Nonlinear Effect of Corporate Social Responsibility on Firm Performance Persistence

Chin-Mei Chou* and Tzu-Yi Yang**

Abstract

This paper employs a panel smooth transition autoregressive model to assess the threshold effect of corporate social responsibility on firm performance persistence among 31 large Taiwanese firms that won the Corporate Social Responsibility Award from 2007 to 2020. The empirical results indicate that the change in firm performance persistence with the degree of involvement in corporate social responsibility activities exhibits a heterogeneous, time-dependent, and asymmetric threshold effect. In addition, corporate social responsibility is found to have a deferred effect on firm performance, and when the past corporate social responsibility index exceeds a certain threshold value (7.979), firm performance quickly becomes more persistent. Finally, we discuss our empirical results concerning corporate social responsibility and firm performance persistence as well as their management implications, provide reference information for national authorities and corporate managers, and propose directions for future research.

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I. Introduction

At this time when the global economy and political situation is in a state of high risk and uncertainty and when consciousness toward environmental protection, human rights, and public health and safety is rising steadily, the issue of corporate social responsibility (CSR) is again attracting the attention of governing authorities and corporate managers in many countries; apart from hoping to rely on sound corporate governance to boost enterprise value and stabilize their national economies, these authorities are also seeking ways to enhance corporate performance and maximize benefits for their shareholders. According to the definition by the World Business Council for Sustainable Development (WBCSD), CSR consists of an enterprise's pledge to continuously uphold ethical standards and contribute to the global economy while improving the quality of life of its employees and their families, the entire local community, and society as a whole. Accordingly, apart from having a positive effect on social harmony and ecologically sustainable development, an enterprise's involvement in CSR activities also has an extremely important impact on an enterprise's business performance and the stability of a nation's economy.

With regard to CSR and corporate business performance, some scholars believe that a positive correlation exists (Cornell and Shapiro, 1987; McGuire et al., 1988; Waddock and Graves, 1997; Orlitzky et al., 2003; Luo and Bhattacharya, 2006; Chih et al., 2016; Chen et al., 2017; Wei et al., 2018). Some scholars have empirically found that beyond enhancing brand

image, an enterprise's involvement in social activities can improve its relations with stakeholders and boost corporate value by winning investors' trust (Porter and Linde, 1995; Fombrun et al., 2000; Vergalli and Poddi, 2009). However, other scholars who have examined this issue from the perspective of limited resources have reached the opposite conclusions, claiming that when an enterprise discharges its social responsibilities toward other interest groups, its business focus consequently shifts away from profit maximization, which causes its operating costs to increase and reduces its business performance (Aupperle et al., 1985; Halme and Niskanen, 2001; Schuler and Cording, 2006; Ullmann, 1985). Although the literature has verified that CSR has profound influences on corporate business performance and corporate value, corporate managers in the practical realm and scholars in relevant academic fields still have differing views concerning whether firms' commitment of resources to CSR activities can help them enhance their corporate value or business performance.

Although research on the relationship between CSR and corporate business performance has a substantial basis and results in the literature, research on some related issues is neglected or poorly represented in the literature. First, most research on the relationship between CSR and business performance focuses on the impact of a firm's current CSR activities on its business performance, and there has been little examination of the changes and trends in a firm's business performance from the perspective of the deferred effect of CSR on firm performance persistence. However, neglecting the deferred effect of key factors and the effect of the firm's past business performance may lead to the underestimation of corporate business performance. Furthermore, while most studies on current corporate performance have used conventional linear models to perform estimations, empirical results may exhibit estimation bias because the empirical procedures used in linear models may neglect significant correlations between variables in the model or because of the heterogeneity that commonly appears when the data structure has cross-sectional characteristics. Finally, because the variables in most empirical models of corporate business performance often have time-series characteristics and heterogeneity and because corporate business performance may exhibit nonlinear characteristics due to asymmetrical relationships between the model variables, conventional linear models may be unable to correctly estimate corporate business

performance.

To resolve the abovementioned issues, this paper seeks to construct a model of firm performance persistence and employ stepwise regression to estimate firms' performance persistence characteristics. In addition, we employ a newly developed nonlinear regression analysis technique—a panel smooth transition autoregressive (PSTAR) model—to test the changes in business performance and firm performance persistence in Taiwan. This model offers the advantages of capturing heterogeneity in the data and accurately describing individual and time fixed effects in the model. At the same time, this model can also resolve problems regarding nonlinearity and heterogeneity in the data while offering predictive ability and identification accuracy that are significantly better than those of conventional linear regression models. Furthermore, to determine whether firms' past business performance will influence their current business performance in a nonlinear manner due to their involvement in CSR activities, we use CSR as a transition variable of the model when performing empirical analyses.

This paper makes tangible contributions to the literature on this subject. First, we use a PSTAR model to assess firm performance persistence, where the model can assess the effect of data that are nonlinear and have a cross-sectional structure on firm performance persistence while also effectively presenting the dynamic smooth transition process of corporate performance. Importantly, these features not only avoid the biased results that may occur when conventional linear models are employed but also enable the accurate estimation of the changes in and persistence of firm performance. Furthermore, this study uses CSR as a transition variable of the model to determine whether CSR has a deferred effect on corporate performance and investigates whether firms' level of involvement in CSR activities has a nonlinear influence on the changes in and persistence of firm performance. Finally, this paper finds that the effect of a firm's level of involvement in CSR activities on its performance persistence has a nonlinear structure that depends on the company and period. Our research process and results can not only help government authorities, corporate managers, and investors correctly draft economic policies, operating strategies, and investment plans but also promote the stabilization of nations' economies, sound corporate governance, enhanced

corporate performance, and better returns on investment.

The remaining sections of this paper are organized as follows. The second section reviews the literature on corporate business performance, CSR, and the relevant research models; the third section presents the estimation procedures in the PSTAR model; the fourth section introduces the data sources, use of the empirical model in testing (including unit root testing, linearity testing, and threshold testing), and empirical results; and the fifth section summarizes the paper and provides recommendations.

II. Literature Review

A. Firm Performance Persistence

To ensure that business goals are met, corporate managers and shareholders typically focus their attention on business performance. Most studies on business performance focus on the key factors affecting it, its prediction, and its assessment indicators. From the perspective of enterprises' pursuit of sustainability and the prediction of business performance, the persistence of corporate business performance is extremely important, not only because persistence can reflect fluctuations in profits during an enterprise's long-term investment process but also because this approach can effectively use past business performance information to predict possible future business operating results, which can enable corporate managers to adjust corporate operating directions and strategies. Ball and Watts (1972) propose that the time-series characteristics of corporate earnings allow for the assessment of enterprises' operating results, prompting scholars to subsequently study the persistence of corporate earnings and becoming an important basic theory in accounting research. Moreover, Lipe (1990) proposes that persistence refers to the degree of the autocorrelation of earnings and expresses the degree to which current-period earnings continue into future fiscal years. The

assessment of the persistence of profits is an important means of assessing a company's financial status and value. Past studies have typically observed changes in time-series data concerning an enterprise's profits, enabling them to make more meaningful inferences concerning an enterprise's operating characteristics (Jones, 1991; Dechow and Dichev, 2002; Riahi-Belkaoui and Alnajjar, 2002; Schipper and Vincent, 2003; Kothari et al., 2005; Asthana and Zhang, 2006).

Corporate performance assessment methods generally analyze either financial or operating performance, where the assessment of financial performance chiefly assesses firm performance from the perspective of financial figures, which typically involves the use of indicators such as return on assets (ROA), net profit margin, and return on investment. Although the assessment of financial performance offers the advantages of clear-cut and transparent sources of information, financial statements may suffer from information asymmetry and uncertainty because financial figures usually constitute lagging indicators, and as soon as a company is operating at a loss, its managers may try to cover up bad news through obfuscation. Ajina et al. (2016) suggest that when corporate managers notice that earnings are falling, they attempt to increase the complexity of their financial statements in an effort to conceal poor performance and that financial statements with poor readability prevent small investors from taking precautions against impending danger. Additionally, the assessment of an enterprise's business performance chiefly addresses enterprise value, which is generally assessed using economic value added (EVA) and Tobin’s Q. Compared with the use of financial performance assessment methods employing financial information to assess enterprises' business performance, assessing enterprise value to gauge operating performance has the advantage of a real-time reflection of market information. However, because the process of assessing the intangible attribute of enterprise value involves human judgment, the subjective factors affecting the assessment process may lead to overidentification and bias in the estimation results.

Tobin's Q, which consists of a firm's market value divided by its replacement cost, is a method of assessing enterprise value. Compared with the information on financial statements, Tobin's Q can reflect a company's market information in a more effective and timely manner

and is currently considered an effective indicator for assessing a company's tangible enterprise value. In recent years, a growing number of finance and accounting scholars have adopted Tobin's Q as a means of assessing tangible enterprise value in view of its immediate reflection of information, correctness, and objectiveness (Aretz et al., 2007; Ruan et al., 2011; Ida, 2013; Vizcaíno and Chousa, 2016). However, the complex calculation methods involved and the difficulty in obtaining correct replacement cost data have reduced the utility of Tobin's Q as a method for assessing enterprise value in empirical research. Chung and Pruitt (1994) revise the Tobin's Q calculation method proposed by Lindenberg and Ross (1981) and employ an estimation method based on basic financial information; in this method, the market values of a company's stock in circulation and total liabilities are used instead of the numerator, while the denominator consists of the book value of total assets when estimating the company's replacement cost. This calculation approach is simpler than those employed previously, and thus, it can more easily obtain the necessary data. As a consequence, this paper employs the revised Tobin's Q as a proxy variable expressing tangible enterprise value when assessing enterprises' operating performance persistence.

B. Theory of CSR and Corporate Performance

Regarding the relationship between CSR and corporate financial performance, many scholars have proposed different views based on different theories, which are described as follows:

a. Supply and demand theory

This theory holds that CSR has no direct relationship with corporate performance. The mission of a business to society is only to fulfill its economic responsibility, namely, to produce and supply the products demanded by consumers, through which to achieve their business goals and maximize their profits (Anderson and Frankle, 1980).

b. Social impact hypothesis

The operation of a company in line with the public's expectations enhances not only the company's reputation and image but also the public's trust in the company. In addition, based on the public's other-regarding morality, the public may be willing to buy the products produced by the company, invest in the company's stock, or even work at the company to reward a company with good CSR performance. These incentives effectively improve the company's financial performance (Cornell and Shapiro, 1987).

c. Stakeholder contract costs theory

Stakeholder theory claims that there is an implicit contract between the enterprise and its stakeholders; that is, stakeholders hope that the enterprise can treat them fairly in terms of their rights and surplus distribution. Therefore, when companies invest resources in CSR activities, if the public can obtain information on these activities, then the cost of relationships between companies and stakeholders are reduced by promoting social harmony, and corporate financial performance is improved; in contrast, if the company violates this implicit contract, then stakeholders interfere with the firm's activities and complain to other stakeholders of the company about the firm's inappropriate behavior, thereby increasing the firm's operating costs and reducing its financial performance profitability. Therefore, stakeholder contract cost theory also suggests that CSR performance has a positive impact on corporate financial performance (Swanson, 1995; Schuler and Cording, 2006).

d. Private costs theory

A firm invests resources in CSR activities; although such activities can increase the public benefit of society, they may also be negative for the private personal benefit of the company's shareholders. Therefore, private costs theory implies that CSR activities are unfavorable to corporate value and business performance. From the perspective of private benefit

maximization, instead of investing company resources in CSR activities, it is better to use these resources in other investment activities that can benefit shareholders. (Preston and O'Bannon, 1997).

e. Management guile theory

Based on the agency relationship, it is difficult for company shareholders to supervise and control the behavior of managers. Therefore, some managers carry out CSR activities in the name of their own interests, and sometimes, even company managers may pretend to be well known to participate in CSR activities to pursue their own interests. As a result, the company's financial performance cannot be maximized. Therefore, management guilt theory holds that the fulfillment of CSR has a negative impact on corporate financial performance (Jensen and Meckling, 1976; Schuler and Cording, 2006).

C. Relationship between CSR and Corporate Performance

The literature contains a large cumulative body of research on the relationship between CSR and corporate business performance, and there have been no consistent conclusions concerning this relationship because of the differences in research methods, sample acquisition, and industry characteristics. Some scholars have relied on private costs theory to conclude that a company's limited resources should be employed to maximize its profits, and if a company engages in CSR activities, then the perspective of opportunity costs dictates that doing so will not maximize the company's profit (Friedman, 1970; Jensen, 2002). Furthermore, other scholars have taken a similar viewpoint in supporting the shift of focus hypothesis, which states that in view of an enterprise's limited resources, when that enterprise makes tradeoffs among different types of stakeholders, if the enterprise seeks to discharge its social responsibility to other interest groups, then this action will shift its operating focus away from profit maximization, cause financial costs to increase, and reduce its level of business performance (Halme and Niskanen, 2001; Béreau et al., 2012). Maqbool and Zameer (2018)

argue that there are costs involved in investing resources in CSR activities (philanthropy, green equipment, pollution control, etc.), which reduce company performance. Oyewumi et al. (2018) empirical study shows that if using a panel context of two-way random and fixed effects, then CSR would have little or no significant effect on the financial performance of companies. Private costs theory and the shift of focus hypothesis consequently imply that CSR activities are unfavorable for corporate value and business performance.

Conversely, in what is known as the social impact hypothesis, numerous past studies have concluded that by satisfying stakeholders' needs, CSR activities can strengthen the relationship between an enterprise and its stakeholders, which will boost the enterprise's financial performance and thereby enhance its business performance (Cornell and Shapiro, 1987; Preston and O'Bannon, 1997; Orlitzky et al., 2003; Schuler and Cording 2006). Corporate CSR practices have important implications for creating internal outcomes for stakeholders in terms of consumer and employee loyalty (Lee et al., 2013). Firms can focus on satisfying stakeholders' expectations, and such a strategy can potentially improve business performance (Bosse et al., 2009; Phillips et al., 2010). Many studies proposing similar findings have asserted that apart from having a positive correlation with corporate image and product sales (Famiyeh, 2017; Galant and Cadez, 2017), corporate involvement in CSR activities can reduce hidden internal costs while boosting corporate business performance (Jamali and Mirshak, 2007; Vergalli and Poddi, 2009; Du et al., 2010; Goss and Roberts, 2011; Simionescu and Gherghina, 2014; Waworuntu et al., 2014). In addition, Vilanova et al. (2009) suggest that the chief reason why CSR is able to boost corporate competitiveness is that corporate learning incorporates CSR in everyday business activities, and the cycle of ongoing learning and innovation coupled with practice gradually forms the enterprise's core competitiveness, thus boosting business performance.

In summary, enterprises' level of involvement in CSR activities will have a profound impact on their business performance. However, there are no consistent conclusions concerning the empirical relationship between CSR inputs and business performance in the literature. In accordance with stakeholder theory, there is an implicit contract between the enterprise and its stakeholders. Therefore, not only will an enterprise's involvement in CSR

activities enhance social harmony, reduce the relationship cost between the enterprise and stakeholders and improve corporate financial performance, but an enterprise's involvement in CSR activities beyond a certain level (threshold value) will also allow it to take a step closer to effectively reducing transaction coordination costs between the enterprise and its stakeholders and further enhance corporate performance. In other words, the relationship between business performance and enterprises' involvement in CSR activities is different from the traditional linear relationship proposed by most studies, and there may be a nonlinear structure.

In summary, at the initial stage of enterprise involvement in CSR activities, the overall operating costs of the enterprise may increase due to high marginal input costs and low marginal benefits, resulting in limited growth in corporate performance; however, once the level of enterprise involvement in CSR activities exceeds the threshold value, its marginal benefits will become more obvious, and overall corporate performance will be effectively improved. Therefore, this paper explores the nonlinear relationship between CSR and the corporate value of listed companies in Taiwan. In addition, using the CSR index as a transition variable, in addition to estimating the threshold value of enterprise involvement in CSR activities, it also explores the different impacts of such involvement on corporate value.

D. Nonlinear Models

Granger and Teräsvirta (1993) point out that because most macroeconomic variables have nonlinear tendencies, if heterogeneity exists between variables during the empirical modeling process, then specification errors will occur during estimation employing a conventional linear model, and bias will consequently be present in the estimation results. To resolve this problem and achieve more precise empirical conclusions, in recent years, a growing number of scholars have employed nonlinear empirical models when a model's variables are heterogeneous in structure. Those nonlinear models most commonly seen in the empirical literature include threshold autoregression (TAR) models (Tong, 1978), which constitute nonlinear regime-switching models. However, it is difficult to capture the true variations in the state of

transition of the models during empirical research because the transition process of this model is radical and discrete. Consequently, the type of model often cannot completely and correctly capture the transition processes of low-frequency data. The smooth transition autoregressive (STAR) model [proposed by Chan and Tong (1986)] is composed of 2 nonlinear autoregressions linked by a transition function, and the transition process permits the variables to move between 2 different states, thus ensuring that the smooth transition process is determined by the value of the lagged transition variable. However, this approach is not suitable for models with a cross-sectional data structure.

The chief characteristic of the panel threshold regression (PTR) model proposed by Hansen (1999) is the use of a time-varying threshold variable to divide the panel data into several different intervals so that when the observed value data are near the transition threshold, a jump will occur. However, this phenomenon is rarely seen in the real world. After changing the jump transition in this PTR model to a smooth transition, González et al. (2005) propose a PSTR model, to which they add a transition speed parameter. This transition speed parameter is used to describe the model's smooth transition phenomenon near the threshold value and ensures that the transition is not a simple jump. Furthermore, the transition variable threshold value is estimated using quantitative methods and not specified artificially. This objective estimation approach can avoid bias in the estimated model extremes due to researchers' subjective preconceptions. In view of the features and advantages of PSTR models, a growing number of scholars have recently adopted models of this type in their research (Béreau et al., 2012; Cheng and Wu, 2013; Wu et al., 2013; Chao et al., 2019, Giannellis and Koukouritakis, 2019).

Wu and Chang (2017) develop the PSTAR model from the PSTR model and use it to test the nonlinearity and persistence effect of monetary and fiscal policies on foreign direct investment (FDI) for ten Organisation for Economic Co-operation and Development (OECD) countries. According to the recommendation of Wu and Chang (2017), a PSTAR model can be constructed via the following steps. First, the linear portion of the smooth transition autoregression model should be confirmed; this portion constitutes an autoregression model with a dependent variable of order p. The next step is to use a stepwise regression model to

determine the optimal p value of the lagged dependent variable. The final step is to use the dependent variable with multiperiod lags in place of the exogenous variable of the PSTR model. Apart from a PSTR model possessing the ability to capture data heterogeneity and the advantages of accurately describing the model's individual and time fixed effects, it can also avoid the common problem of multicollinearity in linear structural models. Furthermore, this model can provide information that is useful for enhancing the model's estimation effectiveness when researchers are studying situations with long lag periods for dependent variables.

In summary, enterprises' level of involvement in CSR activities will have a profound impact on their business performance. However, in the empirical process of observing the existing relevant literature, only the relationship between corporate CSR investment and current business performance is considered, while the persistence impact of CSR investment on corporate business performance and the possible deferred effects between the two are not discussed. In fact, the durability of operating performance is extremely important from the perspective of a company's pursuit of persistence and forecasting of operating performance. In addition, according to the social impact hypothesis, to reward a company with good CSR performance, customers are willing to buy those products produced by the company, invest in the company's stock, or even work at the company. These incentives have had a positive impact on the company's operating performance. However, due to the different reaction times of people's behavior, the effect of the abovementioned incentive measures on the company's operating performance may be delayed. According to Lipe (1990), persistence refers to the degree of autocorrelation of returns and indicates the extent to which current returns persist into future fiscal years. In addition to affecting the sustainability of business performance, corporate CSR investments may also have deferred effects. Because this paper seeks to investigate corporate performance changes and persistence threshold effects and because the model's variable data have time-series characteristics, we opt to use a PSTAR model in our empirical analysis.

III. Model and Method

A. Empirical Model

This paper takes 31 large Taiwanese firms that won the Corporate Social Responsibility Award from 2007 to 2020 as its subjects. In accordance with the extension of the PSTR model proposed by González et al. (2005) and suggested by Wu and Chang (2017), we construct a PSTAR model to assess the effect of CSR inputs on firm performance persistence and threshold effects.

The PSTR model employs a nonlinear transition function to link 2 linear intervals; apart from being able to capture heterogeneity in the sample data, this approach can also more accurately describe individual and time fixed effects in the sample data. In addition, regarding obtaining the model's threshold value, in contrast to past methods relying on subjective judgments, this approach employs estimation using quantitative methods. Compared with conventional empirical models, the PSTR model offers the advantage of determining the transition threshold in a more objective manner. Furthermore, in addition to revising the jump that occurs in the PTR model proposed by Hansen (1999), when the observed transition value reaches the vicinity of the threshold value for a smooth transition, the PSTR model adds a transition speed parameter to explain the smooth transition that occurs near the transition threshold value. This approach is especially suitable when the model employs macroeconomic variables or variables that have time-series characteristics. The PSTR model in this paper is constructed as follows:

$$y_{it} = \alpha_i + \beta_0 X_{it} + \omega\beta_1 X_{it} G(Z_{it\text{-d}}; \gamma, C) + \mu_{it} \tag{1}$$

Where $i = 1, 2, ..., N$ is the number of cross-sectional enterprises; $t = 1, 2, ..., T$ is time,

y_{it} is the business performance of the i^{th} enterprise during year t, and X_{it} is the independent variable of time-varying dimension vectors k. This paper employs a stepwise regression model to find the optimal exogenous variables when modeling firms' past performance. α_i denotes individual fixed effects; $G(Z_{it-d};\gamma,C)$ is a transition function with a value between 0 and 1; Z_{it-d} is a transition variable with lag period d and is also an exogenous variable; γ is the transition speed parameter, which is used to describe the transition function's transition in the model; C is the transition threshold value; and ε_{it} is the residual. Furthermore, the Akaike information criterion (AIC) and Bayesian information criterion (BIC) with the smallest values must be used to estimate the optimal current-period and lagged transition variables. In accordance with the recommendations of Granger and Teräsvirta (1993) and Teräsvirta (1994), the model's transition function is specified as follows:

$$G(Z_{it-d};\gamma,C)=\left\{1+\exp[-\gamma\prod_{j=1}^{m}(Z_{it}-C_j)]\right\}^{-1} \tag{2}$$

or

$$G(Z_{it-d};\gamma,C)=1+\exp[-\gamma\prod_{j=1}^{m}(Z_{it}-C_j)]^2 \tag{3}$$

where $\gamma>0$ and $C_1 \le C_2 \le ... \le C_m$. $C = (C_1, C_2, \ldots, C_m)$ is defined as the location parameter of dimension m, and the value of γ represents the slope of the transition function, which implies that the greater the value of γ is, the steeper the slope of $G(.)$. In particular, when $\gamma \to \infty$, $G(.)$ converge at 1, in effect implying a structural change at a single point in time; in this case, the model is identical to the single-point jump model of Hansen (1999), and the PSTR model will have been simplified to a PTR model. When $\gamma \to 0$, $G(.)$ approximates a linear form, the structural change at the single point is not significant, and the PSTR model will have been revised to possess panel estimation ability with fixed effects.

Eqs. (2) and (3) are monotonically increasing functions of Z_{it-d}, with the former being a logistic specification with an asymmetric adjustment to equilibrium and the latter being an

exponential specification with a symmetrical inverted bell-shaped distribution. Following the proposition of Teräsvirta (1994), this paper adopts a logistic transition function with two regimes and *m* location parameters based on the maximum F statistic. According to the empirical suggestion of González et al. (2005), to capture nonlinear forms, it is usually sufficient to consider one of 2 forms, *m* = 1 or *m* = 2. *m* = 1 implies a logistic model [see Eq. (2)], and the transition threshold value will divide the data into 2 intervals, while *m* = 2 implies an exponential model (see Eq. (3)), and the transition threshold value will divide the data into 3 intervals. A generalized PSTR model is as follows:

$$y_{it} = \alpha_{0i} + \sum_{j=1}^{j} \beta_j X_{it-j} + \sum_{j=1}^{j} \beta_j' X_{it-j} G(Z_{it-d}; \gamma, C)_{it-d} + \tau_{it} \quad (4)$$

where $j = 1, 2, ..., r$ is the transition function quantity in the model, there are (r + 1) transition intervals, and the form of the transition function is determined by the results of estimation using Eq. (2) or (3).

Before constructing a PSTAR model, we employ cross-sectional data concerning past firm performance and apply a stepwise regression model to find the linear characteristics of firm performance. In view of the cyclical characteristics of the variable data used in this paper, we estimate the length of the lag period for the j^{th} period to a lag of 4 periods. The firm performance autoregression model is as follows:

$$Tobin's\ Q_{it} = \alpha_{i0} + \sum_{j=1}^{j} \alpha_j Tobin's\ Q_{it-j} + u_t \quad (5)$$

where $Tobin's\ Q_{it}$ and $Tobin's\ Q_{it-j}$ are the firm performance of firm *i* at time *t* and that at time *t* with lag period *j*, respectively; α_{i0} and u_{it} are the intercept term and residual, respectively; and α_j is the persistence coefficient of firm performance. After estimating the linear characteristics of firm performance, this paper chooses the firm's level of CSR inputs as the transition variable. Following the suggestion of Wu and Chang (2017), we perform estimations using Eq. (5) and obtain the dependent variable with multiperiod lags, which is

substituted for the exogenous variable in the PSTR model. The PSTAR model used in this paper is defined as follows:

$$Tobin's\ Q_{it} = \beta_{i0} + \sum_{j=1}^{j} \beta_j Tobin's\ Q_{it-j} + \sum_{j=1}^{j} \beta_j' Tobin's\ Q_{it-j} G(CSR_{it-d}; \gamma, c) + \varepsilon_{it} \quad (6)$$

where $G(CSR_{it-d}; \gamma, c)$ is a transition function with a value between 0 and 1; CSR_{it-d} is the CSR at the d^{th} lag period; γ is the transition parameter, which describes the transition speeds in the model's 2 extreme situations; and c is the transition threshold value. The transition function can describe a smooth transition in firm performance, and CSR may have a lagged threshold effect on firm performance. Accordingly, in view of the characteristics of the data in this paper, we choose to use a transition variable with lags from 1 to 4 periods (CSR_{it-d}, d =, 1, 2, 3, 4) instead of the current-period transition variable (CSR_{it}) and employ an assessment method using the smallest AIC and BIC values to estimate the optimal lag transition value; ε_{it} is the residual.

B. Model Specification and Testing

Before performing estimation using the empirical model, to ensure that the sample data do not have nonstationary characteristics, which might cause bias in the estimation results, we employ cross-sectional unit root testing to determine whether the sample data constitute a stationary time series. After confirming that the sample data have stationary characteristics, we employ the model estimation method proposed by González et al. (2005) and Wu et al. (2013). First, we perform linearity testing to determine whether firm performance satisfies the nonlinearity condition, where the rejection of the null hypothesis of linearity implies that the model constitutes a nonlinear panel model. We then confirm that the sample data are heterogeneous and estimate the transition threshold, which confirms the transition function's transition parameter and the model's form. Finally, after confirming the number and form of the model's transition variables, we estimate the nonlinearity and persistence of the effect of

CSR on firm performance using Eq. (6) and the nonlinear least squares method. The testing steps and process are explained below.

Because the PSTR model is not suitable for estimations involving homogeneous cross-sectional data, we convert the model into a general linear panel model when performing empirical data analysis. Accordingly, we perform homogeneity testing before conducting model parameter estimation, which confirms that the model possesses nonlinear characteristics. This approach is equivalent to testing the null hypothesis $H_0 : r = 0$ (r is the number of threshold variables), which implies a linear model. However, although the model's null hypothesis, $H_0 : r = 0$, theoretically can be seen as implying a linear model with no transition effect, interfering parameters (such as location parameter problems) may still prevent the test statistics from following a normal distribution. Following the suggestion of González et al. (2005), to test the linearity of Eq. (6), this paper consequently uses the first-order Taylor expansion of $H_0 : r = 0$ in place of the model's transition function $G(Z_{it-d}; \gamma, C)$ when performing homogeneity testing. The auxiliary regression equation is as follows:

$$\delta_{it} = \theta_{i0} + \sum_{j=1}^{j} \theta_j Tobin's\ Q_{it-j} + \sum_{j=1}^{j} \theta_j' Tobin's\ Q_{it-j} CSR_{it-d} + \tau_{it} \quad (7)$$

where δ_{it} is the residual in Eq. (6), θ_{i0} is the intercept term, $Tobin's\ Q_{it-j}$ denotes firm performance with *j* lag periods, and CSR_{it-d} denotes CSR with *d* lag periods. Linearity testing chiefly involves testing the null hypothesis $H_0 : \theta_1' = \theta_2' = ... = \theta_j' = 0$; if the null hypothesis of a concurrent value of 0 is established, then the use of an approximation of the first-order Taylor expansion will not lead to an asymmetrical distribution. The empirical testing method for this hypothesis is to apply the LM test to the x^2 or *F* statistic. The LM testing model is as follows:

$$LM = TN(SSR_0 - SSR_1) / SSR_0$$

$$LM_F = \left[\left((SSR_0) - (SSR_1) \right) / mk \right] \Big/ \left[SSR_1 / \left(TN - N - m(k+1) \right) \right] \quad (8)$$

where SSR_0 is defined as the sum of the squares of residuals in the null hypothesis; i.e., the model is a linear panel model with a specific effect. SSR_1 is defined as the sum of the squares of residuals in an alternative hypothesis; i.e., the model has *m* intervals, where *m* is the number of transition parameters, *k* is the number of explanatory variables, *T* is the time, and *N* is the cross-sectional number of firms. The LM model involves testing asymptotic $x^2(mk)$ and $F(mk,\ TN - N - m\ (k+1))$ statistics with different distributions and determines whether the model data are homogeneous (i.e., whether the model has nonlinear characteristics).

After the completion of model linearity testing, if the null hypothesis of model linearity is rejected (i.e., the model has nonlinear characteristics), then the model's transition function has at least 1 threshold transition variable. We next estimate the number of model transition functions, test whether other transition effects exist in the empirical model, and estimate an appropriate number of transition thresholds. Following the suggestion of González et al. (2005), because the rejection of the assumption of model linearity implies that a transition effect exists in the model, estimation should first be performed using a model with 1 transition function (*r* = 1) when testing the number of threshold values, and an auxiliary regression equation should be used to confirm the number of transition parameters, which tests the null hypothesis ($H_0 : r = 1$) of 2 threshold values corresponding to implementation of 1 threshold value. If the test results do not reject the null hypothesis of 1 threshold value, then testing for the optimal number of threshold values must continue until the null hypothesis of an additional threshold value cannot be rejected. At that time, the model's *r* value can be seen as the optimal number of thresholds in the model. After confirming that the sample data are heterogeneous and determining the number of transition variables and their form, a nonlinear least squares method is used to estimate the nonlinearity and persistence of the effect of CSR on firm performance.

IV. Empirical Results

A. Data Sources

This paper takes 31 Taiwan Stock Exchange (TWSE) and Gre Tai Securities Market (GTSM) listed Taiwanese firms that won *CommonWealth Magazine*'s Corporate Social Responsibility Award from 2007 to 2018 (Table 9 in the 'Appendix') as its research subjects. Among these firms, 22 are manufacturing firms, 5 are financial firms, and 4 are service firms. Sample data are obtained from the *Taiwan Economic Journal* (*TEJ*) and *CommonWealth Magazine*. Tobin's *Q*, which constitutes a proxy variable of enterprise value, is the empirical model's dependent variable; in view of data acquisition factors, this paper adopts the approximate Tobin's *Q* estimation method proposed by Chung and Pruitt (1994) [(the ending market value of equity + the book value of liabilities)/the book price of assets], and the transition variable consists of the CSR index determined by *CommonWealth Magazine* during the process of determining Corporate Social Responsibility Award winners. The variable definitions and descriptive statistics of the relevant variables are provided in Table 1 below and Table 7 (in the Appendix).

Table 1 Descriptive Statistics

Variable	Min	Max	Mean	Median	Std. Dev.
Tobin's Q	0.060	5.390	1.110	0.760	0.968
CSR	5.740	9.510	8.081	8.270	0.857

The data used in this paper's empirical model have time-series and cross-sectional characteristics. To avoid bias in the empirical results and spurious regression, we employ 3

cross-sectional unit root testing methods, namely, the method proposed by Levin et al. (2002), the augmented Dickey–Fuller (ADF) test, and the PP test, to determine whether the sample data's sequence fluctuations gradually converge on a certain interval (convergence of fluctuations) over time and whether the data consequently have stationary characteristics. The test results are provided in Table 2, showing that the variables in the empirical model uniformly reject the null hypothesis that the sequence has a unit root, which implies that all variables constitute stationary sequences.

Table 2 Panel unit Root Test

Variable	LLC	*p*-value	ADF-Fisher	*p*-value	PP-Fisher	*p*-value
Tobin's Q	–2.688	0.000	70.681	(0.210)	133.794	(0.000)
CSR	–7.988	0.000	122.336	(0.000)	236.730	(0.000)

Note: *CSR* denotes corporate social responsibility

B. Empirical Results

After confirming that the empirical model's variables uniformly meet the stationary condition, this paper then uses the stepwise regression model to estimate firm performance persistence. In view of the cyclical characteristics of this paper's empirical variable data, we test the length of the lag period for the j^{th} period to a lag of 4 periods and set the test standard to 0.1. The model's test results are shown in Table 3. The results in Table 3 show that corporate performance with lags from 1 to 4 periods has a significant influence on current-period corporate performance, which implies that current-period firm performance is significantly influenced by past firm performance, and firm performance persistence is 1.009 (1.062-0.307+0.413-0.160). Furthermore, the model's residual estimation results significantly reject the null hypothesis that the residual does not have a normal distribution but do not reject the null hypothesis that the residual does not have serial correlations.

Table 3 Persistence Estimation of Firm Performance

AR Model	*p*	
Variable Parameter	*Coefficient*	*p-value*
α_1	1.062	0.000***
α_2	–0.307	0.000***
α_3	0.413	0.000***
α_4	–0.160	0.001***
Q (2)	0.619	0.539
Jarque-Bera	360.735	0.000***
Adjusted R^2	0.919	

Note: 1. α_j , j = 1,2,3,4 is the persistence coefficient of firm performance.

2. Q(2) and Jarque-Bera are tests of serial correlation and normality, respectively.

3. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

After confirming the optimal lag period affecting firm performance persistence, we follow the suggestion of Wu and Chang (2017) by substituting corporate performance with lags from 1 to 4 periods in place of the exogenous explanatory variable in the PSTR model. In addition, because the effect of CSR on corporate performance may have a deferred threshold effect (i.e., past CSR activities may have a significant effect on current-period corporate performance), this paper employs CSR with lags from 0 to 4 periods as the transition variable in the empirical model. Relying on the model's smallest AIC and BIC values as the optimal model selection method, this paper constructs a PSTAR model of firm performance persistence.

After confirming the structure of the empirical model, we then test whether the empirical model has asymmetric asymptotic characteristics and determine the number of transition variables. The estimation results are shown in Tables 4 and 5. It can be seen from Table 4 that in the models with a CSR transition variable with lags from 0 to 4 periods, the m = 1 and m = 2 models significantly reject the null hypothesis of model linearity (H_0: linear model). This finding implies that the majority of empirical models in this paper have a nonlinear structure

and characteristics. This paper accordingly selects the PSTAR model as being most appropriate for the analysis of firm performance persistence. Apart from capturing the heterogeneity of data in the model and accurately describing the model's individual and time effects, a PSTAR model can also avoid the multicollinearity that often occurs in linear models. These advantages cannot be obtained in conventional linear models.

Table 4 Linearity Test

CSR_{it-d}	Test Statistic	Number of Location Parameters			
		$m = 1$		$m = 2$	
		w	*p-value*	*w*	*p-value*
d =0	*LMF*	3.700	0.006	3.312	0.001
d = 1	*LMF*	4.046	0.003	4.484	0.000
d = 2	*LMF*	3.003	0.018	2.721	0.006
d = 3	*LMF*	5.708	0.001	4.176	0.000
d = 4	*LMF*	3.965	0.004	4.428	0.000

Note: H_0: Linear model. H_1: PSTAR model with at least 1 threshold variable ($r = 1$). LMF is the Fisher test. *w* and *p*-value are the results and significance level of the Fisher test.

Table 5 Test of No Remaining Nonlinearity

CSR_{it-d}	Test Statistic	Number of Location Parameters			
		$m = 1$		$m = 2$	
		w	*p-value*	*w*	*p-value*
d =0	*LMF*	2.014	0.092	3.303	0.001
d = 1	*LMF*	4.854	0.001	3.165	0.002
d = 2	*LMF*	1.781	0.132	1.131	0.341
d = 3	*LMF*	5.002	0.001	2.926	0.003
d = 4	*LMF*	1.583	0.178	2.319	0.019

Note: H_0: PSTAR with $r = 1$ H_1: PSTAR with at least $r = 2$.

Furthermore, it can be seen from Table 5 that in the m = 1 model, when CSR has 0, 1 and 3 lag periods, and that in the m = 2 model, when CSR has 0, 1, 2 and 4 lag periods, the testing results suggest that these two models have 2 transition threshold values. However, the testing results for the other models cannot reject the null hypothesis of a threshold value of 1 (H_0: PSTAR with r = 1), which implies that the remaining models have only 1 transition threshold value.

After testing model linearity and determining the number of threshold values, this paper confirms that the empirical model has a nonlinear structure and at least 1 transition function. We next use the model's smallest AIC and BIC values as a means of selecting the optimal model. This approach enables us to confirm that the empirical PSTAR model should employ model location parameter 1 (m = 1), transition function 1 (r = 1), and a CSR parameter with 3 lag periods. The relevant parameter estimation results are provided in Table 6.

In accordance with the results shown in Table 6, the model's estimated threshold value C and the transition parameter γ are 7.979 and 45.149, respectively. Past corporate performance has a positive influence on current-period corporate performance, and the degree of influence has different levels of magnification depending on the firm's past level of involvement in CSR activities; i.e., $0.569 + 0.089 * G(CSR_{it-2}; 45.149, 7.979) > 0$. For $G(CSR_{it-2}; 45.149, 7.979) = 0$ and 1, the effects of firm performance persistence are 0.569 and 0.658, respectively. In other words, when past involvement in CSR activities exceeds the threshold value of 7.979, the transition function rapidly shifts to the upward interval, and the effect of past corporate performance on current-period corporate performance will shift from upward at 0.569 to a transition point at 0.658.

Because different firms have different CSR indices at different times, firm performance persistence differs depending on the CSR index. In addition, a relatively large CSR index results in high firm performance persistence and low current-period corporate performance. This finding implies that apart from giving the enterprise a favorable image in the eyes of customers, employees, and society and improving corporate performance via enhanced product sales, an enterprise's past commitment to CSR activities may have a deferred effect on the

enterprise's image and reputation. In addition, as soon as an enterprise's past involvement in CSR activities passes the threshold value, the deferred effect serves to magnify the enterprise's performance persistence.

C. Robustness Analysis for the PSTAR Model

To illustrate the appropriateness of using the PSTAR model to estimate firm performance persistence, in addition to again using a common proxy variable for firm performance, stock return and return on equity (ROE) to test the nonlinear relationship between CSR investment and firm performance persistence, this paper also uses the traditional linear panel data model to test firm performance persistence. This paper reports the estimation results in Table 6 and discusses them below.

First, regardless of whether the stock return or ROE is used as a proxy variable for firm performance, the empirical results show that the CSR index over the threshold value will result in high firm performance persistence; that is, there is a nonlinear relationship between CSR investment and firm performance persistence. Wei et al. (2018) find that CSR winners may also have significantly higher stock returns than those of non-CSR companies in the four to five months following CSR announcements. Moreover, Matuszak and Różańska (2017) find similar empirical results: a positive relationship between banks' CSR disclosures and their profitability, as measured by ROA and ROE.

In addition, the results of the empirical model using the stock return or ROE as a proxy for firm performance are similar to those of the model using Tobin's Q. However, compared with the Tobin's Q model, the empirical model has a lower transition parameter and a higher threshold value, while the latter model has a higher transition parameter and a higher threshold value.

Furthermore, previous firm performance has a significant impact on current firm performance. Compared with the abovementioned PSTAR model, the linear model estimation result not only fails to show that firm performance changes with time and across companies but

also cannot estimate the threshold value of CSR affecting firm performance. In other words, the linear model estimation process may hide information on structural changes in firm performance.

Finally, to support the robustness of the empirical results in this paper, we conduct a polynomial regression test on CSR and firm performance persistence, the results of which show that there is indeed a significant nonlinear relationship between the two. The relevant test results are shown in Table 8. Therefore, it is important to model firm performance persistence with a nonlinear approach.

Table 6 Estimation Results for Firm Performance

Chosen Model Firm performance Variable Parameter	PSTAR model Tobin's Q $r = m = 1$; d=3	PSTAR model Stock return $r = m = 1$; $d = 4$	PSTAR model ROE $r = m = 1$; $d = 3$	Linear model Tobin's Q —
γ	45.149	13.799	8,932.4	—
C	7.979	8.811	8.474	0.013
β_1	0.8683 (8.178)***	—	—	1.060 (19.101)***
β_2	–0.2717 (–2.415)***	0.035 (0.442)	0.399 (3.550)***	–0.308 (6.451)***
β_3	0.2584 (2.654)***	—	—	0.412 (–4.313)***
β_4	–0.2857 (–2.766)***	0.024 (0.488)	0.046 (0.762)	–0.162 (–3.200)***
β_1'	–0.4997 (–2.554)***	—	—	—
β_2'	0.3966 (1.943) *	0.232 (1.430)	–0.451 (–3.244)***	—
β_3'	–0.1857 (–1.020)	—	—	—
β_4'	0.3774 (2.191) **	0.489 (2.825)***	0.461 (2.749)***	—
R^2	—	—	—	0.919
AIC	–2.399	–2.880	3.052	—
BIC	–2.306	–2.824	3.108	—
Persistence effect				
$G(SR_{it-d};\gamma,c)=0$	0.569	0.059	0.445	—
$G(SR_{it-d};\gamma,c)=1$	0.658	0.780	0.455	—

Note: γ and C are the estimated transition parameter and threshold value, respectively. The values in brackets are the t-statistics. β_i and β_i', i = 1,2,3,4 are the lag length of corporate performance. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. After stepwise regression testing, in the empirical model of ROE and stock return as proxy variables of corporate performance, corporate performance with lags 2 and 4 periods has a significant influence on current-period corporate performance,

V. Conclusions and Recommendations

A. Research Conclusions

At a time when the global economy is in an ongoing state of high risk and uncertainty, governments, corporate organizations, and even ordinary citizens are well aware that CSR activities can provide enterprises with more opportunities for growth. Apart from possibly enhancing social harmony and ecologically sustainable development, CSR activities provide profound assistance for corporate business performance and national economic stability. To understand the effect of CSR inputs on firm performance, this paper constructs a PSTAR model, selects the CSR index as the model's transition variable, and tests the business performance persistence of those listed Taiwanese enterprises that won the Corporate Social Responsibility Award between 2007 and 2020 to determine whether involvement in CSR activities has a threshold effect. Our empirical results are explained below.

First, a company's CSR involvement has a deferred effect on firm performance persistence, and nonlinear relationships exist among the company, period, and level of CSR inputs. Furthermore, regarding corporate performance, CSR has a significant mediating effect and is an important situational variable. This paper's research results indicate that the level of involvement in CSR activities has a positive influence on firm performance persistence, which supports the social impact hypothesis concerning CSR. Finally, the empirical results reveal that the effect of the CSR lag period on firm performance persistence is subject to a threshold effect; we find the CSR index threshold value to be 7.979. When the level of involvement in CSR activities passes this threshold, firm performance persistence increases from 56.9% to 65.8%. This phenomenon may occur because when a company's past CSR involvement is just beginning, it must bear the opportunity cost of shifting funds to CSR activities, which offsets

some of the benefits that the enterprise should expect to derive from its CSR activities. However, over time, the company's benefits from its CSR involvement accumulate to a certain level, and its corporate image and reputation increase significantly, which have a positive effect on firm performance persistence.

This paper proposes the following managerial implications based on the abovementioned empirical results. First, this paper's empirical results reveal that CSR has a positive influence on firm performance persistence, which implies that apart from finding niches that favor their enterprises' development, corporate managers should also continue to attempt to fulfill their enterprises' social responsibilities. In addition, enterprises' CSR inputs have a threshold effect on firm performance; the social responsibility threshold value is found to be 7.979. When CSR exceeds this threshold value, business performance persistence increases from 0.569 to 0.658. This result implies that enterprises' level of involvement in CSR activities has a nonlinear influence on their business performance. Consequently, when companies embark on CSR undertakings, they can regularly test their own CSR threshold indicators. This approach enables corporate managers to draft optimal operating strategies to cope with intense fluctuations in the economic environment. Second, apart from revealing the degree to which enterprises' past performance influences their current performance, firm performance persistence also implies that an enterprise's future profitability can be predicted on the basis of its current performance. In other words, the estimation of firm performance persistence can provide corporate managers with an effective source of management reference information. This information can not only allow managers predict future corporate performance trends on the basis of current performance but also facilitate the drafting of effective future operating strategies and directions that the enterprise can take to maintain its long-term stable profitability. Finally, despite the fact that past corporate performance has a positive influence on current corporate performance, our empirical results suggest that more than 34% of corporate performance is derived from an enterprise's operating results for the current period. As a consequence, compared with CSR involvement, searching for better operating strategies can still be a more effective method of boosting corporate performance.

B. Research Restrictions and Recommendations

Because the data source for this paper's empirical model consists of large Taiwanese firms that had won the Corporate Social Responsibility Award, the research results are indicative only of the relationship between large Taiwanese firms' CSR involvement and their performance persistence. However, the linkage between enterprises' CSR involvement and performance may differ in the case of different economies and enterprises of different sizes. Future research on related subjects should consider focusing on enterprises in other economies and should opt to take enterprises of different sizes as research subjects. Future studies could even attempt to include other key factors affecting corporate performance in their empirical models; apart from determining whether CSR still has a major effect on firm performance in other economies, such studies should additionally test whether CSR is a key factor that has a nonlinear influence on corporate performance. Such research and its findings will not only attract the attention and interest of scholars and governing authorities but also boost research capabilities in this field and yield results with more value.

Appendix

CommonWealth Magazine's Corporate Social Responsibility Award

CommonWealth Magazine published Taiwan's "New Benchmarking Enterprises in the 20th Century" in October 2000, which was the first survey of CSR evaluation conducted by an unofficial organization in Taiwan. In view of the increasing emphasis on CSR in the world, *CommonWealth Magazine* conducted an independent and complete survey of 1,100 domestic companies for the first time and independently established its Corporate Citizenship Award in 2007. The scoring method for the award refers to international indicators and evaluation methods such as the United Nations Programme, OECD, and Dow Jones Sustainability Index of the United States. The evaluation process is divided into three stages and four fields. The former refers to the screening of nearly 2,000 public companies in Taiwan (including listed, over-the-counter (OTC), and emerging companies) that have made profits for three consecutive years, followed by more than 500 institutional professionals (analysts and accountants) mutually scoring with these companies, and approximately 100 companies are chosen for the final selection. Finally, the best 50 companies are selected from the abovementioned companies, which are denoted as the "Top 50 Sustainable Citizens in the World." The latter covers areas such as corporate governance, corporate commitment, social participation and environmental protection.

Table 7 Variable Definitions

Variable	Code	Measurement	Data source
Tobin's Q	*Q*	(The ending market value of equity + the book value of liabilities) / the book price of assets	*Taiwan Economic Journal* (*TEJ*)
Corporate Social Responsibility	*CSR*	The index is scored by multiple analysts, accountants and selected companies.	*CommonWealth Magazine*.

Table 8 Robustness Analysis between CSR and Firm Performance Persistence

Variable Parameter	Polynomial Model	
	Coefficient	*p-value*
C	–34.050	0.031**
θ_1	14.116	0.024**
θ_2	–1.881	0.021**
θ_3	0.082	0.019**
θ_4	0.230	0.000***
θ_5	–0.047	0.019**
θ_6	0.085	0.000***
θ_7	0.002	0.904
Adjusted R^2	0.830	

Note: 1. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

2. The polynomial model of firm performance persistence is written as follows:

$$Tobin's\ Q_{it} = C_0 + \theta_1 CSR_{it} + \theta_2 CSR_{it}^2 + \theta_3 CSR_{it}^3 + \theta_4 Tobin's\ Q_{it-1}^2 + \theta_5 Tobin's\ Q_{it-2}^2 + \theta_6 Tobin's\ Q_{it-3}^2 + \theta_7 Tobin's\ Q_{it-4}^2 + \omega_{it}$$

Table 9 Firms Who Have Won CommonWealth Magazine's Corporate Social Responsibility Award

Enterprises	Times	Enterprises	Times
Uni-President Enterprises Corp.	7	Advantech Co., Ltd.	8
United Microelectronics Corp.	9	AU Optronics Corp.	7
Far Eastern New Century Corp.	12	Chunghwa Telecom Co., Ltd.	14
Teco Electric & Machinery Co., Ltd.	10	MediaTek Inc.	10
China Steel Corp.	13	Fubon Financial Holding Co., Ltd.	13
Hiwin Technologies Corp.	14	Cathay Financial Holdings Co., Ltd.	11
Yulon Motor Co., Ltd.	12	E.SUN Financial Holding Co., Ltd.	14
China Motor Corp.	10	Taishin Financial Holding Co., Ltd.	8
Hotai Motor Co., Ltd.	12	Chinatrust Financial Holding Co., Ltd.	9
LITE-ON Technology Corp.	14	President Chain Store Corp.	13
Delta Electronics Inc.	12	Taiwan Mobile Co.,Ltd.	14
Compal Electronics, INC.	8	Wistron Corp.	11
Taiwan Semiconductor Manufacturing Co., Ltd.	13	Far EasTone Telecommunications Co., Ltd.	13
Inventec Corp.	11	Coretronic Corp.	9
Asustek Computer Inc.	9	CTCI Corp.	13

Note: The period spans from 2007 to 2020.

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企業社會責任對企業績效持續性的非線性門檻效果

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摘 要

本文採用縱橫資料平滑移轉自我迴歸模型 (panel smooth transition autoregressive model, PSTAR) 針對 2007 年至 2018 年 31 家獲得企業公民獎項的台灣大型企業，評估企業社會責任 (corporate social responsibility, CSR) 對企業績效持續性的門檻效果。實證結果顯示企業績效持續性隨著企業投入社會責任活動的不同程度，確實存在異質性、時變性與不對稱的門檻效果。另外，企業社會責任對企業績效表現具有遞延影響作用，當過去企業社會責任指數超過門檻值 (7.875)，企業績效持續性將會快速轉換爲更高的持續效果。最後，我們討論企業社會責任與企業績效持續性的實證結果與管理意涵，提供國家當局與企業經營者參考依據，並爲未來的相關研究提供方向。

關鍵詞：縱橫資料平滑移轉自我迴歸模型、企業社會責任、企業績效持續性、轉換變數

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