The Relationship between Corporate Social and Financial Performance: Evidence from Chinese Heavy-polluting Industries

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Abstract

This study investigates the relationship between corporate social performance (CSP) and corporate financial performance (CFP) within the context of a particular CSP element: environmental investment. Two models of the determinants of companies’ environmental investment are estimated in order to capture the difference between firms’ actual and expected level of environmental investment. The regression residuals are used as our measure of corporate social performance. Both market-based and accounting-based measures of financial performance are applied to represent corporate financial performance. With the analysis of a sample encompassing 223 Chinese heavy-polluting companies, we have found that it is more likely to observe a significantly positive relationship between firms’ environmental endeavors and their accounting-based financial performance among firms that are more active to disclose corporate information. Besides, building on our empirical findings that corporate social performance is positively correlated with accounting-based financial performance but has no correlation with market-based financial performance, we suggest a priority for managers from Chinese heavy-polluting industries when they fulfill social demands of various stakeholders.

Keywords: corporate social performance; corporate financial performance; CSP-CFP relationship; environmental investment; regression residuals; Chinese heavy-polluting companies
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1 Introduction

1.1 Research Background

Corporate social responsibility (CSR) refers to achieving business success in ways that abide by ethical rules and respect people, social communities, and the natural environment (White, 2006). For decades, whether CSR engagement can create a sufficient financial return to justify the efforts that companies have made to be socially responsible remains controversial (Kurucz et al., 2008). This led to Barnett’s (2007:794) statement that ‘after more than thirty years of research, we cannot clearly conclude whether a one-dollar investment in social initiatives returns more or less than one dollar in benefit to the shareholder.’ Friedman (1970) has asserted that managers’ only core mission is to realize profit maximization for their shareholders. If they conduct CSR activities and contribute company’s resources and assets to the society, it will harm the shareholders’ economic interests and hinder profit maximization. While according to Freeman (1984), firms should fulfill multiple CSR to meet different stakeholders’ interests. This is because once various stakeholders’ demands are met, in return, they will invest more money and offer more resources for the companies to operate smoothly; therefore, companies can gain higher profits and realize financial growth. Against this backdrop, a large number of empirical studies have developed which investigate the relationship between corporate social performance (CSP) and corporate financial performance (CFP). Some of the literature has shown a positive CSP-CFP link (Waddock & Graves, 1997; Simpson & Kohers, 2002; Li et al., 2013). Others have revealed a negative relationship between CSP and CFP (Davidson & Worrell, 1988; Becchetti & Ciciretti, 2006; Surroca & Tribó, 2008). Except for the positive and negative correlation findings, scholars have also found other relationships between CSP and CFP. A neutral CSP-CFP link has been revealed by McWilliams and Siegel (2000) and Choi and Jung (2008). More recently, researchers have discovered a nonlinear CSP and CFP relationship (Hillman & Keim 2001; Brammer & Millington, 2008; Wang et al., 2008; Barnett & Salomon, 2012).
Despite the proliferation of literature on CSP-CFP relationship, controversy and uncertainty still persist (Orlitzky et al., 2003). The absence of the consensus on the relationship between CSP and CFP may be attributed to three main reasons. First of all, previous studies have explored CSP-CFP link within different CSR dimensions. CSR is a multidimensional construct that contains a variety of corporate behaviors and activities in various dimensions including economic, social, and environmental (Carroll, 1979). Scholars have investigated CSP-CFP link either in a single aspect of CSR such as the welfare of employees and philanthropic giving, or by constructing a comprehensive study towards all CSR dimensions (Orlitzky et al., 2003). Different dimensions of CSP can be motivated differently, and may accordingly have diversified implications for CFP under different contexts (Margolis & Walsh, 2003). Consequently, it is necessary to focus on one particular aspect of CSP in the study of CSP-CFP link (Rowley & Berman, 2000).

Secondly, the methods of measuring CSP are various (Griffin & Mahon, 1997). Four types of CSP measures are commonly adopted in the research of CSP-CFP link, which will be further discussed in Chapter 2.3. We deem that distinct employment of CSP measures may result from different interpretation of the nature of CSP and may contribute to the inconsistent empirical results of extant researches. For example, reputation ratings and CSR disclosures are two widely used CSP measures in previous studies examining the CSP-CFP relationship. The former reflects the public assessment of companies’ CSR efforts while the latter indicates the evaluation of companies’ attitudes towards CSR engagement. Studies applying reputation ratings as CSP measures have revealed more highly relevant CSP-CFP relationship than those adopting CSR disclosures measurement (Orlitzky et al., 2003).

Thirdly, different adoption of CFP measures contributes to the diversified results in the current literature. For instance, it is argued that CSP is more highly correlated with accounting-based CFP measures than with market-based ones (McGuire et al., 1988; Margolis et al., 2007). Market-based CFP measures and accounting-based CFP
measures reflect CFP in different dimensions. The former tends to reflect shareholder-related financial performance while the latter captures the company’s internal operating efficiency (Cochran & Wood, 1984). The inherent difference between these two CFP measures may cause various interpretations of companies’ financial performance from distinct perspectives, and may consequently lead to different results of the relationship between CSP and CFP. A detailed discussion of the two types of CFP measures will be presented in Chapter 2.4.

1.2 Current Studies on CSP-CFP Relationship in China

In recent years, the relationship between CSP and CFP has also been discussed in China and been focused on Chinese companies (e.g., Ren & Zhao, 2009; Chen & Wang, 2011; Li et al., 2013; Pan et al., 2014; see Guan & Noronha, 2013 for meta-analysis). However, there exist two major limitations in the current studies on CSP-CFP link of Chinese companies.

One limitation is in regard to the lack of focus on the environmental dimension of CSP. China is criticized both at home and abroad for its severe environmental pollution caused by companies from heavy-polluting industries (Wang et al., 2010). And the poor environmental situation hinders the sustainable development of China (Lin, 2010). In order to maintain the sustainable development, Ministry of Environmental Protection of the People’s Republic of China has been imposing strict environmental protection policies on Chinese heavy-polluting companies. For instance, in 2014, it has imposed unprecedented stringent Emission Standards for Industrial Pollutants on heavy-polluting industries. Besides, the ministry has been actively encouraging heavy-polluting companies to disclose environmental protection information so that they can be under more transparent and rigorous supervision by the public. Furthermore, in the <Blue Book of Corporate Social Responsibility of Chinese Companies 2013> released by Chinese Academy of Social Sciences Research Center for Corporate Social Responsibility (CASSCSR), environmental
responsibility has been set as top priority for Chinese companies’ CSR engagement. Surprisingly, although it is reported that environmental dimension of CSR has been addressed most among all CSR-related academic studies in China (Moon & Shen, 2010), few studies have concentrated on the investigation of the CSP-CFP link in the context of environmental investment. This situation leads to the uncertainty for decision makers in heavy-polluting companies regarding whether it is financially beneficial to be environmentally responsible.

The other limitation in the studies on CSP-CFP link of Chinese companies concerns the imperfections in the adoption of CSP measures (Guan & Noronha, 2013). The majority of current studies have adopted three CSP measures, including reputation ratings (e.g., Li et al., 2013; Lu & Abeysekera, 2014; Pan et al., 2014), CSP disclosures (e.g., Ren & Zhao, 2009; Luethge & Han, 2012), and self-defined CSP measures (e.g., Zhang & Wu, 2010; Chen & Wang, 2011). Firstly, reputation rating is the most broadly employed CSP measurement in the studies on CSP-CFP link of Chinese companies (Guan & Noronha, 2013). Among different reputation ratings in China, HEXUN Corporate Social Responsibility Database is the most widely used CSP measurement in current studies (Pan et al., 2014). It evaluates CSP in five dimensions containing shareholder, environment, public, employee, as well as supplier and customer responsibilities. This reputation rating is multidimensional and comprehensive, however, its rating procedure is not optimal due to omissions and misinterpretation in data collection process, which may lead to inaccuracy and unreliability. Secondly, CSP disclosures measurement is achieved by content analysis. It depends considerably on the comprehensiveness and intentions for which the documents were originally generated, therefore, CSP disclosures measurement can be biased and lack objectivity (Waddock & Graves, 1997). Thirdly, some researchers have developed their own CSP measures to examine the correlation between CSP and CFP of Chinese companies. However, Guan and Noronha (2013) has conducted a meta-analysis of the existing literature on the CSP-CFP link of Chinese firms, and their empirical findings suggest that the majority of studies using a self-defined CSP
measure seem to lack systematic research methodologies and concrete theoretical supports.

1.3 Research Problem and Purpose

All the aforementioned facts in the research of the relationship between corporate social and financial performance contribute to our interest in analyzing the research problem formulated as follows:

*What is the relationship between corporate social performance (CSP) and corporate financial performance (CFP) of Chinese heavy-polluting companies within the context of environmental investment?*

The purpose of this research is to explore whether it is worth paying to invest in environmental CSR activities in China. We hope our study could act as a useful reference for managers from Chinese heavy-polluting industries when they craft business strategies regarding environmental issues.

1.4 Research Contribution

The contribution of our research arises from two aspects in investigating the CSP-CFP relationship of Chinese companies. On one hand, we are among the first few studies that analyze the CSP-CFP relationship of Chinese companies in the context of environmental CSR. Also, our study is valuable because environmental responsibility is of dramatic significance for Chinese firms but lacks specific academic research associated with firm financial performance. Our research concentration on only one aspect of CSR can be supported by Ward and Smith (2006), which has stated that it is of great necessity to decompose CSP into one particular dimension when investigating CSP-CFP link because CSR strategies can only be effective when conducted in a specific dimension rather than in a generic way (Porter & Kramer, 2006). Besides, in our research, we choose to target at Chinese companies from heavy-polluting industries as they are the companies that exert the most severe impact
on the environment in China. Moreover, we refer to companies’ environmental investment as the indicator of CSP. This is because firstly, previous studies have already employed environmental investment as a viable CSP indicator when examining the CSP-CFP relationship (e.g., Mahapatra, 1984; Gilley et al., 2000). Secondly, according to Albertini (2013), environmental investment comprehensively and explicitly reflects the endeavors that companies have made in order to be environmentally responsible. Thirdly, in China, CASSCSR stipulates that environmental investment should be the primary information to release when companies disclose CSR activities regarding environmental issues.

On the other hand, our study differs from previous literature that examines the CSP-CFP link of Chinese companies in CSP measurement. In order to avoid the deficiencies of the commonly used CSP measures of Chinese companies discussed above, we employ a widely applied statistic method in social science studies (e.g., Fama, 1981; Brammer & Millington, 2008) to evaluate CSP in the context of environmental investment. In the use of this method, we calculate the difference between the actual level of firms’ environmental investment and the expected level of it on the basis of a range of firm characteristics including firm size, industry, and financial resources availability. We view the residuals as a proper reflection of companies’ CSP in that they indicate the extent to which a company’s observed level of environmental investment deviates from its expected level given various characteristics. A larger residual refers to a better social performance while a smaller one can be regarded as a worse performance in CSR. The application and implications of applying this method to assess CSP will be elaborated in the subsequent chapters of methodology, empirical results, and final discussion.

In sum, this thesis differs from others in two main aspects. One is we investigate the relationship between corporate social and financial performance within a particular aspect of CSP, namely environmental investment. The other is we utilize an innovative method to assess CSP with an eye towards more effective research on the
link of CSP-CFP. These innovations aim to deal with the limitations in the current studies of Chinese companies and thus enable us to shed new light on the relationship between CSP and CFP of Chinese companies.

1.5 Disposition

This study is organized as follows. In Chapter 2, a presentation of the theoretical framework and literature review will be given. Chapter 3 is the methodology section where we illustrate the method employed in our research as well as the data and sample. Subsequently, the empirical results of the relationship between CSP and CFP are demonstrated in Chapter 4. We then interpret and analyze our empirical findings in combination with the theoretical background in Chapter 5. Finally in Chapter 6, a conclusion of this thesis including limitations and directions for further research are provided.
2 Theoretical Background and Literature Review

2.1 Corporate Social Performance and Corporate Financial Performance

Corporate social performance (CSP) can be defined as ‘a business organization’s configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm’s societal relationships’ (Wood 1991a: 693). Wood (1991a) has also stated that ‘CSP can be assessed by examining the degree to which principals motivate companies’ CSR actions, the extent to which the companies utilize socially responsive processes, the existence and nature of policies and programs established to manage the firms’ societal relationships, the influence of companies’ actions, programs, and policies on the society.’

According to Venkatraman and Ramanujam (1986), corporate financial performance (CFP) can be defined as a company’s financial viability or the extent to which the firms accomplish the economic goals. The outcome-based financial indicators are supposed to reflect the fulfillment of firms’ economic goals. Such indicators include sales growth, profitability (reflected by ratios such as return on investment, return on sales and return on equity), share price, earnings per share, and so forth.

2.2 Theoretical Background of CSP-CFP Relationship

2.2.1 CSP-CFP Relationship from the Stakeholder Perspective

Most of the extant literature supporting a positive relationship between CSP and CFP is based on the stakeholder theory. Stakeholder theory has developed since 1960s and gained its popularity in 1980s. However, it was Freeman (1984) that marked the systematic and formal establishment of the stakeholder theory (Chen & Wang, 2011). Unlike the traditional notion of stakeholder as being just companies’ owners or shareholders, Freeman (2003) has proposed a stakeholder model that includes five internal stakeholders which are shareholders, employees, communities, customers,
suppliers, and six external stakeholders containing NGOs, environmentalists, governments, media, critics, and others. Stakeholders, according to Freeman (1984), refer to “any group or individual who can affect or is affected by the achievement of the firm's objectives.” Companies rely on diversified external resources to operate and achieve business goals; therefore, such kind of dependence provides various stakeholders with right and capacity to control and exert influence on companies’ behavior (Ullmann, 1985). As a matter of fact, when making business decisions, companies should take all stakeholders’ interests into consideration as well as meet the conflicting needs of various stakeholders both internally and externally.

Therefore, stakeholder theory (Freeman, 1984) advocates that companies should implement multiple CSR activities to cater for different stakeholders. Apart from making economic profits for companies’ shareholders, managers are supposed to adopt a variety of CSR strategies to satisfy different stakeholders’ demands. For example, companies can offer favorable working conditions for their employees, encourage workforce diversity, be an excellent steward of the environment and actively devote to creating better life quality in local communities and in society as a whole (Thompson et al., 2012). As a result, in return, these stakeholders will concern more about the companies’ interests and may be encouraged to offer more resources and assets to support companies’ further operations, thus, helping the companies to gain more profits and realizing financial improvement (Yang & Zhou, 2001).

2.2.2 CSP-CFP Relationship from the Agency Perspective

Agency theory acts as the basis leading to a negative relationship between CSP and CFP in previous studies. In accordance with Jensen and Meckling (1979), an agency relationship can be defined as ‘a contract under which the principals engage the agents to perform some service on their behalf which involves delegating some decision-making authority to the agents.’ Agency theory addresses two major problems. The first one is the agency problem that occurs when (1) the objectives or desires of the principal and the agent conflict and (2) it is hard or costly for the
principal to confirm what the agent is really doing. The problem in such scenarios is that the principal cannot verify that the agent has performed properly. The second one is the risk sharing issue that arises when the principal and the agent hold dissimilar attitudes to risks. The problem in this situation is that the principal and the agent may prefer different actions due to their distinct risk preferences (Eisenhardt, 1989). In the real business world, the principal can be the owners or the shareholders of the companies, and the agent can be the executive manager. And it is generally acknowledged that an agent’s (the executive manager) core mission is to maximize the principal’s (the owner or the shareholders) welfare, namely, companies’ profits and assets (Eisenhardt, 1989).

Taking the agency theory as the rationale, in 1970, Friedman published “The Social Responsibility of Business is to Increase its Profits” on The New York Times Magazine, which caused huge repercussions at that time. In this article, he has demonstrated strong opposition against managers taking social responsibilities and implementing CSR strategies in their business. It is stated by Friedman (1970) that when the executive managers spend companies’ money (which mainly comes from the shareholders) in contributing to the communities by for instance, donating money to the poor, hiring unemployed rather than better qualified workers, or protecting the environment by going to lengths to reduce companies’ pollution, then the managers are conducting a tax-imposition upon firms’ shareholders. Friedman (1970) has stated ‘the only justification for the shareholders to hire a manager is to let the manager serve the interests of his/her principal (shareholders or owner).’ While such kind of justification will vanish when the manager imposes taxes and spends the money from shareholders for social purposes. As a result, CSR may harm the shareholders’ economic interests and be detrimental to the companies’ profit maximization. Figure 1 demonstrates the relationship between CSP and CFP based on the stakeholder theory and the agency theory.
2.3 Measures of Corporate Social Performance

In quest of the relationship between CSP and CFP, researchers have adopted various CSP measures including: (1) reputation ratings; (2) CSP disclosures; (3) social audits, CSP processes, and observable outcomes; (4) self-defined CSP measures (Lu et al., 2014).

In recent decades, using indexing techniques such as direct scores provided by accessible databases, CSP reputation ratings like KLD and Fortune 500 ratings are frequently adopted by researchers who analyze the CSP-CFP link (e.g., McGuire et al. 1988; Fombrun & Shanley, 1990; Brammer et al, 2006; Baird et al, 2011). KLD index identifies and evaluates different CSP dimensions in the KLD database and represent the firm relations with employees, consumers, environment, community, and society as a whole (Ruf et al., 2001). The Fortune 500 reputation index is based on the opinions of the survey responded by senior managers and rates the ten largest companies in those managers’ industries on eight attributes of reputation (e.g., responsibility to the community, the environment, financial soundness, etc.), using a scale of zero (poor) to ten (excellent)(Shen & Chang, 2009). Reputation ratings are based on the assumption that CSP reputations are good reflections of fundamental CSP behaviors and values and tend to be viewed as a transparent and comprehensive
CSP measurement (Orlitzky et al., 2003). While, on the other hand, critics also advocate that such reputational indices like KLD cannot optimally take advantage of public available data and lack accuracy in some rating dimensions (Chatterji et al., 2009).

CSP disclosures refer to the content analysis of corporate CSR reports, annual reports, corporate websites, and press releases (Lu et al., 2014). Content analysis is utilized to select specific CSP elements and measures the relevant texts in the reports so as to draw inferences about companies’ underlying CSP (e.g., Wolfe, 1991; Campbell et al., 2002; Aras et al., 2010). The main advantages of CSP disclosures include firstly, once the specific variables have been selected, the research procedure could be objective and independent. Secondly, it can be applied to large sample studies. The disadvantages of CSP disclosures stem from the fact that the choice of specific variables can be subjective. Besides, sometimes content analysis can only indicate what the companies claim they are doing, instead of what they are actually doing (Cochran & Wood, 1984).

Social audits and concrete observable CSP processes and outcomes have also been widely employed to measure CSP in studies examining the CSP-CFP relationship (e.g., Russo & Fouts, 1997; Brammer & Millington, 2005; Boehe & Cruz, 2010). Social audits CSP measurement refers to a third-party effort to assess a company’s objective CSP behaviors, such as community services, environmental protection activities, and corporate charitable giving. Objective data are the basis of such behavioral measures of CSP. However, the behavioral measurement that is based on social audits might still lead to a ranking (Orlitzky et al., 2003). Nevertheless, social audits measurement possesses systematization and objectivity due to third-party assessment (Lu et al., 2014). Additionally, it can reveal neglected social impacts and consequently reflect the underlying CSR values and performance of the companies (Owen et al., 2000).
Except for solely using the aforementioned CSP measures, recently, many scholars have made different combinations and modifications and developed their own CSP measurement strategies. One of the most prevailing self-defined measures is a scaling technique (e.g., Simpson & Kohers, 2002; Hull & Rothenberg, 2008), which aims to assess certain dimensions of CSP akin to that used by KLD and Fortune 500 ratings. A second measurement is self-defined sustainable indicators (e.g., Zheng, 2006; Rettab et al., 2009). The third one is the coding of conduct according to the institutional conditions (e.g., Godfrey et al., 2009; Chih et al., 2010). The fourth self-defined measurement uses dichotomous or dummy variables to ascertain whether particular CSR principles are adopted by a company (Barnett & Salomon, 2006; Mill, 2006). Researchers tend to adopt self-defined CSP measurements when their analytic concentrations or research dimensions are not in conjunction with authoritative reputation ratings or cannot be satisfied by CSP disclosures and social audits. However, self-developed CSP measures hold a manifest disadvantage that since they are created by scholars in recent years, most of these CSP measures lack concrete theoretical foundations and supports to ensure the reliability (Lu et al., 2014).

Due to the imperfections of all the four CSP measures, it is not surprising that an ideal way of measuring CSP does not exist up to now (Simpson & Kohers, 2002), and the CSP measures will continue to diversify in future researches (Lu et al., 2014).

### 2.4 Measures of Corporate Financial Performance

Like CSP, CFP is also a multidimensional construct. Existing researches of the CSP-CFP link have employed different measures of corporate financial performance (Griffin & Mahon, 1997; Orlitzky et al., 2003). Most of the extant empirical studies have measured CFP using either an accounting-based measure of profitability such as return on assets (ROA) and return on equity (ROE) (e.g., Aupperle et al., 1985; Graves & Waddock, 1994; Griffin & Mahon, 1997; Waddock & Graves, 1997), a market-based measure of return from stock market (e.g., Alexander & Buchholz, 1978;
Belkaoui, 1976; Brammer & Millington, 2008), or both (e.g., Blackburn et al., 1994; Pava & Krausz, 1995). Although both market-based and accounting-based measures are broadly accepted by scholars as indicators of CFP (Gentry & Shen, 2010), a debate on which one of them is a more appropriate indicator of CFP when examining the CSP-CFP link arises owing to the divergent conceptualizations of these two CFP measures.

Theoretically, researchers conceptualize accounting-based measures of financial performance as reflections of past or short-term financial performance of a company (Hoskisson et al., 1994; Keats & Hitt, 1988). Accounting-based CFP measurement can capture a company’s internal operating efficiency in some ways (Cochran & Wood, 1984). Furthermore, it is argued by Orlitzky et al. (2003) that accounting returns are dependent on managers’ discretionary distributions of capitals to diversified programs and policies, thus, it can mirror internal decision-making capabilities and managerial performance of a company. Despite the empirical evidences that CSP appears to be more highly correlated with accounting-based CFP measures than with market-based ones (Orlitzky et al., 2003; McGuire et al., 1988; Margolis et al., 2007), critics of accounting-based CFP measurement also persist. Firstly, since accounting performance reflects managers’ discretionary choices, it may lack objectivity and informational value (Benston, 1982; Baird et al., 2011). Secondly, Marom (2006) has argued that a long-term standpoint should be taken into account when observing the impacts of CSP on CFP because stakeholders’ reactions to short-term CSP initiatives may unfold over the long run. However, an accounting-based measure can only provide historical and short-term financial performance. Consequently, it results in the incapacity of properly capturing the intangible and long-term values generated or ruined by changing stakeholder relationships (Hillman & Keim, 2001). Thirdly, financial ratios such as ROA and ROE which capture a single aspect of CFP may not be correlated with companies’ value (Lubatkin & Shrieves, 1986) and may be incongruous with a comprehensive measure of CSP.
On the other hand, market-based measures tend to be regarded as reflections of future or long-term financial performance of a company (Hoskisson et al., 1994; Keats & Hitt, 1988). Advocates of market-based CFP measures maintain that market performance is the most relevant dimension of financial performance to investors and shareholders, and it embodies investors' assessment of a company's ability to generate future financial earnings instead of past performance. In addition, McGuire et al. (1988) hold the view that market-based measures are less susceptible to distinct accounting processes and managerial manipulations than accounting-based ones. While dissenters argue that market-based CFP measures can be affected by a range of factors unrelated to companies’ individual activities (Shane & Spicer, 1983). What’s more, Ullmann (1985) has suggested that market-based CFP indicators reflect investors' valuation of firm performance. Although it is a proper performance measure, sole concentration on investors' evaluations may not be sufficient since companies face multiple constituencies (Pfeffer & Salancik, 1978).

2.5 Current Research Results of CSP-CFP Relationship

To date, scholars have reached different conclusions on the relationship between CSP and CFP, including positive correlation, negative correlation, no correlation and nonlinear correlation.

A positive correlation between CSP and CFP has been revealed by a broad range of literature. In earlier times, using Fortune magazine's ratings of corporate reputations and conducting both market-based and accounting-based CFP measures, McGuire et al. (1988) have found that CSP has a positive effect on CFP. Waddock and Graves (1997) have used rating data from KLD in several industries and drawn the conclusion that CSP is positively associated with both companies’ prior and future financial performance. Additionally, using questionnaires and data from KLD to measure the link between CSP and CFP, Ruf et al. (2001) have demonstrated that CSP is positively associated with companies’ growth of sales in current and subsequent
year. Orlitzky (2001) has shown that when taking firm size as the control variable, CSP is still positively correlated with CFP. Simpson and Kohers (2002) have studied the link between CSP and CFP in banking industry, and the result supports the positive correlation between them. Shen and Chang (2008) have adopted four matching methods and confirmed that CSP has a positive relationship with firms’ pretax income to net sales and profit margin. Pan et al. (2014) have investigated the correlation of CSP and CFP in the mineral industry in China and has found that companies’ overall CSP has a positive relationship with CFP.

Several research results also indicate a negative relationship between CSP and CFP. Brammer et al. (2006) have employed reputational indices of UK companies and found a negative impact of CSP on companies’ stock returns. In addition, using reputation rating measurement, Surroca and Tribó (2008) have conducted a cross-country analysis and revealed a negative correlation between corporate social performance and corporate financial outcomes. Furthermore, Makni et al. (2009) have applied individual measures of CSP and demonstrated a significantly adverse impact of the environmental dimension of CSP on three indicators of CFP, namely return on assets, return on equity, and market returns.

While positive and negative links have been supported by a significant number of scholars, a neutral relationship between CSP and CFP has also been discovered. Using an elaborate, forced-choice instrument administered to corporate CEOs listed in Forbes 1981 Annual Directory, Aupperle et al. (1985) have found no correlation between CSP and firms’ financial performance. Apart from that, McWilliams and Siegel (2000) have tried to make up for the limitations of previous studies and taken investment in R&D as the control variable, their result has also indicated a neutral relationship between CSP and CFP. Besides, Surroca et al. (2010) have stated that taking the mediating effect of a firm’s intangible resources into consideration, there’s no direct relationship between CSP and CFP.
Last but not least, some researchers have discovered a nonlinear correlation between CSP and CFP. Wang et al. (2008) have stated that corporate philanthropy and financial performance is best captured by an inverse U-shape. Except for that, Brammer and Millington (2008) have found that companies with both unusually high and low CSP have better CFP than others; firms with unusually poor CSP performing best in the short term, and unusually good social performers doing best over longer time horizons. In addition, Barnett and Salomon (2012) have shown that companies with low CSP have higher CFP than companies with moderate CSP, but companies with high CSP possess the highest CFP.

2.6 From Theory to Empirical Study

Based on the theoretical background mentioned above and our interest towards environmental protection in China, in the following research, we will employ environmental investment, one of the social audits indicating concrete observable outcome of environmental efforts, combined with an innovative statistical method to measure CSP. Meanwhile, since accounting-based and market-based CFP measures possess different and unique advantages, we will adopt both of them to measure CFP. Having embraced the indicators of CSP and CFP respectively, we will then analyze the relationship between CSP-CFP of Chinese heavy-polluting companies within the context of environmental investment. We would like to see whether the CSP-CFP link is positive as supported by the stakeholder theory, or there exists a negative correlation between CSP and CFP as argued by the agency theory, or perhaps there is a neutral or even a nonlinear link between CSP and CFP which has also been explored in previous literature.
3 Methodology

In this chapter, we first demonstrate the collection process of our cross-sectional dataset and sample description. Next, we briefly introduce the method we employ in this research to investigate the link of CSP-CFP in general. After that, we detail the measure of CSP and the empirical models from which CSP stems. Subsequently, different CFP measures are presented followed by the illustration of the final stage of our analysis where the correlation between CSP and CFP is examined.

3.1 Data and Sample

This study aims to investigate the relationship between CSP and CFP of Chinese companies in the context of environmental investment. Therefore, we have primarily focused on Chinese heavy-polluting companies because companies from heavy-polluting industries tend to disclose more environmental information (Kuo et al., 2012) and pay more attention to environmental issues thanks to their significant negative impact on the environment (Aerts & Cormier, 2009). According to Ministry of Environmental Protection of the People’s Republic of China, eight industries including petroleum, paper manufacturing, metals, pharmaceuticals, chemicals, brewing, mining, and energy are defined as heavy-polluting industries in China.

We manually assemble primary data of environmental investment from Chinese heavy-polluting companies of the year 2013. Such choice is in consideration of data availability, sufficiency, and timeliness. In accordance with Chinese Academy of Social Sciences Research Center for Corporate Social Responsibility (CASSCSR), most of the Chinese companies have started to release stand-alone CSR reports since 2010. In 2013, the number of CSR reports had witnessed its first soar, with 1231 reports in total which has doubled the number in 2010 and increased 60% from 2012. We do not take into account those CSR reports launched before 2013 since the quantity of the reports from heavy-polluting industries with the information on
environmental investment is too small for our study. Besides, we would like to analyze the latest environmental data; however, Chinese heavy-polluting companies’ CSR reports of 2014 have not been fully released up to now. Consequently, we employ data of environmental investment from companies’ CSR reports of 2013. What’s more, some of our target companies have released environmental investment information in their annual reports rather than CSR reports. Henceforth, taking all aforementioned facts into consideration, in our study, data of environmental investment is collected from both Chinese heavy-polluting companies’ CSR reports and annual reports of 2013. Also, we target at listed Chinese companies from heavy-polluting industries on account of the fact that we could gain abundant and valid data that can be utilized for our empirical study, while data of non-listed companies may be inadequate and inappropriate, and can pose difficulty for data collection process. In our research, companies’ CSR reports and annual reports of 2013 both come from the official websites of Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE).

Additionally, in this study, we conform to the stipulation of the Ministry of Environmental Protection of the People’s Republic of China, that companies’ environmental investment in China includes the aggregate monetary investment in 1) industrial pollution prevention and control, 2) construction, operation and maintenance of environmental protection facilities and 3) environmental protection management. Furthermore, we only take companies’ proactive environmental investment (e.g., voluntary investment in new environmental protection facilities and the cost of organizing lectures on environmental protection for employees) into consideration and exclude their reactive environmental investment (e.g., regulatory sewage charges). Such choice is due to the argument that proactive environmental CSR activities should lead to a greater reduction of the negative environmental impact than reactive ones (Dixon-Fowler et al., 2013). Reactive environmental CSR initiatives are encouraged by obedience and aims to meet legal requirements (Buysse & Verbeke, 2003; Sharma, 2000), thus, lacking significant involvement from top
management as well as various stakeholders. By contrast, proactive environmental
approaches incorporate environmental issues into organizational business strategies
beyond the requirements of government regulations (Buysse & Verbeke, 2003) and
consequently include significant stakeholders’ collaboration. In conclusion, in our
analysis, we define companies’ environmental investment as the aggregate proactive
monetary investment in the three aforementioned aspects which has occurred during
the reporting period of their annual reports and CSR reports of 2013.

Secondary data such as firms’ financial and capital market data derives from two
Chinese financial market information providers, www.hexun.com and Tonghuashun
Stock Software. In our study, for the sake of more effective research on the influence
of CSP on CFP, we introduce a one-year time lag when examining the CSP-CFP link.
Thus, financial and market data of the year 2013 and 2014 is necessary for this
research. Issues regarding the time lag will be further discussed in Chapter 3.2.2
where we present the measures of CFP. In short, data of accounting-based CFP (e.g.,
profitability) of the year 2013 and 2014 is obtained from HEXUN website. HEXUN is
the largest financial news portal in China, which provides abundant and reliable
financial data and information and acts as the prior data source that can be referred to
by scholars in their researches (Pan et al., 2014). Besides, we collect capital market
data (e.g., stock price) of the year 2013 and 2014 for market-based measures of CFP
from Tonghuashun Stock Software, which is one of the most popular and professional
stock software in China. Moreover, thanks to the fact that approximately half of the
companies in our sample have not released their annual financial information of the
year 2014 up to now, we could only extract their first-three-quarter financial data of
the year 2014. This contributes to our research incorporating two groups of analysis,
one being correlation between 2013 CSP and 2014 annual CFP that is based on the
sample of companies with complete 2014 annual financial data, and the other being
correlation between 2013 CSP and 2014 first-three-quarter CFP which is based on the
whole sample.
By the end of 2013, there are 580 companies listed in SSE and SZSE from the eight heavy-polluting industries. We have eliminated companies with missing data on environmental investment, which consequently results in our final sample size of 223 companies. We are confident that this sample includes all the Chinese listed heavy-polluting companies that are engaged in environmental endeavors, which allows us to conduct a comprehensive observation on the relationship between CSP and CFP of Chinese companies in the context of environmental investment. Table 1 and 2 exhibit the industry composition and sample description.

Table 1. Industry Composition and Descriptive Statistics

<table>
<thead>
<tr>
<th>Industry</th>
<th>No. of Observations</th>
<th>Average Environmental Investment (¥'000)</th>
<th>Average Sales (¥'000)</th>
<th>Average R&amp;D Intensity</th>
<th>Average Leverage</th>
<th>Average Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>5</td>
<td>1,941,150</td>
<td>607,584,090</td>
<td>1.26%</td>
<td>0.75</td>
<td>0.096</td>
</tr>
<tr>
<td>Paper</td>
<td>14</td>
<td>117,278</td>
<td>14,297,491</td>
<td>1.94%</td>
<td>1.08</td>
<td>-0.046</td>
</tr>
<tr>
<td>Energy</td>
<td>24</td>
<td>275,648</td>
<td>4,812,979</td>
<td>0.09%</td>
<td>1.13</td>
<td>0.125</td>
</tr>
<tr>
<td>Metals</td>
<td>38</td>
<td>229,221</td>
<td>33,978,175</td>
<td>1.72%</td>
<td>1.03</td>
<td>-0.007</td>
</tr>
<tr>
<td>Brewing</td>
<td>13</td>
<td>15,865</td>
<td>5,306,418</td>
<td>1.40%</td>
<td>3.35</td>
<td>0.085</td>
</tr>
<tr>
<td>Mining</td>
<td>25</td>
<td>243,383</td>
<td>27,078,480</td>
<td>1.14%</td>
<td>1.14</td>
<td>0.077</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>33</td>
<td>29,329</td>
<td>4,607,291</td>
<td>2.50%</td>
<td>2.37</td>
<td>0.075</td>
</tr>
<tr>
<td>Chemicals</td>
<td>71</td>
<td>61,108</td>
<td>4,210,443</td>
<td>2.24%</td>
<td>1.29</td>
<td>-0.053</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>166,980</td>
<td>26,151,797</td>
<td>1.75%</td>
<td>1.47</td>
<td>0.019</td>
</tr>
</tbody>
</table>
Table 2. Descriptive Statistics of Sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Investment</td>
<td>223</td>
<td>658.31</td>
<td>8,454,000,000.00</td>
<td>166980657.10</td>
<td>696311894.97</td>
</tr>
<tr>
<td>Size</td>
<td>223</td>
<td>22674884.65</td>
<td>2880311000000.00</td>
<td>26151797855.37</td>
<td>193315658696.36</td>
</tr>
<tr>
<td>R&amp;D Intensity</td>
<td>223</td>
<td>0.00%</td>
<td>8.99%</td>
<td>1.75%</td>
<td>1.74%</td>
</tr>
<tr>
<td>Profitability</td>
<td>223</td>
<td>-3.23</td>
<td>0.38</td>
<td>0.019</td>
<td>0.259</td>
</tr>
<tr>
<td>Leverage</td>
<td>223</td>
<td>0.03</td>
<td>13.93</td>
<td>1.47</td>
<td>1.93</td>
</tr>
</tbody>
</table>

3.2 Method

In this research, our methodology could be divided into two stages. In the first stage, inspired by a plenty of existing studies, we employ a widely used method in social science research (e.g., Fama, 1981; Brammer & Millington 2008) to assess the corporate social performance of our sample within the context of environmental investment. In general, this method captures the distinction between the observed level of a given phenomenon and the predicted level of that on the basis of an empirical model comprising a range of determinants or influence factors of that phenomenon. These residuals can be regarded as a reflection of the extent to which the observed value of the given phenomenon differs from its expected value according to its characteristics, and then can be used in analysis of particular problems. For example, Fama (1981) has used such a method to measure unexpected stock returns. Similar method can also be found in studies of CSP-CFP link, Brammer and Millington (2008) have employed this method to classify firms with unusually high and low CSP according to the residuals of a regression model of firm charitable giving. In the second stage of our research, we conduct a correlation analysis examining the link between CSP (measured by the residuals obtained in the first stage) and both market-based and accounting-based CFP of our sample.
3.2.1 Measuring Corporate Social Performance

In our analysis, we calculate the variance between companies’ observed level of environmental investment and the expected level of it. The residuals are considered as the indicator of firms’ CSP. Moreover, companies’ expected level of environmental investment is evaluated on the basis of a range of given characteristics (e.g., size, profitability, etc.) that may exert influence on it, which indicates that different companies possess different expected level of environmental investment. To be more precise, if the company’s actual level of environmental investment is higher than its expected level given the company’s characteristics, then we regard its environmental performance, the proxy of CSP in this study, as better than expected; otherwise, we view its CSP as worse than expected. Besides, the numerical value of these residuals implies the degree to which companies outperform or underperform what would be expected. For instance, a larger residual with a value above zero refers to better CSP, while a positive but smaller one indicates that this company’s social performance is better than expected but worse than the one with a larger positive residual; that a residual equals to zero means the company’s CSP has exactly reached its expected level. The superiority of applying this method when evaluating CSP explicitly lies in two aspects. Firstly, it keeps the relativity among observations based on their individual characteristics. In this case, the expected values of environmental investment obtained from the regressions represent the weighted average level of CSR efforts against the whole sample’s characteristics. One company’s CSP is assessed according to the efforts it has made and the efforts it should make compared to what others have done. Thus, it retains not only the relativity between CSP and characteristics of every single company, but also the relativity between each firm and the whole sample in terms of taking the population expectation into consideration. Secondly, this method enables us to quantify CSP easily. We can identify whether the company’s CSP is good as well as the extent to which it outperforms or underperforms expectation. It also provides an efficient way to compare the performance among firms or different groups of firms. We will further discuss the
advantage of using this method to evaluate CSP in Chapter 4.2 and Chapter 5.3 where we explore more about the residuals obtained from our data and regression models.

Using the method discussed above, corporate social performance of each observation can be evaluated according to the following equation:

$$CSP = \frac{(EI_a - EI_e)}{EI_e} \times 100\% \quad (1)$$

where CSP represents corporate social performance of each company, $EI_a$ and $EI_e$ are actual and expected level of environmental investment of the company respectively. Note that equation (1) is the general expression of applying residuals to assess CSP when raw data of environmental investment is utilized as the value of dependent variable of regression. In our research, in order to avoid violating the assumption of normality of dependent variable, we transform the data of environmental investment using the natural logarithm of environmental investment. Thus, the actual measure of CSP is formulated as follows:

$$CSP = \ln(EI_a) - \ln(EI_e) \quad (2)$$

where $\ln(EI_a)$ and $\ln(EI_e)$ refer to the natural logarithm of the actual and expected level of environmental investment of the company respectively. Equation (1) and (2) are both effective to reflect a relative measurement of CSP and have the same monotonicity (greater the extent to which the actual value is larger than expected value, better the CSP), which means they could be viewed as equivalent expressions. Although this point can be supported mathematically, it is beyond the scope of this thesis, and we will not explain it further for the sake of brevity. In sum, equation (2) is applied in our research to evaluate CSP of the companies.

**Empirical Model of Environmental Investment**

Building on earlier contributions, in this session we establish an empirical model of influence factors of environmental investment. Our basic model hypothesizes that a company’s environmental investment is a function of firm size, industry and financial resources availability. The model is presented as below.

$$Environmental\,\,Investment = f\,(Size,\,Industry,\,Financial\,\,Resources) \quad (3)$$
Firm size has been hypothesized to be a key determinant of environmental performance (Ullmann, 1985). Etzion (2007) suggests that rather than being a determinant, firm size may act as the proxy for several other firm characteristics, such as firm visibility (Brammer & Millington, 2008). Larger companies are more exposed to publicity, and thus their activities are subject to increased supervision from different stakeholders. Henceforth, in order to maintain or strengthen stakeholder relationships and meet social demands required by investors, customers, regulators, etc., they may voluntarily fulfill their social responsibilities and consequently be more likely to pay attention to environmental issues (Cohen & Konar, 2000; Clarkson et al., 2011). In addition, larger companies may possess slack resources that allow them to invest more in environmental CSR activities (Clarkson et al., 2011).

In this study, although we assemble our sample from heavy-polluting industries in order to control the influences of various regulatory contexts, pressures from stakeholders and companies’ ability to reduce environmental impacts (Etzion, 2007; Patten, 2002), a range of factors such as competition intensity, industry growth and the stage of the product lifecycle still differ across our selected industries (Ambec & Lanoie, 2008; McWilliams & Siegel, 2000; Russo & Fouts, 1997; Brammer & Millington 2008). Such industry differences may pose impacts on a company’s initiative of environmental investment. For instance, companies from young and fast developing industries may have plenty of alternative investment options competing with environmental investment, thus leading to a weaker initiative of environmental investment. While others in relatively mature industries may face fewer investment choices and be more likely to invest in environmental CSR activities. What’s more, our model also includes a particular characteristic, which is companies’ R&D intensity. McWilliams and Siegel (2000) argue that R&D intensity is an important component of a differentiation strategy and may exert influence on the relationship between CSP and CFP, therefore it should be considered as a control variable in analysis of CSP-CFP link (Orlitzky, 2008). Besides, according to Christmann (2000), R&D intensity may also be correlated with environmental performance, for R&D may
be a precursor of environmental performance providing companies with innovative approaches to environmental issues. In the present context, for example, as one of the forms of environmental investment, reconstruction of environmental protection facilities may require R&D efforts; R&D activities that lead to an advanced production process or manufacturing technique that consequently reduces the pollution level may also influence the level of investment in industrial pollution prevention and control. To sum up, we suggest that industry-correlated factors may have a great impact on the level of companies’ environmental investment, henceforth, we take a set of industry effects into our model, including primary business activity (industry category) and R&D intensity.

The availability of financial resources is another crucial set of determinants of environmental investment. It may be best supported by the slack resources hypothesis stated by Waddock and Graves (1997). The slack resources hypothesis suggests that superior CFP leads to slack resources that permit companies to invest in environmental activities. Bourgeois (1981) defines organizational slack as “cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change.” The slack allows companies to invest in resources and capabilities that are not likely to pay-off in the short run but are essential to improve the extent to which companies adapt to the external environments (Bansal, 2005; Cheng & Kesner, 1997). In our opinion, environmental investment is such kind of investment as discussed above. On one hand, it may not generate instant benefits in a short run but may assist companies to obtain a long-term competitive advantage resulting from enhanced relations with primary stakeholders. On the other hand, the implementation of environmental investment requires resources and capabilities, especially financial resources. High levels of CFP cause available slack resources (Preston & O’Bannon, 1997) and consequently the slack allows companies to allocate more resources to invest in environmental issues. In support of the slack resources hypothesis, we suppose that a significant influence of the availability of financial resources on the level of environmental investment could
be expected. More specifically, companies with higher profitability are expected to be more capable and probably more willing to invest in environmental CSR, while those with a higher level of debt are expected to have fewer resources for environmental investment because they may be forced to direct more financial resources towards interest payment. Therefore, we introduce two measures of the availability of financial resources into our model, which are firm profitability and leverage.

Taking all presented influence variables into account, our full empirical model of the determinants of environmental investment is:

$$ EI = \beta_0 + \beta_1 \text{Size} + \beta_2 \text{Industry}_{1-7} + \beta_3 \text{R&D Intensity} + \beta_9 \text{Profitability} + \beta_{10} \text{Leverage} + \epsilon $$

where dependent variable EI refers to the level of companies’ environmental investment. Firm size is measured by the natural logarithm of firms’ total sales, and R&D intensity is measured by the ratio of R&D expenditure to total sales. We use ROE and the natural logarithm of the ratio of total debt to equity to measure company’s profitability and leverage respectively. Since our target firms come from eight industries, we establish seven dummy industry variables that take on the value one for firms from that industry and zero otherwise. The eighth industry is reflected by the intercept. Furthermore, in order to pursue the robustness and further exploration of using residuals as a measure of CSP, we conduct two regression models using different operationalizations of dependent variables. In these two models, the level of environmental investment is measured respectively by the natural logarithm of the ratio of environmental investment to total sales and by the natural logarithm of the amount of environmental investment. Note that all the data applied in the regression models is from the year 2013, and we do not use a time lag in this stage.

3.2.2 Measuring Corporate Financial Performance

Equally important to our research is the measurement of CFP. Considering the functions as well as the dysfunctions of the two kinds of measures of CFP discussed
in the theory section, we decide to employ both market-based and accounting-based measures of CFP in our study for the purpose of having a comprehensive understanding of CSP-CFP link. We agree with Marom’s (2006) argument that a long-term perspective should be taken into account when investigating the implications of CSP initiatives for CFP in that stakeholder reactions to CSP-related expenditures may unfold over a long term. In the present case, one practical issue could be that the environmental investment in technical transformation occurred in the short term may have a contemporaneous impact on financial performance but more importantly is its long-term influence in the future. For example, it may potentially have a positive influence on CFP in the coming years thanks to the improvements in the production process or customer relationship achieved by the transformation. Such benefits from investment could be viewed as a competitive advantage that will last over a long run. However, an observation of current financial performance cannot capture the whole picture of its potential influence. Therefore, in order to effectively examine the link between CSP and CFP over a longer time horizon, we hereby introduce a one-year time lag in the measures of CFP and focus on how CSP potentially influence the changes of CFP in the future. Operationalizations of both market-based and accounting-based financial performance are presented as follows.

Firstly, for each observation, we use the company’s annual average stock price in the year 2014 and the growth rate of stock price over the period from the year 2013 to 2014 as the indicators of its market-based financial performance (MFP). The growth rate of stock price is measured by the following equation:

\[
\text{GRP}_{2014} = \frac{(P_{2014} - P_{2013}) + D_{2014}}{P_{2013}} \times 100\% 
\]

where \( \text{GRP}_{2014} \) represents the growth rate of stock price over the period from the year 2013 to 2014, \( P_{2013} \) and \( P_{2014} \) refer to the stock price of the year 2013 and the year 2014 respectively, \( D_{2014} \) is the dividend that companies paid in the year 2014.

Secondly, we employ two indicators of company’s profitability, namely, return on equity (ROE) and earnings per share (EPS), and also the growth rates of these
indicators over the period from 2013 to 2014 as measures of accounting-based financial performance (AFP). The calculation method of the growth rates is as below:

\[
GRROE_{2014} = \frac{ROE_{2014} - ROE_{2013}}{|ROE_{2013}|} \times 100\% \quad (6)
\]

\[
GREPS_{2014} = \frac{EPS_{2014} - EPS_{2013}}{|EPS_{2013}|} \times 100\% \quad (7)
\]

where GRROE_{2014} and GREPS_{2014} refer to the growth rate of firms’ ROE and EPS from the year 2013 to 2014 respectively. ROE_{2013, 2014} and EPS_{2013, 2014} are measured by the numerical value of firms’ ROE and EPS in the year 2013 and 2014. |ROE_{2013}| and |EPS_{2013}| are the absolute value of two indicators of the year 2013 respectively. As discussed in data and sample session, our data availability is limited, only partial firms in our sample have disclosed the annual financial data of the year 2014, also, complete financial data of all firms in the sample is available within the period of the first three quarters of the year 2014. As a result, growth rates of ROE and EPS of year 2014 are calculated over different time periods, from the end of the year 2013 to the end of the year 2014 and from the end of the first three quarters of the year 2013 to that of the year 2014, respectively.

### 3.2.3 Measuring CSP-CFP Relationship

After acquiring the CSP of the year 2013 measured by the regression residuals of the models of environmental investment determinants and the CFP of the year 2014 measured by several accounting-based and market-based financial indicators, we conduct correlation analyses between CSP and CFP of Chinese listed heavy-polluting companies to examine whether it is worth paying to be environmentally responsible in terms of financial returns. The correlations of CSP and CFP are investigated based on two clusters of firms. The CSP-CFP link of firms that have disclosed annual financial information of the year 2014 is examined adopting a one-year lag from the end of the year 2013 to the end of the year 2014, while that link of all firms in our sample is investigated using a one-year lag from the end of the first three quarters of the year 2013 to that of the year 2014 due to the lack of complete data.
4 Results

4.1 Determinants of Environmental Investment

In our analysis, in order to take into account the potential random effects in our cross-sectional dataset, as mentioned in Chapter 3.2.1, we establish two regression models applying different estimators of environmental investment as a consistency check. The dependent variable in model 1 is the rate of environmental investment measured by the natural logarithm of the ratio of environmental investment to total sales, while that in model 2 is the amount of environmental investment measured by the natural logarithm of environmental investment.

Table 3. The Determinants of Environmental Investment

<table>
<thead>
<tr>
<th></th>
<th>Size</th>
<th>R&amp;D Intensity</th>
<th>Profitability</th>
<th>Leverage</th>
<th>$R^2$</th>
<th>Adj. $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
<td>0.148**</td>
<td>-0.258**</td>
<td>0.168</td>
<td>0.126</td>
</tr>
<tr>
<td>(EI/Sales)</td>
<td></td>
<td>2.259*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>0.815***</td>
<td></td>
<td>3.716**</td>
<td>-0.292**</td>
<td>0.470</td>
<td>0.443</td>
</tr>
<tr>
<td>(EI)</td>
<td></td>
<td>3.716**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.10; ** p < 0.05; *** p < 0.01

“/” suggests insignificant variables in the models

Table 3 and 4 report the results of estimating two linear regression models of the determinants of environmental investment. In particular, we can see from Table 3 that as anticipated, both estimations indicate that financial resource availability significantly affects environmental investment. Firms with higher profitability (p = 0.092 in model 1 and p = 0.011 in model 2) and lower leverage (p = 0.026 in model 1 and p = 0.028 in model 2) invest more in environmental CSR activities in terms of both the rate and the amount of environmental investment. However, the two models differ according to variables of firm size and R&D intensity. Model 1 indicates that R&D intensity (p = 0.028) is positively associated with the rate of environmental
investment while firm size is found to have no statistically significant contribution to this model. Conversely, in model 2, we discover that firms with larger size (p = 0.000) are highly significantly expected to make more environmental investment, but R&D intensity is not significantly correlated with the amount of environmental investment in this model.

We believe this difference results from the utilization of the two different estimators of the dependent variable. To be specific, the rate of environmental investment, on one hand, may reflect firms’ strategic motives towards environmental issues. Like R&D intensity, it can be regarded as a part of firms’ differentiation strategy related to decision makers’ strategic intentions, which is not necessarily associated with how large the firm is. On the other hand, the rate of environmental investment is a relative indicator, and the operation of measuring the rate (investment divided by total sales) mathematically controls the effects of firm size on environmental investment. Therefore, it is reasonable to find that R&D intensity appears to be significantly correlated with the rate of environmental investment while firm size does not. On the contrary, the amount of environmental investment, as an absolute indicator, is heavily dependent on another absolute indicator that is firm size measured by the natural logarithm of total sales (part correlation = 0.445 in model 2). These absolute indicators like the amount of sales, total assets, and investment may be good reflections of firms’ scale but may hardly represent the level of firms’ strategic efforts. Thus, R&D intensity may not act as a proper predictor for the amount of environmental investment. To sum up, according to our empirical results, it seems that the same type of indicators (relative ones or absolute ones) are more likely to have a significant correlation with each other in this particular field of research. Since the influences of size and R&D intensity are not significant in model 1 and model 2 respectively, we remove size variable from model 1 and R&D intensity variable from model 2 to obtain better estimations.
In addition, according to Table 4, industry variation in environmental investment is also detected in both models. Firms from metals, mining, pharmaceuticals, and chemicals industries are expected to make environmental investment at a lower rate; firms from metals, brewing, and pharmaceuticals industries devote significantly less to environment in terms of lower amount of environmental investment. Since the industry effects on firms’ environmental investment and the CSP-CFP link are not the major concern in this research, we do not show other combinations of industry dummy variables or remove those variables that are not significant in the models. More detailed investigation of industry effects on the environmental investment and the CSP-CFP link is beyond the scope of our study and may require further research.

To conclude, based on our empirical results from these two models of the determinants of environmental investment, we generally believe that corporate environmental investment can be basically characterized by a function of firm size, industry, and availability of financial resources. The hypothesis of environmental investment model proposed in Chapter 3.2.1 is supported. It is also important to report that in model 1, the value of $R^2 = 0.168$, the value of adjusted $R^2 = 0.126$ ($p = 0.000$) and in model 2, $R^2 = 0.470$, adjusted $R^2 = 0.443$ ($p = 0.000$). All variables in the two models are normally distributed and independent. VIF value of each independent variable is no greater than 1.640. There is no violation of assumptions of normality,
independence, linearity, multicollinearity, and homoscedasticity in both models according to the preliminary analyses.

4.2 The Residuals of Regression Models (CSP)

As discussed in the previous chapter, we use the residuals of the estimations to assess firms’ CSP, thus it is of great importance to investigate the residuals generated by our empirical regression models before moving to the next step of our analysis. After removing unusual points with standardized residual greater than 3 in absolute value, both sets of residuals pass the Kolmogorov-Smirnov normality test indicating each set of residuals are normally distributed. Using $\frac{3 \times p}{n}$ as a cutoff for centered leverage value ($p$ is the number of variables), high-leverage points in model 1 (leverage value greater than 0.145) and model 2 (leverage value greater than 0.142) are stable. Further check shows those high-leverage points are just firms from petrol industry where only five firms are included. Only five observations taking one as the value of that dummy variable makes them look like points with an unusual value of the independent variable, which, in fact, does not matter in our analysis. The maximum values of Cook’s distance of two estimations are 0.058 and 0.089 respectively, indicating there should be no influential points in both models. Besides, Durbin-Watson value of each model is 1.904 and 1.980 respectively, which demonstrates acceptable independence among residuals. The plot of residuals and predicted values suggest that the residuals have equal variance without a nonlinear pattern. All the statistical tests demonstrate that there are no outliers and unusual points in the residuals, and ensure the normality, linearity, independence, and equality of variance of the residuals in both regression models.

Furthermore, using Pearson correlation coefficient, we find that there is a strongly positive correlation between the two sets of residuals, $r = 0.973$, $n = 207$, $p = 0.000$. This strong relationship indicates firms that perform better than expected in terms of the rate of environmental investment also make more amount of investment in the
environment than expected. We also run a correlation analysis of the two dependent variables that reflect environmental performance from an absolute perspective. The Pearson correlation coefficient between the two dependent variables is 0.697, \( n = 207, \ p = 0.000 \), which means firms with higher level of environmental investment also invest more in terms of the investment amount. Despite the relatively strong correlation between two dependent variables, the correlation between two sets of residuals is much stronger. This empirical finding may imply that using residuals as a reflection of performance may be superior to traditional absolute indicators since it keeps better consistency when different measures are used to operationalize one construct. For the sake of brevity in this session, we will discuss further in Chapter 5.3 the implications of using regression residuals to measure performance.

### 4.3 The CSP-CFP Relationship

Table 5, 6, 7 report the relationships between CSP measured by residuals of two estimations and CFP measured by several financial indicators over different time horizons. Since we have introduced a one-year time lag into our analysis, all the financial indicators presented in this session are from the year 2014. Only approximately half of the firms in our sample have published their 2014 annual reports. Due to this limitation of data availability, we check CSP-CFP link of all the firms in our sample using the financial performance of the first three quarters of 2014. We also examine the relationship between CSP and CFP of firms that have already disclosed their 2014 annual financial information on the basis of the whole year financial performance. Both of the investigations are carried out using Pearson correlation coefficient.
Table 5. Results of CSP-CFP Correlation Based on Complete Sample

<table>
<thead>
<tr>
<th></th>
<th>ROE (3 quarters)</th>
<th>ROE (Annual)</th>
<th>ROE Growth Rate (3 quarters)</th>
<th>ROE Growth Rate (Annual)</th>
<th>EPS (3 quarters)</th>
<th>EPS (Annual)</th>
<th>EPS Growth Rate (3 quarters)</th>
<th>EPS Growth Rate (Annual)</th>
<th>Stock Price (Annual)</th>
<th>Stock Growth (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.062</td>
<td>0.208**</td>
<td>0.116</td>
<td>0.243***</td>
<td>0.064</td>
<td>0.265***</td>
<td>0.030</td>
<td>0.228**</td>
<td>0.034</td>
</tr>
<tr>
<td>Model 1</td>
<td>Sig. (2-tailed)</td>
<td>0.377</td>
<td>0.022</td>
<td>0.110</td>
<td>0.008</td>
<td>0.357</td>
<td>0.003</td>
<td>0.667</td>
<td>0.011</td>
<td>0.623</td>
</tr>
<tr>
<td>(EI/Sales) N</td>
<td>206</td>
<td>121</td>
<td>192</td>
<td>118</td>
<td>207</td>
<td>122</td>
<td>205</td>
<td>122</td>
<td>207</td>
<td>122</td>
</tr>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.067</td>
<td>0.171*</td>
<td>0.091</td>
<td>0.209**</td>
<td>0.089</td>
<td>0.277***</td>
<td>0.017</td>
<td>0.206**</td>
<td>0.002</td>
</tr>
<tr>
<td>Model 2</td>
<td>Sig. (2-tailed)</td>
<td>0.332</td>
<td>0.057</td>
<td>0.205</td>
<td>0.021</td>
<td>0.196</td>
<td>0.002</td>
<td>0.801</td>
<td>0.021</td>
<td>0.973</td>
</tr>
<tr>
<td>(EI)</td>
<td>N</td>
<td>211</td>
<td>124</td>
<td>197</td>
<td>121</td>
<td>212</td>
<td>125</td>
<td>210</td>
<td>125</td>
<td>212</td>
</tr>
</tbody>
</table>

* p < 0.10; ** p < 0.05; *** p < 0.01
According to Table 5, we find that there is no statistically significant relationship between CSP and accounting-based financial performance when all observations in our sample are taken into account using financial data of the first three quarters of the year 2014. Market-based financial performance measured by the growth rate of the stock price is not available during the first-three-quarter period because this indicator requires information on firms’ annual dividends. Nevertheless, when the sample is restricted to those with complete annual financial data of the year 2014, all the accounting-based indicators of CFP appear to be positively associated with CSP generated from both regression models. In particular, 2014 annual ROE (p = 0.022 with CSP from model 1 and p = 0.057 with CSP from model 2), 2014 annual ROE growth rate (p = 0.008 and p = 0.021 respectively), 2014 annual EPS (p = 0.003 and p = 0.002) and 2014 annual EPS growth rate (p = 0.011 and p = 0.021) all have a significant and positive relationship with corporate social performance within the context of environmental investment. However, there is no significant correlation between CSP and market-based CFP in the current case.

In addition, Table 6 and Table 7 reveal that when exploring further in the limited number of firms in our sample that have already published annual reports of the year 2014, not only their annual financial performance but also the performance of the first three quarters appear to have a significantly positive correlation with CSP. 2014 first-three-quarter ROE (p = 0.1 and p = 0.087 respectively), 2014 first-three-quarter ROE growth rate (p = 0.008 and p = 0.049), 2014 first-three-quarter EPS (p = 0.014 and p = 0.006) and 2014 first-three-quarter EPS growth rate (p = 0.051 and p = 0.096) are all positively associated with CSP. Note that all the correlations of CSP-CFP observed in this analysis are relatively weak (no greater than 0.3).
Table 6. Results of CSP-CFP Correlation Based on Sample of Firms with 2014 Annual Financial Data (ROE)

<table>
<thead>
<tr>
<th></th>
<th>ROE (3 quarters)</th>
<th>ROE (Annual)</th>
<th>ROE Growth Rate (3 quarters)</th>
<th>ROE Growth Rate (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.150*</td>
<td>0.208**</td>
<td>0.247***</td>
</tr>
<tr>
<td>Model 1</td>
<td>Sig. (2-tailed)</td>
<td>0.100</td>
<td>0.022</td>
<td>0.008</td>
</tr>
<tr>
<td>(EI/Sales)</td>
<td>N</td>
<td>121</td>
<td>121</td>
<td>116</td>
</tr>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.154*</td>
<td>0.171*</td>
<td>0.181**</td>
</tr>
<tr>
<td>Model 2</td>
<td>Sig. (2-tailed)</td>
<td>0.087</td>
<td>0.057</td>
<td>0.049</td>
</tr>
<tr>
<td>(EI)</td>
<td>N</td>
<td>124</td>
<td>124</td>
<td>119</td>
</tr>
</tbody>
</table>

* p < 0.10; ** p < 0.05; *** p < 0.01

Table 7. Results of CSP-CFP Correlation Based on Sample of Firms with 2014 Annual Financial Data (EPS)

<table>
<thead>
<tr>
<th></th>
<th>EPS (3 quarters)</th>
<th>EPS (Annual)</th>
<th>EPS Growth Rate (3 quarters)</th>
<th>EPS Growth Rate (Annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.222**</td>
<td>0.265***</td>
<td>0.178*</td>
</tr>
<tr>
<td>Model 1</td>
<td>Sig. (2-tailed)</td>
<td>0.014</td>
<td>0.003</td>
<td>0.051</td>
</tr>
<tr>
<td>(EI/Sales)</td>
<td>N</td>
<td>122</td>
<td>122</td>
<td>121</td>
</tr>
<tr>
<td>CSP</td>
<td>Pearson Correlation</td>
<td>0.246***</td>
<td>0.277***</td>
<td>0.150*</td>
</tr>
<tr>
<td>Model 2</td>
<td>Sig. (2-tailed)</td>
<td>0.006</td>
<td>0.002</td>
<td>0.096</td>
</tr>
<tr>
<td>(EI)</td>
<td>N</td>
<td>125</td>
<td>125</td>
<td>124</td>
</tr>
</tbody>
</table>

* p < 0.10; ** p < 0.05; *** p < 0.01
5 Discussion

In quest of the underexplored research topic of the relationship between corporate social performance and financial performance of Chinese companies, we have employed a different CSP measure inspired by a statistic method that Fama (1981) has used to evaluate the unexpected stock returns in his research. Our empirical findings suggest that among Chinese heavy-polluting companies that have already disclosed their 2014 annual financial information, firms with better social performance in the sense that they invest more in environmental activities than what would be expected have a significantly higher accounting-based financial performance.

5.1 Interpretations of Empirical Findings

The empirical results of the relationship between corporate social and financial performance indicate that we have observed a difference between two clusters of firms. Due to the fact that approximately half of our observations lack the annual financial data of the year 2014, we firstly use first-three-quarter financial indicators of 2014 of the whole sample to measure the correlation between CSP and CFP. Results show that there is no significant relationship between corporate social and financial performance. Nevertheless, when we filter the sample and only retain those with 2014 annual financial data, new results reveal a significantly positive relationship between CSP and accounting-based CFP. That is, in Chinese heavy-polluting industries, companies that invest more in environmental CSR activities than what would be expected in the current year gain higher profits as well as financial growth in the following year. Conversely, companies devoting less to environmental CSR activities than expected in the current year witness lower profitability and growth rate in the subsequent year. Additionally, when we explore further on the firms that have more active disclosures of information, we have not only found a significantly positive link between CSP and their 2014 annual accounting-based financial performance, but also a significantly positive relationship
between CSP and accounting-based CFP of the first three quarters of 2014. Compared with the examination of the whole sample, this robust finding may indicate that a positive relationship between environmental CSR endeavors and financial returns may be more likely to appear within those Chinese heavy-polluting firms that are more willing and active to disclose corporate information.

On the other hand, however, in common with previous literature arguing that CSP is more highly correlated with accounting-based CFP measures than with market-based ones (McGuire et al., 1988; Margolis et al., 2007), our findings suggest no statistically significant relationship between corporate social performance and market-based financial performance. The reason for such a neutral link in our study may result from China’s unique circumstance of the capital market. Chinese stock market can not only be influenced by long-term factors such as market rules and disciplines, but can also be affected by short-term factors like government policies, economic volatility, and even abrupt negative news about the company. In China, those short-term factors are reported to have predominant effects on the market price, which make the change of share price relatively flexible in the short run (Chen et al., 2010). It is evident that firms’ stock price is a comprehensive reflection of diversified influence factors so that it cannot be apparently determined by only one factor. Therefore, we believe that there is difficulty in drawing a significant correlation between market-based CFP (stock price and its growth rate) and CSP of Chinese companies, especially in a relatively short period of time (one-year time lag). However, research on this specific problem based on a longer time horizon is restricted to the insufficient disclosure of CSR information in China.

5.2 Theoretical Implications

Consistent with previous studies that have explored a positive relationship between CSP and CFP (e.g., Ruf et al., 2001; Simpson & Kohers, 2002; Van Beurden & Gössling, 2008), our research provides new evidence from Chinese heavy-polluting industries in
support of a positive CSP-CFP link. According to our empirical findings, we find ourselves aligned with the stakeholder theory. We deem that companies which invest more money in environmental protection activities than expected are committing greater social responsibility for the natural environment as well as people’s living environment. Such commitment meets different stakeholders’ demands and satisfactions, therefore in return, these stakeholders (e.g., environmentalists, consumers, and governments) are willing to offer more resources and assets to support companies’ further operations. As a result, companies can operate more smoothly and expansively, gain profit growth and realize the improvement in financial performance. For instance, environmental protection authorities can be satisfied by a company’s proactive devotion to environmental protection activities, and consequently grant more government environmental subsidies to the company. Such subsidies can help make up for the company’s costs on environmental CSR. Also, environmentalists may get satisfied with one company’s dedication to environmental protection and speak well of this company in public, which results in the company’s improved reputation and attractiveness among customers and potential growth in sales, thus increasing its profitability in the coming years. On the contrary, our research results are opposite to the agency theory and Friedman (1970)’s profit maximization perspective. We believe that from the viewpoint of companies’ shareholders, the resources and money required to be socially responsible are not so high as to make the company less profitable. Instead, there exists the possibility that companies may even receive competitive advantages from social performance expenditures that create favorable stakeholder relationships (Waddock & Graves, 1997).

Furthermore, our analysis may contribute to revealing an interesting phenomenon in the Chinese stock market. Since firms’ earnings per share (EPS) is positively correlated to CSP while share price of firms is not, according to the stock pricing mechanism, that is stock price = EPS × Price-to-Earning (PE) Ratio, we could speculate that there is a neutral or negative relationship between firms’ PE ratio and CSP. Otherwise, a positive link between CSP and stock price should be detected in
our research. We realize that the PE ratio is an artificially established market indicator of firms and the change of share price and PE is a dynamic process determined by the market, but still, the PE ratio of a firm reflects how investors in the market assess the value and prospect of the firm from a long-term perspective. A neutral or negative link of CSP-PE may imply that Chinese stock investors either do not care whether firms are socially or environmentally responsible, or regard firms being socially responsible as costly and even detrimental to firm value and development. Building on this point, we would like to make two arguments that are, (1) better CSP seems to be internally relevant to firm value creation and efficiency but not externally increase firm valuation in the market and (2) although in line with the stakeholder theory, we perceive a difference in the attitudes of various stakeholders towards firms’ efforts on CSR. Not all the stakeholders approve firms’ social endeavors, which may suggest a priority for decision makers when fulfilling the social demands of the stakeholders.

5.3 Methodological Implications

Unlike much of the extant literature that shows evidence for a positive CSP-CFP link which is solely based on absolute CSP measures (e.g., rating scores, dummy variables), our analysis using regression residuals of the determinant models of environmental investment as reflections of CSP sheds new light on the CSP-CFP link in terms of providing a more effective research methodology for this particular field of research. As mentioned in the chapter of method and results, we believe the method that we apply to assess social performance may be superior to other traditional measures because firstly, it maintains the relativity among samples based on their individual attributes. Secondly, it is of great efficiency to use residuals when quantifying and comparing the social performance of firms. Besides, our empirical results show that correlation between two sets of residuals from models using different operationalizations of the level of environmental investment is much greater than that between two indicators of environmental investment, which implies that the residuals generated from the determinant models may be better indicators of CSP than
those absolute indicators because using residuals keeps better consistency when
different measures are adopted to operationalize one construct. To be more explicit,
applying the residuals as reflections of performance to some extent may avoid the
variance between different operationalizations of that construct and thus is closer to
the substance of firm performance. We believe that no matter what operationalization
is used, a certain performance of firms should be relatively stable because firms’
characteristics given are unchanged. In this sense, the residuals we use empirically
demonstrate a great potential to retain stable expectations of firm performance. In sum,
this statistic method of evaluating firm performance statistically neutralize the
endogenous distinctions of operationalizations and somehow avoid the “noise” caused
by various measures that may influence the results of CSP-CFP link. Also, it may
potentially contribute to more effective and efficient investigations on relevant
studies.
6 Conclusion

6.1 Concluding Remarks

This study aims to shed new light on the relationship between corporate social and financial performance of Chinese firms within the context of a specific CSP component: environmental investment, with an eye towards useful managerial recommendations for managers from Chinese heavy-polluting companies when they decide whether to invest in environmental CSR activities. Based on a specially constructed cross-sectional dataset of Chinese heavy-polluting companies, we adopt two empirical models of the determinants of environmental investment using different operationalizations of environmental investment. The regression residuals of the models are then regarded as the indicators of CSP. Our findings are aligned with many current research results and support a positive relationship between CSP and accounting-based CFP. However, this positive relationship only appears among those firms that have already disclosed their 2014 annual financial data. Importantly, our research differs from extant studies in two major aspects. Firstly, our methodology of measuring CSP concerns the significance of deviation from expected level of CSR efforts for a company’s financial performance. The other distinction lies in our effort to investigate the CSP-CFP link within the context of environmental CSR dimension, which deserves deeper research but lacks investigation to date.

6.2 Managerial Implications

Our research findings suggest that in Chinese heavy-polluting industries, companies that actually outperform the expectation of their environmental performance in terms of higher level of environmental expenditures gain increasing profitability in the coming year, while those underperform their expected environmental performance experience reduced financial outcomes. Besides, whether or not firms are environmentally responsible does not seem to affect the market price of firms’ share. In this sense, this study may act as a reference for managers from Chinese
heavy-polluting industries. It suggests that strategic activities regarding the environmental issues may demonstrate various capacities of improving firm performance under different contexts. Proactive environmental investment appears to be more effective to help enhance firm internal efficiency rather than external market performance, which implies that managers need to consider whether it could be beneficial to invest in environment when they have different management goals to accomplish. Furthermore, we also suggest a priority when firms fulfill their stakeholders’ environmental demands. In Chinese heavy-polluting industries, financial returns are more likely to increase via strengthened stakeholder relationships when focusing on the environmental demands of consumers, environmentalists, and governments.

6.3 Limitations and Suggestions for Future Research

The major limitation of our research can be generalized as the limited availability of data, which has caused several restrictions on the study of the nature of CSP-CFP link. Firstly, despite adopting a one-year time lag to demonstrate the link between current CSP and future CFP, we clearly realize that our empirical models and statistic method are not effective to explore the causality of the CSP-CFP link. Insufficient observations and data at this moment restrict the possibility of investigating this problem over a longer time horizon. Therefore, we suggest a longitudinal research in the future that may provide insight into the cause-and-effect of the CSP-CFP link as well as how the degree to which the financial payoffs are associated with particular CSR strategies varies over different time horizons. Secondly, the fact that only half of the companies in our sample have released their annual financial data of the year 2014 leads to our empirical results building on a sample of no more than 125 companies. A complete sample with more observations might alter the CSP-CFP correlation. Henceforth, future studies to analyze the CSP-CFP relationship with a larger sample size and substantial data would be valuable.
Reference


Friedman, M. 1970. The social responsibility of business is to increase its profits. *New York Times Magazine, (13).*


