Corporate Sustainability and Stock Value in Asian–Pacific Emerging Markets: Synergies or Tradeoffs among ESG Factors?

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Abstract: We use structural equation modelling to examine whether multi-dimensional corporate sustainability (CS)—measured by environmental, social and governance (ESG) factors—affects stock value. We find that investors are willing to pay for each dollar of earnings that the highly rated ESG company generates. Moreover, the positive synergistic effect among the ESG factors implies that companies that focus on any single dimension or the equally weighted aggregation of ESG factors underestimate the value relevance of CS. In other words, successful sustainability practices should comprise all of the dimensions of CS in order to gain benefit from their synergistic effect with stock value. However, the synergistic effect among ESG factors does not imply that the individual components of CS should be weighted equally in sustainability practices. Our findings show that social engagement emerges as the main driver of CS and should be weighted more heavily than the other factors in sustainability practices. Interestingly, when we account for corporate economic performance, we find that investors put more (less) value on CS when corporate economic performance is weak (strong). This implies that economic performance and ESG performance contain similar information, and that their effects on stock value subsume each other.

Keywords: corporate sustainability; emerging markets; ESG factors; economic performance; value relevance

1. Introduction

The environmental, social and governance (ESG) transmission channels of corporate sustainability (CS) have recently gained the attention of shareholders, as companies and investors have paid much attention toward increasingly critical corporate sustainability. Despite some differences, the terms “corporate sustainability (CS)” and “corporate social responsibility (CSR)” are often used interchangeably to indicate whether companies integrate non-financial information (i.e., environmental, social and governance considerations) into their business practices. In this respect, we review relevant studies on CS as well as CSR. A strong ESG program enables companies to generate a good public relations story, access large pools of capital, maintain a competitive advantage in today’s economy and endorse sustainable long-term growth that profits companies and investors alike. Many studies have focused on the effects of non-financial ESG factors on several financial performance measures, such as Tobin’s Q ratio, return of equity, return on assets, cost of capital and the debt-to-equity ratio (see [1] for a comprehensive review of the literature). However, none of them examine how much stock investors are willing to pay for each dollar of earnings the highly rated ESG company generates. Integrating ESG factors into a company’s strategy can avoid ESG risks and capitalize on growth opportunities that generate long-term value for stock investors. We hypothesize that the higher the ESG ratings a company achieves, the more investors are willing to pay for a dollar of the company’s earnings. Therefore, we aim to investigate three transmission channels of CS, individually and in aggregate, on the price-to-earnings ratio (PER), a measure of how much investors are willing to pay for each dollar of earnings the company generates. The current study contributes to the limited research on the valuation effect of CS—proxied by ESG factors—on stock value, measured by PER, in the following aspects.
First, the extant studies are typically based on a single-equation regression and find a positive, negative or non-existent impact of ESG practices on financial performance, though the majority of the studies support a positive valuation effect of ESG factors [2,3]. A lack of consensus among the prior research casts doubt on whether the ESG dimensions of CS are indeed value-relevant. The inconclusive findings of CS valuation effects are possibly due to several reasons, such as data constraints, unreliable CS measures, a mediating mechanism or methodological restrictions [4]. In this study, we address the possible endogeneity concerns in previous regression-based studies of the linkage between CS, proxied by ESG factors, and stock value. We demonstrate that measurement errors of CS proxies play a crucial role in the uncertain valuation effects of CS on stock value. As CS is a multi-faceted concept covering numerous aspects related to ESG issues, we put forward that CS should be considered as a latent variable: it is a formal representation of a theoretical construct that is measured with errors or is inherently unobservable. Researchers usually approximate sustainability performance by ESG measures, which bring forth the likelihood of measurement errors [5]. It is likely that measurement errors of CS proxies are correlated with the error term in the regression model. This potential endogeneity problem could give rise to bias in the ordinary least squares estimations [6]. In the presence of measurement errors of CS proxies, structural equation modelling (SEM) is more suitable than traditional regression analysis [7]. Using a system of equations, SEM does not aggregate the measurement errors into the residual error term but rather partitions the measurement errors of CS proxies into the measurement equations and the error term into the construct equation. Gaining a richer understanding of the CS effect requires an alternative methodology that can account for measurement errors in CS indicators. In order to overcome the shortcoming of traditional regression analysis, we employ SEM to explore the valuation effects of CS.

Second, the preceding studies usually associate CS with a number of financial performance measures such as Tobin’s Q ratio, the return on equity, the return on assets, the cost of capital and the debt-to-equity ratio [3,8]. In this study, we shift gears and analyze the CS effect from the investor’s perspective in stock valuation. More specifically, we examine whether the market is willing to pay a premium to buy a company’s stock with strong ESG records. Among investment valuation ratios, the price-to-earnings ratio (PER) is a widely-used measure of the expected performance of companies, and it is arguably the most well-known method to assess how expensive the stock of a company is, relative to the amount of earnings it generates [9]. One interpretation of PER is the measure of how much investors are willing to pay for each dollar of earnings the company generates. In addition, PER allows for the tradeoff between the negative and positive CS effects on stock prices. On the one hand, ESG activities can lower earnings, which leads to a negative impact on stock price; on the other hand, company engagement in ESG issues appears to be valued by investors and hence has a positive effect on stock price.

Finally, while much CS research focuses on companies in developed markets [3,10], a small number of studies put across the CS effect from emerging markets’ perspectives [11]. Institutional theory suggests that different organizational responses to ESG issues depend on levels of market development and geographical regions. Given the variations in legal, cultural, institutional and economic conditions, ESG practices in emerging markets may not be successfully implemented with the same regularity in developed markets where the stakeholders’ expectations are different. Managerial policymakers therefore require a specialized understanding of the differences between emerging and developed markets [12]. Motivated by these insights, we use a comprehensive ESG data set of 865 firms across nine emerging markets in the Asia–Pacific region over the period of 2010 to 2019.

By applying an econometrically sound methodology, we uncover some noteworthy findings. Most notably, we demonstrate a particular flaw in the commonly-used regression analysis of the relevance of the CS value. A single-equation regression model gives rise to conflicting results depending on which proxies for CS (i.e., E, S and G performance factors) enter the model, individually and in combination. More specifically, only the social factor provides evidence in favor of a positive and significant influence on stock value, while the
environmental and governance factors do not have significant explanatory power. This implies that the individual dimensions of CS are likely to be priced by the markets differently. When the ESG sustainability performance factors are included in the model simultaneously, the effect related to the social factor weakens and loses statistical significance. The result is also insignificant if we aggregate the E, S and G factors into a composite index by the equally-weighted method. This indicates that the use of an ESG composite index as a whole measure of CS masks the heterogeneous impacts of the individual components of CS and hence provides illusory support for value irrelevance of CS. We therefore put forward that the measurement errors of CS proxies tend to play an important role in this uncertain outcome, as the accurate measurement of CS relies on various corporate attributes that are inherently unobservable or measured with errors. When the measurement errors of CS proxies are properly taken into account by SEM, we find a remarkable positive synergistic effect among ESG factors on stock value. This finding suggests that investors are willing to pay for each dollar of earnings that the highly rated ESG company generates. Moreover, it is more beneficial for firms to apply ESG sustainability practices altogether, rather than independently, because they have such positive synergistic elements among the E, S and G dimensions that are valued by investors. Conducting sustainability practices based on any single dimension appears to understate the valuation effect of CS. However, the presence of a synergistic effect among ESG factors does not mean that each dimension of CS should be weighted equally. By examining three transmission channels of CS, our findings show that social performance emerges as the main driver of CS. As a consequence, social performance should be weighted more heavily than environmental and governance performance in sustainability practices in order to enhance stock value. Moreover, there is a tradeoff between corporate economic performance and CS. Strong (weak) economic performance weakens (strengthens) the positive synergistic effect of ESG sustainability performance on stock value.

The remainder of this paper proceeds as follows. Section 2 reviews the current research on CS measured by ESG sustainability performance factors. Section 3 presents the methodological framework. Section 4 describes the data set. Section 5 reports the empirical results, as well as robustness checks. Finally, Section 6 concludes.

2. Literature Review

2.1. The Concept of Corporate Sustainability

Corporate sustainability (CS) is a multifaceted concept that involves many features or perspectives of companies. There are multiple definitions of CS and varied sustainable business practices. Among several attempts to define CS, the triple bottom line (TBL) approach is one of the most widely used definitions of CS. The TBL approach defines CS as the integration of environmental, social and economic performance [13–15]. These three dimensions of CS—social, environmental and economic—steer firms toward strategic actions fitted to the concept of the organization as a participating citizen in society, and not just as a money machine. In this context, corporate managers should tabulate the bottom line outcomes in not only economic activities but also social and environmental activities. Though a single-minded concentration on economic activities can make firms succeed in the short term, it is required that firms engage in the environmental and social aspects of CS in order to achieve their long-term goals. This implies that if firms want to become genuinely sustainable, they should contribute to better social welfare and lower environmental influence, as well as being profitable.

Nevertheless, several studies argue that the TBL approach of CS overlooks corporate governance performance, one of the important elements in sustainable business practices [16–18]. The integration of the governance dimension into the TBL is commonly known as the quadruple bottom line approach (QBL) [16]. As part of the response to the 2008–09 financial crisis, many firms have raised the greater awareness of a sound governance system [19,20]. In addition, firms have realized that not only the environmental, social and economic pillars of the TBL but also good governance can enhance
long-term corporate value and insulate companies from the negative impacts of a financial crisis [21,22]. For example, Zagorchev and Gao [23] showed that good governance business practices in the U.S. are negatively related to the excessive risk-taking of financial institutions (i.e., total non-performing assets and real estate non-performing assets) and positively associated with the firm’s value. Madanoglu et al. [24] found that a subset of governance provisions is positively associated with corporate financial performance, and that the use of the aggregate score of governance provisions masks the effect of good governance on firm value.

Recently, corporate managers have often used CS to refer to the integration of environmental, social and governance concerns into business operations and interactions with stakeholders [25–27]. As can be seen from these broad ESG categories that make up the CS concept, sustainability is a very broad and complex composite variable. The general concept is that for businesses and humanity to be maintained over the long run, there are certain actions and activities that cannot be optimized without negatively impacting the ability to thrive. Thus, humanity cannot cause undue damage to the environment without harming the ability of future generations to thrive. Businesses cannot endure over the long term by harming individuals now through bad labor practices, damaging local communities or by producing products that cause harm or injury [18]. There appears to be an increasing opinion that firms that fit ESG criteria are well equipped to manage risk and operate in a sustainable manner. Thus, firms with high ESG performance are attractive investment choices in their own right. In this respect, ESG factors are increasingly popular criteria for investors to assess firms in which they might want to invest. ESG criteria can also help investors avoid firms that might pose a greater financial risk due to their environmental, social and governance practices. ESG investing aims to quantify and assess firms in these three categories, guiding investment into firms that are well governed and treat their communities and staff in a responsible manner. Fund managers are integrating these ESG criteria into their asset selection and portfolio management to varying degrees, with many fund managers building their whole research and selection process from the bottom-up to ensure that the firms in which they invest conform to these ESG standards.

2.2. The Impact of Corporate Sustainability on Firm Value and Financial Performance

The stakeholder theory states that firms should create value not only for shareholders but also for all stakeholders, including customers, suppliers, investors, creditors, employees, government, communities and others who have a stake in the organization [28]. The stakeholder theory has widely served as the main platform for the investigation of the effect of corporate sustainability on corporate financial performance and firm value. Firms that seriously take responsibility for a broader group of stakeholders can improve financial performance and ultimately create firm value [29]. According to the instrumental view of stakeholder theory, the social impact hypothesis emphasizes a linkage between firms and individuals who have a social impact on firms through social drivers and barriers, or who are socially impacted. The effective social performance that fulfills stakeholders’ needs will ultimately heighten financial performance [30]. In this context, a firm’s engagement in environmental, social and governance (ESG) activities that meet the expectations of stakeholders will enhance a firm’s reputation and positively affect firm value. By contrast, dissatisfying stakeholders might have a negative economic influence on firms by increasing the perceived risk and the cost of capital.

Three strands of hypotheses have emerged to predict the plausible influences of ESG sustainability performance factors on corporate financial performance and firm value. Amongst others, the social impact, available funding and positive synergy hypotheses propose a positive relationship, whereas the tradeoff, managerial opportunism and negative synergy hypotheses suggest a negative relationship, and the supply–demand theory of the firm claims a neutral relationship [30,31]. Despite the ongoing debate about the sign of relationships, the majority of prior studies find a positive impact of ESG sustainability factors [32–35]. Chauhan and Kumar [11] found that the non-financial ESG factors of Indian
firms are positively associated with firm value, with standalone firms exhibiting stronger relationships than business group firms. This positive valuation effect is attributable to higher operating cash flows and the lower cost of capital. Fatemi et al. [10] used 403 U.S. listed companies to examine the moderating role of ESG disclosure on the relationship between ESG performance and firm value. Their results reveal that a firm’s strengths (weaknesses) with regard to ESG performance increase (decrease) firm value, with ESG disclosure attenuating (extenuating) the positive (negative) impact of ESG strengths (weaknesses). In a similar vein, Li et al. [3] found a positive relationship between three different measures of ESG disclosure and the value of the FTSE 350 listed companies, with CEO power acting as the moderating role of this relationship. Ng and Rezaee [36] found that non-financial ESG sustainability performance factors are positively related to stock price informativeness after accounting for corporate economic performance. Nonetheless, such a relationship is stronger for companies with higher ESG sustainability disclosure. Jarjir et al. [37] challenged the factor models widely used to explain stock returns of the European firms and found a risk premium associated with ESG ratings priced by the market. Recently, Broadstock et al. [25] showed that ESG factors mitigate financial risk during financial crisis, and that the role of ESG factors is attenuated in normal times, confirming its incremental importance during crisis.

Although many studies find supporting evidence for the positive value relevance of ESG sustainability performance factors, some suggest a neutral relationship [4,38,39] and few argue for a negative valuation effect of ESG factors [5,40]. For example, Signori et al. [26] revealed that ESG indices cannot be used as an indicator of value creation for stakeholders but, rather, should be considered as just one of the components. This implies that ESG indices are not appropriate for utilization in decision-making on stakeholder value creation. A plausible explanation for a negative valuation effect is that ESG factors are harmful to firm value because companies investing in ESG sustainability practice activities incur unnecessary expenses and possibly weaken the competitive advantage. McWilliams and Siegel [39] argued for no discernible link between social performance and financial performance due to the offsetting effects between costs and prices. Their explanation for the offsetting effect is that companies with high (low) investment in corporate social responsibility appear to have higher (lower) costs, but their customers are willing to pay higher (lower) prices. Chih et al. [38] examined 520 financial firms across 34 countries from 2003 to 2005. They stated that although large financial firms exhibit more concerns on corporate sustainability performance, the linkage between ESG sustainability practices and financial performance is insignificant. Crisostomo et al. [41] utilized the data of 78 non-financial Brazilian corporations from 2001 to 2006, and their estimations of panel regression models indicated that non-financial performance factors are detrimental to corporate value creation.

Given the inconsistent value relevance of ESG sustainability performance factors in the literature, several researchers have attempted to propose a number of plausible explanations related to sampling errors, unreliable sustainability measures, the omission of relevant control variables, mediating mechanisms and model misspecifications [4,5]. Recent studies claim that the existing literature on the relationship between corporate sustainability and financial performance suffers from the fact that the endogeneity problem is not properly dealt with. The endogeneity in the relationship could potentially be due to several reasons, such as unobserved firm and industry characteristics. Amongst others, Garcia-Castro et al. [4] demonstrated that the positive association between social performance and financial performance is spuriously driven by unobserved firm characteristics. After correcting for the possible endogeneity problem by the fixed-effect and instrument variable estimations, they were able to show that the relationship between aggregate social performance and financial performance becomes insignificant. Similarly, Baird et al. [5] estimated linear mixed models which allow for time-invariant industry and industry-interaction effects. They found a negative association between corporate
social performance and financial performance based on the panel data of 5073 firm–year observations from the years 2001 to 2008.

3. Methodology

In order to develop a fundamental understanding of the link between ESG factors of CS and the valuation of stock, we rely on the classical constant growth dividend discount model (DDM). The DDM yields an estimate of the share value by assuming that future cash flows from the company equal its constant growth dividends:

\[ P_t = \frac{D_{t+1}}{k - g} \]  

where \( P_t \) is the price of stock at time \( t \), \( D_{t+1} \) is the dividend at time \( t + 1 \), \( k \) is the cost of equity, and \( g \) is the growth rate of the dividend. Dividing both sides of Equation (1) by earnings per share yields \( (E_t) \), a theoretical model for the determinants of the price–earnings ratios (PER), as shown in Equation (2):

\[ \text{PER}_i = \text{Payout ratio} \frac{(1 + g)}{(k - g)} \]  

Equation (2) suggests that the dividend payout ratio and the rate of growth are positively associated with PER, whereas the cost of equity is negatively related to PER. According to capital asset pricing model, the cost of equity can be decomposed into the risk-free interest rate and the equity risk premium. This implies that both components are negatively related to PER. In addition to the above explanatory variables implied from the DDM, several factors have been shown to affect PER. Larger firms measured by market capitalization generally have higher PER than do smaller firms because mutual funds typically gravitate toward investing in larger firms [42]. Investors require a higher rate of return for firms with higher leverage, as measured by the debt-to-asset ratio, thus resulting in the higher PER [43]. Firms with high market-to-book ratios have high growth opportunities and high PER [44,45]. When the dividend yield is lower, the expected return tends to be lower, which in turn could result in a higher PE ratio [46]. Therefore, we include all of these variables as control variables in our model.

In order to investigate the effect of corporate sustainability (CS)—proxied by ESG performance scores—on stock value, we first estimate the panel regression, with the inclusion of industry- and year-fixed effects in addition to the ESG metrics and a set of control variables, as shown in the model presented in Equation (3).

\[ \text{PER}_{it} = \beta CS_{it} + \gamma Control_{it} + \sum Industry\ FE + \sum Year\ FE + \epsilon_{it} \]  

where \( i \) denotes the \( i \)th firm, \( t \) denotes the \( t \)th year, \( \text{PER}_{it} \) is the price-to-earnings ratio representing the value of the stock, \( CS_{it} \) is the proxy for multi-dimensional corporate sustainability performance (i.e., E, S, G or an aggregate ESG factor), \( Control_{it} \) is a set of control variables, \( \sum Industry\ FE \) is the industry-fixed effects term, \( \sum Year\ FE \) is the year-fixed effects term, \( \epsilon_{it} \) is the error term, \( \beta \) is a parameter, and \( \gamma \) is a coefficient vector associated with control variables.

The PER is affected not only by idiosyncratic factors particular to the firm but also by movement in the market as a whole and the industry in which the firm operates. The PER is generally used to compare the relative values of firms in the same industry because the PER is highly industry-dependent. We account for variations of the PER across industries and years by including both industry- and year-fixed effects in our model. The inclusion of industry-fixed effects controls for time-invariant unobservable industry characteristics that possibly drive both CS and stock value. The year-fixed effect controls for effects that may vary over time, but are constant across industries. The lack of fixed effects is likely to cause spurious results and account for why regression models with different independent variables have provided inconsistent results in previous studies [4,36].
We test for the effects of individual E, S and G dimensions of the CS on stock value. This approach enables us to assess whether the impact of each dimension is relevant for stock value. In practice, most companies do not implement sustainability strategies based on one dimension at a time, but rather work on the ESG sustainability problem as a whole [47]. Furthermore, the ultimate challenge of studies on the value relevance, however, is the integration of the several dimensions of CS. In parallel studies, decision makers have a proclivity to allocate the available resources evenly to each alternative, i.e., the so-called ‘naïve diversification heuristic’ [48]. The obvious inference is that, due to the absence of any objective basis on which to allocate resources to individual dimensions of CS, there is the tendency for managers to spread resources equally across each dimension. Despite its flawed assumptions, the equally-weighted aggregation of ESG factors is frequently used as a unified measure of sustainability performance [4,49]. Several sustainability indices, such as the Human Development Index, Living Planet Index and Genuine Saving Index, have been constructed using an equal weighting method. In order to shed light on the effect of individual ESG performance factors and their equally-weighted aggregation on stock value, we estimate Equation (3) in several sub-models by including a particular proxy for CS.

In addition to the ESG sustainability variables, we include eight control variables that have been identified in the existing literature as having possible effects on the PER, a measure of stock value [42,43,46,50]. Accordingly, we would expect that the PER is positively related to the dividend payout ratio, growth rate of earnings, market capitalization and market-to-book ratio, but negatively associated with the risk-free interest rate, equity risk premium, debt-to-asset ratio and dividend yield. Moreover, the dividend discount model postulates that the PER is positively related to the expected growth rate but negatively associated with the discount rate. Prior research also demonstrates that firms adopting effective ESG strategies tend to have higher earnings growth and cheaper equity financing [32,51]. Taken all together, firms with superior ESG sustainability performance factors would result in greater PER due to high earnings growth and low discount rate valuations. We would thus expect the positive association between the proxy for multi-dimensional CS and stock value ($\beta > 0$).

In spite of its simplicity and widespread use, the equally-weighted aggregation of ESG factors may obscure the different effects of the individual dimensions of CS and mislead its valuation effect. In the related literature, Madanoglu et al. [24] demonstrated that the use of an aggregate score masks the impact of good governance on firm value, and that a subset of governance provisions indeed results in higher corporate financial performance. Characterizing CS by individual ESG scores, rather than by the aggregate ESG score, may provide a more precise notion of the financial markets’ reaction to the sustainability information. Therefore, it would be more reasonable if the weighting scheme of the ESG performance factors reflected their relative importance to CS, rather than assigning an equal weight to each dimension of CS.

Although any integration of the ESG sustainability performance factors should result in a composite index that reflects the progress in CS, it needs to take into consideration the measurement errors of CS proxies. Any integration method should also address the association between different aspects of CS, and should be independent of any subjective weight specification [6]. In order to allow for different impacts of particular dimensions of CS on stock value, we assume CS to be a latent variable, which is independent of any subjective a priori weight specification. This assumption makes perfect sense. As CS has a multidimensional nature covering several dimensions related to ESG issues, the CS latent variable can provide a unidimensional measure of the overall sustainability compliance of a company. A unidimensional quantitative synthesis of all of the available ESG information is a preferable requirement for the examination of the CS effect [6]. Besides this, measuring CS requires a combination of several ESG attributes that are typically measured with some errors. The CS latent variable is intended to represent the true score of corporate sustainability and be free of any measurement error.
In this study, we therefore use an alternative econometric approach that directly takes into account the presence of the measurement errors of CS proxies. We estimate the following system of Equations (4)–(7), so-called ‘structural equation modeling’ (SEM), which integrates the interrelation effects of ESG factors into the CS latent variable. One of the main advantages of using latent variables and SEM instead of a composite index, and simple regression is the possibility to control for different kinds of random and nonrandom measurement errors [7].

\[
\text{PER}_{it} = \beta \text{CS}_{it} + \gamma \text{Control}_{it} + \sum \text{Industry FE} + \sum \text{Year FE} + \epsilon_{it} \tag{4}
\]

\[
E_{it} = \theta_1 + \omega_1 \text{CS}_{it} + \mu_{1it} \tag{5}
\]

\[
S_{it} = \theta_2 + \omega_2 \text{CS}_{it} + \mu_{2it} \tag{6}
\]

\[
G_{it} = \theta_3 + \omega_3 \text{CS}_{it} + \mu_{3it} \tag{7}
\]

Equation (4) is the construct equation that associates the stock value measured by the PER with the CS latent variable, a set of control variables and industry- and year-fixed effects. Equations (5)–(7) are the measurement equations that link the CS latent variable with its proxies (E, S and G performance scores). \(\theta_1\) to \(\theta_3\) are the constant terms. \(\omega_1\) to \(\omega_3\) are factor loadings representing the relationships between the observed E, S and G performance scores and the CS latent variable. \(\mu_{1it}\) to \(\mu_{3it}\) are measurement errors related to the E, S and G performance scores, respectively. With reference to the methodology of the ASSET4 ESG database, higher scores are more favorable in terms of ESG sustainability performance. As such, the anticipated signs of all of the factor loadings are positive (\(\omega_1 > 0, \omega_2 > 0, \omega_3 > 0\)).

In the most usual case, we structure the model in Equations (5)–(7) so that the ESG indicators are “effects” of the CS latent variable, as in the case of the common factor analysis. The idea of using the reflective model is that the value of the CS latent variable causes firms to respond as they do on the observed E, S and G indicators. In the SEM literature, an important distinction is made between reflective and formative models. The modelling in Equations (5)–(7) suggests a reflective model, as the CS latent variable is the independent variable which influences—or in SEM terms, “causes”—the dependent variables’ E, S and G indicators. In a reflective model, the different measurement items are assumed to be highly correlated because they are all caused by the latent construct. This assumption seems valid because a number of studies find strong causal relationships among the E, S and G performance factors [52].

It is worth noting that the SEM in Equations (4)–(7) has real advantages over the single-equation regression model in Equation (3). The accurate measurement of CS relies on numerous E, S and G attributes that are practically measured with some errors. Consequently, the measurement errors embedded in the E, S and G performance scores may correlate with an error term in Equation (3), which in turn leads to biased ordinary least squares estimates of the relationship. By contrast, SEM explicitly takes into consideration the measurement errors by isolating the measurement errors from the CS latent variable in Equations (5)–(7). These measurement errors allow each dimension of CS to have its own unique variance and do not reflect the shared variance of these three dimensions. Accounting for how companies engage in all dimensions of CS, the CS latent variable is what the E, S and G performance factors share in common. By isolating the shared variance of the three dimensions of CS from their unique variances, we are able to obtain a better measure of the CS latent variable. Furthermore, we are likely to obtain a stronger relationship in Equation (4) by removing the measurement errors because measurement errors, by their nature, have no explanatory power but add noise to our measurement [7].

4. Data

In this study, we measure corporate sustainability (CS) by environmental, social and governance (ESG) pillars. We use Refinitiv’s annual data on the ESG sustainability perfor-
mance scores of ASSET4, one of the largest ESG rating agencies. According to ASSET4’s definition of ESG performance, the environmental pillar (E) measures corporate influences on living and non-living natural systems to avoid environmental risk. The social pillar (S) measures the corporate ability to generate loyalty and trust among employees, customers and society. The governance pillar (G) measures corporate systems and processes to ensure that the company’s executives and board members perform to generate long-term shareholder value. In order to measure ESG performance, a large number of key performance indicators are aggregated into 15 categories grouped within the E pillar (resource reduction, emission reduction, product innovation), S pillar (employment quality, health and safety, training and development, diversity, human rights, community, product responsibility) and G pillar (board structure, compensation policy, board functions, shareholders rights, vision and strategy). The definition of each category score is briefly described in Appendix A.

In order to benchmark a company’s pillar scores against the entire ASSET4 company universe, ASSET4 normalizes each pillar score by z-scoring. The pillar score ranges from 0 to 100, with the median score moderated to be close to 50. Higher pillar scores are more desirable for sustainability performance. In this study, we focus on companies in nine emerging markets in the Asia–Pacific region where there is comprehensive coverage of sustainability data in terms of the number of firms and the scope of the ESG pillar scores over the period from 2010 to 2019. Note that the number of observations of the ASSET4 ESG dataset for Asia–Pacific emerging markets is sparse before 2010, thereby creating bias for our conclusion. We therefore decided to exclude the years prior to 2010. In accordance with the definitions of ASSET4, these nine emerging markets include China, Hong Kong, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan and Thailand.

In addition to the ASSET4 ESG dataset, we also use corporate financial data from Refinitiv Eikon, of which the definitions are provided in Appendix B. We use The Refinitiv Business Classification (TRBC) to group companies into their industry group. Despite several definitions of the price-to-earnings ratio (PER), we employ the trailing PER as a main measure of stock value throughout the subsequent analysis, unless otherwise stated. Following prior studies on the determinants of PER, we exclude observations for which earnings are negative [44]. Negative earnings post a difficult theoretical interpretation, as traditional earnings capitalization models suggest that investors are willing to pay a certain multiple for current earnings. Banks generally have specifics in financial performance and different ESG practices from other industries. In this regard, we exclude banks from the analysis. After the data treatment, our unbalanced panel data consisted of 6337 firm–year observations.

5. Empirical Results
5.1. Descriptive Statistics

In Table 1, we report the number (percentage) of companies and the summary statistics of the individual ESG performance scores in each market. Across all 27 cases reported in the table, 22 (81%) cases have median scores below 50. Compared to the mean score, the median score is less affected by outliers and is more suitable for comparing data across markets. In this subsection, we therefore interpret the ESG data using the median score rather than the mean score. As ASSET4 normalizes and benchmarks companies’ ESG performance scores against the ASSET4 company universe with a median score equal to 50, companies in Asia–Pacific emerging markets, on average, underperform in the ASSET4 company universe. Besides this, each market tends to advance individual dimensions of corporate sustainability (CS) at a different pace. Of all the three dimensions of CS, governance performance has the highest median scores for 6 out of 9 (67%) markets, including China, Hong Kong, Indonesia, Malaysia, the Philippines and Taiwan. A plausible explanation for this finding is that most companies have raised the awareness of a sound corporate governance system in part due to the after-effect of the 2008–09 financial scandals [20]. Moreover, corporate governance is directly associated with the benefits of shareholders.
Several studies found that companies that are managed effectively with tough corporate governance measures can enhance the long-term corporate value and insulate companies from the negative impacts of a crisis [36,53].

Table 1. Summary statistics of the environmental, social and governance performance scores.

| Markets       | No. of Companies (%) | Descriptive Statistics | Environmental Score (E) | Social Score (S) | Governance Score (G) |
|---------------|----------------------|------------------------|-------------------------|-----------------|----------------------|
| China         | 226 (26.13%)         | Mean: 28.46            | Median: 24.98           | Min: 0.38       | Max: 84.29            | Stddev: 20.19         |
|               |                      | 23.60                  | 19.63                   | 0.50            | 91.33                | 16.50                 |
|               |                      | 49.27                  | 50.67                   | 1.23            | 91.32                | 21.40                 |
| Hong Kong     | 189 (21.85%)         | Mean: 36.69            | Median: 35.19           | Min: 0.23       | Max: 98.17            | Stddev: 23.73         |
|               |                      | 34.03                  | 32.02                   | 0.16            | 94.01                | 21.55                 |
|               |                      | 47.25                  | 47.35                   | 4.11            | 97.79                | 19.29                 |
| India         | 81 (9.36%)           | Mean: 41.26            | Median: 38.67           | Min: 0.62       | Max: 96.42            | Stddev: 24.91         |
|               |                      | 51.95                  | 50.95                   | 3.26            | 97.43                | 23.69                 |
|               |                      | 50.49                  | 49.44                   | 1.54            | 96.73                | 21.92                 |
| Indonesia     | 34 (3.93%)           | Mean: 35.48            | Median: 32.57           | Min: 0.97       | Max: 89.94            | Stddev: 21.82         |
|               |                      | 47.80                  | 45.79                   | 4.36            | 97.18                | 24.42                 |
|               |                      | 45.75                  | 46.30                   | 6.99            | 92.26                | 22.02                 |
| Malaysia      | 48 (5.55%)           | Mean: 33.80            | Median: 31.25           | Min: 0.61       | Max: 91.10            | Stddev: 21.10         |
|               |                      | 43.21                  | 44.55                   | 1.09            | 97.12                | 22.17                 |
|               |                      | 47.51                  | 47.69                   | 2.47            | 91.76                | 21.31                 |
| Philippines   | 21 (2.43%)           | Mean: 35.47            | Median: 31.98           | Min: 0.51       | Max: 86.65            | Stddev: 24.49         |
|               |                      | 37.37                  | 35.22                   | 3.27            | 92.77                | 23.34                 |
|               |                      | 47.09                  | 48.03                   | 4.13            | 90.39                | 23.05                 |
| South Korea   | 109 (12.60%)         | Mean: 51.41            | Median: 61.44           | Min: 0.39       | Max: 95.50            | Stddev: 27.10         |
|               |                      | 41.87                  | 44.96                   | 0.33            | 97.47                | 29.07                 |
|               |                      | 47.70                  | 49.27                   | 1.00            | 94.98                | 25.05                 |
Table 1. Cont.

| Markets   | No. of Companies (%) | Descriptive Statistics | Environmental Score (E) | Social Score (S) | Governance Score (G) |
|-----------|----------------------|------------------------|-------------------------|------------------|----------------------|
| Taiwan    | 125 (14.45%)         | Mean 40.83             | 33.89                   | 45.94            |
|           |                      | Median 39.72           | 26.97                   |                  |
|           |                      | Min 0.08               | 0.22                    | 0.88             |
|           |                      | Max 98.25              | 95.84                   | 95.13            |
|           |                      | Stdev 25.48            | 27.28                   | 25.15            |
| Thailand  | 32 (3.70%)           | Mean 46.33             | 57.41                   | 48.81            |
|           |                      | Median 51.69           | 63.39                   | 49.34            |
|           |                      | Min 0.48               | 5.63                    | 4.81             |
|           |                      | Max 96.93              | 96.28                   | 89.43            |
|           |                      | Stdev 25.22            | 22.52                   | 22.10            |

Notes: This table shows the summary statistics of corporate sustainability for 865 companies in nine emerging markets in the Asia–Pacific region over the period of 2010 to 2019. The three dimensions of corporate sustainability include environmental (E), social (S) and governance (G) performance factors. The highest median score in each market is identified by bold characters.

In Table 2, we present the descriptive statistics of the variables in our models for firm–year observations pooled across all of the companies and markets over the period from 2010 to 2019. Some consistent patterns are evident. First, the median scores of the ESG sustainability performance factors show that governance performance exhibits the highest score (47.46), followed by environmental (35.39) and social (33.81) performance, implying more headroom for ESG improvement. Second, the individual ESG performance scores show great variations. Governance performance displays the lowest standard deviation (22.30), followed by environmental (22.84) and social (24.90) performance. Finally, the mean is larger than the corresponding median for all variables, often substantially so. The difference between the mean and median scores indicates the potentially skewed distributions. In order to moderate the potential skewness as well as the heterogeneity problems, we apply the natural logarithm to each variable before estimating our models in the subsequent analysis.

Regression analysis is likely to produce spurious results if the variables in the model contain unit root processes. In order to address this issue, we tested unit roots of our unbalanced panel data by the Augmented Dickey–Fuller test. Despite there being a variety of panel-data unit root tests such as the Levin–Lin–Chu, Harris–Tzavalis, Im–Pesaran–Shin and Phillips–Perron, we chose the Augmented Dickey–Fuller, as it allows us to test the unit roots of the unbalanced panel and incorporate both the drift and lag terms. Because the mean of any variable is nonzero, we included the drift term and two lags to remove the higher-order autoregressive components of the series. We also performed unit root tests with several specifications, but the conclusion of stationarity was unchanged. As both the inverse normal (Z) and modified inverse chi-squared (Pm) statistics of any variable reveal in Table 2, the null hypothesis of the panels containing unit roots can be rejected at a highly significant level. We therefore conclude that all of the variables are stationary and can be used in regression analysis in their log-level forms.
Table 2. Descriptive statistics and unit root tests.

| Variable                  | Mean  | Median | Standard Deviation | Inverse Normal (Z) | Modified Inverse Chi-Squared (Pm) |
|---------------------------|-------|--------|-------------------|--------------------|-----------------------------------|
| Price-to-earnings ratio   | 28.82 | 16.90  | 88.70             | −15.75 ***         | 15.91 ***                         |
| Dividend payout ratio     | 0.33  | 0.30   | 0.26              | −14.23 ***         | 16.25 ***                         |
| Growth rate of earnings   | 0.10  | 0.08   | 0.14              | −15.16 ***         | 17.77 ***                         |
| Risk-free interest rate   | 0.03  | 0.02   | 0.02              | −15.30 ***         | 21.52 ***                         |
| Equity risk premium       | 1.12  | 1.08   | 0.57              | −25.39 ***         | 31.23 ***                         |
| Market capitalization     | 6.00  | 2.39   | 16.78             | −17.11 ***         | 15.14 ***                         |
| Debt-to-asset ratio       | 0.26  | 0.24   | 1.43              | −13.54 ***         | 15.85 ***                         |
| Market-to-book ratio      | 2.96  | 1.75   | 15.87             | −20.73 ***         | 24.48 ***                         |
| Dividend yield            | 0.03  | 0.02   | 0.05              | −17.71 ***         | 20.23 ***                         |
| Environmental score (E)   | 37.98 | 35.39  | 24.84             | −14.45 ***         | 18.29 ***                         |
| Social score (S)          | 36.90 | 33.81  | 24.90             | −18.67 ***         | 21.95 ***                         |
| Governance score (G)      | 47.75 | 47.46  | 22.30             | −17.28 ***         | 18.33 ***                         |

Notes: This table provides the aggregated descriptive statistics and unit root tests of all of the firm–year variables: the trailing price-to-earnings ratio, dividend payout ratio, growth rate of earnings per share, risk-free interest rate, equity risk premium as measured by the stock beta, market capitalization (billion USD), debt-to-asset ratio, market-to-book ratio, dividend yield, environment score, social score and governance score. The Augmented Dickey–Fuller (ADF) test with drift and two lags was 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 1 percent levels, respectively.

5.2. Panel Regression Analysis Approach

We present, in Table 3, the estimations of various models nested in Equation (3). For the baseline model, Model 1 explores the relationship between the stock value and the control variables. The coefficients of all of the control variables are significantly associated with stock value at the 1% level, with the exception of the equity risk premium and debt-to-asset ratio, of which the coefficients are significant at the 5% and 10% levels, respectively. In accordance with the extant empirical research, the stock value measured by the price-to-earnings ratio has a positive association with the dividend payout ratio, growth rate of earnings, market capitalization and market-to-book ratio, but a negative relationship with the risk-free rate, equity risk premium, debt-to-asset ratio and dividend yield [42,44,50].

The estimation results of our baseline model will constitute a building framework for the investigation of the effect of the E, S and G transmission channels of CS, individually and in aggregate.

We next analyzed the influence of a particular dimension of CS on stock value. By adding each factor into the baseline model at a time, we tested the effect of the E (Model 2), S (Model 3) and G (Model 4) factors separately. The results of Models 2 to 4 revealed that the effects of individual ESG sustainability factors on stock value are rather mixed and depend on which dimension of CS enter the specification in Equation (3). From the signs of the estimated coefficients, the ESG sustainability performance factors could be beneficial (positive sign) or harmful (negative sign) to stock value. This finding is in line with prior studies of which the results indicate that different dimensions of CS send ambiguous signals of value relevance to investors and corporate decision makers [54]. Only the social factor in Model 3 provides evidence in favor of a positive and significant impact on stock value at the 5% level. This is consistent with several studies indicating that the superior social performance of companies is valued positively by financial markets [55].
Table 3. The estimations of the panel regression models.

| Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---------|---------|---------|---------|---------|---------|
| Explanatory variables | PER | PER | PER | PER | PER | PER |
| Panel A: Control variables | | | | | | |
| Dividend payout ratio | 0.159 *** | 0.185 *** | 0.185 *** | 0.187 *** | 0.185 *** | 0.188 *** |
| | [7.24] | [7.48] | [7.50] | [7.52] | [7.49] | [7.54] |
| Growth rate of earnings | 0.310 *** | 0.311 *** | 0.310 *** | 0.310 *** | 0.310 *** | 0.310 *** |
| | [36.14] | [33.81] | [33.82] | [33.78] | [33.74] | [33.84] |
| Risk-free interest rate | -0.123 *** | -0.147 *** | -0.142 *** | -0.142 *** | -0.142 *** | -0.145 ** |
| | [-4.44] | [-4.53] | [-4.36] | [-4.51] | [-4.32] | [-4.46] |
| Equity risk premium | -0.016 ** | -0.037 ** | -0.037 ** | -0.036 ** | -0.037 ** | -0.037 ** |
| | [-2.09] | [-2.48] | [-2.39] | [-2.26] | [-2.31] | [-2.45] |
| Market capitalization | 0.178 *** | 0.095 *** | 0.089 *** | 0.103 *** | 0.091 *** | 0.093 *** |
| | [5.02] | [2.65] | [2.57] | [2.72] | [2.69] | [2.68] |
| Debt-to-asset ratio | -0.006 * | -0.006 * | -0.005 * | -0.006 * | -0.005 * | -0.005 * |
| | [-1.80] | [-1.77] | [-1.75] | [-1.80] | [-1.84] | [-1.72] |
| Market-to-book ratio | 0.152 *** | 0.169 *** | 0.177 *** | 0.161 *** | 0.175 *** | 0.173 *** |
| | [3.18] | [4.17] | [4.02] | [4.04] | [4.15] | [4.10] |
| Dividend yield | -0.179 *** | -0.204 *** | -0.205 *** | -0.204 *** | -0.205 *** | -0.205 *** |
| | [-8.53] | [-8.62] | [-8.27] | [-8.45] | [-8.17] | [-8.16] |
| Panel B: Proxies for corporate sustainability | | | | | | |
| Environmental factor (E) | - | -0.020 | -0.020 | -0.008 | -0.008 | -0.008 |
| | | [-0.99] | [-0.99] | [-0.27] | [-0.27] | [-0.27] |
| Social factor (S) | - | - | 0.041 ** | - | 0.054 | - |
| | | | [2.24] | | [1.63] | | |
| Governance factor (G) | - | - | - | 0.005 | 0.005 | - |
| | | | | [0.45] | [0.45] | | |
| Aggregate ESG factor | - | - | - | - | 0.037 | - |
| | | | | | [1.51] | |
| Panel C: Goodness-of-fit | | | | | | |
| R² | 0.6541 | 0.6728 | 0.6739 | 0.6728 | 0.6774 | 0.6732 |

Notes: This table presents the estimations of the panel regression models in Equation (3). The equally-weighted aggregation of the ESG factors is used in Model 6. The industry- and year-fixed effects are included in all of the estimations. The robust t-statistics are shown in brackets. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

The findings of Models 2 and 4 also show that the environmental and governance performance factors do not have significant explanatory power for stock value. The environmental factor is harmful to the companies, as it has a negative relationship with stock value. The lack of a significant link between both sustainability factors and stock value contrasts with prior studies of which the results indicate the value relevance of a company’s environmental performance and governance performance [56,57]. Note that the coefficients of all of the control variables remain qualitatively similar to those of the baseline Model 1. The sign and significance of these control variables are consistent with those of prior studies [42–44,46,50,58]. Thus, they are important control variables in determining stock value with respect to the ESG sustainability factors.

As most companies do not focus on only one dimension of CS at a time, but rather work on ESG practice as a whole, which includes all of the three dimensions of CS [47], we took the analysis one step further by simultaneously incorporating E, S and G performance factors into our estimations in Model 5. The signs of the coefficients of all of the performance factors remained the same as those in Models 2 to 4. Different dimensions of CS contribute unequally to stock value, with the social factor showing the greatest impact but losing
statistical significance. This implies that the individual components of ESG sustainability performance factors are likely to be priced by the stock markets differently. All in all, Model 5 does not support the linkage between any dimension of CS and stock value.

The challenge of empirical studies on the value relevance of CS, however, is the integration of the ESG sustainability performance factors. Following a traditional approach utilized in most studies, we estimated Equation (3) by using the equally-weighted aggregation of E, S and G factors as a proxy for the overall sustainability performance \[4,49\]. This method counts each factor as being equally relevant to CS. As the results of Model 6 show, the relationship between a simple average of ESG factors and stock value is positive but insignificant at any conventional level of significance. The use of a simple aggregate ESG factor in Model 6 tends to mask the positive effect of the social factor on the stock value in Model 3. This finding implies that although simply assigning equal importance to all of the dimensions of CS is transparently arbitrary and commonly used in the literature, their effects may be cancelled out in sum. Hence, the use of a naïve allocation heuristic to allocate the available corporate resources equally to different dimensions of CS is seemingly inefficient.

While our findings from Model 6 sharply contrast with some studies supporting the value relevance of the aggregated ESG sustainability performance factors \[2,59\], they are in line with other studies which argue that a simple aggregation of ESG factors appears to blur the influence of CS \[24\]. Despite its popularity, the equally-weighted average of ESG factors suffers from an aggregation problem. To elaborate, a simple aggregate ESG factor implicitly assumes that the individual ESG factors have an identical contribution to CS. This assumption seems to be practically unrealistic in business applications. The underlying intuition is that the impact of individual components of CS is not necessary uniform. As can be seen by the differences in median scores across the ESG sustainability performance factors in Table 2, companies tend to have different propensities to engage in particular dimensions of CS.

### 5.3. Structural Equation Modeling Approach

Given the ambiguous effects of the ESG sustainability factors in regression analysis, it would be unsound to conclude that CS is value irrelevant to stock value. To do so would be doubtful at best, as the available ESG factors are almost certainly imperfect proxies for CS. This motivates the use of latent variable analysis to address the issue of measurement errors of CS proxies. To this end, we simultaneously estimated Equations (4)–(7), which contain the CS latent variable to capture the shared effects of the ESG dimensions of CS.

We present the maximum likelihood estimates of SEM in Model 7 of Table 4. We first focus on the measurement portions of our models in Panel A. As noted earlier, the factor loading of one indicator should be fixed to unity in order to estimate SEM. In this study, we used the environmental factor to identify the CS latent variable. Irrespective of which ESG factors are employed to identify the CS latent variable, the estimated results are qualitatively similar and lead to the same conclusion. The results of the use of the social and governance factors to identify the CS latent variable are available upon request. From a substantive perspective, the unstandardized factor loadings are positive and statistically significant, in accordance with our prediction, although the magnitudes of the associations are different for the individual ESG sustainability performance factors. The positive sign of the factor loadings indicates that higher ESG performance scores are more desirable in terms of CS. In order to identify which factor is the best indicator of the CS latent variable, we used standardized factor loadings, which are computed by multiplying the unstandardized factor loadings by the model-implied standard deviation of the indicator divided by the standard deviation of the CS latent variable \[7\]. As shown in Table 5, the standardized factor loadings of the E, S and G factors are 0.610, 0.797 and 0.652, respectively. For the standardized estimation, the variance of the latent variable, rather than the factor loading of any indicator, is fixed at 1.0 \[7\]. This enables us to identify which factor is the best indicator of the CS latent variable. From the detailed estimation results (unreported), the standardized
factor loadings of the environmental pillar are \( \frac{1 \times \sqrt{20.631}}{\sqrt{(1^2 \times 20.631) + 34.814}} = 0.610 \), the social pillar is \( \frac{0.421 \times \sqrt{20.631}}{\sqrt{(0.421^2 \times 20.631) + 34.814}} = 0.797 \), and the governance pillar is \( \frac{0.195 \times \sqrt{20.631}}{\sqrt{(0.195^2 \times 20.631) + 1.061}} = 0.652 \). This indicates that the social factor appears to be the best indicator of the CS latent variable, followed by the governance and environmental factors. As different ESG sustainability performance factors do not have an identical contribution to CS, this finding provides evidence against the use of the equally-weighted aggregation of ESG scores as a whole measure of sustainability performance. We therefore suggest that the social engagement should be given a greater weight in companies’ sustainability practices.

**Table 4.** The estimations of the structural equation modelling (SEM).

| Explanatory variables | Model 7 | Model 8 | Model 9 | Model 10 |
|-----------------------|---------|---------|---------|----------|
| Panel A: Measurement equations | \( \omega_1 = 1 \) | \( \omega_1 = 1 \) | \( \omega_1 = 1 \) | \( \omega_1 = 1 \) |
| CS | CS | CS | CS |
| Environmental factor (E) | 1 | 1 | 1 | 1 |
| Social factor (S) | 0.421 *** | 0.414 *** | 0.426 *** | 0.310 *** |
| Governance factor (G) | 0.195 *** | 0.181 *** | 0.172 *** | 0.094 ** |
| Panel B: Construct equations | | | | |
| PER | PER | PER | PER |
| Dividend payout ratio | 0.447 *** | 0.440 *** | 0.421 *** | 0.237 *** |
| Growth rate of earnings | 0.239 *** | 0.244 *** | 0.228 *** | 0.193 *** |
| Risk-free interest rate | -0.023 ** | -0.022 ** | -0.020 ** | -0.018 * |
| Equity risk premium | -0.032 ** | -0.031 ** | -0.033 ** | -0.021 ** |
| Market capitalization | 0.033 *** | 0.031 *** | 0.030 *** | 0.022 ** |
| Debt-to-asset ratio | -0.009 * | -0.008 * | -0.009 * | -0.006 |
| Market-to-book ratio | 0.198 *** | 0.196 *** | 0.188 *** | 0.102 *** |
| Dividend yield | -0.424 *** | -0.408 *** | -0.401 *** | -0.317 ** |
| Corporate sustainability (CS) | 0.253 *** | 0.228 *** | 0.209 *** | 0.116 ** |
| Economic factor | 0.082 ** | | | |
| Economic factor × CS | -0.009 *** | | | |

\[ \text{PER} = \frac{1 \times \sqrt{20.631}}{\sqrt{(1^2 \times 20.631) + 34.814}} = 0.610, \text{ social pillar is} \frac{0.421 \times \sqrt{20.631}}{\sqrt{(0.421^2 \times 20.631) + 34.814}} = 0.797, \text{ and the governance pillar is} \frac{0.195 \times \sqrt{20.631}}{\sqrt{(0.195^2 \times 20.631) + 1.061}} = 0.652. \]
Table 4. Cont.

| Panel C: Goodness-of-fit | Model 7 | Model 8 | Model 9 | Model 10 |
|--------------------------|---------|---------|---------|----------|
| $R^2$                    | 0.7117  | 0.6928  | 0.6843  | 0.4627   |
| CFI                      | 0.978   | 0.967   | 0.959   | 0.961    |
| RMSEA                    | 0.011   | 0.026   | 0.030   | 0.046    |

Notes: This table presents the estimations of SEM using Equations (4)–(7). Panel A reports the results for the measurement equations. Panel B shows the results of the construct equations. The industry- and year-fixed effects are included in all of the estimations. Panel C reports the goodness-of-fit statistics. The environmental factor is used to identify the CS latent variable. Irrespective of which dimension of the ESG sustainability factor is employed to identify the CS latent variable, the estimated results are qualitatively similar and lead to the same conclusion. The robust $z$-statistics are shown in brackets. The goodness-of-fit statistics include the $R$-squared, comparative fit index (CFI) and root mean squared error of approximation (RMSEA). For the robustness tests, Model 8 lags the ESG factors by one year, Model 9 uses the forward price–earnings ratio, and Model 10 includes the corporate economic factor and its interaction term with the CS latent variable. The economic performance factor was not available after Thomson Reuters was taken over by Refinitiv in 2018. Consequently, we can only perform the robustness test in Model 10 with a reduced sample spanning 2010–2017. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

Table 5. Standardized factor loadings of the ESG indicators.

| Description | Environmental Factor (E) | Social Factor (S) | Governance Factor (G) |
|-------------|--------------------------|-------------------|-----------------------|
| Unstandardized factor loading | 1.000 | 0.421 | 0.195 |
| Variance of ESG latent variable | 20.631 | 20.631 | 20.631 |
| Model-implied variance of indicators | 34.814 | 2.100 | 1.061 |
| Standardized factor loading | 0.610 | 0.797 | 0.652 |

Notes: This table presents the standardized factor loadings of the ESG indicators from Model 7, in which the environmental factor (E) is used to identify the CS latent variable. The standardized factor loading was computed by multiplying the unstandardized factor loadings by the model-implied standard deviation of the indicator divided by the standard deviation of the CS latent variable [7].

We next consider the construct components of our models in Panel B. The coefficients of all of the controls display the anticipated signs and remain statistically significant at the 1% level, with the exception of the risk-free rate, equity risk premium and debt-to-asset ratio, of which the coefficients are statistically significant at the 5%, 5% and 10% levels, respectively. Furthermore, the coefficient of the CS latent variable is positive and highly significant, with a larger magnitude than most of the control variables. This finding provides evidence in support of the proposition that CS, proxied by the ESG sustainability performance factors, has a positive influence on the stock value. Strikingly, the coefficient of the CS latent variable in Model 7 (0.253), estimated by SEM, is much larger than that of the social factor, the most influential driver of stock value in Model 3 (0.041), as estimated by regression analysis. This implies that although social performance appears to be a main channel through which CS affects stock value, the effect of CS on stock value depends, to a greater extent, on the synergistic effect among ESG performance factors, rather than any single dimension of CS.

Now turning to how well our SEM estimation in Model 7 fits the data, we report the results of the goodness-of-fit in Panel C. From the value of the $R$-squared, we can see that 71.17% of the variance in the stock value is explained by our model. The $R$-squared value is higher in the SEM approach (Model 7) than in the regression analysis (Models 1 to 6), possibly because the individual ESG performance factors are specified as measurements of the CS latent variable in Equation (4) and their measurement errors are moved to the error terms in Equations (5)–(7); that is, a measurement portion of the model is included in addition to the construct equation. As mentioned earlier, measurement errors have no explanatory power but add noise to our measurement. By excluding the noise generated by the measurement errors of the CS proxies (i.e., E, S and G indicators), we are able to obtain a better measure of CS and a stronger relationship with the stock value. For the other goodness-of-fit statistics, the comparative fit index (CFI) of 0.978 is better than the
conventional CFI target of 0.950 [7]. The value of CFI is between 0 and 1. A higher value means a better goodness-of-fit. An acceptable fit is larger than 0.95 [7]. The root mean squared error of approximation (RMSEA) of 0.011 is below the goal of being less than 0.050 [60]. A value of the RMSEA within the range of 0.00 to 0.05 suggests a close fit, an RMSEA value between 0.05 and 0.08 suggests a fair fit, an RMSEA value between 0.08 and 0.10 suggests a mediocre fit, and an RMSEA value above 0.10 suggests an unacceptable fit [60]. In summary, all of the goodness-of-fit statistics validate that our SEM estimations in Model 7 appropriately fit the data.

5.4. Robustness Tests

In this subsection, we consider some robustness checks to substantiate our findings from the SEM estimations. First, prior research shows that sustainability practices lead to strong financial performance and enterprise value over the long-term horizon [8]. In order to gain further robustness, we repeated our SEM estimations by lagging the ESG sustainability performance measures by one year. We limited our analysis to a one-year lag effect of CS on stock value due to the reduction in the number of observations that can be used in the estimations. The estimation results of a lead-lag relationship in Model 8 of Table 4 are broadly consistent with those of the simultaneous relationship in Model 7, with a slight reduction in the estimated coefficients of the CS latent variable (0.228) and the value of the R-squared (69.28%). This slight weakening of the results is most likely because of the reduction in the sample size.

Second, when investors talk about the price-to-earnings ratio, they usually refer to the trailing price-to-earnings ratio. The trailing price-to-earnings ratio is calculated based on the past 12-month earnings per share, whereas the forward price-to-earnings ratio favors the forecasted earnings per share for the next 12 months. However, the forward price-to-earnings ratio is also desirable for investors who believe that stock selections are better made relying on estimates of the future, rather than past earnings [45]. Thus far, we analyzed the value relevance of CS using the trailing price-to-earnings ratio as the main measure of stock value. In order to verify whether our results hold up with the changing definition of the price-to-earnings ratio, we also estimated the SEM by using the forward price-to-earnings ratio and report the estimation results in Model 9 of Table 4. The coefficient of the CS latent variable in Model 9 (0.209) is slightly lower than that in Model 7 (0.253). This indicates that the use of the forward price-to-earnings ratio as a measure of stock value does not lead to any change in our inference about the positive synergistic effect among the ESG dimensions of CS on the stock value.

Finally, as corporate economic performance is the primary determinant of stock price informativeness, it seems feasible that investors might ignore corporate sustainability performance when corporate economic performance is strong [36]. It is, therefore, crucial to comprehend whether the pricing of CS is robust to the inclusion of corporate economic performance. In this respect, we include in Model 10 the economic performance factor as well as its interaction term with the CS latent variable. The estimation of Model 10 in Table 4 shows that the economic performance factor is significantly positively associated with the stock value. Thomson Reuters was taken over by Refinitiv in 2018. Refinitiv then changed the datatypes of environmental, social and governance performance scores of ASSET4 from ENVSCORE/SOCSCORE/CGVSCORE to ENSCORE/SOSCORE/CGSCORE, respectively. Moreover, although the economic performance score (ECNSCORE) of ASSET4 is available in the Thomson Reuters Datastream, it was excluded from the Refinitiv Datastream. As a consequence, we can only perform this robustness test with a reduced sample spanning 2010–2017, with 5053 firm–year observations. Note that the ECNSCORE obtained from the Thomson Reuters Datastream is a non-financially based score which refers to the market share, sale region and number of customers. The ECNSCORE measures a firm’s capacity to produce sustainable growth and a high return on investment through the efficient use of all of its available resources. It is reflection of a firm’s overall financial health and its ability to generate long term shareholder value through its use of the best management practices.
This finding is quite intuitive because the market typically prices the economic performance of the companies. Interestingly, a negative and significant interaction coefficient between the economic factor and the CS latent variable means that the effect of the combined action of economic performance and CS on stock value is less than the sum of the individual effects. In other words, there is a tradeoff between corporate economic performance and the ESG dimensions of CS.

The goodness-of-fit statistics of all of the robustness tests reveal that the CFI is greater than 0.95 and the RMSEA is lower than 0.05 for any model. These measures of fit are all acceptable and confirm that the estimations of the SEM in Models 8 and 10 are adequate. Taken together, even though some variations exist across the SEM estimations in Table 4, the findings from the robustness checks in Models 8 and 10 are qualitatively identical to those in Model 7. Our study therefore provides robust evidence in support of the positive synergistic effect among the ESG dimensions of CS on stock value.

6. Discussion and Conclusions

6.1. Discussion

Compared to prior studies on the ESG effects [10,35,36], the current study utilized a different dependent variable focusing on the question of whether the market is willing to pay a premium to buy a company’s stock with strong ESG records. Specifically, we made the case for using the price-to-earnings ratio as a proxy for stock value. This can assist in knowing how much investors are willing to pay for each dollar of earnings the company generates [44,45]. By using structural equation modeling, we reported on the positive synergistic effect of the ESG factors on stock value. This finding would not be possible if single-equation multiple regression were used because it gives inappropriate results depending on the order of the sub-dimensions used in the model.

The finding regarding the positive valuation effect of ESG factors is in line with a number of recent studies [3,25,36,37]. This can be understood in the context of the stakeholder theory. ESG performance improvements can contribute to economic benefits by advancing a company’s relationship with its internal and external stakeholders [61]. The stakeholders will consider ESG performance improvements as a trustworthy indication of the fulfillment of their expectations on environmental, social and governance issues. Because of its improved corporate reputation, the company can gain financial benefits from charging a premium price [62]. The positive synergistic effect among ESG factors on the stock value implies that a holistic approach to sustainable business practices creates a unified and seamless experience for stakeholders regarding social, environmental and governance issues. This finding enables corporate managers to make decisions on whether and to what extent the ESG sustainability factors should be incorporated into business practices, which could positively affect stock value. Therefore, effective sustainable business practices should comprise all of the ESG dimensions of CS in order to gain benefit from the synergistic effect with stock value that is not present for ESG factors in isolation.

Despite the positive synergistic effect among ESG dimensions of CS, there is a tradeoff between corporate economic performance and ESG performance; that is, strong (weak) corporate economic performance weakens (strengthens) the positive synergistic effect of ESG sustainability performance factors on stock value. It is likely that economic performance and ESG performance contain similar information, and that their effects on stock value subsume each other. This finding is in line with the recent study of Ng and Rezaee [36], who demonstrated that when economic performance is weak (strong), investors tend to pay more (less) attention to the sustainability performance factors of the companies.

In addition, each of the ESG dimensions of corporate sustainability should be viewed as “necessary but not sufficient” for stock valuation because each of these factors can cause harm to consumers and communities, and therefore shareholders (we are grateful to the anonymous referee for these suggestions). For example, it is very bad publicity if corporations are found to have unfair labor practices, to be evading environmental regulations, or to be impacting people and the environment. Such factors represent tremendous risk to
earnings and may devalue the company. When viewed in this way, corporate sustainability can be seen as both a risk mitigation strategy and as a long-run strategy. As a long-run strategy, sustainability costs money in the present or short-term because investments need to develop a sound human resource policy, good working conditions, and a higher environmental quality of products and processes through additional investments. In the long run, such companies may become even more valuable by getting the head start or first mover advantages that can accrue. If government regulation for environmental or human resource/labor condition laws change, highly rated sustainability firms will be well positioned to take advantage of the new environment. The synergy may exist in the typical sense or because of “the weakest link in the chain” concept, according to which any shortcoming in one of the dimensions opens the door to higher risk. Higher risk is then priced in the market.

In essence, our results show empirical evidence for the long term versus short term effects of sustainability. In other words, there is a cost associated with investing heavily in supporting sustainability. Heavy investments can exert downward pressure on short run profits. However, sustainability efforts can reduce risk and provide a long run benefit to firms as governments, NGOs and global institutions put increasing pressure on sustainability metrics. There is likely a “sweet spot” or middle of the road sustainability investment strategy that would deliver the right mix of profitability flows over the relevant time frames.

6.2. Conclusions

In this study, we aimed to shed new light on the valuation effect of the environmental, social and governance (ESG) dimensions of corporate sustainability (CS) on stock value via the application of empirical models which were new to the CS literature. We put forward that the heterogeneous ESG effects found in prior regression-based studies were possibly due to more fundamental problems related to measurement errors of CS proxies (E, S and G performance factors). As CS is a multi-faceted concept that is inherently unobservable or measured with errors, the measurement errors of CS proxies are likely to correlate with the error term in the regression model. This potential endogeneity problem could give rise to biased ordinary least squares estimates of the relationship. In an attempt to advance the literature in this crucial aspect, we overcame the shortcoming of traditional regression analysis by using structural equation modeling (SEM) to explicitly take into account the measurement errors of the CS proxies. This enables us to examine whether there exist synergies or tradeoffs among the ESG factors.

Using the panel data of 865 companies in Asian–Pacific emerging markets from 2010 to 2019, we showed that traditional regression analysis, depending on which dimension of CS enter the model, is woefully inconsistent in terms of revealing the effect of CS on stock value. More specifically, when we separately examined the effects of different ESG sustainability performance factors, we found that the individual dimensions of CS show inconsistent patterns of value relevance. Only the social factor provides evidence in favor of a positive and significant influence on stock value, while the environmental and governance factors do not have significant explanatory power. This implies that the individual dimensions of CS are likely to be priced by the markets differently. When the ESG sustainability performance factors are included in the model simultaneously, the effect related to the social factor weakens and loses statistical significance. The result is also insignificant if we aggregate the E, S and G factors into a composite index by the equally-weighted method. This indicates that the use of the ESG composite index as a measure of CS as a whole masks the heterogeneous impacts of the individual components of CS, and hence provides illusory support for the value irrelevance of CS. When CS was considered as a latent variable and the measurement errors of CS proxies were properly taken into account by the SEM approach, we found a significant and positive synergistic effect among the ESG sustainability factors on stock value. This suggests that investors tend to place more value on companies with a holistic approach to ESG sustainability practices, and that investors are willing to pay
for each dollar of earnings that the highly-rated ESG company generates. Ignoring the synergistic effect among ESG dimensions of CS could cause a biased conclusion toward the value irrelevance of CS. Furthermore, our findings show that social engagement deserves greater attention as a value-creation channel because it emerged as the main driver of CS. To reiterate, it is the social factor, more so than either the environmental or the governance factors, that appears to meaningfully and measurably drive the stock value. Interestingly, there is a tradeoff between corporate economic performance and CS; that is, strong (weak) corporate economic performance weakens (strengthens) the positive synergistic effect among the ESG dimensions of CS on the stock value. In other words, there is a tradeoff between corporate economic performance and the ESG dimensions of CS.

The results of this study have important implications for corporate managers, investors, asset managers and regulators. Corporate managers should incorporate ESG sustainability strategies into one coherent approach, rather than independently, in order to gain the synergistic effect among the ESG factors on stock value. Focusing on any single dimension of CS tends to understate the positive synergistic effect among the ESG factors on stock value. Nonetheless, the synergistic effect among ESG factors does not imply that the individual components of CS should be weighted equally in sustainability practices, as investors progressively consider not only financial performance but also environmental, social and governance performance when screening for potential investments and evaluating potential risks of stocks. Such an investment strategy is widely known as ESG investing. Investors’ consideration of the ESG impact of their investment activities is transforming the proposition offered by many asset managers and the ways in which they operate. The emerging ESG trends and issues also influence the way that issuers and asset managers think about performance and disclosure. Furthermore, understanding legal and regulatory considerations and requirements that apply to ESG is important for legal and compliance professionals. In this respect, regulators of the stock exchange may consider tax incentives to encourage listed firms to take initiative to minimize their environmental and social impacts and enhance good governance practices.

Although the current study provides a better insight into the valuation effect of ESG factors on stock value, its limitations suggest future avenues for empirical research. This study only focuses on the effect of ESG performance at the level of the ESG pillar scores, whereas the ASSET4 ESG data set contains 15 category scores grouped within the E pillar (resource reduction, emission reduction, product innovation), S pillar (employment quality, health and safety, training and development, diversity, human rights, community, product responsibility) and G pillar (board structure, compensation policy, board functions, shareholders rights, vision and strategy). It is therefore interesting to re-estimate the models by using the category scores to determine whether a positive synergistic effect exists among the category scores. Moreover, there is increased pressure on emerging countries to be competitive and to keep costs low through low labor costs, which are in fact promoted by reduced legal pressure for labor laws and reduced environmental regulation. Thus, it would be an interesting area of future research to correlate the results with the amount of regulation in each member country (we are grateful to the anonymous referee for these suggestions). Some researchers have referred this as the “race to the bottom” that drives global competition to seek out less environmental regulation and the corresponding movement of production to countries with less regulation [63,64].

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Appendix A The Definition of ESG Category Scores

- **Resource Reduction**: The resource reduction category measures a company’s management’s commitment and effectiveness towards achieving an efficient use of natural resources in the production process. It reflects a company’s capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving the supply chain management.

- **Emissions Reduction**: The emission reduction category measures a company’s management’s commitment and effectiveness towards the reduction of environmental emissions in the production and operational processes. It reflects a company’s capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx and SOx, etc.), waste, hazardous waste, water discharges and spills, or its impacts on biodiversity, and its ability to partner with environmental organizations to reduce the environmental impact of the company in the local or broader community.

- **Product Innovation**: The product innovation category measures a company’s management’s commitment and effectiveness towards supporting the research and development of eco-efficient products or services. It reflects a company’s capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability.

- **Employment Quality**: The employment quality category measures a company’s management’s commitment and effectiveness towards providing high-quality employment benefits and job conditions. It reflects a company’s capacity to increase its workforce loyalty and productivity by distributing rewarding and fair employment benefits, and by focusing on long-term employment growth and stability by promoting from within, avoiding lay-offs and maintaining relationships with trade unions.

- **Health and Safety**: The health and safety category measures a company’s management’s commitment and effectiveness towards providing a healthy and safe workplace. It reflects a company’s capacity to increase its workforce loyalty and productivity by integrating into its day-to-day operations a concern for the physical and mental health, well-being and stress level of all of its employees.

- **Training and Development**: The training and development category measures a company’s management’s commitment and effectiveness towards providing training and development (education) for its workforce. It reflects a company’s capacity to increase its intellectual capital, workforce loyalty and productivity by developing its workforce’s skills, competences, employability and careers in an entrepreneurial environment.

- **Diversity**: The diversity category measures a company’s management’s commitment and effectiveness towards maintaining diversity and equal opportunities in its workforce. It reflects a company’s capacity to increase its workforce loyalty and productivity by promoting an effective life–work balance, a family friendly environment and equal opportunities regardless of gender, age, ethnicity, religion or sexual orientation.

- **Human Rights**: The human rights category measures a company’s management’s commitment and effectiveness towards respecting fundamental human rights conventions. It reflects a company’s capacity to maintain its license to operate by guaranteeing the freedom of association and excluding child, forced or compulsory labor.

- **Community**: The community category measures a company’s management’s commitment and effectiveness towards maintaining the company’s reputation within the general community (local, national and global). It reflects a company’s capacity to maintain its license to operate by being a good citizen (donations of cash, goods or staff time, etc.), protecting public health (the avoidance of industrial accidents, etc.) and respecting business ethics (avoiding bribery and corruption, etc.).

- **Product Responsibility**: The product responsibility category measures a company’s management’s commitment and effectiveness towards creating value-added products and services upholding customers’ security. It reflects a company’s capacity to maintain its license to operate by producing quality goods and services integrating
the customer’s health and safety, and preserving its integrity and privacy through accurate product information and labelling.

- **Board Structure**: The board structure category measures a company’s management’s commitment and effectiveness towards following the best practice corporate governance principles related to a well-balanced membership of the board. It reflects a company’s capacity to ensure a critical exchange of ideas and an independent decision-making process through an experienced, diverse and independent board.

- **Compensation Policy**: The compensation policy category measures a company’s management’s commitment and effectiveness towards following the best practice corporate governance principles related to competitive and proportionate management compensation. It reflects a company’s capacity to attract and retain executives and board members with the necessary skills by linking their compensation to individual or company-wide financial or extra-financial targets.

- **Board Functions**: The board functions category measures a company’s management’s commitment and effectiveness towards following the best practice corporate governance principles related to board activities and functions. It reflects a company’s capacity to create an effective board by setting up the essential board committees with allocated tasks and responsibilities.

- **Shareholders Rights**: The shareholder rights category measures a company’s management’s commitment and effectiveness towards following the best practice corporate governance principles related to shareholder policy and the equal treatment of shareholders. It reflects a company’s capacity to be attractive to minority shareholders by ensuring them equal rights and privileges, and by limiting the use of anti-takeover devices.

- **Vision and Strategy**: The vision and strategy category measures a company’s management’s commitment and effectiveness towards the creation of an overarching vision and strategy integrating financial and extra-financial aspects. It reflects a company’s capacity to convincingly show and communicate that it integrates the economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

### Appendix B The Definition of the Variables

- **The trailing price-to-earnings ratio** is a company’s current share price relative to its last twelve months (LTM) earnings per share from continuing operations. The trailing price-to-earnings ratio is not calculated when the earnings per share are less than or equal to zero.

- **The forward price-to-earnings ratio** is a company’s current share price relative to its estimated earnings per share for the next year. The forward price-to-earnings ratio is not calculated when the estimated earnings per share are less than or equal to zero.

- **The dividend payout ratio** is the ratio of the gross dividends of common stocks for the trailing twelve months divided by the income available to common stocks excluding extraordinary items for the same period.

- **The risk-free rate** is benchmarked by the three-month treasury-bill rate.

- **The growth rate of earnings** is the statistical average of all of the broker estimates. Long-term growth is an estimate of the compound average rate of earnings per share growth that analysts expect over a period of three to five years.

- **The equity risk premium** is proxied by a 5-year monthly beta which is the measure of a company’s common stock price volatility relative to the market price volatility for a 5-year duration using a least square linear regression line. A 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** represents the sum of the market value for all of the relevant issue level share types. The issue level market value is calculated by multiplying the requested share type by the latest close price. This item supports default, free float, and outstanding shares types.
• The debt-to-asset ratio is calculated as the net debt divided by the total asset. Net debt represents the sum of the total debt, minority interest, redeemable and non-redeemable preferred stock less cash, cash and equivalents, and short-term investments.
• The market-to-book ratio is calculated by dividing the company’s latest closing price by its book value per share. The book value per share is calculated by dividing the total equity by the current total shares outstanding.
• The dividend yield is 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 the dividend yield. The price is the closing price on the prior trading day.

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