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# A new approach for addressing endogeneity issues in the relationship between corporate social responsibility and corporate financial performance

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ABSTRACT

This paper aims to reexamine the relationship between corporate social responsibility (CSR) and corporate financial performance (CFP) using a panel dataset of Chinese listed firms. Previous studies obtained divergent empirical evidence on the CSR-CFP relationship due to unclear, incomplete, or inappropriate consideration of endogeneity issues. By introducing a Heckman-2SLS model, we comprehensively address the main endogeneity problems (i.e., sample selection bias, reverse causality, and unobserved heterogeneity) simultaneously within the CSR-CFP relationship. Results not only indicate a robust CSR-CFP relationship after correcting for endogeneity issues but also serve as a strong case for future investigation and correction of endogeneity issues.

## 1. Introduction

How corporate social responsibility (CSR) affects corporate financial performance (CFP) has attracted considerable attention in the finance, strategy, and management fields (Brammer and Millington, 2008; Callan and Thomas, 2011; Cuypers et al., 2016; Lev et al., 2010; Surroca et al., 2010; Wang and Qian, 2011). However, the literature on the relationship between CSR and CFP is largely inconclusive. Some scholars have argued that CSR positively affects CFP (Cornett et al., 2016; Cuypers et al., 2016; Rhou et al., 2016), whereas other scholars have reported negative (Chen et al., 2018) or U-shaped (Brammer and Millington, 2008) relationships between the two. We argue that, empirically, one important reason for such inconsistent findings is the inappropriate or incomplete treatment of endogeneity issues.

As summarized in Table 1, the two-stage Heckman selection model and the instrumental variables with two-stage least squares (IV-2SLS) model have been widely used for solving endogeneity issues, although the instrumental variables estimator implemented using a generalized method of moments (IV-GMM), fixed-effects model, and three-stage least squares (3SLS) model has also been applied in a few cases. Nonetheless, methodologically, three issues have been identified in the existing literature. First, huge variances exist in the reasons for adopting the same methodology. For instance, in some studies, the two-stage Heckman selection model

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**Table 1**
A brief summary of previous studies on CSR-CFP relationship.

| Author(s) | Samples | Endogeneity concern | Models for addressing endogeneity | Findings on CSR-CFP relationship |
|---|---|---|---|---|
| Brammer and Millington (2008) | 537 firms listed on the London Stock Exchange during 1990–1999 | Sample selection bias | Tobit model | U-shaped |
| Chen et al. (2018) | 5,278 firm-year observations listed on Chinese Stock Markets based on CSMAR database during 2006–2011 | Omitted variable bias | Propensity score matching (PSM) and difference-in-differences (DID) estimator | Negative |
| Cornett et al. (2016) | 22,846 US firm-year observations based on KLD database during 2003–2013 | Unobserved heterogeneity and sample selection bias | Instrumental variables estimator implemented using the generalized method of moments (IV-GMM estimator) | Positive |
| Cuypers et al. (2016) | 3,409 US public firms based on KLD database during 1991–2009 | Sample selection bias | Two-stage Heckman selection model | Positive |
| Erhemjamts et al. (2013) | 5,235 US public firms based on KLD database during 1995–2007 | Reverse causality and omitted variable bias | Instrumental variables with two-stage least squares (IV-2SLS) estimator | Positive |
| Lev et al. (2010) | 251 US public firms during 1989–2000 | Reverse causality | Granger causality test | Positive |
| Mishra and Modi (2016) | 1,725 US public firms based on KLD database during 2000–2009 | Sample selection bias and reverse causality | Two-stage Heckman selection model, three-stage least squares (3SLS) estimator and residuals approach | Positive |
| Rhou et al. (2016) | 53 US public firms based on KLD database during 1992–2012 | Omitted variable bias | Fixed-effects model | Positive |
| Wang and Qian (2011) | 1,453 listed on Chinese Stock Markets based on CSMAR database during 2006–2011 | Sample selection bias | Two-stage Heckman selection model | Positive |
| Wu and Shen (2013) | 162 banks from 22 countries, based on EIRIS survey | Sample selection bias | Two-stage Heckman selection model | Positive |
| Yoo and Pae (2016) | 23,249 Korean firm-year observations during 1990–2009 | Sample selection bias | Two-stage Heckman selection model | Positive |

was adopted to solve endogeneity arising from selection bias and reverse causality, whereas in other studies, it was adopted to solve endogeneity arising from selection bias and unobserved heterogeneity. The sources of endogeneity are not clearly identified. Second, the two-stage Heckman selection model has been misused in some cases. For example, some studies explicitly identify the two-stage Heckman selection model as an approach for solving endogeneity arising from unobserved heterogeneity and reverse causality. However, it has been confirmed that Heckman models are efficient and pertinent only for resolving sample-induced endogeneity (i.e., sample selection bias) (Certo et al., 2016) and not endogeneity from other sources (Heckman, 1979). Finally, some studies only correct for a certain type of endogeneity without being able to control for different other sources of endogeneity at the same time (Callan and Thomas, 2011; Rhou et al., 2016). Undoubtedly, ignorance about other types of endogeneity issues can significantly bias the CSR-CFP relationship estimation. All these issues will lead to inefficient and incomplete correction for endogeneity problems. To address gaps in the CSR-CFP relationship findings in the existing literature, and simultaneously consider both sample selection bias and other common sources of endogeneity (Wooldridge, 2010; Zepeda, 1994), we propose a new method—namely, Heckman-2SLS model— in this study for estimating the CSR-CFP relationship.

The Heckman-2SLS approach combines the two-stage Heckman sample selection model with a two-stage least squares estimator that can solve the sample selection bias in the selection model while simultaneously correcting for reverse causality and unobserved variables. To better apply the Heckman-2SLS model methodology, this study reexamines the CSR-CFP relationship using a sample of Chinese listed firms during the 2008–2015 period. In the current research, CSR refers to charitable giving, whereas CFP refers to return on assets—both widely used measurements in the existing literature (Gao et al., 2019; Wang and Qian, 2011). China provides an appropriate context because according to its traditions and Confucian values, the community's well-being is a key measure of successful business leadership (Gao and Hafsi, 2015). After controlling for common endogeneity issues together, the results show a positive CSR-CFP relationship. At the same time, the statistics for evaluating the Heckman-2SLS model suggest a good and efficient estimation.

We make two contributions to the literature. First, by adopting a novel yet appropriate Heckman-2SLS model, we not only correct for endogeneity issues arising from sample selection bias but also control for endogeneity caused especially by reverse causality and unobserved heterogeneity. This efficient methodology not only sheds light on comprehensiveness as consideration for tackling endogeneity issues but also provides a strong case for advancing future ongoing CSR-CFP debate. Second, based on the empirical results of this study, we offer robust support for a positive relationship between CSR and CFP, which gives managers strong confidence in conducting CSR activities for improving firms' performance.

## 2. Methodology

We used a sample of all Chinese A-share firms listed in the Shanghai and Shenzhen Stock Exchanges for the period 2008–2015, which is one of the most widely used sources in previous CSR studies. Publicly listed firms contributed approximately 70% of the total charitable donations in China (Yang, 2018), providing an ideal sample for investigating the relationship between CSR and CFP (Wang and Qian, 2011). Numerous data sources were used in this study. Firm-level data, including financial information, were collected from the China Stock Market and Accounting Research (CSMAR) database, and philanthropic data were manually collected from firms' annual reports (Liu et al., 2017). Regional data, including gross domestic product (GDP) and marketization index, were sourced from the China Statistical Yearbook and National Economic Research Institute (NERI) annual reports. After eliminating the missing values, we assembled an unbalanced panel dataset comprising 18,110 firm-year observations from 2,853 total unique firms.

As mentioned in the introduction, endogeneity bias in examining the CSR-CFP relationship is mainly due to the coexistence of reverse causality, sample selection bias, and unobserved heterogeneity. First, sample selection bias exists because firms that engaged in donations may differ systematically from those without donations, and thus the factors that affect a firm's donation choice may also be correlated with its financial performance, our dependent variable (Wang and Qian, 2011). Second, reverse causality occurs when CSR and CFP affect each other (Ben Lahouel et al., 2019). Third, unobserved heterogeneity occurs when there is an omission of variables in the regression models. In this study, we adopted the Heckman-2SLS approach, which combines the two-stage Heckman sample selection model with a two-stage least squares estimator to correct for endogeneity bias. In practice, we first processed the Heckman's first-stage model and then calculated the 2SLS estimator for the second stage of the Heckman model. In line with Heckman (1979), in the first stage, we applied a standard probit model to the entire sample of firms in which the dependent variable was a dummy variable indicating whether a firm donated to charity in a given year (*GIVDUM*). As Certo et al. (2016), and Leung and Yu (1996) suggested, at least one additional variable should be included in the first-stage regression to ensure the identification of a sample selection model. We thus followed related studies on the CSR-CFP relationship (Gao et al., 2019; Wang and Qian, 2011), and adopted industry-average charitable giving (*INDGIV*) as the exclusion restriction. Additionally, a valid 2SLS estimator requires that the instrumental variables in Heckman's second-stage model are also the instruments from the first-stage model (Wooldridge, 2010). We carefully selected two instrumental variables for the 2SLS estimator—namely, female director ratio and earthquake. Female director ratio (*FEMALE*) represents the proportion of women serving on a firm's board of directors, and previous studies have found evidence that there is a significant correlation between the feminization of boards and the development of CSR (Bruna et al., 2014), and female directors are more likely to engage in charitable giving (Williams, 2003). However, there is no direct influence of this ratio on a firm's profit (Rose, 2007). The earthquake variable (*EARTHQ*) represents the years of China's three most significant earthquake disasters in the twenty-first century—specifically, the 2008 Wenchuan earthquake with $M_L 8.0$, the 2010 Yushu earthquake with $M_L 7.1$, and the 2014 Ludian earthquake with $M_L 6.5$. A firm is more likely to donate during a disaster (Zhang et al., 2010), but the earthquakes did not have a direct effect on firms' profitability. Based on the above, Heckman's first-stage model is estimated as follows:

$$GIVDUM_{i,\ t-1} = \alpha_0 + \alpha_1 INDGIV_{i,t-1} + \alpha_2 FEMALE_{i,t-1} + \alpha_3 EARTHQ_{i,t-1} + \sum_{j=8}^{n} \alpha_j CONTROL_{i,t-1} + \delta_{i,t-1} \tag{1}$$

where for firm *i* in year *t, GIVDUM* is the dummy variable that reflects the firm's donation choice; *INDGIV, FEMALE*, and *EARTHQ* are the exclusion restriction and instruments in Heckman's first-stage model; and *CONTROL* is a vector of control variables used in this study, including firm size (*SIZE*), firm age (*AGE*), financial leverage (*LEVERAGE*), prior financial performance (*PRIROA*), political ties (*POLITIE*), state ownership share (*STATE*), provincial GDP per capita (*GDP*), and marketization index (*NERI*). Year (*YEAR*), region (*REGION*), and industry (*INDUSTRY*) effects were also included to capture potential variations.

From the first-stage probit model, we calculated the "inverse Mills ratio" (IMR), an adjustment term, and included it as a control variable in the second stage regression, where we examined the relationship between CSR and CFP. We employed the 2SLS estimator (Heckman's second-stage model) as follows:

2SLS first stage:

$$GIVING_{i,\ t-1} = \beta_0 + \beta_1 FEMALE_{i,t-1} + \beta_2 EARTHQ_{i,t-1} + \beta_3 IMR_{i,t-1} + \sum_{j=8}^{n} \beta_j CONTROL_{i,t-1} + \varepsilon_{i,t-1} \tag{2}$$

2SLS second stage:

$$ROA_{i,\ t} = \gamma_0 + \gamma_1 \widehat{GIVING}_{i,t-1} + \gamma_2 IMR_{i,t-1} + \sum_{j=8}^{n} \gamma_j CONTROL_{i,t-1} + \mu_{i,t-1} \tag{3}$$

where for firm *i* in year *t, GIVING* is a continuous variable that reflects the level of the firm's CSR, that is, charitable giving; $\widehat{GIVING}$ is the predicted value estimated on instrumental variables from the 2SLS first-stage model; *ROA* represents the CFP; IMR is the inverse Mills ratio to correct for potential selection bias; and *CONTROL* is a vector of control variables that are consistent with those used in the first stage. Year (*YEAR*), region (*REGION*), and industry (*INDUSTRY*) effects were also included in the second stage. The detailed measurements and data sources for each variable are provided in Table 2.

## 3. Results and discussions

### 3.1. Base results

The statistics of the variables, including the mean, standard variance, minimum, median, and maximum values, in both Heckman's first-stage and second-stage models are summarized in Table 3. Since the variables *ROA* and *PRIROA* are highly skewed, we winsorized these two variables at the upper and lower 1% tails of the distribution. The mean value of *GIVDUM* was 0.683, suggesting that about 68.3% of the total listed firms in China engage in CSR. The mean value of *GIVING* was 12.481 (¥2319,376 RMB in real value, equivalent to US$327,776 based on the 2019 exchange rate), whereas the maximum value was 20.646 (¥930,000,000 RMB in real value, equivalent to US$131,428,330). These values regarding CSR data in our sample are similar to those in the existing literature (Gao et al., 2019). The correlations between any two variables were relatively small. We future calculated the variance inflation factors (VIFs), and the mean VIF was 1.72 with a maximum value of 3.50, substantially lower than the rule-of-thumb cutoff of 10 (Ryan, 1997). Thus, multicollinearity was not a serious concern in this study.

Table 4 reports the baseline results of CSR's effect on CFP using the Heckman-2SLS approach. Model 1 presents the results of Heckman's first-stage model. We computed the IMR and corrected potential sample selection bias based on the results in Model 1. Models 2 and 3 show the results of Heckman's second-stage model—namely, a complete 2SLS estimator to mitigate endogeneity

**Table 2**
Variable definitions.

| Variables | Definition |
|---|---|
| *ROA* | Corporate financial performance, calculated as the net income over total assets. |
| *GIVDUM* | Giving dummy, a dummy variable that equals to 1 for firms that donated in a given year, and 0 for those that did not donate. |
| *GIVING* | Giving amount, calculated as the natural logarithm of the total amount of a firm's charitable giving. |
| *SIZE* | Firm size, calculated as the natural logarithm of a firm's total assets. |
| *AGE* | Firm age, measured as the number of years since a firm's foundation. |
| *LEVERA* | Financial leverage, calculated as the ratio of total debt to total assets. |
| *PRIROA* | Prior financial performance, measured as the ROA lagged by one year. |
| *POLITI* | Political ties, measured as a dummy variable that equals to 1 if a firm's CEO or board chairman is currently serving or previously served as a delegate to the People's Congress or Chinese People's Political Consultative Conference, and 0 otherwise. |
| *STATE* | State ownership share, calculated as the ratio of state share to the whole share. |
| *GDP* | Provincial gross domestic product (GDP) per capita, calculated as the natural logarithm of the provincial GDP per capita where a focal firm is located. |
| *NERI* | Marketization index, assessed from indexes developed by the National Economic Research Institute (NERI) annual reports. |
| *INDGIV* | Industry-level average giving, calculated as the natural logarithm of the total amount of charitable giving by the focal firm's industry peers. |
| *FEMALE* | Female director ratio, calculated as the ratio of the number of female directors to the total number of directors in the board. |
| *EARTHQ* | Earthquake, measured as a dummy variable, equals 1 for the years 2008, 2010, or 2014, and 0 otherwise. |

**Table 3**
Summary statistics of the variables.

| Panel A: Heckman first-stage variables | | | | | | |
|---|---|---|---|---|---|---|
| Variables | N | Mean | Std. Dev. | Min | Median | Max |
| *GIVDUM* | 18,110 | 0.683 | 0.465 | 0 | 1 | 1 |
| *SIZE* [a] | 18,110 | 21.839 | 1.453 | 10.8 | 21.7 | 30.7 |
| *AGE* | 18,110 | 14.321 | 5.424 | 0 | 14 | 48 |
| *LEVERA* | 18,110 | 0.412 | 1.724 | 0 | 0.343 | 142.763 |
| *PRIROA* [b] | 18,110 | 0.037 | 0.065 | −0.325 | 0.036 | 0.204 |
| *POLITI* | 18,110 | 0.121 | 0.327 | 0 | 0 | 1 |
| *STATE* | 18,110 | 0.072 | 0.165 | 0 | 0 | 0.971 |
| *GDP* [a] | 18,110 | 10.787 | 0.483 | 9.196 | 10.853 | 11.590 |
| *NERI* | 18,110 | 7.427 | 1.740 | −0.3 | 7.66 | 9.95 |
| *INDGIV* [a] | 18,110 | 13.591 | 0.644 | 11.610 | 13.480 | 16.648 |
| *FEMALE* | 18,110 | 0.126 | 0.115 | 0 | 0.111 | 0.833 |
| *EARTHQ* | 18,110 | 0.347 | 0.476 | 0 | 0 | 1 |
| **Panel B: Heckman second-stage variables** | | | | | | |
| Variables | N | Mean | Std. Dev. | Min | Median | Max |
| *ROA* [b] | 12,365 | 0.039 | 0.056 | −0.325 | 0.036 | 0.204 |
| *GIVING* [a] | 12,365 | 12.481 | 2.099 | 4.615 | 12.604 | 20.646 |
| *SIZE* [a] | 12,365 | 22.024 | 1.344 | 16.1 | 21.8 | 30.5 |
| *AGE* | 12,365 | 14.099 | 5.464 | 0 | 14 | 48 |
| *LEVERA* | 12,365 | 0.371 | 0.352 | 0 | 0.35 | 19 |
| *PRIROA* [b] | 12,365 | 0.042 | 0.057 | −0.325 | 0.039 | 0.204 |
| *POLITI* | 12,365 | 0.134 | 0.340 | 0 | 0 | 1 |
| *STATE* | 12,365 | 0.074 | 0.169 | 0 | 0 | 0.971 |
| *GDP* [a] | 12,365 | 10.780 | 0.486 | 9.196 | 10.853 | 11.590 |
| *NERI* | 12,365 | 7.440 | 1.781 | −0.3 | 7.73 | 9.95 |
| *FEMALE* | 12,365 | 0.126 | 0.113 | 0 | 0.111 | 0.667 |
| *EARTHQ* | 12,365 | 0.362 | 0.481 | 0 | 0 | 1 |
| *IMR* | 12,365 | 0.336 | 0.254 | 0.000 | 0.280 | 2.161 |

Notes: [a] expressed as the natural logarithm value
..[b] winsorized at 1 and 99%.

issues, especially reverse causality. As shown in Model 2 in Table 4, the coefficients on our instrumental variables—namely, *FEMALE* and *EARTHQ*—were significant ($\beta = 0.621,\ p = 0.000$ and $\beta = -7.283,\ p = 0.028$, respectively). In the second stage (Model 3), the coefficient on *GIVING* was positively significant ($\gamma = 0.019,\ p = 0.016$), suggesting that corporate giving (*GIVING*) has a positive and significant relationship with CFP (*ROA*). This is consistent with the results of the existing literature (Wang and Qian, 2011). The *F*-statistic was 117.54 with 0.1% significance level ($p = 0.000$) and the *R*-squared was 0.186. Both values reported the overall significance of the model with good quality.

Further, several tests were conducted to check the relevance, exogeneity, and strength of the instrumental variables. The *F*-statistics of the first-stage regression was 15.985, larger than the threshold value of 10 (Stock and Yogo, 2005), meaning that the instrumental variables satisfied the strength requirement. The Kleibergen-Paap rk *LM*-statistic was 16.049 at the 0.1% significance level ($p = 0.000$), signifying that the instrumental variables were well identified. Finally, the results of Hansen *J*-statistics indicated that the instrumental variables could be considered exogenous. Overall, we can confirm that the positive relationship between CSR and CFP is valid after appropriately accounting for significant endogenous concerns.

### *3.2. Additional analyses*

We conducted several additional analyses to strengthen our results further. First, we conducted several additional tests for confirming the presence of endogeneity issues in our primary analyses. A Durbin–Wu–Hausman test was conducted to check whether endogeneity exists in the model (Davidson and MacKinnon, 1993). The results for the original sample (18,110 observations) and the selected sample after the Heckman's sample selection (12,365 observations) are both significant ($F = 6.80,\ p = 0.009$ and $F = 5.29,\ p = 0.022$, respectively), indicating that endogeneity is present in both the original sample and the second stage sample. The coefficient on *IMR* (*Lambda*) in Model 2 in Table 4 is significantly positive ($\beta = 1.294,\ p = 0.000$), indicating that sample selection bias exists in our sample. A panel Granger causality test was then used to examine whether the dual-directional causality exists between CSR and CFP (Lev et al., 2010). The results showed that all *F*-statistics on joint tests of Granger causality are significant in both the original sample and selected sample, suggesting that the reverse causality also exists after correcting for the sample selection bias. Thus, the above tests validate that sample selection bias and reverse causality simultaneously exist in our sample.

Second, a sample of privately-owned Chinese firms was used as an alternative sample for a robustness check. The data were collected from a nationwide survey of private firms in China that is conducted every two years and is widely used as a data source in China's CSR research (Du, 2015; Gao and Hafsi, 2015). We included survey data conducted in 2006, 2008 and 2010 and then assembled a final cross-sectional sample consisting of 4,407 private firms. All the variables used remained the same, except for

**Table 4**
Heckman-2SLS approach to test the relationship between CSR and CFP.

| Variables | Sample: Chinese listed firms First stage (Heckman) (1) *GIVDUM* | | Second stage (Heckman) First stage (2SLS) (2) *GIVING* | | Second stage (2SLS) (3) *ROA* | | Sample: Chinese private firms First stage (Heckman) (4) *GIVDUM* | | Second stage (Heckman) First stage (2SLS) (5) *GIVING* | | Second stage (2SLS) (6) *ROA* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *SIZE* | 0.413*** | (0.020) | 0.980*** | (0.034) | −0.016* | (0.008) | 0.096*** | (0.012) | 0.432*** | (0.028) | −0.559*** | (0.116) |
| *AGE* | −0.022*** | (0.006) | −0.019*** | (0.004) | −0.000 | (0.000) | 0.033*** | (0.005) | 0.003 | (0.010) | −0.035** | (0.012) |
| *LEVERA* | 0.008 | (0.016) | 0.065 | (0.049) | −0.007*** | (0.002) | 0.000 | (0.000) | −0.000 | (0.000) | −0.000 | (0.000) |
| *PRIROA* | 0.993*** | (0.242) | 5.750*** | (0.312) | 0.357*** | (0.047) | | | | | | |
| *POLITI* | 0.175** | (0.058) | 0.204*** | (0.051) | 0.000 | (0.002) | 0.411*** | (0.058) | 0.303* | (0.121) | −0.360* | (0.172) |
| *STATE* | 0.072 | (0.110) | −0.445*** | (0.107) | 0.012* | (0.005) | | | | | | |
| *GDP* | 0.118 | (0.250) | −0.150 | (0.282) | −0.006 | (0.009) | 1.561*** | (0.243) | −8.890*** | (0.4709) | −0.276 | (0.208) |
| *NERI* | 0.056 | (0.047) | 0.144** | (0.054) | −0.001 | (0.002) | −0.043 | (0.032) | 0.334*** | (0.034) | 0.043 | (0.054) |
| *INDGIV* | 0.440† | (0.234) | | | | | 0.090 | (0.069) | | | | |
| *FEMALE* | 0.137 | (0.176) | 0.621*** | (0.155) | | | −0.074 | (0.065) | 0.146† | (0.081) | | |
| *EARTHQ* | 1.275*** | (0.209) | −7.283* | (3.323) | | | −0.483*** | (0.112) | 3.612*** | (0.140) | | |
| *IMR* | | | 1.294*** | (0.210) | 0.005 | (0.012) | | | −1.806** | (0.601) | −2.739** | (0.871) |
| *GIVING* | | | | | 0.019* | (0.008) | | | | | 0.487*** | (0.095) |
| *YEAR* | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| *REGION* | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| *INDUSTRY* | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Constant | −15.773*** | (4.340) | −7.676* | (3.266) | 0.176 | (0.120) | −17.549*** | (2.849) | 96.054*** | (4.938) | 7.896** | (2.904) |
| Log likelihood | −8402.988 | | | | | | −2154.188 | | | | | |
| Wald $\lambda^2$ | 964.00*** | | 479,671.00*** | | 3,177.13*** | | 563.36*** | | | | | |
| *F*-statistics | | | 15.98*** | | 117.54*** | | | | 743.37*** | | 1.59** | |
| $R^2$ | | | | | 0.186 | | | | | | 0.012 | |
| Weak identification test (*F*-statistics) | | | | | 15.985 | | | | | | 337.663 | |
| Underidentification test (*LM*-statistics) | | | | | 16.049*** | | | | | | 235.440*** | |
| Overidentification test (Hansen *J*- statistics) | | | | | Yes | | | | | | Yes | |
| Observations | 18,110 | | 12,365 | | 12,365 | | 4,407 | | 3,223 | | 3,223 | |

Notes: † $p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$. Standard errors are in parentheses.

**Table 5**
Results of robustness check.

| Variables | Dependent variable (1) *TOBINQ* | | Dependent variable: ROA (2) *GRATIO* | | (3) *CSRSCO* | |
|---|---|---|---|---|---|---|
| *SIZE* | −0.452*** | (0.136) | 0.004** | (0.002) | −0.008 | (0.005) |
| *AGE* | 0.001 | (0.003) | −0.000 | (0.000) | −0.001** | (0.000) |
| *LEVERA* | 0.094† | (0.051) | −0.006* | (0.003) | 0.005*** | (0.001) |
| *PRIROA* | 0.621*** | (0.021) | 0.457*** | (0.019) | 0.238† | (0.133) |
| *POLITI* | 0.038 | (0.039) | 0.001 | (0.002) | −0.001 | (0.003) |
| *STATE* | 0.246* | (0.107) | 0.013* | (0.006) | 0.015† | (0.008) |
| *GDP* | −0.231 | (0.194) | −0.007 | (0.010) | 0.004 | (0.019) |
| *NERI* | −0.008 | (0.041) | −0.003 | (0.003) | 0.004 | (0.003) |
| *IMR* | 0.593*** | (0.172) | 0.017† | (0.009) | 0.010 | (0.007) |
| *GIVING* | 0.257† | (0.133) | | | | |
| *GRATIO* | | | 0.240* | (0.112) | | |
| *CSRSCO* | | | | | 0.014† | (0.008) |
| *YEAR* | Yes | | Yes | | Yes | |
| *REGION* | Yes | | Yes | | Yes | |
| *INDUSTRY* | Yes | | Yes | | Yes | |
| Constant | 10.578*** | (2.488) | 0.002 | (0.124) | 0.085 | (0.239) |
| Wald $\lambda^2$ | 21,583.01*** | | 2,687.20*** | | 2,248.37*** | |
| *F*-statistics | 946.42*** | | 100.50*** | | 83.23*** | |
| $R^2$ | 0.636 | | 0.122 | | 0.061 | |
| Weak identification test (*F*-statistics) | 21.510 | | 10.237 | | 5.618 | |
| Underidentification test (*LM*-statistics) | 21.592*** | | 10.284*** | | 5.640* | |
| Overidentification test (Hansen *J*- statistics) | Yes | | Yes | | Yes | |
| Observations | 11,631 | | 12,255 | | 14,765 | |

Notes: †$p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$. Standard errors are in parentheses.

*PRIROA* and *STATE*, because the data structure is cross-sectional and they are private firms. All the prior formulas were rerun using the same Heckman-2SLS approach. These results are also reported in Table 4 (Models 4–6). The coefficients on variables of interest showed solid consistency with the previously discussed results.

Third, considering the 2008 financial crisis could be a potential risk that may bias our estimation results, we conducted a difference-in-difference (DID) approach to test whether the financial crisis has a substantial impact on corporate financial performance. We set the two cutoff points of the crisis, 2008 and 2009, and both results showed that the financial crisis does not significantly affect financial performance ($p = 0.246$ and $p = 0.229$, respectively). Besides, we followed the literature (Jahmane and Gaies, 2020) and set a dummy variable *CRISIS*, which takes the value of one in a crisis year (2008 and 2009 in this study). The results also hold after adding this variable in our primary analyses.

Furthermore, we adopted several alternative measures of our key variables to check whether our results are sensitive to different operationalizations. For the dependent variable, we used the firm's Tobin's Q (*TOBINQ*), a proxy of market-to-book value ratio of CFP, measured as the firm's market value divided by its total assets at the end of the year, to replace the *ROA* used in the main analyses (Ben Lahouel et al., 2019). Additionally, we followed previous related studies and used two alternative measures, *GRATIO*, measured as the ratio of a firm's charitable giving to its total sales (Gao and Hafsi, 2015), and *CSRSCO*, a rating score of a firm's CSR activities developed by the Chinese CSR rating agencies, namely "Hexun" and "Runling" (Marquis and Qian, 2014). The results of *GIVING, GRATIO* and *CSRSCO* showed in Table 5 remain similar to those in Table 4. All these additional analyses, therefore, support the robustness of the results and validity of the Heckman-2SLS approach.

## 4. Conclusion

Given the growing interest in and divergent findings of the CSR-CFP relationship, applying a reliable modeling technique that can address different sources of endogeneity is of primary importance. Most studies documented in the literature focus on considering either selection bias or reverse causality, which may lead to biased estimation due to inappropriate and incomplete treatment of mitigating endogeneity issues. By using a sample of Chinese A-share firms, we tested a proposed Heckman-2SLS model and found that corporate charitable giving indeed had a positive and significant impact on a firm's financial performance during the years 2008–2015. Alternatively, supplementary analyses further validated these results.

The results of this study enhance our understanding of the CSR-CFP relationship and make potential contributions to the literature on this topic. On the one hand, after correcting for different sources of endogeneity issues, our empirical study provides further evidence for the positive association of the CSR-CFP relationship, which responds positively to the classic argument "doing well by doing good" in the CSR literature (Falck and Heblich, 2007; Karnani, 2011). Theoretical discussions on the CSR-CFP relationship tend to follow two distinct arguments. The first is mainly based on stakeholder theory, which proposes that meeting the needs of key stakeholders in the society can help firms create competitive advantages and acquire strategic resources to enhance their financial performance (Brammer and Millington, 2008). The contrary argument suggests that investments in CSR activities are resource-consuming, which may inhibit sufficient resources allocated to business operations and hence damage the profitability of the firms. Our results in the study contribute to the ongoing CSR-CFP debate and provide strong empirical support to the stakeholder theory. Most importantly, our study suggests that in order to continue a meaningful and valid CSR-CFP debate theoretically, we should minimize multiple sources of endogeneity concerns regarding the CSR-CFP relationship. On the other hand, our results also offer important practical implications for practitioners. We suggest that for managers, both in large-scale listed firms and small and medium-sized private ones, should commit resources to CSR because it can help firms gain strategic resources from the key stakeholders (e.g., the government, investors) which in turn can improve firms financial performance. Our robust evidence gives managers strong confidence to support their CSR activities.

There are still two limitations that future studies might seek to address. First, although we used the data on corporate giving on donation and rating scores of CSR activities to measure a firm's contribution to the society (Gao et al., 2019; Wang and Qian, 2011), firm's environmental performance has not been captured. Future research may develop a more appropriate measurement with more comprehensive CSR dimensions and re-investigate our proposed models. Second, our study was conducted in the context of China, which is the world's largest transition economy with some unique characteristics of the institutional environment. We believe it would be meaningful for future studies to extend our models to other countries and compare findings across different countries.

## Author statement

Wei Liu: Resources; Methodology; Software; Writing-Original draft preparation; Formal analysis
Xuefeng Shao: Reviewing; Funding acquisition
Marco De Sisto: Conceptualization; Writing-Reviewing and editing
Wen Helena Li: Writing-Original draft; Writing-Reviewing and editing; Supervision; Project administration

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2020.101623.

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