for comparing data across countries.

Table 2: Descriptive statistics and unit root tests

| Variable | Mean | Median | Standard deviation | Inverse normal (Z) | Modified inverse chi-squared (Pm) |
|---|---|---|---|---|---|
| $PE$ | 24.14 | 16.10 | 62.12 | -14.57*** | 16.29*** |
| $DPR$ | 0.33 | 0.29 | 0.26 | -13.58*** | 15.12*** |
| $GRO$ | 0.11 | 0.09 | 0.16 | -14.62*** | 18.71*** |
| $RFR$ | 0.03 | 0.02 | 0.02 | -15.28*** | 20.56*** |
| $ERP$ | 1.14 | 1.10 | 0.69 | -26.47*** | 32.52*** |
| $MCA$ | 8.60 | 3.62 | 20.34 | -13.66*** | 14.59*** |
| $DAR$ | 0.25 | 0.22 | 0.20 | -12.13*** | 16.83*** |
| $MTB$ | 3.43 | 1.73 | 18.45 | -21.86*** | 25.14*** |
| $DIY$ | 0.02 | 0.02 | 0.02 | -17.71*** | 21.42*** |
| $ENV$ | 47.38 | 42.02 | 30.42 | -13.34*** | 17.82*** |
| $SOC$ | 46.53 | 41.87 | 31.60 | -17.89*** | 20.89*** |
| $GOV$ | 26.78 | 20.00 | 23.03 | -18.59*** | 17.93*** |
| $ESG$ | 28.32 | 21.90 | 23.47 | -17.46*** | 17.21*** |
| $FPE$ | 18.13 | 13.23 | 46.08 | -14.48*** | 18.16*** |

Notes: This table provides aggregated descriptive statistics and unit root tests of all firm-year variables: price-earnings ratio ($PE$), forward price-earnings ratio ($FPE$), dividend payout ratio ($DPR$), growth rate of earnings per share ($GRO$), risk-free interest rate ($RFR$), equity risk premium ($ERP$) as measured by stock beta, market capitalization ($MCA$: billion USD), debt-to-asset ratio ($DAR$), market-to-book ratio ($MTB$), dividend yield ($DIY$), environment score ($ENV$), social score ($SOC$), governance score ($GOV$), and the equally-weighted aggregation of environment, social, and governance scores ($ESG$). The Augmented Dickey-Fuller (ADF) test with drift and two lags is performed under the null hypothesis that the panel variables contain unit roots. The inverse normal (Z) and modified inverse chi-squared (Pm) statistics are reported for the ADF test. *, **, *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 3: The estimations of panel regression models

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | $PE$ | $PE$ | $PE$ | $PE$ | $PE$ | $PE$ |
| Panel A: Control variables | | | | | | |
| $DPR$ | 0.156*** [7.14] | 0.182*** [7.37] | 0.182*** [7.39] | 0.183*** [7.41] | 0.182*** [7.38] | 0.184*** [7.44] |
| $GRO$ | 0.307*** [38.41] | 0.310*** [33.77] | 0.309*** [33.74] | 0.309*** [33.68] | 0.309*** [33.63] | 0.309*** [33.73] |
| $RFR$ | -0.127*** [-4.60] | -0.145*** [-4.74] | -0.140*** [-4.58] | -0.145*** [-4.73] | -0.140*** [-4.54] | -0.143** [-4.68] |
| $ERP$ | -0.017** [-2.14] | -0.035** [-2.38] | -0.035** [-2.29] | -0.034** [-2.16] | -0.035** [-2.21] | -0.035** [-2.35] |
| $MCA$ | 0.186*** [6.45] | 0.093*** [2.74] | 0.087*** [2.68] | 0.100*** [2.81] | 0.087*** [2.78] | 0.089*** [2.77] |
| $DAR$ | -0.004* [-1.83] | -0.005* [-1.78] | -0.004* [-1.74] | -0.005* [-1.81] | -0.004* [-1.86] | -0.004* [-1.70] |
| $MTB$ | 0.141*** [4.11] | 0.167*** [4.19] | 0.174*** [4.39] | 0.159*** [4.09] | 0.173*** [4.33] | 0.171*** [4.31] |
| $DIY$ | -0.179*** [-9.57] | -0.206*** [-9.56] | -0.207*** [-9.62] | -0.206*** [-9.55] | -0.207*** [-9.61] | -0.207*** [-9.61] |
| Panel B: CSR proxies | | | | | | |
| $ENV$ | - | -0.023 [-0.95] | - | - | -0.007 [-0.24] | - |
| $SOC$ | - | - | 0.046** [2.01] | - | 0.051 [1.60] | - |
| $GOV$ | - | - | - | 0.003 [0.37] | 0.002 [0.27] | - |
| $ESG$ | - | - | - | - | - | 0.035 [1.49] |
| $R^2$ | 0.6540 | 0.6724 | 0.6733 | 0.6722 | 0.6734 | 0.6729 |

Notes: This table presents the estimations of panel regression models in equation (1). The variables in models are listed as follows: price-earnings ratio ($PE$), forward price-earnings ratio ($FPE$), dividend payout ratio ($DPR$), growth rate of earnings per share ($GRO$), risk-free interest rate ($RFR$), equity risk premium ($ERP$) as measured by stock beta, market capitalization ($MCA$), debt-to-asset ratio ($DAR$), market-to-book ratio ($MTB$), dividend yield ($DIY$), environment pillar score ($ENV$), social pillar score ($SOC$), corporate governance pillar score ($GOV$), and the equally-weighted aggregation of environment, social, and governance scores ($ESG$). The robust t-statistics are shown in brackets. *, **, *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 4: The estimations of structural equation modeling (SEM)

| | Model 7<br>$\omega_1 = 1$ | Model 8<br>$\omega_2 = 1$ | Model 9<br>$\omega_3 = 1$ |
|---|---|---|---|
| Panel A: Measurement equations | | | |
| | $CSR$ | $CSR$ | $CSR$ |
| $ENV$ | 1<br>- | 0.709***<br>[23.33] | 0.697***<br>[4.06] |
| $SOC$ | 0.410***<br>[23.33] | 1<br>- | 0.426***<br>[4.08] |
| $GOV$ | 0.193***<br>[4.05] | 0.167***<br>[4.08] | 1<br>- |
| Panel B: Structural equations | | | |
| | $PE$ | $PE$ | $PE$ |
| $DPR$ | 0.445***<br>[23.75] | 0.445***<br>[23.75] | 0.445***<br>[23.75] |
| $GRO$ | 0.237***<br>[26.02] | 0.237***<br>[26.02] | 0.237***<br>[26.02] |
| $RFR$ | -0.021**<br>[-2.19] | -0.021**<br>[-2.19] | -0.021**<br>[-2.19] |
| $ERP$ | -0.031**<br>[-2.24] | -0.031**<br>[-2.24] | -0.031**<br>[-2.24] |
| $MCA$ | 0.030***<br>[3.24] | 0.030***<br>[3.24] | 0.030***<br>[3.24] |
| $DAR$ | -0.007*<br>[-1.72] | -0.007*<br>[-1.72] | -0.007*<br>[-1.72] |
| $MTB$ | 0.196***<br>[15.37] | 0.196***<br>[15.37] | 0.196***<br>[15.37] |
| $DIY$ | -0.435***<br>[-26.89] | -0.435***<br>[-26.89] | -0.435***<br>[-26.89] |
| $CSR$ | 0.257***<br>[3.82] | 0.269***<br>[3.95] | 0.240***<br>[3.68] |
| Panel C: Goodness-of-fit tests | | | |
| $R^2$ | 0.7108 | 0.7108 | 0.7108 |
| $CFI$ | 0.971 | 0.971 | 0.971 |
| $RMSEA$ | 0.012 | 0.012 | 0.012 |

Notes: This table presents the estimations of SEM using equations (2) to (5). Panel A reports the results for measurement equations. Panel B shows the results of structural equations. Panel C reports goodness-of-fit statistics. The variables in models are listed as follows: price-earnings ratio ($PE$), forward price-earnings ratio ($FPE$), dividend payout ratio ($DPR$), growth rate of earnings per share ($GRO$), risk-free interest rate ($RFR$), equity risk premium ($ERP$) as measured by stock beta, market capitalization ($MCA$), debt-to-asset ratio ($DAR$), market-to-book ratio ($MTB$), dividend yield ($DIY$), environment pillar score ($ENV$), social pillar score ($SOC$), and corporate governance pillar score ($GOV$). $ENV, SOC,$ and $CGV$ are used to identify $CSR$ of models 7 to 9, respectively. The robust z-statistics are shown in brackets. Goodness-of-fit statistics includes R-squared, comparative fit index (CFI), and root mean squared error of approximation (RMSEA). *, **, *** indicate significance at the 10, 5 and 1 percent level, respectively.

Table 5: Robustness tests of structural equation modeling (SEM)

| | Model 10<br>1-year lagged CSR proxies<br>$\omega_1 = 1$ | Model 11<br>The FPE ratio<br>$\omega_1 = 1$ | Model 12<br>Industry-fixed effects<br>$\omega_1 = 1$ |
|---|---|---|---|
| Panel A: Measurement equations | | | |
| | $CSR$ | $CSR$ | $CSR$ |
| $ENV$ | 1<br>- | 1<br>- | 1<br>- |
| $SOC$ | 0.402***<br>[22.78] | 0.414***<br>[21.98] | 0.408***<br>[23.17] |
| $GOV$ | 0.187***<br>[3.95] | 0.177***<br>[3.78] | 0.187***<br>[4.01] |
| Panel B: Structural equations | | | |
| | $PE$ | $PE$ | $PE$ |
| $DPR$ | 0.438***<br>[21.52] | 0.419***<br>[19.82] | 0.440***<br>[22.91] |
| $GRO$ | 0.241***<br>[24.87] | 0.225***<br>[25.19] | 0.239***<br>[25.28] |
| $RFR$ | -0.020**<br>[-2.07] | -0.019**<br>[-2.11] | -0.020**<br>[-2.16] |
| $ERP$ | -0.030**<br>[-2.19] | -0.031**<br>[-2.22] | -0.031**<br>[-2.25] |
| $MCA$ | 0.029***<br>[3.13] | 0.030***<br>[3.06] | 0.032***<br>[3.18] |
| $DAR$ | -0.006*<br>[-1.70] | -0.007*<br>[-1.71] | -0.007*<br>[-1.69] |
| $MTB$ | 0.193***<br>[13.82] | 0.182***<br>[12.37] | 0.189***<br>[14.92] |
| $DIY$ | -0.419***<br>[-24.18] | -0.403***<br>[-23.32] | -0.431***<br>[-25.68] |
| $CSR$ | 0.225***<br>[3.26] | 0.203***<br>[3.73] | 0.219***<br>[3.59] |
| Panel C: Goodness-of-fit tests | | | |
| $R^2$ | 0.6917 | 0.6832 | 0.7317 |
| $CFI$ | 0.961 | 0.958 | 0.969 |
| $RMSEA$ | 0.028 | 0.034 | 0.021 |

Notes: This table reports the results of robustness checks using SEM in equations (2) to (5). Panel A reports the results for measurement equations. Panel B shows the results of structural equations. Panel C reports goodness-of-fit statistics. The variables in models are listed as follows: price-earnings ratio ($PE$), forward price-earnings ratio ($FPE$), dividend payout ratio ($DPR$), growth rate of earnings per share ($GRO$), risk-free interest rate ($RFR$), equity risk premium ($ERP$) as measured by stock beta, market capitalization ($MCA$), debt-to-asset ratio ($DAR$), market-to-book ratio ($MTB$), dividend yield ($DIY$), environment pillar score ($ENV$), social pillar score ($SOC$), and corporate governance pillar score ($GOV$). The robust z-statistics are shown in brackets. Goodness-of-fit statistics includes R-squared, comparative fit index (CFI), and root mean squared error of approximation (RMSEA). *, **, *** indicate significance at the 10, 5 and 1 percent level, respectively.