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Relationship between Corporate Social Responsibility and Financial Performance in the Mineral Industry: Evidence from Chinese Mineral Firms

Xiping Pan ^{1,2,*}, Jinghua Sha ^{1,2,*}, Hongliang Zhang ^{1,3} and Wenlan Ke ^{1,2}

¹ School of Humanities & Economic Management, China University of Geosciences, Beijing 100083, China; E-Mails: zhanghongliang@swust.edu.cn (H.Z.); kewanlan1988@hotmail.com (W.K.)

² Key Laboratory of Carrying Capacity Assessment for Resource and Environment, Ministry of Land and Resource, Beijing 100083, China

³ School of Economics and Management, Southwest University of Science and Technology, Mianyang 621010, China

* Authors to whom correspondence should be addressed; E-Mails: panxp1234@outlook.com (X.P.); shajinghua@outlook.com (J.S.); Tel.: +86-10-8232-3059 (J.S.); Fax: +86-10-8232-1783 (J.S.).

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Abstract: This paper examines the relationship between Corporate Social Responsibility (CSR) and Corporate Financial Performance (CFP) using panel data for 228 Chinese mineral listed firms from 2010 to 2013 with Pooled Least Squares regression analysis. Our study considers five different sublevel CSR issues—shareholder responsibility, employee responsibility, environmental responsibility, public responsibility, and supplier, customer and consumer responsibility—in capturing the effects of CSR elements on CFP. The estimation results show the different effects of each sublevel CSR issue on CFP. Overall, shareholder, employee responsibility, environmental responsibility, supplier, customer and consumer responsibility have significant relationships with CFP, which are the stakeholders who have the closest linkage with firm operations. Meanwhile, public responsibility outside the firm does not show significant interaction with CFP, which is why many mineral firms ignore the public interest and this leads to conflicts. Shareholder responsibility has the most significant positive effect on CFP. Supplier, customer and consumer responsibility and environmental responsibility usually have negative effects on CFP as costs increase. Moreover, all 228 listed mineral firms that were selected in this paper have been classified into five sub-sectors: the extractive industry, metal fabrication

industry, oil and gas industry, gas and water-related industry, and oil-producing equipment industry, based on the Industry Classification Benchmark (ICB). Our study shows that the differences in the relationship between CSR and CFP for five sublevel industries are due to industry characteristics. If the government wants to solve these conflicts and positively encourage firms to adopt CSR, it is necessary to create a mining development environment whereby firm profits are closely tied to CSR.

Keywords: corporate social responsibility; corporate financial performance; Chinese mineral firms; relationship

1. Introduction

The mineral industry experienced a huge boost over the last decade with mining output increasing 5.6 times during the 2002–2011 period [1]. However, accompanying this rapid growth was a lack of Corporate Social Responsibility (CSR), the presence of externalities, and many social conflicts, such as environmental pollution, security issues, employment of local residents, and illegal land use. All of these conflicts are closely associated with stakeholder interests. In recent years, the stakeholders of firms such as shareholders, employees, investors, governments, local communities, trading partners, consumers, and non-governmental organisations are conscious of their interests and corporate management. This directly or indirectly influences a firm's financial performance [2]. In China, for example, many mineral enterprises have been shut down because of their significant environmental pollution and substandard security. At the present time, management usually ignores the stakeholder benefits outside the firms (such as the community and public) because the companies do not have an interest in adopting CSR spontaneously unless they could receive financial benefits. CSR is just a guise to cope with government regulation and fawn on the public. This phenomenon is also common in the minerals sector of some natural resources-rich areas such as Ghana and sub-Saharan Africa where companies have little sense of who to target in their local economic development policies, and programs lead to conflicts and scrambles [3,4].

To solve mineral conflicts and to maintain the sustainable development of the Chinese mineral industry as well as social harmony, minerals firms must adopt CSR ideas. Milton Friedman argued that it is the firm's nature to pursue its interests and that the social responsibility of a business is to increase its profits [5]. To solve this problem, it is important to ask whether CSR has effects on Corporate Financial Performance (CFP) in the Chinese mineral industry. This paper aims to answer this question.

In previous studies, scholars sought to find the linkage between CSR and CFP. The earliest study of this subject began in the 1970s [6–10], came of age in the 1980s [11], and has continued in recent years. However, even in recent years, the empirical research has not arrived at a consensus. There have been different results about the relationship between CSR and CFP. The different opinions are mainly sorted into three types: positive, negative, and neutral. Vance found that firms considered to have good CSR performance may not do well in the stock market, and his research shows that CSR and return of equity (ROE) have a negative relationship [10]. Some studies also find that if managers pursue their own interests, they may sacrifice the interests of shareholders and stakeholders [12–14]. Related

opinions that hold that the two have a negative relationship argued that managers pursuing CSR will come into conflict with value maximisation [15]. Blowfield found there is usually a neutral and negative correlation between social or environment issues and companies' business performance. This situation is even more so in developing countries [16,17]. The idea that business is an agent to solve international development problems such as poverty is insufficient and unjustified [18]. Frynas argues that private firms are unlikely to act as successful development actors without corporate governance reforms, which would align the interests of non-traditional stakeholders with corporate interests [19]. There are fundamental problems surrounding the capacity of private firms to deliver development and the aspiration of achieving development through Corporate Social Responsibility (CSR) based on the evidence from multinational oil companies [20]. Scholars holding the neutral relationship opinion said that the two do not have a significant interaction because profits from socially responsible conduct will compensate for the cost in market equilibrium. The linkages are quite complex. Some academic research shows that a social orientation does not have any linkage with the firm's financial performance [21]. Most empirical studies' results support the positive relationship hypothesis, and the opposing research is usually based on a country or region [22–25].

In recent years, the new research direction for the relationship between CSR and CFP has been detailed in specific industries and specific CSR elements. Industry specialisation includes the financial industry (banking industry), petroleum-gas industry, information technology industry, and restaurant industry [26–30]. This trend may be due to fast development within these industries during recent years, which caused conflicts among stakeholders and attracted public attention. The second research innovation in this field is that scholars began to find relationships between CFP and a specialised CSR element such as employee and supply chain responsibility. Lee *et al.* studied the relationship between employee rights protection and CFP and stated that both buyer and supplier should adopt employee rights protection to improve their corporate reputation and financial performance [31]. Wang found that financial benefits are associated with environmental and social supply chain management activities [32]. Some scholars found that environmental issues interact with CFP [2,33,34]. There is also some research focused on moderate roles such as ownership, institutional difference, or R&D on the relationship between CSR and CFP [35–37]. Meanwhile, we have not found previous studies that capture empirical research on the linkage between CSR and CFP specific to the minerals industry.

This paper aims at complementing the existing literature by explicitly studying the relationship between CSR and CFP in the Chinese mineral industry using the panel data of 228 listed mineral firms from 2010 to 2013 with Pooled Least Squares regression analysis. In this paper, there are four main goals we want to achieve. First, this study adopts well-established techniques in a systematic manner using the Pooled Least Squares regression method to find the relationship between CSR and CFP, instead of a qualitative judgment. Second, we try to find the relationships between CSR elements and CFP. In this paper, CSR is composed of shareholder responsibility, employee responsibility, supplier, customer and consumer responsibility, environmental responsibility, and public responsibility based on stakeholder theory. Third, all 228 listed mineral firms selected have been classified into five sub-sectors: the extractive industry, metal fabrication industry, oil and gas industry, gas and water-related industry, and oil-producing equipment industry based on the Industry Classification Benchmark (ICB). This research will find the different relationships between CSR and CFP among the five sub-sectors. Fourth, we try to find measures to solve Chinese mineral industry conflicts from the financial scope which are different from other measures such as legislation and supervision.

The structure of the remainder of this paper is as follows. Section 2 introduces the data. Section 3 introduces the measures and methods. The empirical results and discussion are reported in Section 4. Finally, there is a brief conclusion.

2. Data

CSR performance and financial performance are taken from a Chinese professional financial services website named HEXUN, which is specialised for high-end investors in China.

The data on CSR performance come from the open online Corporate Social Responsibility Database released by HEXUN. It is the only available data source we could obtain that covers the evaluation and ranking of CSR performance on all of the listed companies in China. The details of the evaluation method used by HEXUN can be seen in Appendix A. The CSR performance evaluation on the website is based on the annual financial report and CSR report of each firm released by the Shanghai stock exchange and Shenzhen stock exchange.

The financial performance data come from the HEXUN online financial ratio database based on each firm's Annual Financial Report. We chose five different financial indicators for CFP that include both accounting-based data and market-based data. The indicators will be introduced in the Measures section. More details can be seen in Appendix B.

We chose all data from the HEXUN website for two reasons: first, it is the only data source we could obtain that covers all Chinese listed mineral firms' CSR performance. Second, all of the data come from the same source and all of these firms' data are calculated in the same way, which ensure the data's consistency and comparability.

We have used all available data in the initiation of this study. This paper yields 228 firms (the details can be seen in Table B2) or 912 firm-years; a total of 9273 data points. Table 1 shows the descriptive statistics of each variable. It appears that there is a wide diversity in the firms and no trend in the variables. This suggests that there is ample scope for analysis and that, apart from looking into the overall data, the sub-level variables seem promising.

Table 1. Descriptive statistics.

	Mean	Median	Maximum	Minimum	S.D	Skewness	Kurtosis	Observations
CSR	30.557	21.12	85.77	−4.25	20.55	0.791834	2.216253	826
Shareholder-R	12.899	13.49	20.47	−8.25	4.388	−0.86577	3.90468	826
Employee-R	4.6102	2.545	15	0	4.678	0.93961	2.393785	826
Supply chain-R	3.6392	0	20	0	5.654	1.063599	2.438038	826
Environmental-R	5.4903	0	30	0	8.625	1.113649	2.584567	826
Public-R	3.9184	4.17	15.79	−10	3.015	−0.255342	5.332701	826
ROE	0.0381	0.07	3.1	−20.7	0.809	−22.04669	543.3537	826
ROA	0.0398	0.03	0.88	−1.09	0.075	−1.875569	84.7509	826
EPS	0.3766	0.27	3.73	−1.69	0.545	1.388215	9.541381	826
MB	0.3551	0.16	50.3	−0.72	2.252	19.04598	389.9247	826
NA	0.5415	0.06	122.97	−0.95	4.457	25.28182	691.0031	826

Notes: Shareholder-R, Employee-R, Supply chain-R, Environmental-R, Public-R MB, and NA in Table 1 is short for Shareholder-Responsibility, Employee-Responsibility, Suppliers, customers and consumers responsibility, Environmental-Responsibility, Public-Responsibility, Growth Rate of Main Operating and Expansion Rate of Net Assets Respectively.

3. Measures of CSR and CFP

3.1. Financial Performance

Raze *et al.* have summarised numerous empirical studies from 1972–2012 in their review paper using content analysis, showing that financial measures such as stock market returns, Tobin's Q, and accounting profits ratios such as return on assets (ROA), return on equity (ROE), and return on sales (ROS) are targeted [38]. Most scholars choose ROE, ROA, EPS, and ROIC as important financial variables in their studies [2,7,39–41]. Scholtens (2008) uses stock returns as a financial index [42]. McGuire *et al.* compare both stock market-based and accounting-based measures that focus on different aspects of financial performance. The accounting-based measures emphasise the firm's historical performance and capture a wide range of indicators such as ROA, ROE, Growth Rate of Main Operating, and Expansion Rate of Net Assets [41]. Stock market-based measures refer to investors' evaluations and expectations of firms. However, these measures may not reflect the real evaluation if there is asymmetric information [42]. In the Chinese mineral industry, firms would face all types of stakeholders, and it is not feasible for them to only focus on investors. Thus, this paper takes into account both stock-market returns and accounting-based measures. We employ EPS as a market-based CFP index and ROA, ROE, Growth Rate of Main Operating, and Expansion Rate of Net Assets as accounting-based CFP indicators.

3.2. CSR Performance

Over the decades, the concept of Corporate Social Responsibility (CSR) has continued to grow in importance and significance, although there is generally no consistent definition. Even competing, complementary, and overlapping concepts such as corporate citizenship, business ethics, stakeholder management, and sustainability are all vying to become the most accepted and widespread descriptor of the field [11]. As there is generally no consistent definition, there is also no consistent evaluation of CSR performance. Scholars use different methods to assess CSR performance. Some studies have used questionnaires answered by CEOs or managers for CSR performance [21]. McGuire used an enterprise's reputation released by FORTUNE magazine as CSR performance [41]. Some CSR performance is based on KLD's measures, which use multidimensional variables capturing a wide range of stakeholder performance aspects [42,43]. In recent years, studies also evaluated CSR performance based on the firms' CSR reports [44]. Furthermore, scholars even establish their own evaluation systems for specific industries such as the construction and infrastructure industry [45,46].

As for China, the CSR field is just in the fledging period. Most Chinese firms' CSR reports were first released in 2010 when required by the State-owned Assets Supervision and Administration Commission of the State Council. In this study, we cited CSR performance evaluation data from a professional Chinese financial website named HEXUN, which evaluated CSR performance every year from 2010 on all listed Chinese firms. According to the website, CSR is divided into five sub-levels: shareholder responsibility, employee responsibility, supplier, customer and consumer rights responsibility, environmental responsibility, and social responsibility based on stakeholder theory. Each of the elements also has several sub-criteria. Shareholder responsibility includes profitability, debt situation, return, credit, and innovation. Employee responsibility covers performance, security, and

caring for employees. Supplier, customer, and consumer responsibility mainly focuses on product quality, service, and mutual good faith. Environmental responsibility is composed of environmental awareness, environmental management system certification, environmental investment amount, number of sewage types, and number of energy conservation types. Public responsibility represents a firm's contribution value, which covers taxes and donations. The detailed definitions of each variable are provided in Appendix A.

3.3. Firm's Sector

In China, there is no clear definition of the minerals industry. Usually there is a wide range of industries which are related to mine exploitation and operation. Their businesses are closely tied with natural resources; most firms have extractive and downstream processing functions as well as a smelting sector. In this paper, the firms we chose are from the HEXUN website, which evaluates the CSR performance of all Chinese listed firms. In their open online CSR evaluation database, the firms are classified into 35 industries according to the Industry Classification Benchmark (ICB). We choose the industries which are closely related to natural resources, which are the extractive industry, metal fabrication industry, oil and gas industry, gas and water-related industry, and oil-producing equipment industry, comprising of 228 firms (see Appendix B, Table B2). These five sectors are basically different from each other by production. As their CSR performance is quite different from each other, we want to study the detailed relationship between CSR and CFP so that we can make feasible suggestions for solving these problems.

4. Models

This study is designed to examine the relationship between CSR and CFP. It appears that the regression model is used to investigate the association between social and financial performance [42]. Regression analysis is a statistical process for estimating the relationships among variables. This method has been developed considerably. Pooled regression can be used when the groups to be pooled are relatively similar or homogenous. Again, it is the regression model with Pooled Least Squares that is used to investigate the association between CSR and CFP in the Chinese mineral industry.

As our samples are extremely equal to all of the listed mineral companies in China and the data period is relatively short (because the CSR field in China has just started in recent years, CSR data are limited though we have found all of the available data), the firms-fixed effects regression model was adopted in this research and we passed over the unit root test for the short term data.

Equation (1) examines the relationship between unitary CSR and CFP. The two variables are CFP and CSR, which are calculated by the CFP ratio and total CSR score. Equation (2) provides a further study of the internal relationship among CSR elements and CFP. All of the CSR sub-criteria are explanatory variables in regression Equation (2) where S, EM, EN, P, C stands for shareholder responsibility, employee responsibility, environmental responsibility, public responsibility, and supplier, customer and consumer responsibility, respectively.

Following previous research studies, some other determinants that may have effects on financial performance also should be included in the estimation equation as supplementary explanatory variables in addition to CSR performance, such as input and tax credit. However, data collection was a

significant problem because we could not obtain data for all 228 firms. As our research mainly focuses on the relationship between CSR and CFP, we would like to include the supplementary explanatory variables as part of the constant β_0 . Our basic equations are expressed as follows:

$$CFP_{it} = \beta_0 + \beta_1 CSR_{it} + \mu_j + \varepsilon_{it} \quad (1)$$

$$CFP_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 EM_{it} + \beta_3 C_{it} + \beta_4 EN_{it} + \beta_5 P_{it} + \mu_j + \varepsilon_{it} \quad (2)$$

where i represents the firm; j refers to the industry; t indicates the period; μ is the firm fixed effects, which will be introduced later; and ε is the standard error term. The CFP performance indicators are ROE, ROA, Growth Rate of Main Operating, Expansion Rate of Net Assets, and EPS.

Our analysis moves as follows. First, we use the full sample data of 228 mineral firms to estimate Equations (1) and (2). Second, we examine the relationship between CSR and CFP in the five mineral sub-sectors.

We adopt software EVIEWS 6.0 to do estimation. After the estimation proceeds, it is important to improve the estimation quality. If the variable could not pass the t-test and the P value, then we reduce insignificant variables gradually. However, the analysis shows that reducing the variables still could not improve the equation's quality. The possible reason is that these variables do not have significant effects on the dependent variable (CFP).

5. Results and Discussion

5.1. The Relationship between CSR and CFP across All 228 Firms

The estimation results of the full sample (228 firms) are shown in Table 2. CSR has significant positive effects on ROA, and EPS in columns (2)–(3), judging from the value of R^2 and the t-test. The results show that CSR may have positive connections with firm profits. CSR does not show significant effects on the growth rate of the main operating or expansion rate of net assets, which shows that CSR does not have a relationship with corporate main operating revenue. Based on the above, CSR issues may help the company reduce costs and then lead to a profit increase.

As for the CSR elements, shareholder responsibility performance has a significant positive effect on most CFP indicators (except for the growth rate of main operating). This finding implies that shareholder responsibility has impacts on firm cost reduction. Shareholder responsibility is composed of profits, debt situation, return, credit, and innovation (see Appendix A), which mainly focus on the issues inside the firm; Apart from shareholder responsibility, supplier, customer and consumer rights responsibility has negative effect on EPS, which means that product quality, service and mutual faith has negative effects on earning. The spare sub-criteria of CSR do not show a significant impact on a firm's financial performance. This finding indicates that the other stakeholders such as the employees, community, clients, and the public do not have significant positive effects on CFP. In addition, only the CSR issues closely related to company operations could have effects on CFP, which is why mineral companies do not have the necessity or motivation for CFP, leading to conflicts.

Table 2. Estimation results for the relationship between CSR and CFP in all 228 firms.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	−0.0697 (−0.7599)	0.0240 *** (3.7270)	0.1419 *** (3.8104)	0.6688 (0.6554)	1.0431 *** (2.7456)
CSR	0.0045 (−1.6336)	0.0005 *** (2.7476)	0.0076 *** (6.8297)	0.0038 (0.1241)	−0.0177 (−1.5666)
R ²	0.2741	0.4851	0.5170	0.2476	0.2517
Constant	−0.9952 *** (−5.1824)	−0.1291 *** (−11.5355)	−0.9048 *** (−15.7045)	−0.7452 (−0.3474)	−0.6596 (−0.8233)
Shareholder responsibility	0.0852 *** (6.0852)	0.0139 *** (16.8531)	0.1000 *** (23.5878)	0.1321 (0.8359)	0.1217 ** (2.0758)
Employee Responsibility	−0.0083 (−0.3012)	−0.0013 (−0.7926)	0.0023 (0.2694)	0.1454 (0.4599)	−0.1614 (1.3926)
Suppliers, customers and consumers responsibility	0.0033 (0.1432)	0.0004 (0.2615)	−0.0175 ** (−2.4731)	−0.0609 (−0.2310)	0.0322 (0.3338)
Environmental Responsibility	−0.0032 (−0.1935)	−0.0011 (−1.1148)	0.0086 (1.7122)	−0.0359 (−0.1915)	−0.0199 (−0.2904)
Public Responsibility	0.0019 (0.0958)	0.0004 (0.3766)	−0.0001 (−0.0169)	−0.1072 (−0.4767)	0.0844 (1.0257)
R ²	0.3147	0.6494	0.7393	0.2488	0.2648
No. of firms	228	228	228	228	227
Observations	838	842	842	840	830

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

A possible reason for the results is China’s mineral industry development period. Different development periods led to different developing environments. Developed countries have robust legislation and monitoring regulations. Whereas, at present in developing countries such as China that lack legislative constraints and effective monitoring measures, companies find that there is very little financial consequence for ignoring CSR. They are typically in a self-regulation position. For example, there are numerous economic incentives from tax breaks and low royalty payments, which may worsen public conditions, destroy the environment, and cheat the government [47]. In this period, CSR issues that do not have close ties to CFP (usually the stakeholders’ interests outside a firm’s operations) would be abandoned by the corporations.

5.2. The Relationship between CSR and CFP in the Extractive Industry

The estimation results in the extractive industry are shown in Table 3. CSR has significant positive impacts on ROA, EPS and insignificant effects on the other three CFP indices. This result indicates that CSR has long-run effects on CFP because ROA includes both assets and equity.

Table 3. Estimation results for the relationship between CSR and CFP in the extractive industry.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	0.0010 (0.0366)	0.0437 *** (2.7756)	0.1984 ** (2.2382)	0.0282 (0.0534)	0.3014 (1.0587)
CSR	0.0028 *** (3.6027)	0.0003 (0.8598)	0.0106 *** (4.2582)	0.0149 (1.0039)	0.0012 (0.1550)
R ²	0.4868	0.4067	0.6511	0.2505	0.3108
Constant	−0.3570*** (−7.6557)	−0.1252 *** (−4.9331)	−0.6663 *** (−4.6403)	−0.6227 (−0.6052)	−0.5822 (−1.0267)
Shareholder responsibility	0.0319 *** (9.9717)	0.0139 *** (7.7350)	0.0912 *** (8.9584)	0.1287* (1.7639)	0.0900 ** (2.2854)
Employee Responsibility	0.0061 (0.7988)	0.0013 (0.2977)	−0.0138 (−0.5468)	−0.1739 (−0.9606)	−0.0608 (−0.6352)
Suppliers, customers and consumers responsibility	0.0032 (0.4674)	0.0040 (0.9900)	0.0251 (1.1010)	0.1076 (0.6584)	0.0593 (0.6928)
Environmental Responsibility	−0.0059 (−1.6302)	−0.0058 *** (−2.7387)	−0.0043 (−0.3550)	0.0441 (0.5097)	−0.0171 (−0.3730)
Public Responsibility	0.0019 (0.3770)	0.0018 (0.5839)	−0.0057 (−0.3280)	−0.0945 (−0.7628)	−0.0264 (−0.4065)
R ²	0.6875	0.6040	0.7646	0.2677	0.3391
No. of firms	54	54	54	54	54
Observations	204	205	205	205	200

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

As for the CSR elements, shareholder responsibility has significant positive impacts on all CFP indicators in Columns (1)–(5). Environmental performance also has a significant negative impact on ROA, which shows that it has negative effects on profits. The other elements of CSR do not have effects on CFP over the 90% significance level.

The difference in the estimation results between the extractive industry and all 228 firms is that environmental performance has negative effects on profits. One explanation for the difference is the extractive industry’s characteristics. The extractive industry is highly polluting, which has aroused the attention of the government and public. As a result of the pressure of these stakeholders, extractive firms must take measures to respond to the environment, which increases costs, burdens the company, and reduces profits.

5.3. The Relationship between CSR and CFP in the Metal Fabrication Industry

The estimation results in the metal fabrication industry are shown in Table 4. CSR performance has significant positive effects on ROA and EPS. The results show that CSR has positive effects on corporate profits by reducing the cost.

Table 4. Estimation results for the relationship between CSR and CFP in the metal fabrication industry.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	0.0213 (0.1110)	−0.0037 (−0.2748)	0.0368 (0.6213)	0.9029 (0.4354)	1.4019 * (1.8457)
CSR	0.0004 (0.0756)	0.0009 ** (2.5287)	0.0067 *** (3.7062)	0.0097 (0.1530)	−0.0293 (−1.2776)
R ²	0.2392	0.3507	0.3621	0.2491	0.2550
Constant	−1.4258 *** (−4.2340)	−0.1825 *** (−10.074)	−1.0406 *** (−14.6465)	−1.5605 (−0.4131)	−1.5963 (−1.1750)
Shareholder responsibility	0.1499 *** (5.3569)	0.0186 *** (12.2328)	0.1129 *** (18.9117)	0.2281 (0.7179)	0.2448 ** (2.1436)
Employee Responsibility	0.0072 (0.1318)	0.0047 (1.5446)	0.0210 * (1.7771)	0.4905 (0.7820)	0.0713 (0.3213)
Suppliers, customers and consumers responsibility	0.0304 (0.5266)	−0.0023 (−0.7185)	−0.0360 *** (−2.8982)	−0.1827 (−0.2767)	−0.3267 (−1.3977)
Environmental Responsibility	−0.0389 (−1.1361)	−0.0021 (−1.1073)	0.0040 (0.5435)	−0.1140 (−0.2915)	0.0240 (0.1734)
Public Responsibility	−0.0626 (−1.5204)	−0.0028 (−1.2402)	−0.0038 (−0.4298)	−0.3026 (−0.6400)	0.0307 (0.1813)
R ²	0.3121	0.5737	0.7241	0.2520	0.2795
No. of firms	113	113	113	113	113
Observations	407	410	410	408	403

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

As for CSR elements, (1) shareholder responsibility has significant positive effects on most CFP indices (except for the growth rate of main operating); (2) supplier, customer, and consumer responsibility has negative effects on EPS; (3) employee responsibility has positive effects on the EPS; and (4) apart from the three CSR elements above, the other sub-criteria do not show a significant impact on a firm’s financial performance. These results imply that in the metal fabrication industry, shareholder responsibility and employee responsibility has positive effects on profits. These results also show that the other stakeholders such as community and the public do not have a significant relationship with CFP.

Metal fabrication mainly uses materials that must be of good quality, which leads to cost increases and profit reductions. Quality management may have short-run negative effects and long-run positive effects on a firm’s profits. Employee responsibility may increase employee motivation and lead to profit increase. Results show that only the CSR issues that are closely related to a company’s traditional operations have effect on CFP.

5.4. The Relationship between CSR and CFP in the Oil and Gas Industry

The estimation results in the oil and gas industry are shown in Table 5. CSR performance only has a significant positive effect on EPS over the 90% significance level.

Table 5. Estimation results for the relationship between CSR and CFP in the oil and gas industry.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	0.0446 ** (2.5029)	0.0186 ** (2.1852)	0.1999 ** (3.4810)	0.0516 (0.2182)	0.2072 (1.0169)
CSR	0.0010 (1.5123)	0.0003 (1.2822)	0.0039 * (1.9008)	0.0088 (1.0587)	0.0029 (0.3972)
R ²	0.6416	0.5843	0.79283	0.2445	0.5621
Constant	−0.0835 * (−2.0579)	−0.0427 ** (−2.2468)	−0.2754 ** (−2.3719)	−0.8615 (−1.4376)	−0.6665 (−1.2098)
Shareholder responsibility	0.0099 ** (2.8251)	0.0046 *** (2.8349)	0.0370 ** (3.6746)	0.0482 (0.9275)	0.0829 * (1.7371)
Employee Responsibility	0.0083 (0.9485)	0.0049 (1.1927)	0.0326 (1.3045)	0.2569 * (1.9898)	−0.0354 (−0.2986)
Suppliers, customers and consumers responsibility	−0.0005 (−0.0557)	0.0003 (0.0764)	−0.0004 (−0.0135)	−0.1391 (−0.9913)	0.0323 (0.2506)
Environmental Responsibility	−0.0036 (−0.8726)	−0.0025 (−1.3132)	−0.0143 (−1.2250)	−0.0381 (−0.6317)	−0.0032 (−0.0579)
Public Responsibility	0.0043 (1.3331)	0.0016 (1.0253)	0.0163 * (1.7571)	0.0265 (−0.5541)	0.0014 (−0.0310)
R ²	0.7782	0.7517	0.9256	0.4209	0.618
No. of firms	9	9	9	9	9
Observations	35	35	35	35	35

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

As for the CSR elements, (1) shareholder responsibility has a significant positive effect on most CFP indices (except for the growth rate of main operating); (2) employee responsibility has a significant positive impact on growth rate of main operating; (3) public responsibility has a positive effect on EPS, indicating that tax and charity has positive effects on profits; and (4) the other elements have no significant relationship with CFP.

The difference from other industries regarding the relationship between CSR and CFP is that public responsibility has significant positive impacts on EPS. One possible explanation for the result is that most oil and gas companies are state-owned, obtaining huge profits and attracting a large amount of public attention. Public responsibility may improve consumer loyalty and coordination with the local community in the exploitation process. Caring for employees would encourage the staff to work better, and their good performance would improve financial performance.

5.5. The Relationship between CSR and CFP in the Oil-Producing Equipment Industry

The estimation results in the oil-producing equipment industry are shown in Table 6. CSR has negative effects on the growth rate of main operating. Shareholder responsibility performance has positive effects on ROE, ROA, and EPS over the 90% significance level. CSR does not show a significant effect on the growth rate of main operating or expansion rate of net assets, which shows that CSR does not have a relationship with corporate main operating revenue. Based on the above, CSR issues may help the company reduce costs, leading to a profit increase.

Table 6. Estimation results for the relationship between CSR and CFP in the oil-producing equipment industry.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	0.1142 *** (4.1215)	0.0819 *** (4.1082)	0.7682 *** (6.8067)	0.4095 *** (4.1124)	1.1438 * (1.8906)
CSR	−0.0002 (−0.1942)	−0.0003 (−0.5319)	−0.0053 (−1.4573)	−0.0056 * (−1.7474)	−0.0108 (−0.5507)
R ²	0.5002	0.5610	0.7630	0.3468	0.1920
Constant	−0.0990 (−1.0520)	−0.0471 (−0.6803)	−0.1993 (−0.5251)	0.0568 (0.1686)	0.9689 (0.4144)
Shareholder responsibility	0.0147 *** (2.8654)	0.0091 ** (2.4190)	0.0588 *** (2.8408)	0.0290 (1.5762)	0.0183 (0.1434)
Employee Responsibility	−0.0066 (−0.8019)	−0.0045 (−0.7463)	−0.0169 (−0.5095)	−0.0315 (−1.0699)	0.0756 (0.3698)
Suppliers, customers and consumers responsibility	0.0020 (0.2431)	0.0010 (0.1544)	−0.0109 (−0.3256)	−0.0395 (−1.3320)	−0.0420 (−0.2040)
Environmental Responsibility	0.0017 (0.2892)	0.0014 (0.3065)	0.0032 (0.1331)	0.0329 (1.5288)	−0.0061 (−0.0412)
Public Responsibility	−0.0016 (−0.1534)	−0.0037 (−0.4761)	−0.0080 (−0.1888)	−0.0548 (−1.4658)	−0.1862 (−0.7179)
R ²	0.6242	0.6550	0.8259	0.5127	0.2144
No. of firms	13	13	13	13	13
Observations	49	49	49	49	49

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

5.6. The Relationship between CSR and CFP in the Gas and Water-Related Industry

The estimation results for the gas and water-related industry are shown in Table 7. CSR has a positive relationship with ROE, ROA, and EPS. This situation is similar to all 228 firms, which shows that CSR may help reduce costs and lead to profit growth.

Table 7. Estimation results for the relationship between CSR and CFP in the gas and water-related industry.

	(1) ROE	(2) ROA	(3) EPS	(4) MB	(5) NA
Constant	0.0812 *** (4.2893)	0.0396 *** (4.6487)	0.3449 *** (4.6159)	0.1706 (0.6704)	0.8041 (1.5096)
CSR	0.0006 (0.9852)	0.0004 (1.6025)	0.0034 (1.4208)	0.0047 (0.5746)	−0.0065 (−0.3810)
R ²	0.4085	0.5794	0.6891	0.2154	0.2091
Constant	−0.1188 *** (−3.0962)	−0.0650 *** (−4.0864)	−0.5014 *** (−3.3772)	−0.9891 (−1.6414)	−0.3855 (−0.2993)
Shareholder responsibility	0.0165 *** (6.5508)	0.0089 *** (8.4814)	0.0697 *** (7.1515)	0.0718 * (1.8138)	0.0643 (0.7607)
Employee Responsibility	−0.0171 * (−1.9517)	−0.0078 ** (−2.1521)	−0.0507 (−1.4944)	0.0087 (0.0633)	−0.0655 (−0.2226)
Suppliers, customers and consumers responsibility	0.0032 (0.8919)	0.0010 (0.6499)	−0.0009 (−0.0640)	0.0007 (0.0116)	−0.0006 (−0.0047)
Environmental Responsibility	0.0016 (0.4290)	0.0018 (1.1245)	0.0192 (1.3165)	−0.0236 (−0.3985)	−0.0226 (−0.1785)
Public Responsibility	0.0018 (0.9736)	0.0005 (0.6425)	0.0047 (0.6734)	0.0446 (1.5603)	0.0477 (0.7803)
R ²	0.5920	0.7532	0.7940	0.2610	0.2236
No. of firms	39	39	39	39	39
Observations	144	144	144	144	144

Notes: 1. The numbers in parentheses are the t-test value; 2. The asterisks ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively; 3. “MB” is the abbreviation for growth rate of main operating and “NA” is the abbreviation for expansion rate of net assets.

As for the CSR elements, (1) shareholder responsibility performance has positive effects on ROE, ROA, EPS and growth rate of main operating over the 90% significance level; (2) employee responsibility has negative effects on ROE and ROA, which implies that it may have a negative impact on profit but have long-run positive effects on profits because ROA includes both debt and equity capital.

6. Conclusions

To solve mineral conflicts and, even further, to maintain the sustainable development of the Chinese mineral industry as well as social harmony, mineral firms must adopt CSR ideas. This paper examines the relationship between CSR and financial performance using data from 228 Chinese mineral listed firms from 2010–2013 with Pooled Least Squares regression analysis.

The main findings in this paper are as follows: (1) overall, CSR has significant effects on ROA, ROE, and EPS, which indicates that CSR issues may help a company reduce costs, thereby leading to a profit increase; (2) shareholder responsibility is mainly positive in relation to a firm’s profits. Environmental responsibility is mainly negative for profits in a highly polluting industry. The reason for these results is that a significantly polluting industry must spend a lot of money to decrease environmental impacts under the pressure of public attention. Employee responsibility has positive

effects on firm profits in the metal fabrication industry and oil and gas industry, whereas it has short-run negative effects on profit in the water and gas-related industry. Public responsibility has positive effects on EPS in the oil and gas industry mainly because it can improve coordination with the local community in the exploitation process; (3) Generally, the CSR sub-criteria that have significant effects on a company's CFP are the stakeholders who are closely related to its business operations. Public responsibility does not show a significant relationship with CFP (except for the oil and gas industry), which may explain why so many mineral firms ignore the public interest, leading to fierce conflicts; (4) Different estimation results for the relationship between the CSR elements and CFP are due to industry characteristics.

The main reason for this phenomenon is the differing industry development periods and developing environments. In China, as the laws are imperfect and there are high costs associated with supervising companies, Chinese mineral firms have only economic incentives and not social responsibility incentives. Most mineral companies only pay attention to profits and have no interest in other public issues.

Our results have some policy implications for the relationship between firms and the government. Chinese mineral firms do not have much interest in stakeholder responsibility outside the firm, such as charities and taxes, because these issues are not closely related to CFP. This situation will improve if firms' profits are closely tied to their CSR performance within the mineral industry development environment. For example, if CSR faces a set of robust command-and-control regulations, then companies would incorporate CSR into their business models to operate normally and obtain profits. What is more, stimulating and restricting mechanisms must be combined. Besides enhancing supervision and legislation, we could implement some measures which would help to stimulate corporate initiatives; for example, provide tax reductions and exemptions to the firms which demonstrate excellent CSR performance, or enhance public awareness and education to improve the firm's devotion to CSR. Then, conflicts would gradually lessen, supporting the sustainable development of the Chinese mineral industry as well as social harmony.

These results can be regarded as a preliminary discussion about the relationship between CSR performance and CFP in the Chinese mineral industry. However, there is a caveat to our sample. As CSR is a relatively new concept for Chinese firms, data related to CSR is extremely limited. The time horizon of our sample data is relatively short, although we employed all available data to initiate this study. During our research period, the most recent data available is only from 2010–2013. Longer term data may provide a more promising research study.

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Author Contributions

Jinghua Sha jointly conceived the study with Xiping Pan, designed and implemented the regression model, prepared the manuscript, discussed the results and commented on the manuscript at all stages; Xiping Pan created the analytic model with contributions from Hongliang Zhang and Wenlan Ke, supervised its analysis and described the analytic model. Xiping Pan collected and interpreted the data, wrote and editing the paper.

Appendix A

(1) CSR Professional Evaluation System for Listed Companies Provided by the HEXUN Website

The CSR professional evaluation system uses the five aspects of shareholder responsibility, staff responsibility, suppliers, customers, and consumers responsibility, environmental responsibility, and public responsibility, which involves 13 secondary-class indicators and 37 third-class indicators.

Each different industry can have its own weight ratio distribution, but the typical distribution is the following: the shareholder responsibility weight accounted for 30% employee responsibility weight was 15%; the supplier, customer, and consumer responsibility weight was 15%; the environmental responsibility weight accounted for 20%; and the social responsibility weight represented 20%. In the consumer sector industry, the employee responsibility weight was 10%; the supplier, customer, and consumer responsibility weight accounted for 20%; and the other indicators' weight ratios remain unchanged. In the manufacturing industry, the environmental responsibility weight accounted for 30%; the public responsibility weight accounted for 10%; and the other index weight ratios remain unchanged. In the services industry, environmental responsibility accounted for 10% weight; the weight of social responsibility accounted for 30%; and the other indicators' weights remain unchanged.

(2) Data Sources of Corporate Social Responsibility Professional Evaluation

- (a) Corporate Social Responsibility report and annual report released by the official website listed in the Shanghai Stock Exchange.
- (b) Corporate Social Responsibility report and annual report released by the official website listed in the Shenzhen Stock Exchange.

(3) Scoring Methods of Corporate Social Responsibility Professional Evaluation

- (a) The social responsibility report professional evaluation index table describes in detail each index assignment.
- (b) The indicators are divided into two categories: the first one is a numeric index, and the second one is a class of logic-based index. The numeric index is calculated using the data and hearing an accurate score based on the centre model; the logic-based index is based on the social responsibility report, as to whether there was disclosure of the indicators and the detailed disclosure score.

- (c) Due to different situations, the focus on shareholders; employees; supplier, customer, and consumer responsibility; the environment; and public responsibility is different, so there will be a corresponding adjustment in the assigned weights to be more reasonable.

Table A1. Data definitions and evaluation system.

First-class indicators	Second-class indicators	Third-class indicators
Shareholder responsibility (A) weight ratio: 30%	Profits (Aa) 10%	ROE (2%)
		ROA (2%)
		OPE (2%)
		Cost margin (1%)
		Earnings per share (EPS) (2%)
		Retained earnings per share (1%)
	Debt situation (Ab) 3%	Quick ratio (0.5%)
		Liquidity ratio (0.5%)
		Cash ratio (0.5%)
		Shareholders' equity ratio (0.5%)
		Asset-liability ratio (1%)
	Return (Ac) 8%	Dividend capital ratio (2%)
		Dividend yield (3%)
		Bonus share allocation ratio of profits (3%)
	Credit (Ad) 5%	Exchange of the company and the number of responsible person penalties (5%)
		Product development expenditure (1%)
	Innovation (Ae) 4%	Concept of technological innovation (1%)
		The number of items of technological innovation (2%)
Employee responsibilities (B) weight ratio: 15% weight: 10% in the consumer sector	Performance (Ba) 5%	Per capita income of workers (4%) (3%)
		Staff training (1%) (1%)
	Security (Bb) 5%	Security check (2%) (1%)
		Safety training (3%) (2%)
	Caring for employees (Bc) 5%	Condolences awareness (1%) (1%)
		Condolences to the people (2%) (1%)
Supplier, customer, and consumers responsibility (C) weight ratio: 15% weight: 20% in the consumer sector	Product quality (Ca) 7%	Quality management awareness (3%) (5%)
		Quality Management System Certificate (4%) (4%)
	Service (Cb) 3%	Customer satisfaction survey (3%) (4%)
		Vendor fair competition (3%) (4%)
	Mutual good faith (Cc) 5%	Anti-bribery training (2%) (3%)
		Environmental awareness (2%) (4%) (2%)
Environmental responsibility (D) weight ratio: 20% weight: 30% in the manufacturing sector weight: 10% in the service sector	Environmental governance (Dd) 20%	Environmental management system certification (3%) (5%) (2%)
		Environmental investment amount (5%) (7%) (2%)
		Number of types of sewage (5%) (7%) (2%)
		Number of types of energy conservation (5%) (7%) (2%)

Table A1. *Cont.*

First-class indicators	Second-class indicators	Third-class indicators
Public responsibility (E)		Tax (10%) (5%) (15%)
weight ratio: 20%		
weight: 10% in the manufacturing sector	Contribution value (Ee) 20%	Donation amount (10%) (5%) (15%)
weight: 30% in the service sector		

Appendix B**Table B1.** CFP Data Definitions and Sources.

Variable	Description	Source
ROE	Return on equity is defined as income for the term divided by total stockholders' equity	[48]
ROA	Return on assets is defined by the following ratio. The numerator is the sum of operating profit, interest revenue/discount fee/interest on securities, and dividend revenue. The denominator is the sum of liabilities and net assets.	[48]
EPS	Earnings per share are defined as income for the term divided by total stockholders' equity.	[48]
Growth Rate of Main Operating	The growth rate of the Revenue of the Main Business.	[48]
Expansion Rate of Net Assets (%)	The growth rate of Net Assets.	[48]

Table B2. Mining firms and classification.

Sectors	Company name	Stock code
Extractive	Chenzhou Mining Group Co., Ltd.	002155
	Sdic Xinji Energy Co., Ltd.	601918
	Shanxi Lanhua Sci -Tech Venture Co., Ltd.	600123
	Jizhong Energy Resources Co., Ltd.	000937
	Yunnan Chihong Zinc & Germanium Co., Ltd.	600497
	Shanxi Lu'an Environmental Energy Development Co., Ltd.	601699
	Inner Mongolia Pingzhuang Energy Resources Co., Ltd.	000780
	China Shenhua Energy Company Limited.	601088
	Huolinhe Opencut Coal Industry Corporation Limited Of Inner Mongolia.	002128
	Shanxi Xishan Coal And Electricity Power Co., Ltd.	000983
	Zijin Mining Group Company Limited.	601899
	Yunnan Coal And Energy Co., Ltd.	600792
	Kailuan Energy Chemical Co., Ltd.	600997
	Shanxi Coal International Energy Group Co., Ltd.	600546

Table B2. Cont.

Sectors	Company name	Stock code
Extractive	China Coal Energy Company Limited	601898
	Shandong Jinling Mining Co., Ltd.	000655
	Shanghai Prosolar Resources Development Co., Ltd.	600193
	Yanzhou Coal Mining Company Limited	600188
	Beijing Haohua Energy Resource Co., Ltd.	601101
	China Molybdenum Co. Ltd.	603993
	Shanghai Datun Energy Resources Co., Ltd.	600508
	Tibet Mineral Development Co., Ltd.	000762
	Taiyuan Coal Gasification Company Limited	000968
	Shandong Dacheng Pesticide Co., Ltd.	600882
	Gansu Jingyuan Coal Industry And Electricity Power Co., Ltd.	000552
	Yang Quan Coal Industry (Group) Co., Ltd.	600348
	Chifeng Jilong Gold Mining Co., Ltd.	600988
	Henan Dayou Energy Co., Ltd.	600403
	Shandong Gold Mining Co., Ltd.	600547
	Guizhou Panjiang Refined Coal Co., Ltd.	600395
	Anhui Hengyuan Coal Industry And Electricity Power Co., Ltd.	600971
	Zhongjin Gold Corp., Ltd.	600489
	Shandong Hongda Mining Co., Ltd.	600532
	Sundiro Holding Co., Ltd.	000571
	Zhengzhou Coal Industry & Electric Power Co., Ltd.	600121
	Xinjiang International Industry Co., Ltd.	000159
	Anyuan Coal Industry Group Co., Ltd.	600397
	Pingdingshan Tianan Coal Mining Co., Ltd.	601666
	Sino-Platinum Metals Co., Ltd.	600459
	Shanghai Ace Co., Ltd.	600652
	Shandong Humon Smelting Co., Ltd.	002237
	Datong Coal Industry Co., Ltd.	601001
	Qinghai Jinrui Mineral Development Co., Ltd.	600714
	Shanxi Antai Group Co., Ltd.	600408
	Gansu Ronghua Industry Group Co., Ltd.	600311
	Qitaihe Baotailong Coal&Coal Chemicals Public Co., Ltd.	601011
	Changchun Gas Co., Ltd.	600333
	Shanxi Meijin Energy Co., Ltd.	000723
	Shanxi Coking Co., Ltd.	600740
	Heilongjiang Heihua Co., Ltd.	600179
	Qinghai Sunshiny Mining Co., Ltd	600381
	Jingu Yuan Holding., Ltd.	000408
	Sichuan Shengda Industrial Co., Ltd.	000835
	Shaanxi Coal And Chemical Industry Group Co., Ltd.	601225

Table B2. Cont.

Sectors	Company name	Stock code
Metal Fabrication	Baoshan Iron & Steel Co., Ltd.	600019
	Yunnan Aluminium Co., Ltd.	000807
	Nanjing Iron & Steel Co., Ltd.	600282
	Shenzhen Zhongjin Lingnan Nonfemet Co., Ltd.	000060
	Henan Shen Huo Coal Industry And Electricity Power Co., Ltd.	000933
	Yunnan Tin Co., Ltd.	000960
	Guizhou Wire Rope Co., Ltd.	600992
	Wuhan Iron And Steel Company Limited	600005
	Shenzhen Green Eco-Manufacture Hi-Tech Co., Ltd.	002340
	Fujian Minfa Aluminium Co., Ltd.	002578
	Inner Mongolia Baotou Steel Rare-Earth (Group) Hi-Tech Co., Ltd.	600111
	Xinxing Ductile Iron Pipes Co., Ltd.	000778
	Pangang Group Vanadium Titanium & Resources Co., Ltd.	000629
	Jiaozuo Wanfang Aluminum Manufacturing Co., Ltd.	000612
	China Nonferrous Metal Industry's Foreign Engineering And Construction Co., Ltd.	000758
	Tongling Nonferrous Metals Group Co., Ltd.	000630
	Beijing Cisri-gaona Materials & Technology Co., Ltd.	300034
	Shanxi Taigang Stainless Steel Co., Ltd.	000825
	Chengtun Mining Group Co., Ltd.	600711
	Gansu Jiu Steel Group Hongxing Iron & Steel Co., Ltd.	600307
	Xining Special Steel Co., Ltd.	600117
	Baoji Titanium Industry Co., Ltd.	600456
	Jiangxi Copper Company Limited.	600362
	Henan Yuguang Gold And Lead Co., Ltd.	600531
	Advanced Technology & Materials Co., Ltd.	000969
	Sansteel Minguang Co., Ltd., Fujian.	002110
	Liuzhou Iron And Steel Co., Ltd.	601003
	Western Mining Co., Ltd	601168
	Hebei Iron And Steel Co., Ltd.	000709
	Xiamen Tungsten Co., Ltd.	600549
	Zhejiang Hailiang Co., Ltd.	002203
	Henan Zhongfu Industrial Co., Ltd.	600595
	Ningxia Orient Tantalum Industry Co., Ltd.	000962
	Aluminum Corporation Of China Limited.	601600
	Angang Steel Company Limited	000898
	Jinduicheng Molybdenum Co., Ltd.	601958
	Anhui Xinke New Materials Co., Ltd.	600255
	Chongqing Iron & Steel Company Limited.	601005
	Xinjiang Joinworld Co., Ltd.	600888
	Maanshan Iron And Steel Co., Ltd.	600808
	Shandong Iron And Steel Company Ltd.	600022
	Anyang Iron & Steel Inc.	600569
	Ji Lin Ji En Nickel Industry Co., Ltd.	600432

Table B2. Cont.

Sectors	Company name	Stock code
Metal Fabrication	Shengda Mining Co., Ltd.	000603
	Sichuan Western Resources Holding Co., Ltd.	600139
	China Minmetals Rare Earth Co., Ltd.	000831
	Jilin Liyuan Aluminum Co., Ltd.	002501
	Yunnan Lincang Xinyuan Germanium Industrial Co., Ltd.	002428
	Honyu Wear-Resistant New Materials Co., Ltd.	300345
	Jiangsu Yulong Steel Pipe Co., Ltd.	601028
	Ganfeng Lithium Co., Ltd.	002460
	Jiangsu Asia-Pacific Light Alloy Technology Co., Ltd.	002540
	Chongyi Zhangyuan Tungsten Co., Ltd.	002378
	Shaanxi Ligeance Mineral Resources Co., Ltd.	000697
	Suzhou Lopsking Aluminum Co., Ltd.	002333
	Dongguan Eontec Co., Ltd.	300328
	Shantou Wanshun Package Material Co., Ltd.	300057
	Yinbang Clad Material Co., Ltd.	300337
	Zhejiang Jiuli Hi-Tech Metals Co., Ltd.	002318
	Shandong Lipeng Co., Ltd.	002374
	Suzhou Yangtze New Materials Co., Ltd.	002652
	Jinzhou New China Dragon Molybdenum Co., Ltd.	603399
	Rising Nonferrous Metals Share Co., Ltd.	600259
	Roshow Technology Co., Ltd.	002617
	Henan Mingtai Al. Industrial Co., Ltd.	601677
	Yechiu Metal Recycling (China) Ltd.	601388
	Jiangsu Changbao Steeltube Co., Ltd.	002478
	Xinjiang Bai Hua Cun Co., Ltd.	600721
	Jiangxi Hengda Hi-Tech Co., Ltd.	002591
	Jiangsu Shagang Co., Ltd.	002075
	Daye Special Steel Co., Ltd.	000708
	Maanshan Dingtai Rare Earth & New Material Co., Ltd.	002352
	Nanjing Yunhai Special Metals Co., Ltd.	002182
	Ningbo Boway Alloy Material Co., Ltd.	601137
	Juli Sling Co., Ltd.	002342
	Guangdong Jingyi Metal Co., Ltd.	002295
	Inner Mongolia Baotou Steel Union Co., Ltd.	600010
	Xinjiang Ba Yi Iron And Steel Co., Ltd.	600581
	Yunnan Copper Co., Ltd.	000878
	Shandong Loftan Aluminium Foil Co., Ltd.	002379
	Luyin Investment Group Corp., Ltd.	600784
	Nbtm New Materials Group Co., Ltd.	600114
	Western Metal Materials Co. Ltd.	002149
	Bengang Steel Plates Co., Ltd.	000761
	Fushun Special Steel Co., Ltd.	600399
	Tibet Summit Industry Co., Ltd.	600338

Table B2. Cont.

Sectors	Company name	Stock code
Metal Fabrication	Jiangsu Fasten Company Limited.	000890
	Ningxia Xinri Hengli Steel Wire Co., Ltd.	600165
	Lingyuan Iron And Steel Co., Ltd.	600231
	Anhui Jingcheng Copper Share Co., Ltd.	002171
	Ningbo Fubang Jingye Group Co., Ltd.	600768
	Xinyu Iron And Steel Co., Ltd.	600782
	Beijing Shougang Co., Ltd.	000959
	Hangzhou Iron & Steel Co., Ltd.	600126
	Jiangsu Alcha Aluminum Co., Ltd.	002160
	Hunan Valin Steel Co., Ltd.	000932
	China Tungsten And Hightech Materials Co., Ltd.	000657
	Yunnan Luoping Zinc&Electricity Co., Ltd.	002114
	Sgis Songshan Co., Ltd.	000717
	Zhuzhou Smelter Group Co., Ltd.	600961
	Huludao Zinc Industry Co., Ltd.	000751
	Sichuan Hongda Co., Ltd.	600331
	Jingui Silver Industry Co., Ltd.	002716
	Jilin Liyuan Precision Manufacturing Co., Ltd.	002501
	Beijing Kingfe Culture Development Co., Ltd.	002721
	Lofen Environmental Technology Co., Ltd.	002379
	Laiwu Steel Corporation Co., Ltd.	600102
	Shengyang Hejin Holding Co., Ltd.	000633
	Hunan Corun New Energy Co., Ltd.	600478
	Wasu Media Holding Co., Ltd.	000156
	Guangdong Golden Horse Tourism Group Stock Co., Ltd.	000602
	Guangzhou Guangri Stock Co., Ltd.	600894
	Langfang Development Co., Ltd.	600149
Oil Producing Equipment	China Oilfield Services Limited	601808
	Offshore Oil Engineering Co., Ltd.	600583
	Guanghui Energy Co., Ltd.	600256
	Sichuan Renzhi Oilfield Technology Services Co., Ltd.	002629
	Yantai Jereh Oilfield Services Group Co., Ltd.	002353
	Landocean Energy Services Co., Ltd.	300157
	China Oil Hbp Science & Technology Co., Ltd.	002554
	Gi Technologies (Beijing) Co., Ltd	300309
	Tong Oil Tools Co., Ltd.	300164
	Sino Geophysical Co., Ltd	300191
	Kingdream Public Limited Company	000852
	Lanzhou Haimo Technologies Co., Ltd.	300084

Table B2. Cont.

Sectors	Company name	Stock code
Oil and Gas	China Petroleum & Chemical Corporation	600028
	PetroChina Company Limited	601857
	Wintime Energy Co., Ltd.	600157
	Oriental Energy Co., Ltd.	002221
	Shenzhen Guangju Energy Co., Ltd.	000096
	Shanghai Lonyer Fuels Co., Ltd.	603003
	Xinjiang Zhundong Petroleum Technology Co., Ltd.	002207
	Zhejianghaiyueco., Ltd	600387
	Sinopec Shandong Taishan Petroleum Co., Ltd.	000554
Gas and Water Related	Jiangsu Jiangnan Water Co., Ltd.	601199
	Tianjin Capital Environmental Protection Group Company Limited	600874
	Beijing Origin Water Technology Co., Ltd.	300070
	Nanghai Development Co., Ltd.	600323
	Shanghai Chengtou Holding Co., Ltd.	600649
	Sound Environmental Resources Co., Ltd.	000826
	Chengdu Xingrong Investment Co., Ltd.	000598
	Shenzhen Gas Corporation Ltd.	601139
	Tianjin Teda Co., Ltd.	000652
	Heilongjiang Interchina Watertreatment Co., Ltd.	600187
	Shanghai Dazhong Public Utilities(Group) Co., Ltd.	600635
	Tieling Newcity Investment Holding Limited	000809
	Luenmei Holding Co., Ltd	600167
	Xinjiang Haoyuan Natural Gas Co., Ltd.	002700
	Beijing Capitalco., Ltd.	600008
	Liaoning Hongyang Energy Resource Invest Co., Ltd.	600758
	Dongjiang Environmental Company Limited	002672
	Yintai Resources Co., Ltd.	000975
	Shaanxi Provincial Natural Gas Co., Ltd.	002267
	Shanghai Safbon Water Service Co., Ltd.	300262
	Jiangsu Welle Environmental Co., Ltd.	300190
	Ningbo Thermal Power Co., Ltd.	600982
	Guangdong Golden Dragon Development Inc.	000712
	Nanjing Cec Environmental Protection Co., Ltd.	300172
	Beijing Water Business Doctor Co., Ltd.	300055
	Yonker Environmental Protection Co. Ltd.	300187
	Tianjin Binhai Energy & Development Co., Ltd.	000695
	Zhongshan Public Utilities Group Co., Ltd.	000685
	Chongqing Water Group Co., Ltd.	601158
	Inner Mongolia Xingye Mining Co., Ltd	000426
	Qianjiang Water Resources Development Co., Ltd.	600283
	Guangzhou Devotion Thermal Technology Co., Ltd.	300335

Table B2. Cont.

Sectors	Company name	Stock code
Gas and Water Related	Shenyang Huitian Thermal Power Co., Ltd.	000692
	Jiangxi Hongcheng Waterworks Co., Ltd.	600461
	Wuhan Sanzhen Industry Holding Co., Ltd.	600168
	Zhongyuan Environment-Protection Co., Ltd.	000544
	Grandblue Environment Co., Ltd.	600323
	Nanjing Gaoke Co., Ltd.	600064
	Changchun Jinkai Co., Ltd.	600215

Notes: More details of these data could be provided if it is need.

Conflicts of Interest

The authors declare no conflict of interest.

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