

Ambition Versus Conscience, Does Corporate Social Responsibility Pay off? The Application of Matching Methods

Chung-Hua Shen
Yuan Chang

ABSTRACT. In this article, we examine the effect of corporate social responsibility (CSR) on firms' financial performance (CSR-effect). Two competing hypotheses, *social impact hypothesis* and *shift of focus hypothesis*, are proposed to investigate this issue, where the former suggests that CSR has a positive relation with performance and the latter are opposite. In order to ensure the CSR-effect is not contaminated by other factors or samples are randomly drawn, we employ four matching methods, Nearest, Caliper, Mahala and Mahala Caliper to match the samples of CSR (CSR-firms) and without CSR (NonCSR-firms) with similar characteristics. Although four methods yield slightly different results, firms engaging in CSR activities tend to obtain significantly higher values on pretax income to net sales and profit margin, and adopting CSR at the very least not deteriorate the performance of firms, making our conclusion favors the *social impact hypothesis* and against *shift of focus hypothesis* in Taiwan. Thus, ambition and conscience are not conflicting with each other.

KEY WORDS: corporate social responsibility, selection bias, matching method

JEL CLASSIFICATIONS: G30, M14

Introduction

A corporation is not only beholden to the wealth maximization of stockholders, but also take care of interests of employee and consumers, maintaining working opportunity of underprivileged minority, protecting environment of community and ecology, etc. This is the concept of corporate social responsibility (CSR),¹ which advocates taking care of the interest of all stakeholders in addition to the stockholders, becomes an alternative framework of

measuring firm achievement around the globe in recent years.

Corporations around the world are realizing they have a responsibility to be good citizens² and Taiwanese companies are taking heed because of vital links in the global supply chain and faced with scrutiny from overseas customers and market regulators. Anecdotal evidence shows that many Taiwanese firms are putting the following words into practice, "if you take from society, put back into society." For example, Lite-On Technology Co. forms Lite-On Cultural Foundation with more than 1,000 volunteers to help schoolchildren who have slight or moderate behavioral problems as a result of dysfunctional family lives at 39 primary schools across northern Taiwan. Gigabyte, a manufacturer of motherboards and mobile phones, has been using an internet platform to get fruit farmers together with corporate purchasers, creating a new public service model. Thousand of cases are bought by over 2,000 employees and help farmers to rebuild their homes after the 1999 earthquake. The late vice president of Inventec Co., Sayling Wen, he helped the local vocational school in a poor rural town in China named Huangyangchuan to set up a website and an e-commerce system, and by selling local farm products over the web, the residents lifted themselves out of poverty.³

Even so the popularity of CSR with some firms responded to these concerns by devoting more resources, others have resisted by arguing that additional investments in CSR is inconsistent with profit maximization. In history, a famous legal precedent is Ford Motor. Co vs. Dodge case in 1916, in which Henry Ford, the controlling shareholder, refused to distribute the accumulated cash to

the shareholders, and invested the money instead into production of low price car, purportedly to increase the convenience of the populace and improve local employment. This may have served Henry Ford's interest in keeping the minority shareholders, the Dodge brothers, from using their investments. The court ruled against Ford and said that: "A business corporation is organized and carried on primarily for the profit of the stockholders. The powers of the directors are to be employed for that end. The discretion of directors is to be exercised in the choice of means to attain that end, and does not extend to a change in the end itself, to the reduction of profits, or to the nondistribution of profits among stockholders in order to devote them to other purposes." Thus, the clincher to be concerned is that sustainable CSR activities should lead to improvement, at least not deteriorate the financial performance.

Academically, there are two prominent conflicting theoretical views regarding the financial impacts of CSR. The *social impact hypothesis*, proposed by Cornell and Shapiro (1987) and Preston and O'Bannon (1997), claims positive association between CSR and financial performance. Several channels could explain this positive effects, such as providing better working place improves employee productivity (Turban and Greening, 1997); donation to the public benefits increases social reputation, trust (Bowman and Haire, 1975; Alexander and Buchholtz, 1978) and brand image and product competitiveness (Porter and van der Linde, 1995; Fombrun et al., 2000). Studies by Moskowitz (1972), Parket and Eilbirt (1975) and Soloman and Hansen (1985) also claim that CSR leads to more benefits than the cost incurred, suggesting that there is positive correlation between CSR and financial performance. As for Taiwanese companies, there are more and more manufacture products sold by major European, U.S, and Japanese brands. The major brands are held to account by the media, stockholders and customers, and the responsibility flows downstream. CSR improves company's image and the customers prefer to do business with good companies and, thus, gain benefits.

The *shift of focus hypothesis*, the competing view, suggested by Becchetti, Ciciretti and Hasan (2007), argue that most of the CSR activities such as building employee and community relationship, providing environmental protection and improving corporate

governance causes a shift of focus from the maximization of stockholders' value to the interests of a wider set of stakeholders and thereby increasing the firm's costs. Previous studies also argue that corporations engaged in CSR activities are found to have lower market competitiveness and worse performance through using resources inefficiently (Friedman, 1970), limiting product developments (Bragdon and Marlin, 1972) and pushing non-profitable social activities (Aupperle et al., 1985; Vance, 1975; Ullmann, 1985). Particularly noteworthy is the lack of public responsiveness to philanthropic behavior as well as the insignificant feedback effect on financial performance (Henderson, 2002; Walley and Whitehead, 1994). Therefore, firms having higher social awareness result in worse financial performance. Some Taiwanese companies may take longer to get involved with CSR because most are small and medium-sized enterprises with limited resources. Many companies are also reluctant to invest because they are not sure how long they will get back the money and how long they will be in business.

Empirical studies regarding the relation between CSR and performance are mixed.⁴ Supporters of social impact hypothesis, such as Cochran and Wood (1984), adopted Moskowitz's (1972) reputation index, which rates firms into outstanding, honorable mention and worst companies, as the proxy of CSR measurement. They find that CSR ratings positively affect firms' accounting returns. Waddock and Graves (1997) employ similar reputation ratings developed by Kinder, Lydenberg and Domini (KLD) as the proxy of CSR⁵ and also found that past and current KLD ratings are positively related to subsequent firm performance. Tsoutsourz (2004) also employ KLD rating and confirm these results.

Alternatively, the shift of focus hypothesis also receives substantial supports. Vance (1975) employs Moskowitz's (1972) ratings and find that firms with better ratings have lower stock returns. Newgren et al. (1985) find that those firms with environmental assessment have inferior stock market returns. Brammer et al. (2005a) examine the relationship between stock returns and CSR score, proxied by the composite indicator constructed from environment protection, community relationship and financial transparency. They find that CSR scores on composite indicator are significantly negatively related to stock returns.

While the above conflicting empirical results may be a result of using different proxies of CSR or different sample periods and firms used, one of their common features is that the adoption of CSR may be endogenously determined. That is, firms with better performance tend to adopt CSR because they have excess profit to engage CSR but not vice versa. That is, when comparing firms taking on social causes (CSR-firms hereafter) with those that do not (NonCSR-firms hereafter), we expect that the only difference between the two groups is the engagement of CSR in the former but not in the latter, other things being equal. Conventional regression method of adding a dummy variable with CSR-firms being equal to unity and zero for Non-CSR-firms may cause the CSR dummy to be correlated with the residuals, creating a sample selection bias problem.

Heckman (1979) suggests using a two-stage method to eliminate sample selection bias. The first step is to estimate a probability model. The resulting inverse Mill's ratio serves as the explanatory variable in the performance function. Hoffer et al. (2004) point out two difficulties for this approach. First, this approach needs to satisfy an identification requirement. That is, we must have at least one variable in the probability model that is not included in the performance equation. Next, the so-called LaLonde's (1986) critiques, suggest that nonexperimental estimates may vary widely, become sensitive to model specifications, and differ greatly from the experimental estimates.

The second approach, i.e., to eliminate sample selection bias is the adoption of the matching theory which is developed mainly in the medical and biological research fields and has been widely used in economics and finance. In standard medical or biological studies, observations participating in an experiment are called the treatment samples. Nonparticipants of experiment that have similar characteristics with participants are called the controlled samples. The changes owing to the experiment between treatment sample and control sample is referred to as experimental or treatment effect. The basic concept of matching theory is that, when examining treatment effect, the treatment sample (e.g., CSR-firm) should have similar characteristics as those of the controlled sample (e.g., NonCSR-firm). If they have similar characteristics, then the

resulting difference between two matched observations is theoretically the treatment effect (e.g., the effect of CSR activities on financial performance). In other words, other characteristics of firms in two groups should be roughly the same to ensure the sample is random determined or is exogenously given. See Rubin (1973) for details.

While the original concept of matching theory is simple, its implementation is not because matching two or more firms with the same multi-dimensional characteristics is difficult, especially when the dimensions are large. The matching, once successful, often reduces the available sample substantially. Rosenbaum and Rubin (1983, 1985a, b) proposed Propensity Score Matching (PSM) to resolve this problem as it reduces multi-dimension matching to only one-dimension matching. PSM contains two steps: The first step is to estimate the probability of including in the experiment by all samples using characteristic variables as the explanatory variables. Then for each firm in the treatment sample, firms in the control samples are selected as matched samples according to the closeness of the above estimated probability. Therefore, the multi-dimensional characteristics are projected into one-dimensional probability and still fulfill the requirement of other things being equal. Rubin and Thomas (1992) further prove that the use of PSM can overcome the selection bias problem.

The applications of PSM to investigate the treatment effect as well as removing the selection bias problem in economics and finances are increasing. Persson (2001) applied this methodology to investigate the effect of joining currency unions on trade growth of countries. Hutchison (2004) examined the effect of IMF program participation on output growth. Hoffer et al. (2004) investigated the relationship between institutional ownership and dividend payout behavior of the firm while using PSM to control for selection bias problem. Glick et al. (2006) applied PSM in currency crisis and liberalization, Vega and Winkelried (2005) in inflation targeting, Ham et al. (2004) in migration and wage growth of young men.

One caveat is worth noting. In order to investigate the CSR effect, it is often suggested to compare the performances of a firm before and after adopting CSR. We do not conduct this comparison for three reasons. First, the macro environments may not be

the same for two periods, making other things not to be the same. Second, engaging in philanthropic activities by a firm is usually a gradual process and we can hardly identify the exact starting date of this behavior. Third, the firms' characteristics may not be the same in the two periods.

The purpose of this article is to investigate financial performance differences between CSR-firms and NonCSR-firm by using Taiwan's data from 2005Q2 to 2006Q1. Since May 2005, one leading Taiwan's commercial magazine, the *Global View Monthly* (GMV), launches "CSR Award" to 25 firms by using the following three criteria: social participation, environmental protection and financial transparency to evaluate the listing companies in Taiwan Stock Exchange (TSE).⁶ A corporate is the CSR-firm if its aggregate ranks of the evaluations are on the top 25; otherwise, it is NonCSR-firm. Once we obtain the CSR- and NonCSR-firms, we adopt the matching theory and to compare the financial performance of these two groups.

The organization of the article is as follows. Section "Measures of corporate social responsibility" describes the measures of corporate social responsibility and how the GMV's compile the CSR data bank. Section "Matching theory and propensity score matching methodology" discusses the matching methodology and its application. Section "Econometric model" discusses the estimation of probability function of being philanthropic firms and analyzes the methods we use. Section "Empirical results" presents empirical results concerning estimation of the propensity scores used in creating the matched samples and main empirical results. Section "Conclusion" concludes this article.

Measures of corporate social responsibility

The estimation of effect of CSR activities on financial performance of firms often confronts with the problem of classifying CSR- from NonCSR-firms. In early stage of research, the CSR-firms are often defined by those which spend the amount of polluting control investment, expenditure on environmental recuperation and protection, prestige investigation from business school students, and social reputation ratings by leading business magazines, such as the *Fortune*, *Times*, and *Business Ethics*.⁷

Recently, some research and financial institutions, like the above-mentioned KLD and FTSE, develop some widely acknowledged social responsible criteria which gradually became an international standard. For example, KLD rates company as a CSR-firm on the basis of the eight criteria, i.e., community, corporate governance, diversity, employee relations, environment, human rights, product quality and controversial business issues. Also, the firms included in FTSE4GOOD indices must meet criteria requirements in three areas, environmental, social and stakeholders, and human rights. Also, those companies whose business interests are involved in tobacco, nuclear weapons and power station, and uranium are also excluded from the index. These indices have been widely employed.⁸

In order to understand the status of CSR awareness and fulfillment among Taiwanese corporations, and to help bring Taiwan in line with global trends in this area, the GVM conducted its first "Survey of Corporate Social Responsibility" of around 700 publicly listed companies in 2005. The magazine also established the annual "Corporate Social Responsibility Award" to commend domestic companies for CSR excellence and encourage specific action and attention to this area.

The framework of evaluating performance of social responsibility is following three dimensions, which are social participation, environmental protection and financial transparency. To be more specific, they refer to OEKOM, an independent research and rating agency of CSR in Germany, to design a questionnaire about engagement and effectuation of the above three aspects for firms listed on the Taiwan Stock Exchange. They then compute scores on each three dimensions of CSR activities based on respondents' reply. Finally, they ranked companies according to their total scores upon three aspects. Firms with the following infamies are also eliminated from rating: negative events challenged by government agencies like Environmental Protection Administration or Council of Labor Affairs; major controversy between the labor and capital, agro with consumers, litigation and departure restriction of CEO; and losses for years.

Once the ranks are yielded in a descending order, the top 25 firms which are elected to conferred on the "Corporate Social Responsibility Award." Following Chih et al. (2007), we exclude financial

institutions, making our CSR samples be 20. Other TSE-listing companies are defined as the control samples, with a total of 640 NonCSR-firms. The first announcement of these ranking is on May 2005, which determines our sample period from 2005Q2 to 2006Q1.

Matching theory and propensity score matching methodology

Estimating the effect of adopting CSR

Our goal is to use matching methods to estimate the effects of CSR on the financial performance of a firm. Following Dehejia and Wahba (2002), we define Y_{i1} and Y_{i0} as the financial performance of firm i with and without adopting CSR, respectively. The difference of the performance between these two firms is, thus, $\Delta_i = Y_{i1} - Y_{i0}$. The average treatment effect over the treated population (ATET) is (we omit subscript i below for simplicity)

$$\begin{aligned} \Delta|_{D=1} &\equiv E(Y_1 - Y_0|D = 1) \\ &= E(Y_1|D = 1) - E(Y_0|D = 1), \end{aligned} \quad (1)$$

where D is a dummy variable and is equal to one if firms adopt CSR and zero otherwise. The estimation of equation (1) is nonfeasible because the second term, $E(Y_0|D = 1)$ is not observed, that is, we are not able to observe the performance of firm without engaging in CSR when it is actually a CSR-firm. Conventional wisdom suggests using $E(Y_0|D = 0)$ to substitute it. However, for this substitution to be valid, the following *conditional independence assumption* (CIA) (Rosenbaum and Rubin, 1983; Rubin, 1973) needs to hold:

$$Y_1, Y_0 \perp D | X$$

where \perp denotes independence and X is a vector of characteristic variables that are unaffected by the treatment. This assumption states that, conditional on a set of observable X , the treated and control groups are regarded as being drawn from the same population. Firms are randomly selected to be in the treated group, therefore, the only difference between the two groups are the treatment effect. Then, $E(Y_0 | D = 0)$ is an unbiased estimator for

$E(Y_0|D = 1)$. Alternatively, if the treatment and control group differ systematically, we have to consider them to be nonrandom sampling of the same population or drawn from different populations, and thus, $E(Y_0|D = 0)$ is no longer an appropriate substitute for $E(Y_0|D = 1)$. The difference between these two measures is the selection bias.

The CIA could fail by two reasons (Heckman et al. 1998). One is that when the characteristic variables of CSR-firms are not comparable with those of NonCSR-firms (noncomparability bias). The other is the different distributions of X between the treated and the control groups (distribution bias), which suggests that firms are not picked via randomized process.

Matching methods

Matching techniques tends to eliminate the aforementioned bias by pairing CSR-firms with NonCSR-firms that have similar observed characteristics. The paired NonCSR-firms are the *counterfactuals* for CSR-firms, and hence we can attribute the difference of outcome between them to the treatment effect. Through this matched counterfactuals, we can reestablish the conditions of a randomized experiment when actually no such data are available.

The propensity score

Matching all variables in X becomes nonfeasible as the dimension of number of variables increases. In order to overcome this problem of dimensionality, Rosenbaum and Rubin (1983) propose propensity score matching (PSM), which reduces a multidimensional matching problem to a one-dimensional problem. Specifically, instead of matching on a vector X , we can match on an index function $P(X)$. This index, the propensity score, is the probability of treatment conditional upon observable characteristics (the probability of being a CSR-firm),

$$P(X) = E(D|X) = P(D = 1|X)$$

which states that observations with the same propensity score must have the same distribution of X independent of the treatment status.⁹

$$Y_1, Y_0 \perp D | X \Rightarrow Y_1, Y_0 \perp D | P(X_i) \quad \forall i$$

and equation (1) becomes

$$\Delta|_{D=1} \equiv E(Y_1 - Y_0 | D=1) = E(Y_1 - Y_0 | P(X), D=1)$$

The noncomparability bias can be eliminated by only considering firms within the common support, the intersection on the real line of the supports of the distribution $[P(X) | D = 1]$ and $[P(X) | D = 0]$. The bias from different distributions of X is eliminated by reweighing the NonCSR-firms observations.

The estimation of the propensity score proceeded with the following steps. Starting with a parsimonious Logit or Probit specification to obtain the estimated propensity score $\Pr(D_i = 1 | X_i)$ for all CSR-firms and NonCSR-firms,¹⁰ which are denoted as P_i and P_j , respectively. Since it is rare to find two groups with exactly the same propensity score, the objective is to find the NonCSR-firms whose propensity scores that are “sufficiently” close to those of the CSR-firms.

Two criteria are often suggested in the literature to find the approximation. The first criterion is the Nearest-Neighbor Matching (Nearest hereafter), which matches each treatment sample with the control sample such that the difference of the two is minimized. That is,

$$C(P_i) = \min_j |P_i - P_j|,$$

where $C(P_i)$ is a set of control units matched with the treated unit i , i.e., samples that has the nearest propensity score with CSR firm i .

The second criterion is the caliper matching (Caliper hereafter), which requires the two groups to be not too distant. That is, it requires the propensity score of the CSR-firm and NonCSR-firm to fall within a prespecified caliper. That is,

$$C(P_i) = |P_i - P_j| < \eta$$

where η is a very small number and is specified as quarter of standard error of estimated propensity scores for all CSR-firms and NonCSR-firms. Note that under this criterion, the number of control samples contained in $C(P_i)$ is arbitrary, from zero to all control samples.

Conventional matching methods

Besides minimizing the differences of the two propensity scores, we also directly compare the characteristic variables between CSR-firm and NonCSR-firm. Thus, the third criterion is Mahalanobis Metric Matching (Mahala hereafter), which is

$$d(i, j) = (X_i - X_j)' V^{-1} (X_i - X_j)$$

where $d(i, j)$ is the Mahalanobis distance between treated firm i and control firm j , and X_i and X_j are their respective $k \times 1$ vectors of observed characteristic variables, where k is the number of characteristic variables and V is $k \times k$ variance-covariance matrix of observed characteristics. For any given treated firm i , we choose the control firm j which gives the smallest d .¹¹

The fourth criterion is Mahalanobis Metric Matching with Caliper (Mahala Caliper hereafter), it matches each treated sample to the control samples with Mahalanobis distance smaller than a prespecified caliper, that is, when $d(i, j) < \eta$, where η is defined above.

Verification of matching results

Once the matching NonCSR-firms are selected, we could verify the matching by performing the following two tests: The first one examines the null hypothesis of $H_0 : (\bar{X}_i - \bar{X}_j) = 0$, where \bar{X}_i and \bar{X}_j are average of characteristic variables of treated firm i and control firm j , respectively. The two groups have the same characteristics if the null is not rejected,

The second verification is to calculate

$$\frac{(\bar{X}_{iB} - \bar{X}_{jB}) - (\bar{X}_{iA} - \bar{X}_{jA})}{(\bar{X}_{iB} - \bar{X}_{jB})} \times 100$$

where \bar{X}_{iB} and \bar{X}_{jB} are average of characteristic variables of treated and control sample *before* matching, respectively and \bar{X}_{iA} and \bar{X}_{jA} are average of characteristic variables of treated and control sample *after* matching, respectively. This measure calculates the percentage change from before-matching to after-matching for a given characteristic variable. For each matching criteria, the larger the average percentage changes, the better the matching.¹²

Econometric model

Propensity scoring matching

As we have mentioned, the first step in adopting PSM is to estimate the propensity scores by using Probit model, which is

$$\Pr(D_{\text{CSR}} = 1) = F(\beta'X) \quad (2)$$

where D_{CSR} is a dummy variable which is equal to 1 if it is a CSR-firm, and 0 otherwise, $F(\cdot)$ is the cumulative probability density function of normal distribution, β is a vector of marginal impact coefficients and X is the vector of characteristic variables.

Our characteristic variables can be categorized into three groups. The first group is related to the scale factor, containing ASSET (the total asset) and SALES (the net sales); the second group is the income factor, containing EBIT (the earnings before interest and tax) and OPERAINC (the operation income) and the last group is the management factor, containing TURNOVER (the asset turnover) and CURRENT (current ratio). Note that Dehejia and Wahba (2002) have stressed that the role of propensity score is only to reduce the dimensions of the conditioning; as such, it has no behavioral assumptions attached to it. Thus, while these variables are close to the determinant of being selected as CSR-firms, the main focus is that they serve as the basic characteristic of two groups of firms. The reason of choosing these variables and their expected signs are explained as follows.

Scale: Dierkes and Coppock (1978), Trotman and Bradley (1981), Fombrun and Shanley (1990) pointed out that the larger the scale, the more the attention that a company attracts from the public. Thus, the response from its philanthropic activities is noticeable. Thus, scale is often considered as a crucial characteristic variable and its effect on the probability of adopting CSR is positive.

Income: McGuire et al. (1988) and Moore (2001) proposed the available funds theory to argue that firms with abundant resources have more ability to engage in CSR activities. Posner and Schmidt (1992) and Alkhafaji (1989), on the contrary, prove that firms with earn sufficient profits could have egocentric behaviors without fear of being challenged

for not noticing the interests of the public. Income is also the important characteristic variable and its effect is uncertain.

Management: Pava and Krausz (1996), Preston and O'Bannon (1997), Stanwick and Stanwick (1998) argued that the firms with well-functioning administration system and management ability are prone to take more care of the benefits of their stakeholders in order to maintain their competitive advantage. Thus, management ability is also an observed characteristic of a firm in its decision to become a CSR- or NonCSR-firm. The effect is expected to be positive.

Once we obtain the estimated propensity score $\Pr(D_i = 1 | X_i)$ for all CSR-firms and NonCSR-firms,¹³ which are denoted as P_i and P_j , respectively, our objective to find the NonCSR-firms whose propensity scores are "sufficiently" close to those of the CSR-firms.

Two approaches to estimate the treatment effects

Two approaches are implemented to determinate whether adopting CSR activities affect the performance of firms. The first one is the basic statistical method, which computes the mean differences of financial performances between two pairs of groups, i.e., the pair of the treatment and controlled samples before- and after- matching, respectively. Bootstrapping methods (1000 times) are used to establish confidence intervals to determine significance for the above differences.

The second approach employs the regression analysis with a CSR dummy variable to examine the differences of financial performances between two groups of firms. The regression model is

$$\text{PERFORMANCE} = \alpha + \beta \text{ASSET} + \lambda D_{\text{CSR}} + \varepsilon \quad (3)$$

where PERFORMANCE is the financial performance, ASSET is the total asset of a firm in order to remove the third factor influence, α , λ and β are coefficients to be estimated, and ε is error term. Estimated λ captures the effect on firm performance of being philanthropic. A significant positive λ suggests that CSR-firms have better financial performance than NonCSR-firms, supporting the *social impact*

TABLE I
Abbreviation and definition of characteristic and performance variables

Variable	Definition	Expected signs
Characteristic variables		
D_{CSR}	A dummy variable which equal to one if firm is winner of “CSR Award” (CSR-firms), conferred by the <i>Global View Monthly</i> in 2005. Otherwise, it is equal to zero (NonCSR-firms)	
Scale factors		
ASSET	Current Assets + Long-term Investment + Total Fixed Assets + Total Other Assets	+
SALES	Gross Sales–Sales Discount and Allowance	+
Income factors		
EBIT	(PreTax Income + Interest Expenses)	Uncertain
OPERAINC	Gross Sales–Sales Discount and Allowance–Cost of Goods Sold–Operating Expenses	Uncertain
Management ability		
TURNOVER	(Total Sales/Total Assets)	+
CURRENT	(Current Asset/Current Liability) \times 100	+
Performance variable		
ROA	(Net Income/Total Assets) \times 100%	
ROE	(Net Income/Total Equity) \times 100%	
PTI	(PreTax Income/Net Sales) \times 100%	
RGM	(Gross Profit/Net Sales) \times 100%	
EPS	(Net Income/Shares Outstanding)	

Note:

1. The CSR- and NonCSR-firms are classified as whether they are winners of “CSR Award,” which is conferred by the *Global View Monthly* in 2005.
2. Their characteristic and financial performance variables are taken from the database of Taiwan Economics journal (TEJ). The last column is expected signs for firms of undertaking CSR.

hypothesis, whereas a significant negative λ supports the *shift of focus hypothesis*.

Our performance measures are: return on assets (ROA), return on equity (ROE), pretax income to net sales (RPTI), gross profit to net sales (RGM) and earnings per share (EPS).¹⁴ Table I presents the definitions and source of six characteristic and five financial performance variables.

Empirical results

Basic statistics before matching

Our samples of CSR- and NonCSR-firms are 80 and 2,480 firm-quarters, respectively. Table II

reports basic statistics of the characteristic and performance variables. Based on samples before the matching, CSR-firms tend to have larger ASSET and SALE, higher EBIT, OPERAINC and TURNOVER but lower CURRENT. For instance, the average ASSET and EBIT of CSR- and before-matching NonCSR-firms are (97.696, 6.477) and (16.109, 0.728) billion NTD, respectively; but they are 182.01 and 209.96 for the CURRENT, respectively. With respect to the performance variables, the average ROA of CSR-firms and before-matching NonCSR-firms are 6.6848% and 4.5026%, respectively and the average EPS for the two groups are 1.61 and 0.9014, respectively. The results from basic statistics suggest that CSR-firms perform better than before-matching NonCSR-firms.

TABLE II
Basic statistics of all samples, CSR-firms and NonCSR-firms

	All Samples				CSR-firms				NonCSR-firms			
	Average	St. dev	Min	Max	Average	St. dev	Min	Max	Average	St. dev	Min	Max
Characteristic variables												
ASSET	18.659	49.332	0.3114	543.72	97.696	129.60	4.5956	543.72	16.109	42.058	0.3114	485.24
SALES	9.3051	30.466	0.0013	673.50	57.969	98.457	1.1868	673.50	7.7346	23.878	0.0013	443.32
EBIT	0.9076	4.8725	-9.2167	96.249	6.4770	15.050	-9.2167	96.249	0.7280	4.0319	-8.8083	66.037
OPERAINC	0.6285	4.0195	-9.5341	93.014	4.6944	13.330	-3.5967	93.014	0.4974	3.2349	-9.5341	61.386
TURNOVER	0.8454	0.6331	0.0100	4.2900	1.2484	0.8955	0.2500	4.1100	0.8324	0.6187	0.0100	4.2900
CURRENT	209.08	219.13	1.7700	2993.3	182.01	106.68	39.040	627.92	209.96	221.76	1.7700	2993.3
Performance variables												
ROA	4.5708	8.0629	-76.010	48.260	6.6848	7.0346	-7.2900	29.480	4.5026	8.0860	-76.010	48.260
ROE	-0.7873	64.001	-2248.1	68.590	6.6344	9.7399	-19.840	27.080	-1.0267	64.988	-2248.1	68.590
RPTI	-11.622	313.85	-6702.2	3809.8	9.1613	15.185	-43.240	58.130	-12.292	318.85	-6702.2	3809.8
RGM	7.3887	252.23	-6553.0	100.00	17.529	13.619	3.1100	59.930	7.0615	256.25	-6553.0	100.00
EPS	0.9235	2.2838	-10.500	33.260	1.6100	2.2313	-2.3400	10.210	0.9014	2.2825	-10.500	33.260

Note:

1. See Table I for the definition of variables.
2. The unit of ASSET, SALES, EBIT and OPERAINC is billions of New Taiwan Dollars. Quarterly data are used, ranging from 2005Q2 to 2006Q1.
3. There are 2,560 firm-quarters in all samples, where the numbers of CSR- and NonCSR firms are 80 and 2,480, respectively.

Table III reports correlation matrix of characteristic and performance variables and dummy variable of being CSR-firms, which equal to one if given sample is belong to CSR-firm and equal to zero if otherwise. From the first column we observe that, first, the correlation coefficient between CSR and ASSET and EBIT are 0.2877 and 0.2052, respectively; for CURRENT, coefficient is relatively low, -0.0227 . Thus, CSR-firms tend to have larger scale and higher level of income than NonCSR-firms. Second, the correlation coefficients between CSR and each performance variable are all slightly positive, for examples, the correlation coefficients between CSR and ROA, between CSR and ROE are 0.0467 and 0.0206, respectively.

Although one tends to conclude that CSR-firms slightly outperform NonCSR-firms using before matching data, we observe that there is also systematic divergence of characteristic variables between two groups of firms, at least on average. We cannot attribute performance difference purely to firms' engaging to philanthropic activities and have to fix the differences in characteristics and get purer identifiable effect on performance of being CSR-firms, that's the performance difference between CSR- and NonCSR-firms at least not duo to difference in characteristics between them.

Basic statistics after matching

Table IV presents the estimated results of propensity score function (PSF) by Probit model.¹⁵ We employ two specifications to examine the robustness. For Model I, contemporary characteristic variables are used to estimate PSF, and we observe that coefficients for ASSET, SALES, and TURNOVER are significantly positive, suggesting that firms with large asset, sales and high asset turnover tend to engage in more CSR. The coefficients for EBIT, OPERAINC, and CURRENT are negative but insignificantly negative. Although the high correlation coefficient between each two characteristic variables, as we discussed earlier, the PSM is not the model of choosing determinants of CSR, but is to reduce the dimensions.

We use model I as our benchmark model to estimate propensity score function, that's the timing of explanatory variables are all contemporaneous.

One may concern that whether lagged characteristics affect the probability of being classified as CSR-firm, for example, a firms with large earnings this period could engage more in CSR activities in the next period because they have more available funds, suggested by McGuire et al. (1988) and Moore (2001). Thus, we also consider lagged income factor, $EBIT_{t-1}$, and $OPERAINC_{t-1}$ as explanatory variables to replace contemporary EBIT and OPERA-INC to establish model II. Since the estimated results of PSF as roughly the same with results of model I, we leave it in latter part of the article.

Based on estimation results of PSF by model I, we obtain propensity score for each sample of firm. Thus, we can select the samples based on the four matching methods, Nearest, Caliper, Mahala and Mahala Caliper.

Table V compares the means of characteristic variables between two groups based on before- and after-matching samples. Unlike those in Table II where the whole sample of CSR-firms and NonCSR-firms are used in Table II, we only employ matched samples here. It is not surprising that, after matching, the averages of two pairs become approximately equal. The Caliper and Mahala Caliper, are the most successful in matching our sample. In order to illustrate this, six characteristic variables between CSR- and after-matching NonCSR-firms become approximately equal because the differences in their means are insignificant. Using Nearest matching method, significant differences exist in CURRENT, but not in the remaining five variables. When Mahala matching is employed, similar results are obtained. As mentioned earlier, the comparison of performance is meaningful only when the characteristic variables are close to each other. Accordingly, the Caliper and the Mahala Caliper methods provide a more reliable matching than those of the Nearest and Mahala methods.

Table VI presents percentage changes of the gaps of the characteristic variables between CSR-firms and NonCSR-firms before and after matching. The deviation of whole NonCSR-firms from matched NonCSR-firms helps us to evaluate the outcome of the matching methods. The large percentage change suggests the success of the matching, and therefore, the use of the whole sample is biased. Two interesting results can be highlighted as follows. First, the Mahala and Mahala Caliper are expected to be better

TABLE III
Matrix of correlation coefficient

	D_{CSR}	ASSET	SALES	EBIT	OPERAINC	TURNOVER	CURRENT	ROA	ROE	RPTI	RGM	EPS
D_{CSR}	1.0000											
ASSET	0.2877	1.0000										
SALES	0.2869	0.7123	1.0000									
EBIT	0.2052	0.7199	0.6987	1.0000								
OPERAINC	0.1816	0.6482	0.6115	0.9386	1.0000							
TURNOVER	0.1146	-0.0178	0.2130	0.0408	0.0427	1.0000						
CURRENT	-0.0227	-0.0290	-0.0434	0.0190	0.0172	-0.0716	1.0000					
ROA	0.0467	0.1102	0.1705	0.2959	0.2510	0.1836	0.1257	1.0000				
ROE	0.0206	0.0349	0.0492	0.0798	0.0547	0.0995	0.0740	0.3368	1.0000			
RPTI	0.0111	0.0236	0.0205	0.0433	0.0360	0.0673	0.0700	0.2579	0.0929	1.0000		
RGM	0.0074	0.0097	0.0087	0.0285	0.0318	0.0422	0.0523	0.1967	0.0348	0.9325	1.0000	
EPS	0.0535	0.1287	0.2424	0.3219	0.2599	0.2302	0.1214	0.8255	0.2768	0.1583	0.0980	1.0000

Note:

1. See Table I for the definition of variables.
2. Quarterly data are used, ranging from 2005Q2 to 2006Q1. There are 2,560 firm-quarters in all samples.

TABLE IV
 Estimation of propensity score function, probit regressions $Pr(D_{CSR} = 1) = F(\beta'X)$

Variables	Model I Estimated coefficients	Variables	Model II Estimated coefficients
Constant	-2.3479 (-17.4)	Constant	-2.3757 (-15.0)
ASSET	0.0059*** (6.11)	ASSET	0.0064*** (4.87)
SALES	0.0029* (1.80)	SALES	0.0030* (1.69)
EBIT	-0.0128 (-0.61)	EBIT _{<i>t-1</i>}	-0.0231 (-1.03)
OPERAINC	-0.0060 (-0.28)	OPERAINC _{<i>t-1</i>}	0.0020 (0.09)
TURNOVER	0.3334*** (4.63)	TURNOVER	0.3294*** (3.89)
CURRENT	-0.0001 (-1.02)	CURRENT	-0.0004 (-0.70)
No. of Observations	2,459	No. of Observations	1,913
Pseudo R ²	0.175	Pseudo R ²	0.179

Note:

1. The period of data ranged from 2005Q2 to 2006Q1.

2. Subscript $t-1$ denotes the time at $t-1$, those without subscripts denote time at t .

3. The t -statistics are given in the parentheses, and ***, ** and * denote the significance at the 1%, 5% and 10% level, respectively.

two matching algorithms because the average percentage changes of the two groups are the largest, 70.4 % and 97.5%, respectively. The conclusion is slightly differs from the results obtained in Table V, where the Caliper and Mahala Caliper methods provide more successful matching.

It is worth noting that the superior matching results are not without costs. For example, the degree of freedom is substantially reduced from 2,480 to 7 when Mahala Caliper method is adopted. Next, the Nearest and Caliper methods are slightly less reliable because of their lower average percentage changes, which are 54.3% and 65.1% respectively. Although their percentage changes are smaller, they do not lose as many observations as Mahala Caliper method and still retain 80 and 78, respectively. Therefore, there might be a trade-off between the closeness in matching and the losses in the degrees of freedom. Mahala Caliper produces a better selection of the NonCSR-firms but it loses a lot of observations; by contrast, Nearest, Caliper and Mahala produces a slightly worse selection but maintain a lots more observations. Since no method is overwhelmingly superior to the others, we report the regression results using all four methods.

Performance comparisons

Table VII presents the differences in means of financial performances between CSR- and Non-CSR-firms, based on before- and after-matching samples. Before matching, the significantly differences are exist in ROA and EPS, where the average ROA and EPS of CSR-firms are higher than NonCSR-firms by 2.16% and 0.7, respectively.

The after matching comparisons are reported from the third to sixth columns in Table VII. First, original significantly superiority of ROA and EPS for CSR-firms disappear. Second, under the matching methods of Nearest, RGM of CSR-firms are significantly higher than NonCSR-firms by 8.653% and others performance variables are insignificantly different from them. Similar results are obtained under Mahala and Mahala Caliper matching. Third, when Caliper is used, the performance of CSR- and NonCSR-firms is regardless of which performance variable is used.

Table VIII presents the estimated results of regression analysis (3) by adding the control variable, ASSET.¹⁶ Employing the sample before matching (reported in Panel A), the estimated coefficients of

TABLE V
Descriptive statistics of characteristic variables: before- and after-matching samples

Characteristic variable	Before matching			After matching											
				Nearest-neighbor matching (Nearest)			Caliper matching (Caliper)			Mahalanobis metric matching (Mahala)			Mahalanobis metric matching with calipers (Mahala Caliper)		
	CSR-firms	Non-CSR-firms	Difference (t-value)	CSR-firms	Non-CSR-firms	Difference (t-value)	CSR-firms	Non-CSR-firms	Difference (t-value)	CSR-firms	Non-CSR-firms	Difference (t-value)	CSR-firms	Non-CSR-firms	Difference (t-value)
ASSET	97.70	16.16	81.54*** (15.2)	97.70	78.58	19.12 (1.02)	91.80	68.40	23.40 (1.23)	97.70	82.59	15.11 (0.79)	7.399	7.447	-0.048 (-0.04)
SALES	57.97	7.766	50.20*** (15.1)	57.97	49.21	8.761 (0.61)	45.18	40.21	4.970 (0.47)	57.97	46.79	11.18 (0.84)	2.831	2.877	-0.047 (-0.09)
EBIT	6.477	0.732	5.746*** (10.6)	6.477	3.692	2.785 (1.35)	5.626	3.992	1.634 (0.80)	6.477	4.926	1.551 (0.74)	0.108	0.025	0.084 (1.22)
OPERAINC	4.694	0.500	4.195*** (9.32)	4.694	2.585	2.109 (1.18)	4.362	2.665	1.697 (0.94)	4.694	3.839	0.855 (0.45)	0.059	0.022	0.037 (0.94)
TURNOVER	1.248	0.832	0.416*** (5.82)	1.248	1.428	-0.180 (-1.29)	1.222	1.377	-0.154 (-1.02)	1.248	1.209	0.039 (0.28)	0.889	0.893	-0.004 (-0.03)
CURRENT	182.0	210.5	-28.51 (-1.14)	182.0	155.9	26.12* (1.95)	182.9	164.5	18.40 (1.10)	182.0	159.3	22.74* (1.65)	177.9	174.6	3.300 (0.19)

Note:

1. The numbers presented are means of CSR- and NonCSR-firms, respectively and their differences.
2. Before Matching denotes the raw sample of the two groups of firms without adopting any matching methods. There are totally 2,560 firm-year samples, with 80 are CSR-firms, and 2,480 are NonCSR-firms.
3. After Matching denotes the sample have been matched by adopting the Nearest, Caliper, Mahala and Mahala Caliper methods, respectively. The number of observation for the NonCSR-firms are 80, 78, 80 and 7 by using the above four matching methods.
4. The t-statistics are presented in parentheses.
5. ***, ** and * denote the significance at the 1%, 5% and 10% level, respectively.

TABLE VI
Percentage changes of characteristic variables after the matchings

Characteristic variable	After matching			
	Nearest-neighbor matching (Nearest)	Caliper matching (Caliper)	Mahalanobis metric matching (Mahala)	Mahalanobis metric matching with calipers (Mahala Caliper)
ASSET	76.6	71.3	81.5	99.9
SALES	82.5	90.1	77.7	99.9
EBIT	51.5	71.6	73.0	98.5
OPERAINC	49.7	59.5	79.6	99.1
TURNOVER	56.8	62.9	90.6	99.0
CURRENT	8.40	35.4	20.2	88.4
Average	54.3	65.1	70.4	97.5

Note:

1. The numbers are the percentage changes of means of five characteristic variables after the matching. The larger the percentage changes, the more efficient in matching, i.e., reducing difference between the two groups: CSR- and NonCSR-firms.
2. Average denotes the average of the six percentage changes of characteristic variables.

TABLE VII
The differences of performance variables: CSR-firms and NonCSR-firms: before- and after-matching samples

Performance variable	Before matching	After matching			
		Nearest-neighbor matching (Nearest)	Caliper matching (Caliper)	Mahalanobis metric matching (Mahala)	Mahalanobis metric matching with calipers (Mahala Caliper)
ROA	2.160** (2.36)	0.726 (0.55)	0.407 (0.29)	3.315** (2.08)	0.649 (0.67)
ROE	7.566 (1.04)	0.439 (0.06)	-0.086 (-0.01)	23.12 (1.28)	1.523 (1.00)
RPTI	17.62 (0.56)	5.570 (0.34)	5.681 (0.65)	6.339 (1.11)	2.861 (1.12)
RGM	10.70 (0.37)	8.653* (1.72)	8.944 (1.27)	4.073*** (3.02)	7.600** (2.05)
EPS	0.700*** (2.70)	-0.276 (-0.60)	-0.489 (-1.13)	-0.032 (-0.09)	0.366 (1.10)

Note:

1. The numbers are the differences of the means for the two groups: CSR- and NonCSR-firms.
2. The bootstrap *t*-statistics are presented in the parentheses by repeating sampling 1000 times.
3. ***, ** and * denote the significance at the 1%, 5% and 10% level, respectively.

D_{CSR} are all positive but insignificantly regardless of the performance variables being used as dependent variable. Thus, before matching, one may conclude that adopting CSR at least not worsen the financial performance of a firm.

The results changed when the after matching samples are used (reported in Panels B to E). First, when Nearest is used and when performance variables are RPTI and RGM, the estimated coefficient

of D_{CSR} are significantly positive with 4.813 and 8.325, respectively. It implies that CSR-firms have higher pretax income to net sales and gross margin. Similar results are obtained when the method of Caliper are used. Second, when method of Mahala is used and when performance variable is RGM, the estimated coefficient is significantly positive. Third, under Mahala Caliper, the estimated coefficients of CSR dummy are all insignificantly positive no

TABLE VIII
Performance regression: ROA, ROE, RPTI, RGM and EPS: OLS Method
PERFORMANCE = $\alpha + \beta$ ASSET + λ D_{CSR} + ε

	ROA	ROE	RPTI	RGM	EPS
Panel A: Before matching					
Constant	4.223 (24.9)	-1.694 (-1.25)	-14.68 (-2.21)	6.399 (1.20)	0.809 (16.9)
ASSET	0.017 (5.17)	0.041 (1.55)	0.148 (1.13)	0.041 (0.39)	0.006 (6.07)
D_{CSR}	0.767 (0.81)	4.280 (0.56)	9.364 (0.25)	7.111 (0.24)	0.239 (0.89)
Panel B: Nearest-neighbor matching (Nearest)					
Constant	5.003 (5.39)	5.542 (3.59)	0.479 (0.27)	7.529 (5.04)	1.772 (3.45)
ASSET	0.012 (2.42)	0.008 (0.99)	0.040 (4.08)	0.017 (2.12)	0.001 (0.52)
D_{CSR}	0.493 (0.41)	0.280 (0.14)	4.813** (2.09)	8.325*** (4.34)	-0.304 (-0.46)
Panel C: Caliper matching (Caliper)					
Constant	5.019 (5.41)	5.557 (3.59)	0.503 (0.28)	7.543 (5.02)	1.777 (3.44)
ASSET	0.015 (2.76)	0.011 (1.19)	0.043 (4.21)	0.019 (2.24)	0.002 (0.70)
D_{CSR}	0.237 (0.20)	0.051 (0.03)	4.440* (1.90)	8.115*** (4.17)	-0.369 (-0.55)
Panel D: Mahalanobis metric matching (Mahala)					
Constant	1.507 (1.05)	-22.47 (-1.81)	-3.132 (-0.77)	10.30 (6.57)	1.346 (3.74)
ASSET	0.023 (2.97)	0.072 (1.11)	0.072 (3.35)	0.038 (4.62)	0.004 (1.89)
D_{CSR}	2.974 (1.62)	22.03 (1.39)	5.250 (1.01)	3.496* (1.75)	-0.086 (-0.19)
Panel E: Mahalanobis metric matching with calipers (Mahala Caliper)					
Constant	3.132 (1.29)	0.525 (0.15)	0.492 (0.10)	7.605 (1.56)	0.045 (0.06)
ASSET	0.018 (3.24)	0.013 (1.65)	0.052 (4.53)	0.027 (2.43)	0.003 (1.75)
D_{CSR}	1.780 (0.69)	4.802 (1.28)	3.574 (0.67)	7.272 (1.41)	1.250 (1.46)

Note:

1. This table reports pooled OLS estimation results of regression analysis of relating being CSR-firm to financial performance.
2. Data are ranged from 2005Q2 to 2006Q1. Before sample matching, there are 80 CSR-firms and 2,480 NonCSR-firms. After matching, the number of NonCSR-firms of Nearest, Caliper, Mahala and Mahala Caliper, are 80, 78, 80 and 7.
3. The t -statistics are presented in parentheses
4. ***, ** and * denote the significance at the 1%, 5% and 10% level, respectively.

matter what the performance variables are used. Fourth, results commonly show that the estimated coefficients D_{CSR} are positive, while some of them are significant, none of them are significantly negative. Therefore, engagement of CSR activities is beneficial for the financial performance of firms in Taiwan, thereby supporting the *social impact hypothesis*.

Recall that we use PSM Model I as our benchmark. We now employ different specification, model II, to examine the robustness. Table IX reports regression results of being CSR-firms on financial performance. The estimated results do not change significantly. First, using the Nearest method, when performance variable are RPTI and RGM, both estimated coefficients of CSR dummy

are significantly negative (4.110 and 5.896, respectively), suggesting the same results that the performance of CSR-firms is superior to those of NonCSR-firms. Significantly higher RGM for CSR-firms under the matching of Caliper and similar results obtained under Mahala. Since most part of estimated coefficients of CSR dummy are positive, implying the advantage of CSR-firms. Thus, using model II to estimate PSF does not shift our principal outcome.

While several matching methods obtain slightly findings, the general results seem to suggest that firms adopting CSR has no worse than financial performance than firms do not adopt it. Therefore, the *social impact hypothesis* seems to be preferred. Our results suggest that corporate ambition can be

TABLE IX

Performance regression: ROA, ROE, RPTI, RGM and EPS: OLS Method (Using Model II to Estimate PSF)
 $PERFORMANCE = \alpha + \beta ASSET + \lambda D_{CSR} + \varepsilon$

	ROA	ROE	RPTI	RGM	EPS
Panel A: Before matching					
Constant	4.223 (24.9)	-1.694 (-1.25)	-14.68 (-2.21)	6.399 (1.20)	0.809 (16.9)
ASSET	0.017 (5.17)	0.041 (1.55)	0.148 (1.13)	0.041 (0.39)	0.006 (6.07)
D_{CSR}	0.767 (0.81)	4.280 (0.56)	9.364 (0.25)	7.111 (0.24)	0.239 (0.89)
Panel B: Nearest-neighbor matching (Nearest)					
Constant	5.534 (5.66)	5.850 (3.94)	1.814 (1.02)	10.19 (6.14)	1.478 (4.63)
ASSET	0.010 (2.17)	0.008 (1.07)	0.033 (3.84)	0.015 (1.84)	0.002 (1.12)
D_{CSR}	0.142 (0.12)	0.033 (0.02)	4.110* (1.90)	5.896*** (2.91)	-0.038 (-0.10)
Panel C: Caliper matching (Caliper)					
Constant	5.618 (5.71)	5.976 (3.99)	2.006 (1.12)	10.34 (6.17)	1.510 (4.69)
ASSET	0.013 (2.54)	0.011 (1.38)	0.038 (4.06)	0.018 (2.12)	0.002 (1.49)
D_{CSR}	-0.196 (-0.16)	-0.389 (-0.21)	3.483 (1.57)	5.396*** (2.59)	-0.143 (-0.36)
Panel D: Mahalanobis metric matching (Mahala)					
Constant	1.507 (1.05)	-22.47 (-1.81)	-3.132 (-0.77)	10.30 (6.57)	1.346 (3.74)
ASSET	0.023 (2.97)	0.072 (1.11)	0.072 (3.35)	0.038 (4.62)	0.004 (1.89)
D_{CSR}	2.974 (1.62)	22.03 (1.39)	5.250 (1.01)	3.496* (1.75)	-0.086 (-0.19)
Panel E: Mahalanobis metric matching with calipers (Mahala Caliper)					
Constant	2.642 (1.08)	0.999 (0.28)	1.847 (0.37)	9.286 (1.91)	0.114 (0.14)
ASSET	0.018 (3.24)	0.013 (1.660)	0.052 (4.54)	0.027 (2.43)	0.003 (1.75)
D_{CSR}	2.270 (0.88)	4.328 (1.16)	2.221 (0.42)	5.593 (1.08)	1.181 (1.38)

Note:

1. Using model II to estimate PSF, this table reports pooled OLS estimation results of regression analysis of relating being CSR-firm to financial performance.
2. Data are ranged from 2005Q2 to 2006Q1. Before sample matching, there are 80 CSR-firms and 2,480 NonCSR-firms. After matching, the number of NonCSR-firms of Nearest, Caliper, Mahala and Mahala Caliper, are 60, 57, 80 and 7.
3. The *t*-statistics are presented in parentheses.
4. ***, ** and * denote the significance at the 1%, 5% and 10% level, respectively.

achieved through kindly conscious. The preach of CSR advocates that companies cannot count only on financial performance to survive in this ever-changing scenario of global competition, but also need to take responsibilities to the various stakeholders in which and where they exist. These established practices are prevalent in modern business environment, and based on our empirical results, taking CSR and maximizing profits are not conflicting goals.

With the extension of business operations in the international realm, multinational businesses – originally perceived as merely face intense economic competition – recognize that they have to view CSR as a significant issue. Taiwan is a country that relies on trade and its companies are investing

exporting overseas. As companies in Taiwan become more international, the impressions and influence of the firms abroad on foreign employment opportunities, employers, and suppliers is growing steadily. Therefore, as a member of the global village, Taiwanese firms need an international outlook and CSR should become a part of its corporate ideals. This business model will help to build the business reputational capitals that Taiwanese firms are good corporate citizens. Many Taiwanese firms in China, which exist huge gap between the rich and the poor in recent year, has led to violent incidents and a backlash against capitalism. Taiwanese firms also have rooms to give something back to society to lessen the sense of relative deprivation of their workers and local residents. Our CSR-firms are

benchmark cases for Taiwanese companies with most efforts in CSR activities, and the positive rewards to these companies confirms the words, “doing well by doing good,” and it pays to take social responsibility for corporate sustainability.

Our empirical results are consistent with Cochran and Wood (1984), McGuire et al. (1988), Waddock and Graves (1997) and Tsoutsourz (2004) etc. All of them find positive association between the degree of taking CSR and accounting performance measures of firms. Our results are not in accordance with Vance (1975), Newgren et al. (1985), Brooks and Pavelin (2005a) and Anginer et al. (2008), which present outcomes of negative relationship between CSR and market performance measures. This article contribute to the introduction of matching methods in standard medical and biological research and consideration of “other things being equal” in analyzing performance difference between CSR- and NonCSR-firms, and thus reduce selection bias from nonrandom sampling in the existing literature. This research is also parallel to more scientific causal inference in program evaluation and policy impact analysis, such as Heckman et al. (1998).

Conclusion

This article examines the effect of corporate social responsibility on financial performance by using CSR- and NonCSR-firms in Taiwan. Two hypotheses, social impact hypothesis and shift of focus hypothesis, are raised, where the former suggests that CSR has positive relation with the firms' performance and the latter are opposite. We adopt matching theory to fix the characteristics of firms in two groups so as to remove the selection bias due to nonrandom assignment of samples. Four matching methods, Nearest, Caliper, Mahala and Mahala Caliper are used.

Before matching, the simple *t*-statistics show that CSR-firms outperform NonCSR-firms in return on asset and earnings per share, but are equally same for return on equity, pretax income to net sales, and gross profit to net sales.

As for our regression analysis results on samples before matching, using Nearest and Caliper, RPTI and RGM are significantly higher for CSR-firms. Under Mahala matching, CSR-firms significantly

outperform NonCSR-firms in RGM. Most of the estimated coefficients for CSR dummy are positive regardless of which matching methods are used. This trend of outperformance of CSR-firms is unchanged as we consider alternative model specification of estimating PSF for robustness checks. Thus, although the estimated results are slightly mixed, at the very least, adopting CSR not deteriorate the performance of firms, making our conclusion favors the *social impact hypothesis* and against *shift of focus hypothesis* in Taiwan. Thus, corporate ambition and conscience are not conflicting with each other, taking CSR gets more gains than pains.

Future research could proceed in following directions. First, our study finds that some methods provide more close matching but lose the sample size (the efficiency), such as Mahala Caliper; in contrast, some methods are just the opposite, they provide less satisfactory matching but retain larger sample size, such as Nearest, Caliper and Mahala. Thus, using the matching theory often reduces the samples, making the estimation less efficiency. Further study using matching theory should take longer period of data or larger samples if possible. Second, CSR topics are also important for financial industry, it is of interest to know whether CSR bank produce better results in Islamic banking (Iqbal and Molyneux, 2005; Lewis and Algaud, 2001).

Notes

¹ According to World Business Council for Sustainable Development (WBCSD), CSR is defined as “the continuing commitment by business to contribute to economic development while improving the quality of life of the workforce and their families as well as of the community and society at large.” While there exist other definitions of CSR, they are similar, such as Frooman (1997), Carroll (1999) and McWilliams and Siegel (2001).

² For example, IBM mobilizes 40,000 employees willing to do volunteer work to bring technology into communities. In Los Angeles, Dreamworks jointly organizes classes with local community colleges and high schools to provide low-income kids with knowledge that may help them get into the entertainment industry.

³ Other example such as Chang Yung-fa, chairman of the Evergreen Group, pledged 2 billion NTD to buy the KMT building for a foundation that will devote to

international charity work. The Shin Kong Group has contributed money to support abused children, and Taiwan Mobile has provided aid to the victims of natural disasters, while UMC and the Hon Hai Group have provided a “children’s aid plan” to benefit disadvantaged children.

⁴ Three types of financial performance are found in the empirical studies between CSR and financial performance. The performance measures of first kind of study is accounting-based, like ROA, ROE (Aigner, 2006; Dam, 2006; Griffin and Mahon, 1997; Guenster et al., 2005; Nelling and Webb, 2006; Orlitzky et al., 2003). The second is market-based, using measures like stock returns (Anderson and Smith, 2006; Brammer et al., 2005a, b; Guerard, 1997a, b; Hamilton et al., 1993). The third method relates to event studies about the impact on short-run stock returns from emersion of engagement or contravention of CSR activities (Brammer et al., 2005b; Becchetti et al., 2007; Posnikoff, 1997; Teoh et al., 1999; Wright and Ferris, 1997).

⁵ KLD assessed the performance of multi-dimension stakeholders’ concerns among S&P 500 companies.

⁶ While there are numerous data of corporate social performance of firms around the world, like KLD, FTSE4Good indices, Dow Jones Sustainability Group Index etc., their evaluation do not consider full TSE-listing companies in Taiwan.

⁷ For example, *Fortune* magazine has been publishing the results of an annual survey of company reputations since 1983 by asking thousands of senior executives, directors and securities analysts who responded to the survey to rate the ten largest companies in their industries on eight attributes of reputation, using a scale of zero (poor) to ten (excellent). The attributes were quality of management; quality of products or services; innovativeness; long-term investment value; financial soundness; ability to attract, develop, and keep talented people; responsibility to the community and the environment; and wise use of corporate assets. The score of a company is the mean of the ratings on the right attributes. Surveys were published in January during 1983–1990, February during 1991–1994 and March during 1995–2006. Anderson and Smith (2006) and Antunovich et al. (2000) found that stocks of companies ranked high by *Fortune* had higher subsequent returns than stocks that ranked low. But Shefrin and Statman (2003) found conflicting results.

⁸ Chih et al. (2007) apply FTSE4GOOD index to study the relationship between the earnings management and CSR and get positive association. Waddock and Graves (1997), Tsoutsoura (2004) use KLD to study the performance between CSR and financial performance.

⁹ Rosenbaum and Rubin (1983) show that the conditions $Y_1, Y_0 \perp D | X$ and $0 < P(X) < 1$ together (strong ignorability of the treatment) are sufficient to identify the treatment effect.

¹⁰ Vega and Winkelried (2005) have pointed out that the estimation requires choosing a set of conditioning variable X that are not influenced by the adoption of the CSR regime. For this reason, the X is the measure of firm attributes before the treatment.

¹¹ For example, if there are 10 treated firms and 20 control firms, we have to compute 200 Mahalanobis distance.

¹² If the numbers of after-matching control samples are very few, then there are trade-off between performance of matching and degree of freedom of samples. However, it is arrearage for the existing literature.

¹³ Vega and Winkelried (2005) have pointed out that the estimation requires choosing a set of conditioning variable X that are not influenced by the adoption of the CSR regime. For this reason, the X is the measure of firm attributes before the treatment.

¹⁴ Literature using accounting financial ratios can be found in Griffin and Mahon (1997), Orlitzky et al. (2003), Guenster et al. (2005), Aigner (2006), Nelling and Webb (2006), Dam (2006). Alternatively, literature using stock market performance includes Hamilton et al. (1993), Guerard (1997a, b), Brammer et al. (2005a, b), Anderson and Smith (2006).

¹⁵ We get similar results when PSF is estimated by Logit model.

¹⁶ We use pooled estimation without considering fixed and random effect.

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Chung-Hua Shen
Department of Finance,
National Taiwan University,
Taipei, Taiwan, Republic of China

Yuan Chang
Department of Money and Banking,
National Chengchi University,
No. 64, Sec. 2, ZhiNan Rd., Taipei City, Wenshan
District, 11605 Taiwan, Republic of China
E-mail: ccuecon@yahoo.com.tw