What do we really know about the influence of environmental on financial performance? A meta-regression analysis (MRA)

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Abstract

The aim of this paper is to aggregate the findings and explore the heterogeneity among 893 effect sizes from 142 empirical primary studies examining the relation between corporate environmental performance (CEP) and corporate financial performance (CFP). Thus, the study analyzes 757,154 firm year observations by applying a mixed-effect weighted least squares meta-regression analysis (MRA). The main results from this comprehensive moderator analysis can be summed up as follows: The analysis reveals a clearly positive relation between CEP and CFP. However, the intensity of the effect heavily depends on regional and industrial differences. The effect is especially small in BRICS countries and large in developing countries as well as for US firms. For the service sector the effect is smaller. Besides, reactive environmental activities have a much lower impact on CFP. Further significant moderators are measurement differences as well as characteristics of the firm level data. Overall, this paper gives new important insights into the background of the CEP-CFP relation which are highly relevant for international management behavior today as well as current economic policy.

1 Motivation

Currently, we observe that corporations are faced with a growing public demand and even claim for sustainable management, which also appears in plenty of non-governmental organizations as well as social entrepreneurships focusing on sustainability and especially environmental protection (Bornstein 2007, p. 3; Goyal et al. 2013, p. 361; Zahra et al. 2009, p. 519). Thus, firms seem to be concerned with increasing costs of ignoring environmental issues. The mentioned global movement comes up from the growing awareness for the environmental impacts of the immensely accelerated human activities in the past decades. The consequences manifest in "air and water pollution, toxic emissions, chemical spills, and industrial accidents" (Hart 1995, pp. 990-991).

This puts more and more emphasis on the research questions at hand whether or not, and under which circumstances, corporate environmental performance (CEP) is financially rewarded by its stakeholders today, compensating the initial "green investments" and leading to a higher corporate financial performance (CFP).

The existing hundreds of scientific attempts of finding a generally valid answer to this complicated question date back 40 years. Often, they suffer from heterogeneous and complex interactions, inappropriate estimation models or insufficient data which lead to inconclusive results (Elsayed and Paton 2005, p. 395; Günther et al. 2012, p. 219). Hence, recent qualitative and quantitative reviews try to aggregate the findings from primary studies and explain the reasons behind the heterogeneity among the results. However, these meta-analyses limit their examinations to single moderating factors and small samples of primary studies taking only a fraction of the mixed evidence into account without providing a comprehensive analysis (among others Dixon Fowler et al. 2013; Endrikat et al. 2014; Horváthová 2010; Molina-Azorín et al. 2009; Orlitzky 2001; Salem et al. 2012). Mainly, methodological and measurement differences are analyzed ignoring e.g. potential regional or industrial effects which are supposed to influence the CEP-CFP relation as well (Günther et al. 2012, p. 291; Molina-Azorín et al. 2009, p. 1094; Wagner et al. 2001, p. 105). Nelson and Kennedy (2009) study 140 meta-analyses dealing with seven topics in environmental and resource economics that confirm these drawbacks in existing reviews consistently for the field of environmental economics. Beneath the fact that most reviews do not cover the population of primary studies by far, further downsides are the underrepresented grey literature as well as inappropriate estimation models. These circumstances show the need of a quantitative literature review, examining the heterogeneity of the CEP-CFP relation in the population of existing primary studies comprehensively by analyzing all relevant moderating variables using an appropriate meta-analytical approach.

Following in general the framework provided by Stanley and Doucouliagos (2012) as well as Stanley et al. (2013), the added value of the study at hand is as follows: Referring to the huge amount of primary studies, the work summarizes the complete empirical literature from 1978 through 2015 examining the relation between CEP and CFP including published as well as unpublished papers. The study provides an integrated analysis of all relevant moderating factors which are possibly responsible for the strong heterogeneity among the results from primary studies. Therein, the study investigates (1) measurement differences, (2) publication characteristics, (3) data characteristics, (4) regional differences, (5) industrial differences, (6) control variables, and (7) estimation differences. Finally, for the underlying empirical analysis the study employs a mixed-effects meta-regression analysis (MRA) as the most appropriate meta-analytical estimation technique considering the underlying data structure. Beside fixed-effects variation due to the moderator variables, the model also considers random-effects errors caused by unobserved heterogeneity.

The results confirm a clearly positive relation between CEP and CFP and reveal several significant moderating effects for the CEP-CFP relation. The positive interaction depends heavily on geographic location and economic performance of a country. Furthermore, the industry sector plays an important role. Besides, reactive environmental activities have a much lower impact on CFP. In contrast to previous analyses, no robust evidence appears among estimation differences.

The work is structured as follows: Section 2 provides a systematic overview and critical discussion of the existing moderator analyses focusing the relationship between CEP and CFP. Subsequently, the theoretical background of the CEP-CFP relation is presented in section 3. The collection of primary studies and coding of the relevant data correspond to the first and second part of section 4, followed by the description of the applied methodology of mixed-effects MRA. Afterwards the empirical results are presented in section 5 which are discussed in section 6 in combination with their limitations. The analysis and its results are finally summarized in section 7.

2 Related meta-analytical literature

With the prevailing confirmation of an overall positive relationship between CEP and CFP in recent meta-analyses, more and more meta-analytical studies focus on the moderating factors on a meta-level which might determine the deviations of single outcomes from the overall positive effect. **Fehler! Verweisquelle konnte nicht gefunden werden.** systematizes the previous meta-analyses investigating the moderating factors of the relation between CEP and CFP.

Insert Table 1 about here

Looking at the number of studies and effect sizes a large deviation is remarkable. The moderator analyses use 20 through 274 studies and 20 through 321 effect sizes. In fact, only the studies from Günther et al. (2012) and Endrikat et al. (2014) seem to have a representative sample of primary studies as needed for a serious meta-analysis. Even if representative results would also be theoretically possible with a smaller number of primary studies, the serious threat of a potential publication bias is rarely addressed in the reviewed meta-analysis. Already this could be a considerable reason why e.g. Horváthová (2010, p. 55) finds several of the results "surprising" and "unexpected". Half of the reviewed works ignore grey literature in their analyses although the value of its additional information can only be estimated after the integration.

The methodologies for aggregating empirical findings are in general limited to simple qualitative literature reviews, vote counting techniques, univariate meta-analyses and subgroup analyses. According to Borenstein et al. (2009) and Hedges and Olkin (1985), beside the high subjectivity of qualitative reviews, the disadvantages of vote counting are the equal weighting of results, the solely consideration of the direction of the effect, and the decreasing power for large samples of primary studies. Thus, Bushman and Wang (2009) conclude that vote counting should at least be combined with a more sophisticated meta-analytical technique if possible. In the same manner, there are also several critical points concerning the other univariate approaches. Beside the overestimating manner of univariate meta-analyses, Bender et al. (2008, p. 861) show that also subgroup analyses can lead to a heavily biased estimates and misleading results caused by the ignorance of dependencies. Horváthová (2010, p. 52) states that omitted factors are responsible for a bias in the initial results of the primary studies already. By applying a more advanced ordered probit model in the sense of a meta-regression, the study from Horváthová (2010) is an exception. The categorical variable for the relation between CEP and CFP equals "-1" for significant negative, "0" for insignificant, and "1" for significant positive findings. However, the identical and fixed scale for positive and negative outcomes induces a huge bias by focusing on the direction of the effect instead of the magnitude in analogy to the vote counting procedure. In addition, heteroskedasticity, between-study variability, as well as the employment of known error terms as common in MRA are not considered properly. As Stanley and Doucouliagos (2012, p. 24) note further, using Pearson correlation coefficient as effect size might draw a completely false picture as it contains also spurious effects compared to partial correlation coefficients. Nevertheless, it is the most common effect sizes used in the reviewed meta-analyses and in economics in general (Stanley and Doucouliagos 2012, p. 24).

Concerning the analyzed moderators the main focus is on technical differences of the variables of interest. Hence, only measurement differences, data characteristics, and estimation differences are considered as moderating factors of the relation between CEP and CFP. However, regional and geographical differences, publication characteristics, and control variables in the primary studies might affect their empirical results (Endrikat et al. 2014; Molina-Azorín et al. 2009; Horváthová 2010). The concentration on single moderators puts emphasis on a potential data mining bias in previous meta-analyses in the field of the CEP-CFP relationship (Doucouliagos and Ulubasoglu 2008, p. 70).

As summed up in the last column of **Fehler! Verweisquelle konnte nicht gefunden werden.**, previous moderator analyses coincide in finding a positive relation between CEP and CFP. However, the findings concerning moderating factors are inconsistent. There is an agreement about the fact, that the analyzed measurement differences, data characteristics and estimation differences affect the CEP-CFP relation but the studies contradict in terms of the direction of the moderation effects Therefore, it can be concluded, that the different statistical analyses in previous meta-analyses do not lead to robust results.

Overall, the existing meta-analytical literature investigating the moderating effect on the CEP-CFP relation suffers from several downsides which are addressed by the study at hand. First, the study uses a comprehensive sample of primary studies, effect sizes respectively, incorporating grey literature explicitly to avoid publication bias. Second, conducting an appropriately modeled meta-regression analysis satisfies the needs of the underlying data structure considering heteroskedasticity and random-effects. Following a general-to-specific approach for fitting the meta-regression analysis additionally avoids data mining bias by employing all potentially relevant moderator variables. In the end, this study constitutes the most comprehensive moderator analysis resolving the CEP-CFP conflict so far.

3 Theory of the CEP-CFP conflict and its moderators

In contrast to the understanding of CEP and CFP, the theoretical background of the CEP-CFP relation is mixed. Therein, Günther et al. (2012, p. 280) define CEP as “the absolute performance of a firm with regard to the environment, i.e. its environmental impact” and CFP as “the result of a company’s activities regarding its targets: liquidity, profit and strategic profit potential”. However, for the causality of the relation three forms are plausible: CEP influences CFP, CFP affects CEP, and a bidirectional relation. Additionally, literature is inconsistent about the sign of the relationship which may either be negative, neutral or positive. Hence, in general this paper follows the structure applied

by Preston and O'Bannon (1997) and Waddock and Graves (1997) for the categorization of the existing theoretical constructs as shown in Table 2. In theoretical literature CEP is not treated separately from the broader term CSP including CEP although environmental performance has a biophysical nature (Salzmann et al. 2005, p. 28). Rather, literature states the validity of the underlying hypothesis for both artefacts (Endrikat et al. 2014, p. 736). There are also reasons for the fact, that not only the extend of environmental performance, but also the kind of environmental management determines the economic residual (Schaltegger and Synnestvedt 2002 p. 339). However, these thoughts are not incorporated in the theoretical frameworks yet. After discussing the different theoretical artefacts in this section as presented in theoretical literature, the moderator variables which might affect the focal relationship are derived from literature leading to the hypotheses that are tested in the empirical analysis.

Insert Table 2 about here

3.1 CEP influences CFP

The most antiquated argumentation for the potential impact of CEP on CFP is known as tradeoff hypothesis, traditionalist or neoclassical view respectively, and can be traced back to Levitt (1958). The representatives of this theory state that CEP has a negative influence on CFP. Accordingly, environmental engagement requires financial investments from the firm which are not compensated by the financial returns from the environmental activities. As financial returns constitute the primary goal of a firm as stated by Levitt (1958, p. 49), CEP stands in a competing relation with CFP. Bragdon and Marlin (1972, p. 9) point out that there is only a choice between investing either in a profitable or a responsible firm. Thus, environmental activities are often denoted as philanthropy in conjunction with short-term shareholder value maximization. Friedman (1970, p. 32) argues that social responsibility including environmental engagement cannot be transferred to business as business as a whole cannot have responsibilities, whereas increasing profits is the social responsibility of business. The additional focus on social goal would result in a weaker productivity through divided leaders' interests which then again leads to inadequately achieved social goal (Davis 1973, p. 319). Friedman (1970, p. 32) further categorizes environmental engagements as an agency problem: Managers pass on their private social, political, and career intentions on shareholders.

The theoretical framework modeling CFP independently of CEP and vice-versa is developed by McWilliams and Siegel (2001) called the supply and demand model. Their analysis reveals the existence of an optimal investment in environmental issues

determined by cost-benefit analyses as confirmed by Elsayed and Paton (2005). Thus, the decision for environmental investments should be based on the same principles as any other investment (Barnett 2007, p. 813; McWilliams and Siegel 2001, p. 125). This leads to a synthesis of interests: the claims of stakeholders like customers, employees, and community for environmental responsibility are considered as well as the maximization of profitability demanded by shareholders (McWilliams and Siegel 2001, p. 125). However, firms following this approach are not more profitable than those, who do not invest in environmental activities. As soon as one firm has a higher return on investment, the competing company would change its product strategy (McWilliams and Siegel 2001, p. 125). This means that there is a neutral relation between CEP and CFP. The same reasoning is supported by the remarks particularly formed by Ullman (1985) which is confirmed by Scholtens and Zhou (2008). He states that in view of numerous influencing factors there is only the possibility of a negative or positive relation by chance. A justifiable relation however is not expectable. Additionally, the existing difficulties in measurement of the underlying constructs do not allow a serious conclusion on the linkage between CEP and CFP.

The assumption of a positive relation is based on the resource-based view (RBV) proposed by Wernerfelt (1984) and Barney (1991). Summarizing the theory until today in a life cycle, Barney et al. (2011) state that this is one of the most prominent theory in understanding organizations. Correspondingly, the strategic advantages of a firm can be reduced to the access to strategically valuable resources in a firm's individual resource bundle on the one hand, e.g. containing management skills, business processes, routines or knowledge as well as a superior utilization of the available resources on the other hand (Barney et al. 2011, p. 1300). Thus, the resources of a firm have to be hard to duplicate by its competitors and have to support a firm's core competences to create sustainable value (Prahalad and Hamel 1990, p. 84, Ulrich and Lake 1991, p. 82). This is in accordance with the opinion of Penrose (1959) who states that the quality of internal resources justifies the resulting economic success. Kraaijenbrink et al. (2010) sum up the critiques to this theoretical approach gathered in twenty years of research. As a weakness of the RBV, Tushman and Anderson (1986, p. 442) as well as Kraaijenbrink et al. (2010, p. 353) postulate that in consideration with technological developments and changes in the environment the concentration on core competences is paralyzing. In the recent past, the natural environment was added to the RBV leading to the natural resource-based view (NRBV) which is also known as Porter hypothesis (Porter and van der Linde 1995). Hart (1995) was the first who notes the neglect of the natural environment in the initial concept. The competitive advantage of a firm is directly linked to its dealing with the natural environment as responsible behavior enables a firm to gather further capabilities

and new resources like knowledge or corporate culture (Branco and Rodrigues 2006, p. 111). Irreversible damage to the nature due to inevitable developments, e.g. the effects of the rapid growth of the world population, can only be avoided by creating new corporate strategies having the enormous scale and scope of human activities in mind. In the near future competitive advantage will be driven by "waste minimization, green product design, and technology cooperation in the developing world" (Hart 1995, p. 991). The statement concerning the value-adding property of the NRBV is already empirically confirmed by Chan (2005, p. 657) and Russo and Fouts (1997, p. 534) among others, especially in the case of a proactive responsiveness (Sharma and Vredenburg 1998, p. 729). The creation of firm value is summed up in three strategic capabilities: pollution prevention, product stewardship, and sustainable development (Hart 1995, p. 991). As supported by Porter and van der Linde (1995, p. 122), pollution prevention is able to realize cost advantages in production and operations by reducing the number of control devices and leads to an increasing productivity and efficiency (Hart and Ahuja 1996, pp. 30-31). The involved employees also benefit from skill development for the improvements which means a further inimitable resource for the firm. Whereas product stewardship refers to carrying the "green" idea into the product itself that should have a minimized environmental impact over its life-cycle, including its components, the product-in-use as well as the way of recycling (Hart 1995, p. 994). The differentiation with green products as an early mover advantage as well as enhanced reputation may lead to competitive advantages as well (Hart 1995, p. 996). This includes the fact, that product stewardship implying the consideration of external perspectives fosters the integration of stakeholders as a valuable capability of the firm. Besides, a sustainable development strategy also requires a long-term vision which leads to an easier labor recruiting, reduced crime, turnover, and absenteeism as well as lower taxes and a higher quality (Davis 1973, p. 313). Davis (1973) sees social responsibility as an extension of the long-run profit maximization meaning a better community and better society. The long term vision also includes the integration of developing countries summed up in the third term sustainable development as the western world is already shrinking. This leads to competitive advantages in the future by reducing the environmental impacts in those countries and create long-term relations with the majority of the global population. This is however only possible by developing sustainable technologies that do not destroy the earth's atmosphere when they are applied in the quantum as needed in the third world (Schmidheiny 1992, p. 38). In the last years literature splits the term sustainable development into clean technology and base of the pyramid (Hart and Dowell 2011, p. 1470). Referring to Hart and Dowell (2011), this means that firms are able to enter new markets by offering technologies that satisfy customer needs without straining the

planet's resources on the one hand. On the other hand, companies may consider the reduction of the poverty for the poorest of the world by preferring cooperation with the base of the pyramid opposite to supplying low-cost products. Overall, the impact of CEP on CFP resulting in competitive advantages for a firm is multidimensional as pointed out above (Barney 1991, p. 110; Hart 1995, p. 998).

The assumption of a positive impact of CEP on CFP is supported by the instrumental stakeholder theory**,** good management theory respectively, which is supported by the legitimacy theory (Donaldson and Preston 1995; Davis 1973; Jones 1995, Orlitzky et al. 2003). Gray et al. (1995) confirm the supporting concepts. According to the instrumental stakeholder theory initiated by Freeman (1984), each firm is surrounded by network of expectations from contractual relationships, e.g. suppliers, employees or customers. Managing these stakeholder interests enables increasing profitability, stability, and growth (Damak-Ayadi and Pesqueux 2005, p. 10). As Jones (1995, p. 432) points out, trusting and cooperative behavior solves problems related to opportunistic behavior. Since environmental engagement can be seen as an effort to meet these stakeholder expectations, a firm has to meet these requirements to achieve financial advantages although the behavior seems to be economically irrational or altruistic (Buysse and Verbeke 2003, p. 453, Jones 1995, p. 432). In this context, a firm is also able to achieve several competitive advantages. As confirmed by Kassinis und Soteriou (2005), these may be summed up in increased reputation, enhanced customer and supplier loyalty, and increased employee satisfaction. They lead to intangible but valuable assets of the firm as well as long-term relationships with its key stakeholders (Hillman and Keim 2001, p. 126). Likewise, firms can benefit from an stakeholder integration itself, rather than it is only a result of product stewardship, as an instrument of proactive firms to reduce waste and launch energy conservation programs (Sharma and Vredenburg 1998, p. 735). A responsible dealing with the natural environment as well as a legally operating business which is claimed by the legitimacy theory, increases customer's willingness to pay a markup (Hart and Dowell 2011, p. 1465). Orlitzky and Benjamin (2001, p. 384) find out that an additional result is also a lower market risk as well as lower cost of capital as confirmed by Ambec and Lanoie (2008, p. 56). As shown by McGuire et al. (1988, p. 856), bankers, investors, and government officials reward a responsible behavior which results in an improved access to sources of capital.

In this context literature also often refers to the social impact hypothesis which is based on the instrumental stakeholder theory and is coined by Latané (1981). As summed up by Cornell and Shapiro (1987, p. 6), a firm not only has to meet explicit expectations of stakeholders as shown above, but also implicit expectations like quality service or social responsibility. If they are not fulfilled, these firms may be faced with additional more

costly explicit agreements in future, e.g. as parties like the government have to pass more stringent rules to achieve a more social behavior. In the contrary, social responsible firms have more low-cost implicit claims which results in a higher financial performance (McGuire et al. 1988, p. 856). Hence, social responsibility is a means to retain freedom in decision making (Davis 1973, p. 314). The implicit claims also have a decisive role when there is a chance of bankruptcy. So, if a firm in addition tries to serve the implicit claims, the enhancing reputation has a positive impact on the financial performance by lowering a firm's risk premium (Miles and Covin 2000, p. 301; Preston and O'Bannon 1997, p. 421).

3.2 CFP influences CEP

Another important strand of theoretical literature deals with the opposite direction of the causal relationship which assumes that CFP influences CEP. Literature provides the managerial opportunism hypothesis which states a negative relation (Preston and O'Bannon 1997, p. 423). The theory is grounded on the assumption that managers follow their own private targets in their daily business which is however not in the interest of the shareholders and stakeholders (Weidenbaum and Vogt 1987, p. 158). Further, this circumstance directly leads to inefficiencies of the operating firm (Weidenbaum and Vogt 1987, p. 158). Twenty years ago, empirical data supported the theory as most managers followed their own interest in corporate decision making neglecting the interests of other stakeholder (Posner and Schmidt 1992, Alkhafaji 1989). This was the consequence of wages linked to short-term profits and stock prices (Preston and O'Bannon 1997, p. 423). Thus, especially when a firm performs well, managers tend to increase their own income by reducing environmental investments. On the other hand, managers want to compensate their disappointment or even justify bad corporate performance by expanding a firm's environmental expenditure (Preston and O'Bannon 1997, p. 424). However, this situation is a subject of change: Posner (2009, p. 460) shows in his thirty years comparison, that the dramatic picture is gradually turning around and the values of other stakeholders gain in importance. One reason may be the fact that salary payments of managers are linked to the long-term performance in more and more firms as well as an altered stakeholder awareness oriented on sustainability today. Latter has an increasing importance in a world of dictating investors' capital market expectations.

For the second theory, there are the representatives of the slack resources theory which suggests a positive impact of CFP on CEP. It is also often named as available funding hypothesis which goes back to the work of March and Simon (1958). As already empirically confirmed (among others McGuire et al. 1988, p. 868; Melo 2013, p. 257; Waddock and Graves 1997, p. 312), good financial performance making slack resources available enables firms to invest in environmental programs (Kraft and Hage 1990, p. 11).

In analogy to the proactive manner in section 3.1, investing in environmental activities is connected with enhancing internal resources, capabilities and comparative advantages of the firm as well as possibilities for differentiation by innovative and eco-friendly developments (Bourgeois 1981, p. 31). Hence, reactive investing also allows firms to adapt to their external environment for a long-term profitability as empirically confirmed by Hull and Rothenberg (2008, p. 786). This chain of thought is carried on by Bowman and Haire (1975) who initially proposed the relation between CFP and CEP to be formed as an inverted U-shaped relationship. According to their view, there is a positive relation between CFP and CEP until maximum of benefits is reached as marginal costs for environmental investments increase in the same manner as marginal benefits decrease (Lankoski 2000, pp. 541-542, Wagner 2001, p. 8).

3.3 Bidirectional relationship between CEP and CFP

In addition to the two previously mentioned manifestations of the causality between CEP and CFP, Waddock and Graves (1997) reconciled these two views proposing a third one. According to their remarks, CEP simultaneously constitutes the independent and dependent variable resulting in a virtuous circle (Waddock and Graves 1997, p. 307). Surroca et al. (2010, p. 464) argue, that a firm enhances their intangible assets by investing in environmental programs. This leads to financial benefits that have to be reinvested in intangible assets for a further improvement of CEP. Thus, this hypothesis is a synthesis of the NRBV and the slack resources hypothesis. In addition, Surroca et al. (2010) consider that intangible assets take a mediating role in the relation between CEP and CFP standing for an indirect relationship between the two constructs. This is in line with the opinion of Preston and O'Bannon (1997, p. 424) who suspect that the temporal interaction is not detectable in the available statistical data.

3.4 Derivation of relevant moderators

There are reasons to believe that the domination of a certain effect between CEP and CFP as presented in the previous section does not happen randomly in an empirical analysis. In reality, numerous factors influence the relationship leading to study specific CEP-CFP relation. In this section, the potential moderators are put in the context of the relation between CEP and CFP. They can be grouped as (1) measurement differences, (2) publication characteristics, (3) data characteristics, (4) regional differences, (5) industrial differences, (6) control variables, and (7) estimation differences.

(1) Measurement Differences

As already meta-analytically analyzed by Endrikat et al. (2014), measurement differences of CEP and CFP do significantly influence the empirical findings. The multi-dimensionality has also already been stated several times before (among others Endrikat et al. 2014; Griffin and Mahon 1997; Ilinitch et al. 1998). Especially for CEP, there is a broad range of operationalizations observable in research. The proxies in empirical literature encompass e.g. the extent of pollution prevention as used by Berrone and Gomez-Mejia (2009), the amount of toxic releases or greenhouse gas emissions (Day et al. 1997, Delmas and Nairn-Birch 2011), the certifications of implemented environmental management systems like in the paper by Heras-Saizarbitoria et al. (2011) or environmental ratings, rankings respectively (Inoue and Lee 2010). To reach taxonomy in the confusion of CEP measurement, the proxy variables are categorized based on their strategic level, quantifiability respectively, which is in line with management literature (among others Ginsberg 1988, Miller and Friesen 1983, Trumpp et al. (2015). Therein, "process-based" measures refer to CEP on a management or process level. These include management practices, environmental policies or environmental innovation. On the other hand, "outcome-based" measures try to quantify the real impacts of these efforts by measuring the amount of emissions, the ratio of recycled to total waste or energy consumption. Busch and Hoffmann (2011) as well as Delmas et al. (2013) provide evidence for different effects of process-based and outcome-based measures on CFP.

For the latter, there is also a variety of measures available, however not as diversified as for CEP. Literature is in general separated in "market-based" and "accounting-based" variables measuring the financial situation of a firm (Günther et al. 2012). Accordingly, Tobin's Q, stock return or market value of a firm belong to the category of market-based measures. Accounting-based measures cover return on assets, return on equity or return on sales. The distinctive characteristics can be summed up as the forward-looking properties of market-based measures taking intangible and future values of environmental efforts into account as well as the backward-looking properties of accounting-based measures considering tangible costs and revenues induced by environmental activities. As the results from Delmas and Nairn-Birch (2011) let assume, the relation between CEP and the two measurement categories of CFP differ in terms of direction which justifies this classification as employed by former meta-analysis (among others Bausch and Pils 2009, Lee and Madhavan 2010).

The starting points of corporate environmental activities can either be clustered in "proactive" and "reactive" efforts (Hart 1995; Henriques and Sadorsky 1999, Walls et al. 2011). Reactive efforts summarize the handling of environmental pollution at the place where it occurs (Walls et al. 2011, p. 73). Typically, this means installing "end-of-pipe solutions" like air filters or water clearers which are often used to comply with

regulations and laws and do not alter the initial industrial process (Yamaguchi 2008, p. 2516). Thus, firms aim at minimizing costs, risks and liabilities (Roome 1992). On the contrary, a proactive solution aims at preventing environmental pollution through building on special capabilities and combinations of resources of the firm like the implementation of environmental management systems or environmental innovation and product design (Walls et al. 2011 p.74). Walls et al. (2011) also reveal the differing nature of the interaction of proactive and reactive environmental activities with CFP.

Hypothesis 1: Measurement differences mediate the relation between CEP and CFP.

(2) Publication Characteristics

A further group of moderating factors correspond to study-specific characteristics and study quality especially. These are typically included in MRAs as they in general explain a substantial part of between-study variation of empirical results (Doucouliagos and Ulubasoglu 2008, Stanley et al. 2013). First, the number of authors is an indicator of available knowledge incorporated in the study. This variable captures several aspects: (1) The probability of an author having published in a related field of research, (2) the probability of having received feedback from a colleague, and (3) the contribution of an author providing extra statistical knowledge to yield more significant results. Additionally, the number of citations takes study-specific quality characteristics as well as the prominence of the publishing medium into account. Thus, it is a complement to the standard error of the effect size in measuring study quality (Stanley and Doucouliagos 2012, p. 34). In comparison to the journal impact factor the number of citation is available for all studies. The number of authors as well as the number of citations explicitly also refer to a crucial aspect in meta-analysis known as publication bias (Rosenthal 1979). The number of authors is one possibility to explain the achievement and the claim to publish significant outcomes. The number of citations covers potentially more significant results published in high-quality journals.

Hypothesis 2: Publication characteristics moderate the relation between CEP and CFP.

(3) Data Characteristics

The study additionally controls for certain data characteristics which are typical in a MRA as noted by Stanley and Doucouliagos (2012, pp. 20-21). In general, they are meant to explain a serious part of the heterogeneity among the effect sizes. The mean year of data is integrated in the analysis which refers to the potential existence of time trends or path dependencies as already applied by Stanley and Jarrel (1998) or Görg and Strobl (2001). The analysis by Günster et al. (2005) confirms a change in the CEP-CFP relation over time. Following recent MRAs by Havránek et al. (2013) and Doucouliagos and

Ulubasoglu (2008) the number of firms, the length of the observation period, the number of countries, and the number of industries is added to the analysis. The sample size and the length of the observation period refer to the precision of the effect size and to the distinction between short- and long-term effects (Stanley et al. 2013, Inoue and Lee 2011). As pointed out by Griffin and Mahon (1997), the differences in the effect gradually blur by the increasing number of simultaneously analyzed countries and industries. This circumstance is covered by measuring the absolute numbers.

Hypothesis 3: Data characteristics moderate the relation between CEP and CFP.

(4) Regional Differences

Recently, Yang et al. (2011, p. 257) as well as Sotorrio and Sánchez (2008, p. 379) state that regional differences heavily influence the effectiveness and profitability of environmental practices. Regional differences cover economic, social, legal and political surroundings (Dixon-Fowler et al. 2012, p. 356). Thus, the discrepancies appear across different geographical zones as well as across different economic situations. Hence, observation variables for Asia, EU, Africa, as well as the US are employed in the MRA. Sotorrio and Sánchez (2008, p. 386) reveal e.g. that in the EU the aim of achieving better financial performance by better environmental responsibility is much higher compared to the US. Furthermore, the grouping by economic situation ranges from developing countries (DVLP), over emerging economies (BRICS) through leading industrialized nations (G8). As stated by Yang et al. (2013, p. 257) the environmental performance has a significant positive impact on financial performance in developed countries compared to an insignificant impact in developing countries.

Hypothesis 4: Regional differences moderate the relation between CEP and CFP.

(5) Industrial Differences

Shetty (1979) already observed that several researchers found a dependency between the level of environmental responsibility and industry-level differences. A huge part of literature explicitly refers to the manufacturing industry (among others Iwata and Okada 2011, Kind and Lenox 2002, Kock et al. 2012, Ragothaman and Carr 2008, Tatsuo 2010, Wagner 2005). As a counterpart, there is a stronger focus on the relation between CEP and CFP of service firms according to the literature review by Goyal et al. (2013, p. 370). Hence, corresponding dummy variables are investigated in the analysis. As stated by De Villiers et al. (2011, p. 1650) firms in environmentally sensitive industries, dirty industries respectively, are able to deal with environmental pollution more effectively. Hence, a variable indicating if a study analyzes firms from the two-digit SIC-codes below 50 is investigated in the analysis. Additionally, Yang et al. (2011, p. 257) show that there

are substantial differences concerning firm size. Large firms may have more resources which favor research and development or new technologies (Dixon-Fowler et al. 2012, p. 356). For this reason, a variable grouping the samples of underlying primary studies in small and large firms is added to the MRA.

Hypothesis 5: Industrial differences moderate the relation between CEP and CFP.

(6) Control Variables

A special capability of MRA is the correction of the initial estimates for model specification errors (Stanley and Doucouliagos 2012, p. 21). Hence, the relevant control variables used in primary studies are integrated in the MRA model as dummy variables. They consider indirect effects and biases of the original model. Consequently, the meta-regression model accounts for research and development expenditure, advertising intensity, capital intensity, financial risk, sales growth, firm size, and industry dummy variables which are related to CEP as well as CFP.

Hypothesis 6: Integrated control variables moderate the relation between CEP and CFP.

(7) Estimation Differences

The choice of the estimation model in a primary study fundamentally determines the magnitude of the findings. Simple regression techniques tend to bias the particular effect (Horváthová 2010) as e.g. the error terms are wrongly estimated or heterogeneity are ignored. In order to pay tribute to these potential moderating effects, the MRA at hand incorporates the application of simple regression approaches as well as the consideration of fixed- and random effects. As discussed in the previous part of chapter 3, the consideration of the endogeneity problem between CEP and CFP is a critical issue. Especially, the bidirectional effect is responsible for this shortcoming. Primary studies often solve this issue by using lagged variables (Konar and Cohen 2001, Cohen et al. 1997, Austin et al. 1999). Hence, the empirical analysis controls for the potential integration of this methodological artifact in the primary study.

Hypothesis 7: Estimation differences moderate the relation between CEP and CFP.

4 Data management

In general, the sample of primary studies analyzing the relation between CEP and CFP in this work consists of two parts, the sample of Endrikat et al. (2014) on the one hand containing studies from 1978 through 2012 and the complement part for the date range

from 2012 through 2015 on the other hand which is derived through a manual literature search. In sum, 26 additional studies are identified.

Looking at the review of existing related literature in chapter 2, the study from Endrikat et al. (2014) provides a very comprehensive sample of empirical primary studies, especially in comparison to the other quantitative literature reviews. Comparing their search protocol for empirical primary studies with the recommendations from relevant and current literature (among others Borenstein et al. 2009, Stanley and Doucouliagos 2012), the yielded sample can be judged as comprehensive and reliable as the major issues to be aware of are addressed. The duplication strategy of the corresponding sample of Endrikat et al. (2014) leads to a total of 147 primary studies. The remaining two publications are not available[1]. As the latest study in the sample of Endrikat et al. (2014) is from 2012, the remaining date range from January 1, 2012 until June 30, 2015 is complemented by duplicating the search strategy for this period. The corresponding database search was conducted on June 30, 2015 and is summed up in Table 3. For published literature the following databases are checked: "ABI/Inform Complete" (via "ProQuest"), "Business Source Premier", "EconLit", "GreenFILE" (via "EBSCOhost"), and "ScienceDirect". As search command Endrikat et al. (2014, p. 742) use a combination of keywords covering the three relevant components to reach meaningful results: (1) CEP by "social* or environment* or green or pollut*", (2) CFP by "firm or compan* or business or corporat* or financ* or economic* or value or performance or pay or market or return*" as well as the need for an (3) empirical investigation of the relastion by "empirical or statistical or test or analy* or relation* or survey*". Studying the titles of the 147 studies from Endrikat et al. (2014) uncovers three further relevant expressions that are consequently added to the first part of the search command: "ISO or emission or emit*". The complete term is searched in the title only. The finally applied search command is given in the second row of Table 3 for each database. At this point, the paper explicitly addresses one major threat to meta-analysis, well-known as publication bias. As the real value of grey literature can only be detected after the integration as stated by the "information paradox", this study incorporates unpublished studies by searching through the "SSRN" database. The critical issues of low quality and low information content will be picked up in the analysis by using a moderator for study quality and conducting a corresponding sensitivity analysis. Starting the search procedure for the period between January 1, 2012 and June 30, 2015 leads to a total of 845 results over all databases. After screening the titles, 49 potentially relevant publications remain.

Insert Table 3 about here

[1] Montabon et al. (2002) as well as Vafeas and Nikolaou (2001)

To ensure the replicability by the reader, the applied inclusion and exclusion criteria for the separation of relevant studies from irrelevant ones are summarized hereafter. These can be categorized in requirements concerning (1) effect measurement, (2) methodology, and (3) data. The first category means that the study has to measure the relation between CEP and CFP. Studies using disclosure data as a proxy for CEP are excluded from the calculation due to the inconsistent behavior in comparison to other measures (among others Hughes et al. 2001, Patten 2002). The second category combines the requirements for an empirical and multivariate analysis of the relation between CEP and CFP. Event studies are excluded from the analysis as well as results from probit and logit models. This is due to the fact that the analysis in this work has to be based on results from comparable analyses in the same scale and the majority of effect sizes represent continuous effects (Stanley and Doucouliagos 2012, pp. 15-16). The third category sums up the necessary data for the calculation of effect sizes. Therefore, the regression coefficient, the corresponding standard error, and the sample size have to be given or at least be reproducible. Applying the above mentioned criteria to the sample of Endrikat et al. (2014) and the studies from the literature search after the first iteration produces a sample of 116 studies remaining from Endrikat et al. (2014) and additional 14 studies from the conducted literature search. For a higher recall, the recommendations for related literature from the ScienceDirect database are screened in the same manner, which provides us 12 further studies after checking the content. All in all, the final sample consists of 142 primary studies from 1978 through 2015 listed in Appendix A. The study sample is checked for independency. Therefore, Hunter and Schmidt (2004) define equal datasets in studies from different authors or the same authors using different datasets as independent (Doucouliagos and Ulubasoglu 2008, p. 70).

The obtained 142 primary studies provide a total database of 893 effect size estimates that are based on 241,104 firm observations, 757,154 firm year observations respectively. As effect size the study uses the partial correlation r^2. This paper additionally uses the Fisher's *z*-transformed values as a robustness test. As typically not directly reported, there must be given at least enough information that allow a calculation of these parameters. The mathematical formulas for the calculation of the partial correlation as well as the *z*-transformed values with the corresponding standard error are presented in Table 4.

[2] Concerning the operationalizations of CEP in primary studies, the direction of its influence on the effect size not unique. E.g. CEP sometimes refers to the total amount of waste which has to be treated differently to the amount of reduced emissions. Hence, the sign of the effect size is unified across studies so that environmental consciousness always leads to a higher CEP.

Further computations include the transformation of test statistics in standard errors by $SE_\beta=\beta/t$ and the derivation of the test statistic from *p*-values[3] and degrees of freedom.

Insert Table 4 about here

For the explanation of moderating effects all potentially relevant variables are integrated in the analysis at the beginning of the analysis as shown in Table 5. Hence, in the same manner as Doucouliagos and Ulubasoglu (2008a, p. 70) a potential data mining bias as introduced in the previous section is avoided. The employed variables are classified as measurement differences, publication characteristics, data characteristics, regional differences, industrial differences, control variables and estimation. Detailed rules which are followed during the coding procedure for certain moderating variables are presented below.

Insert Table 5 about here
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5 Methodology of Meta-Regression Analysis (MRA)

Using the coded variables, the aim of this study is to reveal the major moderating factors of the relation between CEP and CFP measured by r_i. The existence of substantial heterogeneity among the effect sizes is confirmed by the Cochrane's Q test. For the corresponding aggregation of results a mixed-effects weighted least squares MRA is used in line with Carney et al. (2011), Doucouliagos and Ulubasoglu (2008b), Konstantopoulos (2011), Havránek et al. (2013), and Stanley and Doucouliagos (2012).

On the first level, a mixed-effects meta-regression model incorporates variation of the error term due to a particular sampling error in primary studies in addition to the fixed-effects variation modeled by the moderating variables. The sampling error of effect size r_i is estimated by the standard error $SE(r_i)$ assuming an unknown but fixed overall effect size so far. After performing the Breusch-Pagan test, the analysis accounts for heteroskedasticity by using the inverse sampling errors $1/SE(r_i)$ as weights (Stanley 2008). On the second level, random-effects variation in the form of a between-study variance τ^2 is included in the mixed-effects model (Konstantopoulos 2011, p. 62). This is motivated by Schaltegger and Synnestvedt (2002) who state that there are many more

[3] If the level of significance is only reproducible from asterisks, the corresponding upper limits are used as *p*-value (e.g. * = *0.01* and so on). For results without an asterisk *p=0.5* is used as named as one possibility by Stanley and Doucouliagos (2012, p. 31) for this case. This procedure leads to a consistently conservative coding, however introducing a little measurement error.

reasons within corporations that influence the relation between CEP and CFP. In the work at hand, the random-effects refer e.g. to variations of the effect due to unobserved effects on a firm-level like specific management quality which vary randomly among firms leading to a study-specific population mean effect size.

Looking at the analysis from a more technical point of view, according to Havránek et al. (2013) the fixed-effects weighted least squares approach on the first level corresponds to

$$\frac{\boldsymbol{r_{ij}}}{\boldsymbol{SE(r_i)}} = \boldsymbol{\beta_0}\left(\frac{\mathbf{1}}{\boldsymbol{SE(r_i)}}\right) + \boldsymbol{\beta_1}\left(\frac{\boldsymbol{SE(r_i)}}{\boldsymbol{SE(r_i)}}\right) + \sum_{\boldsymbol{k=1}}^{\boldsymbol{K}} \frac{\boldsymbol{\gamma_k Z_{ik}}}{\boldsymbol{SE(r_i)}} + \frac{\boldsymbol{\varepsilon_i}}{\boldsymbol{SE(r_i)}} =$$

$$= \mathbf{t_{ij}} = \boldsymbol{\beta_1} + \boldsymbol{\beta_0}\left(\frac{\mathbf{1}}{\boldsymbol{SE(r_{ij})}}\right) + \sum_{\boldsymbol{k=1}}^{\boldsymbol{K}} \frac{\boldsymbol{\gamma_k Z_{ijk}}}{\boldsymbol{SE(r_{ij})}} + \boldsymbol{\nu_{ij}}, \qquad (1)$$

where SE(r_i) is the standard error of the effect size r_i, t_i is the *t*-statistic of the regression coefficient extracted from primary studies, and *Z* corresponds to the set of *K* moderating variables. v_i denotes the weighted disturbances. In order to test and correct for a potential publication bias which also tested in the univariate case by Egger's regression test, SE(r_i) is standardly incorporated in the analysis as a separate variable. This captures the crucial relation between the effect size and its standard error as pointed out in section **Fehler! Verweisquelle konnte nicht gefunden werden.**. Thus, the coefficient of β_1 measures a potential publication bias in the form of a funnel-asymmetry test. The coefficient of β_0 measures the overall mean effect in terms of a precision-effect test.

At the second level, random-effects are added to the equation (1) following Konstantopoulos (2011, p. 63) leading to

$$\mathbf{t_i} = \boldsymbol{\beta_1} + \boldsymbol{\beta_0}\left(\frac{\mathbf{1}}{\boldsymbol{SE(r_i)}}\right) + \sum_{\boldsymbol{k=1}}^{\boldsymbol{K}} \frac{\boldsymbol{\gamma_k Z_{ik}}}{\boldsymbol{SE(r_i)}} + \boldsymbol{\eta_i} + \boldsymbol{\nu_i}, \qquad (2)$$

where η_i represents the residual random-effects not covered by the moderating factors. Hence, the effect size *i* varies because of differing samples measured by SE(r_i) as well as random-effects measured by τ^2 leading to specific population parameters around the overall mean. According to the recommendations from Thompson and Sharpe (1999), the restricted maximum-likelihood (REML) estimator is the most appropriate choice for the calculation of τ^2 in a weighted regression. Hence, τ^2 is estimated by the following iterative scheme

$$\tau^2 = \frac{\sum_{i=1}^{N} w_i^{*2} \left[\left(\frac{k}{k-2} \right) \left(y_i - \hat{\alpha} - \hat{\beta} x_i \right)^2 - SE(r_i) \right]}{\sum_{i=1}^{N} w_i^{*2}}. \quad (3)$$

For a robustness test the maximum-likelihood (ML) estimator as well as the Bayes (BE) estimator are applied. This is due to the fact that the first tends to underestimate the between-study variance. On the contrary, the BE estimator yields larger estimates than the ML methods (Thompson and Sharp 1999, p. 2705).

6 Empirical results

6.1 Descriptive statistics

The sample of primary studies incorporated in this study consists of 142 studies. 12 of them are working papers which are not published yet. One analysis is part of a book. The remaining studies are from peer reviewed journals. Appendix B gives a detailed overview of the journals where the primary studies are published. The first study is from 1978, the latest from 2015. The exact numbers of studies per year are shown in Appendix C. The overview reveals a clear increase since 2000. 893 effect sizes are drawn from the 142 primary studies. 613 effect sizes show a positive sign, 280 are negative. 270 effect sizes are significantly positive and 52 are significantly negative at the 95% level. According to the vote counting, an overall neutral relation between CEP and CFP is obvious as the insignificant effect sizes prevail.

Figure 1 shows the chronological development of the CEP-CFP relation. The mean year of data refers to the average year from which the firm data in primary studies are drawn from. The mean effect size *r* is the simple mean of the year-dependent effect sizes. As presented by the dashed line, the peak of the financial profitability of CEP is around 1994. Until today the effect between CEP and CFP gradually declines. The overall maximum was in 1991 with a mean effect size of more than 0.2, the overall minimum in 2010 with a mean effect size of less than -0.15. This development could be explained with the growing demand of environmentally responsible behavior in the 1990s. The positive change of the development at the beginning of the 1990 could be traced back to the Brundtland report "Our Common Future" from the United Nations which coined the expression "sustainable development" (Brundtland 1987; Kopfmüller et al. 2007). However, the decrease of the effect since 2000 may be reasoned by a declining marginal utility of green investments and higher standards.

Insert Figure 1 about here

As common in meta-analysis, the funnel plot as shown in Figure 2 is investigated further. Therein, the effect size *r* is plotted in respect to its precision 1/SE(*r*). As assumed, the large effect sizes coincide with low precision. In line with an increasing precision, the effect size converges to a mean effect size. The bold line corresponds to the random-effects mean effect size as presented in the following chapter with a value of 0.073. This is clearly larger than zero, represented by the dashed line. Furthermore the funnel plot is useful for a graphical detection of a potential publication bias. A publication bias exists if the funnel plot is asymmetric. However, as it can be seen the single effect sizes constitute a typical funnel which demonstrates the absence of publication bias. Additionally, there are some outliers detectable represented by low precision and a large effect even larger than 0.5. To account for these outliers a sensitivity analysis is performed excluding these outliers from the sample. There are also some leverage points with high precision and a small effect. However, the distance to the remaining data is very small.

Insert Figure 2 about here

6.2 Univariate results

As a first statistical calculation a univariate meta-analysis is performed to achieve a first summary and overview of the underlying data. The corresponding results are given in Table 6.

Insert Table 6 about here

First, a fixed-effects mean effect size is calculated which leads to a statistically significant value of 0.068. The mean is based on inverse variance weighted effect sizes and includes no heterogeneity. Following Doucouliagos and Ulubasoglu (2008a) among others, the fixed-effects mean effect size assumes a common population mean effect size for all studies varying among studies due to a specific sampling error and systematic differences due to the research process. The existence of heterogeneity is tested by the Cochrane's Q test. With a statistically significant test statistic Q_{total} of 4852.160 the test rejects the null hypothesis of no heterogeneity. Looking at the values of $Q_{between}$ and Q_{within}, the amount of heterogeneity is evenly distributed between variation among study-specific means and variation within studies with respect to the study-specific means. This encourages the integration of study-specific moderators as well as effect size-specific moderators for the investigation of heterogeneity. The heterogeneity is integrated in the calculation of a

random-effects mean effect size by adding a further between-study variance to the denominator of the study weight. The new random-effects weights are given by $1/[SE(r) + \tau^2]$. The between-study variation is calculated by the method of moments estimator in the univariate case. In addition to the fixed-effects, the random-effects mean effect sizes incorporates random variation between studies whose source cannot be identified. This leads to a study-specific and overall normally distributed population mean effect size. The value of 0.073 with a test statistic of 14.045 confirms the existence of a positive relation between CEP and CFP. In the following of the results section, the heterogeneity is explored by employing several moderators which might by responsible for the variation among effect sizes. Hence, they are supposed to capture systematic differences between the effect sizes.

As a complement to the graphical investigation of the publication bias, the Egger's regression test is conducted which leads to more objective results. In detail, the test checks the funnel plot for a potential asymmetry. Table 6 shows the results stating a statistically insignificant test statistic. Thus, the null hypothesis of no publication bias cannot be rejected.

6.3 Meta-Regression Analysis (MRA)

The main results of the work at hand are derived from a MRA. This section provides an interpretation and compares them to previous meta-analytical findings from chapter 2. The results of the analysis are presented in Table 7. All models are based on a weighted least squares approach, as the Breusch-Pagan test confirms heteroskedasticity with a test statistic of 210.59 which is significant at any level. The first model refers to a fixed-effects weighted least squares MRA which includes all potential moderators. The second model replicates incorporating additional random-effects which are calculated by the REML estimator. Using Fisher's *z* as effect size, model 3 and 4 duplicate the first two models controlling for potential downsides of the partial correlation *r* as discussed in section **Fehler! Verweisquelle konnte nicht gefunden werden.**. The preferred results are given in the last column by model 5 with a R^2 of 0.27. This model only includes moderator variables which contribute to the explanation of the heterogeneity (Doucouliagos and Stanley 2009). Therefore, the model is fitted by the general-to-specific approach. This means, that the most insignificant variable is dropped from the full model sequentially until all remaining variables have a test statistic greater than 1. The effect size measuring the intensity of the CEP-CFP relation is the dependent variable in each MRA. All MRAs are based on a sample of 863 effect size estimates as for 30 effect sizes no information about regional moderators are available in primary studies.

Insert Table 7 about here

The intercept of the regression serves as a precision effect test. Hence, the preferred model 5 reveals a statistically significant positive relation between CEP and CFP with a value of 0.248. This is in line with the univariate results from the previous section. Further, the absence of publication bias is obvious by controlling the regression coefficient of the standard error of the effect size SE(ES). This is also consistent with the univariate findings. Thus, the MRA confirms the results from previous meta-analyses as discussed in chapter 2.

The remaining regression slopes refer to the moderator variables as introduced in section 4.2. The major conclusions are drawn from model 5 which are summarized in Table 8. The consistent und statistically significant findings can be summed up as follows.

Insert Table 8 about here
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(1) Measurement Differences

Among the measurement differences, two moderators are significantly related to the effect size. First, the CEP variable indicates that the effect between CEP and CFP is greater for outcome-based CEP measures. The value of the regression coefficient (-0.037) is clearly negative at the 99% level which speaks for the outcome-based CEP measure. Thus, it contradicts the result from Horváthová (2010, p. 55). The information of objective outcome-based CEP measures is more widely spread and available to investors and customers. Such measurable indices like emission ratios are e.g. often part of quarterly or annual reports. Process-based information serves especially for internal purposes. This seems to confirm that stakeholders value better CEP which prevails over cost savings due to lower material consumption of a firm. The latter coincides more with process-based information. Second, REACT has a regression slope of -0.108 which is significant at the 99.9% level. Hence, reactive environmental activities underperform in terms of profitability. This finding verifies the outcomes from Endrikat et al. (2014) and Murphy (2002). They are often only used to comply with emission limits. As described by the NRBV in section 3, proactive strategies coincide with new technologies and capabilities of employees of the firm. They contribute to the inimitability of a firm's resource bundle and lead to strategic advantages of the firm (Hart 1995). Additionally, stakeholders appreciate such behaviors and are willing to pay a markup for proactive actions. Compared to previous works by Albertini (2013) and Endrikat et al. (2014) we only find a contradicting weakly significant positive effect for the CFP variables at the

90% level. This result speaks for a larger effect size for studies using market-based CFP measures which is in line with the finding of Dixon-Fowler et al. (2013). Thus the future oriented market-based measures include the positive expectations from shareholders of better environmental performance.

(2) Publication Characteristics

The number of authors as a publication characteristic also explains a substantial part of the heterogeneity among the effect size estimates. The regression slope has a value of 0.039 and has a *p*-value below 0.001. This variable refers to two crucial issues in research: data mining bias as publication bias. The instance that larger research teams yield higher effect size indicate several problems. First, with a growing number of researchers, the claim of publishing in a high-quality journal raises. This motivates them to "construct" larger effect sizes. As the available knowledge grows, the statistical capabilities and background knowledge of the field of research provide more significant results.

(3) Data Characteristics

Data characteristics are also highly relevant to the explanation of varying effect sizes. First, MILLENIUM shows that the link between CEP and CFP was greater before 2000. This may be due to the fact that the marginal unit of investments in better environmental performance decreases. "Low hanging fruits" yield the best financial performance. Further, higher environmental standards lead to higher mandatory costs related to environmental activities. Investments which go beyond the standards are not as much financially rewarded anymore by the stakeholders. This trend is especially obvious in the 2010s as it can be seen in Figure 1 which dominates the result of the negative trend indicated by a regression coefficient of -0.277 which is statistically significant at the 99% level. Although, during the 2000s the link between CEP and CFP was still strong. Figure 1 shows that the 2000s is the only decade where all mean effect sizes are positive. This is statistically confirmed with a beta of 0.109 for this time period. In addition, multinational samples yield higher effect sizes than single country examinations measured by MLTNAT. This is represented by a coefficient of 0.131 and a *p*-value below 0.001 although Endrikat et al. (2014) come to the opposite result. At first glance, this seems a bit confusing. However, this result speaks for the reason, that international investigations are dominated by omitted factors in the regression analyses. So, the analysis confirms the finding of Horváthová (2010) that omitted factors have a huge impact on the CEP-CFP relation. Thus, several variations may be better modeled within single countries than across several countries e.g. due to the data availability. The picture remains for the number of sectors with a weakly significant regression slope of 0.041 for MLTSECT

which often coincides with international examinations in primary studies. This finding contradicts Endrikat et al (2014) who find single industry samples to have a larger effect size than international samples. The assumption that the effect size blurs with the increasing number of countries is verified by the NoCOUNT variable which has a statistically significant value of -0.010 (Berman et al. 1999. p. 502). Hence, the aggregation of several countries let the effect size decrease as highly varying effects are summarized. Regarding differences between longitudinal and non-longitudinal studies, Albertini (2013) and Horváthová (2010) come to different conclusions. However, the analysis in this work does not find a significant moderating effect for the length of the investigated time period. This means that long-term effects do not significantly differ from short-term effects.

(4) Regional Differences

As a further group of moderator variables regional differences are employed in the analysis. First, with a regression coefficient of 0.273 which is significant at the 99.9% level, the relation between CEP and CFP is significantly larger in developing countries. This is an indicator that the profitability of firms located in developing countries can be increased by investing in better CEP. As material costs play an important role, especially compared to personnel costs, there seem to be savings potential through environmental activities. The effect is be reinforced by the relatively low profitability in these countries. The higher effect may also be reasoned by environmental supplier development. International firms try to enhance their CEP by investing in suppliers located in developing countries. These free financial resources are then invested in lowering the environmental impact of the firm. Second, in BRICS countries the effect is much lower. With a highly significant beta of -0.212, the opposite effect is observed in BRICS countries than in developing countries. Reasons may be the higher profitability in these countries as well as the acceptance of worse CEP for the economic success. Third, the same picture exists in Asian countries, indicated by a highly significant ASIA variable with a coefficient of -0.164. As for ASIA the geographical scope is much larger than for BRICS, the effect is not as clear as for BRICS. Fourth, the US variable is a clear positive moderating effect for the CEP-CFP relation. This confirms that better CEP coincides with better CFP more in US countries than in the rest of the world. This may be a consequence of lower standards and more “low hanging fruits” accordingly but also high investments of slack resources in environmental activities. Finally, looking at the G8 countries and the EU, the analysis shows neither an under- nor an outperformance in these countries as the high standards and high expectations from stakeholders in general weaken the effect. Firms are forced to invest in better CEP due to regulations and stakeholder claims which

reduces the financial performance due to higher costs. Overall, this part of the analysis provides new insights as Horváthová (2010) only distinguishes between common law and civil law countries. The MRA confirms the findings from Albertini (2013) as well as Dixon-Fowler et al. (2013) than the CEP-CFP relation is stronger in the US.

(5) Industrial Differences

For industrial differences, only for service firms the analysis shows a negative effect with a highly significant regression slope of -0.081. This confirms that service firms invest less money in environmental improvements. As common in cleaner industries, the financial returns are smaller for service firms. The analysis does not unambiguously support the finding from Dixon-Fowler et al. (2013) that the CEP-CFP relation is greater for smaller firms.

(6) Control Variables

Regarding the control in primary studies, there is only one strong and robust effect. CAP with a significant regression coefficient of -0.088 confirms the relevance of this control variable for the investigation of the CEP-CFP relation. The negative effect shows, that capital intensity is positively related to the focal construct as it reduces the effect size in the initial regression in primary studies. This implies that better CEP coincides with, respectively is built on higher capital intensity. Further, the significantly negative sign of SIZE shows, that larger firms tend to invest more money in environmental activities. The negative sign again speaks for this positive relationship between the two artefacts.

(7) Estimation Differences

Among the moderator variables referring to estimation differences the MRA does not reveal a strong effect. The effect size estimates which come from analysis in primary studies that account for heterogeneity and endogeneity do not show a significantly different magnitude. Hence, the result is not in line with Endrikat et al. (2014) who found significantly smaller effect sizes if a study addresses endogeneity on average. Model 5 only reveals a weak moderating effect for simple estimation techniques. The regression coefficient with a value of 0.033 which is significant at the 10% level indicates a overestimation of the CEP-CFP relation for simple regression techniques. This result is in accordance with Horváthová (2010).

6.4 Robustness tests

All results from Table 7 are robust as confirmed by the corresponding robustness test. The results are presented in Table 9. In model 6 the ML estimator is employed, in model

7 the BE estimator respectively. This is due to the fact that the former tends to underestimate τ^2 and the BE estimator overestimates τ^2 (Thompson and Sharpe 1999). As pointed out by Thompson and Sharpe (1999) the appropriate modeling and estimation of the between-study variance τ^2 is a crucial issue in MRA. This means that the choice of the corresponding estimator influences the results. Due to this reason the ML (model 6) as well as the BE estimator (model 7) are employed, having no impact on the results. This is one reason for the validity of the results in this paper.

In addition to various between-study variance estimators, the MRA is performed using different subsamples of the effect sizes. To control for the influence of outliers, in model 8 largest and smallest 5% of effect sizes are excluded which provides evidence for the sensitivity of the results to these data. Model 9 follows the same strategy by excluding effect sizes from unpublished research. As identified in Figure 2, there are some outliers and leverage points in the sample which may have an influence on the results. However, results remain the same after excluding them in model 8. Especially in the context of publication bias, grey literature is an important issue. Hence, the results are checked for their sensitivity against the integration of unpublished works. Model 9 shows that the exclusion of grey literature does not affect the results.

Insert Table 9 about here
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7 Discussion and Limitations

The analyses in this paper are face with several challenges. First, as already mentioned in section **Fehler! Verweisquelle konnte nicht gefunden werden.** the search term is constructed in consideration of an appropriate balance between precision and recall. Although their sample is comprehensive, the database search could be also expanded by further databases. Further, the search is limited to English- and German-speaking studies. This might be the reason for a potential language bias which is however supposed to be small in economics (Rothstein and Hopewell 2009; Stanley and Doucouliagos 2012). In addition, the analysis in this work only considers studies using regression techniques. This limits the analysis to a part of the whole population of studies. As it results from the analysis by Endrikat et al. (2014) many studies analyze the CEP-CFP relation using univariate estimation techniques which are not included in the study at hand.

Second, for the choice and operationalization of moderator variables many paths are possible. On the one hand, the meta-analyst can employ a wide range of moderator variables. Further, the single moderators may be defined in many different ways. The

problems within a meta-analysis at this stage remain the same compared to a standard regression approach: multicollinerarity and overspecification (Greene 2011, pp. 129-131; Wooldridge 2012, p.88). To overcome these two downsides, the choice of moderators is based on their relevance for the CEP-CFP relation as shown in section 3.4. Due to the high correlation among different definitions of these moderators, the most important issue is to include the particular variable at all. An interesting aspect would also be the investigation of the moderators for the different causalities between CEP and CFP as introduced in section 3 and analyzed in primary studies by lagged variables. However, splitting the sample of effect sizes into corresponding subsamples does not allow a comparing analysis yet. Further, there may be even more relevant and observable moderators as incorporated in the analysis in this work. This is indicated by the value of R^2 (0.27) of the preferred model (5) facing a potential omitted variable bias. To be able to integrate more moderators, additional primary studies are needed that cover them. The overspecification is avoided by conducting the general-to-specific approach for the derivation of the main results.

Finally, a special topic for MRAs is data dependency when multiple estimates per study are integrated in the analysis (Stanley and Doucouliagos 2012, p. 36). There are several approaches available to solve this problem, e.g. fixed effects or random-effects multilevel and unbalanced panel models (Rosenberger and Loomis 2000; Bateman and Jones 2003). However, Stanley and Jarrell (1989) state that such dependencies are unlikely for MRAs in economics. In addition, several characteristics of the primary studies are integrated in the MRA by moderator variables which are related to this dependency in the data. Further data dependency may arise from authors publishing more than one study (author dependence) or researchers receiving direct feedback from colleagues (spatial dependence) as summed up by Stanley and Doucouliagos (2012, p. 36). So there are possibilities of within-study and between-study dependence. The latter is incorporated by coding several moderators that describe the different study samples as presented in the subsequent section. Within-study dependence does not play an important role in this study due to the following fact, that the outcomes from the same study are typically vary due to different specifications of CEP and CFP as shown above. These differences are again captured by the respective moderator variables.

8 Conclusion

Overall, this paper gives new important insights into the background of the CEP-CFP relation which are highly relevant for international management behavior today as well as current economic policy. Therefore, the heterogeneity is explored among 893 effect sizes

from 142 empirical primary studies based on 757,154 firm year observations. In this study a mixed-effects weighted least squares MRA is applied. The results confirm a clearly positive relation between CEP and CFP. In addition to previous moderator analyses (Albertini 2013; Dixon-Fowler et al. 2013; Endrikat et al. 2014; Günther et al. 2012, Horváthová 2010, Murphy 2002), this study reveals several significant moderating variables for the CEP-CFP relation. The positive interaction depends heavily on geographic location and economic performance of a country. Furthermore, the industry sector plays an important role. Besides, reactive environmental activities have a much lower impact on CFP. These findings should encourage decision-makers to invest in proactive environmental activities, however keeping the location and industry of a firm in mind. Finally, for economic policy the results imply that especially high-polluting countries have to create a setting that incentives firms to carry on investing in better CEP.

On a meta-level, the examination of the endogeneity between CEP and CFP in a multivariate framework would be appreciated in future research. As summarized in section 3 the causality of the two variables is not unique. However, this problem is hard to address in meta-analysis, as only secondary data is available for the included primary studies. Cheung and Chan (2005) present the "meta-analytic structural equation modeling" (MASEM) approach in their paper which would be a potential approach.

Table 1: Prior moderator analyses of the CEP-CFP relationship

Study code	Method	Number of studies	Number of effect sizes	Effect size	Gray literature	Date range	Analyzed moderators	Key findings
Albertini 2013	Univariate meta-analysis, subgroup analysis	52	205	Pearson correlation coefficient	Yes	1975-2011	- Industry sectors - Countries - Observation period - Measurement characteristics - Duration of the study	1) Overall positive relation between CEP and CFP 2) Measurement differences, regional differences and duration determine the relation: - Rest of the world > US/Canada > EU - Environmental management CEP > environmental disclosure CEP - Accounting based CFP > market-based CFP - Non-longitudinal studies > longitudinal studies
Dixon-Fowler et al. 2013	Univariate meta-analysis, subgroup analysis	39	202	Pearson correlation coefficient	No	1970-2009	- Measurement characteristics - Sample characteristics - Methodological issues - Industry type	1) Overall positive relation between CEP and CFP 2) Sample characteristics and measurement characteristics matter: - Small > large - US > rest of the world - Market-based CFP > accounting-based CFP
Endrikat et al. 2014	Univariate meta-analysis, subgroup analysis	149/117[1]	245/208[1]	Pearson correlation coefficient/ partial correlation	Yes	1970-2012	- Measurement characteristics - Control variables - Endogeneity - Sample characteristics - Observation period	1) Overall positive relation between CEP and CFP 2) Measurement characteristics, control variables, endogeneity, sample characteristics, and the observation period bias the effect - Accounting-based CFP > market-based CFP - Proactive environmental initiatives > reactive environmental actions - Financial risk controlled > financial risk not controlled - Endogeneity addressed > endogeneity not addressed - Single industry sample > cross sectional sample
Günther et al. 2012	Narrative review, vote counting	274	321	-	No	1970-2010	- Measurement characteristics	1) Overall positive relation between CEP and CFP 2) Measurement characteristics matter - Strategic CEP measures/ratings > environmental reporting CEP /environmental events/operational CEP - Questionnaire based CFP > accounting based CFP/market based CFP
Horváthová 2010	Ordered probit model	37	64	Categorical variable	Yes	1978-2007	- Measurement characteristics - Estimation differences - Sample characteristics - Observation period	1) Overall positive relation between CEP and CFP 2) Measurement, estimation and sample characteristics partially matter - Correlation coefficient/portfolio studies > regression analysis/panel data analysis - Longitudinal studies > non-longitudinal studies - Process-based CEP > outcome-based CEP - Common low countries > civil law countries
Murphy 2002	Narrative review	20	20	-	No	1992-2002	- Measurement characteristics	1) Overall positive relation between CEP and CFP 2) Measurement characteristics matter - Environmental disclosure has a different association with accounting-based CFP than CEP - Proactive CEP positively related to CFP

This table sums up prior research on the moderating factors of the relation between CEP and CFP. Beside the study code, the applied methodology for the aggregation of results, the underlying number of primary studies and the number of extracted effect sizes over all studies are noted. The fifth column shows the type of effect sized measure followed by the information if the study explicitly searched for grey literature to avoid publication bias. The last two columns sum up the categories of moderating factors analyzed in the study as well as the corresponding results. ">" means that the CEP-CFP effect is larger for the former subsample which is derived from splitting a sample by a certain moderator variable.

[1] The first number of studies/effect sizes corresponds to the analysis based on Pearson correlation coefficients, the second refers to the meta-analysis using partial correlations.

Table 2: Typology of possible environmental-financial performance relationships following Preston and O'Bannon (1997)

	Direction		
Causal sequence	negative	neutral	positive
CEP → CFP	Tradeoff hypothesis	Supply and demand model	Natural resource-based view/ Instrumental stakeholder theory/Social impact hypothesis
CEP ← CFP	Managerial opportunism hypothesis		Slack resources theory
CEP ↔ CFP	Virtuous circle		

This table classifies the theories concerning the assumed direction of the effect and the supposed causal sequence between CEP and CFP.

Table 3: Overview of the literature search process in the electronic databases

	ABI/Inform Complete (via ProQuest)	Business Source Premier, EconLit, GreenFILE (via EBSCOhost)	ScienceDirect	SSRN (via ProQuest)
Search command	TI((social* or environment* or green or pollut* or ISO or emission or emit*) and (firm or compan* or business or corporat* or finance* or economic* or value or performance or pay or market or return*) and (empirical or statistical or test or analy* or relation* or survey*))	TI((social* or environment* or green or pollut* or ISO or emission or emit*) and (firm or compan* or business or corporat* or finance* or economic* or value or performance or pay or market or return*) and (empirical or statistical or test or analy* or relation* or survey*))	ttl((social* or environment* or green or pollut* or ISO or emission or emit*) and (firm or compan* or business or corporat* or finance* or economic* or value or performance or pay or market or return*) and (empirical or statistical or test or analy* or relation* or survey*))	TI((social* or environment* or green or pollut* or ISO or emission or emit*) and (firm or compan* or business or corporat* or finance* or economic* or value or performance or pay or market or return*) and (empirical or statistical or test or analy* or relation* or survey*))
Search options	Language: English and German Date range: January 1, 2012 – June 30, 2015 Peer-reviewed only			Language: English and German Date range: January 1, 2012 – June 30, 2015
Search results	109	75	568	93
1. Iteration (Title)	24	8	12	5
2. Iteration (Content)	5	0	7 + 12[1]	2
Study codes of integrated primary studies	De Burgos-Jiménez et al. 2013, Ferron 2012, Katakeda et al. 2012, MacDonald and Maher 2013, Melo 2013	-	Agan et al. 2014, Ghisetti and Rennings 2014, Llach et al. 2013, Muhammad et al. 2015, Pan et al. 2014, Qi et al. 2014, Zhang et al. 2013 + Aggarwal and Dow 2011, Arafat et al. 2012, Aragón-Correa et al. 2013, Fujii et al. 2012, Horváthová 2012, Iwata and Okada 2011, Lee et al. 2014, Menguc and Ozanne 2005, Menguc et al. 2010, Ngwakwe 2008, Nyirenda et al. 2013, Qian 2012	Sabri 2013, Fiori et al. 2012

The table presents the details of the literature search in electronic databases. Beneath the names of the electronic databases, the individual search command as well as the search options used for the database search are listed. Afterwards, the number of search results produced given settings are noted together with number the remaining studies after checking the title and the content. The last row shows the study codes of the primary studies that are integrated in the analysis of the study at hand.

[1] Number of related studies recommended by the database

Table 4: Formulas for the calculation of effect sizes

Effect size	Partial correlation *r*		Fisher's *z*	
	r	SE(*r*)	*z*	SE(*z*)
Formula	$r = \frac{t}{\sqrt{t^2 + df}}$	$SE(r) = \sqrt{\frac{(1 - r^2)}{df}}$	$\mathrm{z} = \frac{1}{2}\ln\left(\frac{1+r}{1-r}\right)$	$\mathrm{SE(z)} = \frac{1}{\sqrt{N-3}}$

This table presents the formulas for the calculation of the effect sizes and the corresponding standard errors (SE). Beside the effect sizes partial correlation *r* and Fisher's *z*, *t* denotes the test statistic from the t-test applied on the regression slopes investigation the relation between CEP and CFP, *df* represents the degrees of freedom related to this test statistic and *N* stands for the sample size of the respective sample used in the regression of the primary study.

Table 5: List of moderators

Moderator variable code	Description	Mean	Standard deviation
Measurement differences			
CEP	=1 if CEP is a process-based performance measure, 0 otherwise for outcome-based performance measures	0.432	0.496
CFP	=1 if CFP is a market-based performance measure, 0 otherwise for outcome-based performance measures	0.308	0.462
PROACT	=1 if CEP measures proactive corporate activities, 0 otherwise	0.408	0.492
REACT	=1 if CEP measures reactive corporate activities, 0 otherwise	0.068	0.252
CAUSAL	Counts the lagged years between the measurement of CFP and CEP in the regression analysis by substituting the time of measurement of CEP from the time of measurement of CFP	0.319	0.835
Publication characteristics			
NOAUTHOR	Counts the number of authors	2.262	1.061
CITE	Measures the number of citations on June 02, 2015 in Google Scholar	155.046	321.729
Data characteristics			
MILLENIUM	=1 if the mean year of firm data in a primary study is from 2000 or later	0.643	0.479
DATERANGE	Measures the date range of primary data in years	4.361	3.314
NOFIRMS	Counts the number of firms on which a regression analysis is based on	282.047	393.765
1980s	=1 if the mean year of firm data in primary data is between 1980 and 1989, 0 otherwise	0.082	0.274
1990s	=1 if the mean year of firm data in a primary study is between 1990 and 1999, 0 otherwise	0.261	0.439
2000s	=1 if the mean year of firm data in a primary study is between 2000 and 2009, 0 otherwise	0.585	0.493
MLTNAT	=1 if the study employs data from more than one country, 0 otherwise	0.143	0.351
NOCOUNT	Counts the number of countries covered by the primary data	2.207	4.461
MLTSECT	=1 if the study employs data from more than one industry sector referring to two-digit SIC-codes, 0 otherwise	0.487	0.500
NOSECT	Counts the number of industry sectors covered by the primary data referring to two-digit SIC-codes	4.241	3.714
Regional differences			
DVLP	=1 if the study investigates only data from developing countries, 0 otherwise[1]	0.069	0.254
G8	=1 if the study investigates only data from countries that are members in the Group of Eight (G8), 0 otherwise	0.720	0.449
BRICS	=1 if the study investigates only data from BRICS countries, 0 otherwise	0.056	0.230
ASIA	=1 if the study investigates only data from Asia, 0 otherwise	0.059	0.236
EU	=1 if the study investigates only data from the EU, 0 otherwise	0.199	0.400
AFRICA	=1 if the study investigates only data from Africa, 0 otherwise	0.010	0.100
US	=1 if the study investigates only data from the US, 0 otherwise	0.340	0.474
Industrial differences			
SMALL	=1 if the study investigates only data of small firms, 0 otherwise[2]	0.233	0.423
MANUF	=1 if the study investigates only data from the manufacturing industry, two-digit SIC-codes 20-39, 0 otherwise	0.389	0.488
SERV	=1 if the study investigates data from the two-digit SIC-codes 60-99, 0 otherwise	0.104	0.306
DIRT	=1 if the study investigates only data from dirty industries, two-digit SIC-codes 10-49, 0 otherwise	0.502	0.500
Control variables			
RD	=1 if the study controls for intensity of research and development in the regression analysis, 0 otherwise	0.306	0.461
AD	=1 if the study controls for advertising intensity in the regression analysis, 0 otherwise	0.171	0.377
CAP	=1 if the study controls for capital intensity in the regression analysis, 0 otherwise	0.249	0.432
RISK	=1 if the study controls for financial risk in the regression analysis, 0 otherwise	0.462	0.499
GROW	=1 if the study controls for sales growth in the regression analysis, 0 otherwise	0.231	0.422
SIZE	=1 if the study controls for firm size in the regression analysis, 0 otherwise	0.766	0.424
IND	=1 if the study controls for industry effects in the regression analysis, 0 otherwise	0.296	0.457

Estimation differences			
SMPL	=1 if the study applies a simple regression approach, 0 otherwise	0.321	0.467
HTRG	=1 if the study controls for unobserved heterogeneity in the statistical approach, 0 otherwise	0.197	0.398
ENDO	=1 if the study controls for endogeneity between CEP and CFP by lagged variables or an appropriate statistical technique, 0 otherwise	0.429	0.495

This table presents the moderator variables employed in the MRA. Beside the abbreviation of the moderator variable name, a short description is given in the second column. The last two columns show the mean and the sample standard deviation for the certain variable.

[1] The classification is based on the publication from the Federal Ministry for Economic Cooperation and Development (BMZ) for 2014 through 2016:
https://www.bmz.de/de/ministerium/zahlen_fakten/hintergrund/dac_laenderliste/index.html.

[2] The data are judged based on firm size. number of employees whether the market capitalization is smaller than one billion dollars which is approximately the lower limit of the S&P 500.

Table 6: Univariate meta-analytical results

Univariate meta-analysis of the relation between CEP and CFP	Statistics
Publication bias	
Egger's regression test	
Test statistic	1.582
Heterogeneity	
Cochrane's Q test	
Q_{total} (*df*=892)	4852.160***
Q_{within} (*df*=751)	2418.871***
$Q_{between}$ (*df*=751)	2433.289***
τ^2	0.016
Fixed-effects model	
Weighted mean effect size (*r*)	0.068
95% confidence interval	0.064 to 0.072
z-Statistic	33.820***
Random-effects model	
Weighted mean effect size (*r*)	0.073
95% confidence interval	0.062 to 0.083
z-Statistic	14.045***

This table presents the results from univariate meta-analysis. First, the sample of effect sizes is tested for a potential publication bias by the Egger's regression test. Second, the amount of heterogeneity is tested by the Cochrane's Q test. The between-study variance is given by τ^2. The mean effect sizes from the fixed-effects as well as from the random-effects model are presented afterwards with the corresponding 95% confidence intervals and test statistics.

. $p < 0.1$
* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

Table 7: Meta-regression analysis with the effect size measuring CEP-CFP relationship as dependent variable

Dep. variable	ES *r*				ES *z*				ES *r*	
	(1) Fixed-effects MRA		(2) Mixed-effects MRA (REML)		(3) Fixed-effects MRA		(4) Mixed-effects MRA (REML)		(5) Mixed-effects MRA (REML)	
Moderator	β	SE_β	β	SE_β	β	SE_β	β	SE_β	β	SE_β
INTERCEPT	0.265	0.084**	0.265	0.118*	0.131	0.094	0.131	0.125	0.248	0.099*
SE(ES)	-0.314	0.152*	-0.314	0.243	0.085	0.152	0.085	0.218	-0.307	0.218
CEP	-0.042	0.008***	-0.042	0.018*	-0.040	0.008***	-0.040	0.018*	-0.037	0.014**
CFP	0.034	0.006***	0.034	0.014*	0.037	0.007***	0.037	0.014**	0.033	0.013*
PROACT	0.013	0.009	0.013	0.019	0.015	0.0090	0.015	0.019	-	-
REACT	-0.101	0.011***	-0.101	0.027***	-0.098	0.011***	-0.098	0.028***	-0.108	0.025***
CAUSAL	0.011	0.004**	0.011	0.008	0.010	0.004**	0.010	0.009	0.010	0.008
NoAUTHOR	0.044	0.004***	0.044	0.008***	0.047	0.004***	0.047	0.008***	0.039	0.006***
CITE	-0.000	0.000.	-0.000	0.000	-0.000	0.000.	-0.000	0.000	-	-
MILLENIUM	-0.300	0.071***	-0.300	0.092**	-0.245	0.080***	-0.245	0.100*	-0.277	0.087**
DATERANGE	0.003	0.001**	0.003	0.002	0.003	0.001**	0.003	0.002	0.003	0.002
NoFIRMS	-0.000	0.000***	-0.000	0.000*	-0.000	0.000***	-0.000	0.000	-0.000	0.000*
1980s	-0.225	0.070**	-0.225	0.089*	-0.167	0.079**	-0.167	0.097.	-0.220	0.086*
1990s	-0.154	0.069*	-0.154	0.086.	-0.092	0.078	-0.092	0.094	-0.150	0.083.
2000s	0.113	0.019***	0.113	0.033***	0.117	0.019***	0.117	0.034***	0.109	0.033***
MLTNAT	0.130	0.016***	0.130	0.030***	0.126	0.017***	0.126	0.031***	0.131	0.027***
NoCOUNT	-0.011	0.001***	-0.011	0.002***	-0.010	0.001***	-0.010	0.002***	-0.010	0.002***
MLTSECT	0.055	0.022*	0.055	0.039	0.076	0.023*	0.076	0.040.	0.041	0.022.
NoSECT	-0.004	0.003	-0.004	0.006	-0.005	0.0030	-0.005	0.007	-	-
DVLP	0.257	0.038***	0.257	0.074***	0.281	0.040***	0.281	0.077***	0.273	0.072***
G8	-0.034	0.013*	-0.034	0.024	-0.036	0.014*	-0.036	0.025	-0.036	0.022.
BRICS	-0.213	0.032***	-0.213	0.053***	-0.238	0.035***	-0.238	0.056***	-0.212	0.050***
ASIA	-0.164	0.030***	-0.164	0.068*	-0.177	0.031***	-0.177	0.069*	-0.164	0.063**
EU	-0.029	0.012*	-0.029	0.024	-0.026	0.012*	-0.026	0.025	-	-
AFRICA	0.126	0.064*	0.126	0.085	0.094	0.073	0.094	0.095	0.121	0.084
US	0.071	0.012***	0.071	0.024**	0.072	0.012***	0.072	0.025**	0.079	0.018***
SMALL	0.022	0.010*	0.022	0.020	0.023	0.010*	0.023	0.021	0.020	0.018
MANUF	-0.006	0.020	-0.006	0.033	0.008	0.021	0.008	0.034	-	-
SERV	-0.068	0.015***	-0.068	0.034*	-0.054	0.015***	-0.054	0.034	-0.081	0.022***
DIRT	-0.008	0.019	-0.008	0.034	0.002	0.020	0.002	0.035	-	-
RD	0.041	0.011***	0.041	0.024.	0.041	0.011***	0.041	0.025.	0.027	0.020
AD	0.026	0.011*	0.026	0.025	0.031	0.012*	0.031	0.025	0.027	0.023
CAP	-0.074	0.011***	-0.074	0.023**	-0.080	0.011***	-0.080	0.024***	-0.088	0.018***
RISK	-0.011	0.007	-0.011	0.017	-0.010	0.008	-0.010	0.017	-	-
GROW	-0.017	0.009.	-0.017	0.021	-0.013	0.009	-0.013	0.021	-	-
SIZE	-0.032	0.009***	-0.032	0.019.	-0.026	0.010***	-0.026	0.020	-0.042	0.016**
IND	0.012	0.007	0.012	0.016	0.011	0.008	0.011	0.017	-	-
SMPL	0.033	0.009***	0.033	0.021	0.032	0.010***	0.032	0.021	0.033	0.019.
HTRG	-0.027	0.010**	-0.027	0.023	-0.022	0.010**	-0.022	0.024	-0.022	0.021
ENDO	-0.025	0.007***	-0.025	0.016	-0.021	0.008***	-0.021	0.016	-0.022	0.015
AIC	1,115.956		-601.163		992.892		-524.434		-634.660	
BIC	1,306.372		-407.932		1.183.309		-331.203		-483.497	
Observations	863		863		863		863		863	

This table presents the final results of the fixed-effects and mixed-effects weighted least squares meta-regression analyses (MRA). The dependent variable in each MRA is the intensity of the CEP-CFP relation measured by the partial correlation *r* as ES, Fisher's *z* respectively. The first model corresponds to a precision-weighted fixed-effects model with all moderators. The second model differs from model (1) by additional random-effects errors estimated by the restricted maximum-likelihood estimator (REML). The same fixed-effects and mixed-effects models (3) and (4) use *z*-transformed partial correlations as effect sizes. The last column shows the mixed-effects model fitted by the general-to-specific approach. Therein, after each re-estimation the most insignificant variable is dropped from the model until the remaining test statistics are consistently larger than 1.

. $p < 0.1$
* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

Table 8: Summary of results for the moderator variables

Moderator	Significance	Finding	Inference drawn from
Robust findings			
CEP	Strong	Outcome-based CEP measures reveal a higher effect between CEP and CFP than process-based measures.	Table 7
CFP	Weak	Market-based CFP measures reveal a higher effect between CEP and CFP than accounting based measures.	Table 7
REACT	Strong	Reactive environmental activities underperform with respect to CFP.	Table 7
NoAUTHORS	Strong	Larger research teams yield higher effect size estimates.	Table 7
MILLENIUM	Strong	The effect between CEP and CFP is smaller after 2000 than before.	Table 7
2000s	Strong	The effect between CEP and CFP is larger during the 2000s.	Table 7
MLTNAT	Strong	Multinational data in primary studies reveal higher effect size estimates than single country analyses.	Table 7
NoCOUNT	Strong	The growing number of analyzed countries in primary studies lead to smaller effect sizes.	Table 7
DVLP	Strong	For developing countries the effect between CEP and CFP is greater.	Table 7
BRICS	Strong	The effect between CEP and CFP is smaller in BRICS countries.	Table 7
ASIA	Strong	In Asia the effect between CEP and CFP is smaller.	Table 7
US	Strong	The effect between CEP and CFP is larger in the US.	Table 7
CAP	Strong	Capital intensity has a strong indirect impact on the CEP-CFP relation	Table 7
Other findings			
1980s	Weak	The effect between CEP and CFP is smaller during the 1980s.	Table 7, model 5
SERV	Strong	For the service sector the effect between CEP and CFP is smaller.	Table 7, model 5
SIZE	Strong	Firm size has a strong indirect impact on the CEP-CFP relation	Table 7, model 5

This table sums up the results from mixed-effects weighted least squares MRA. Beside the respective moderator variable, the significance of its moderating effect on the CEP-CFP relation as well as a short interpreting statement are given. The last column shows where the finding is located in the results table. Strong significance refer to the 99% level, weak significance means the 95% level.

Table 9: Alternative model specifications as robustness test for the specific moderating factors of the effect size measuring CEP-CFP relationship as dependent variable

Dep. variable	ES *r*							
	(6) Mixed-effects MRA (ML)		(7) Mixed-effects MRA (BE)		(8) Mixed-effects MRA (Mid 90%)		(9) Mixed-effects MRA (Published)	
Moderator	β	SE_β	β	SE_β	β	SE_β	β	SE_β
INTERCEPT	0.248	0.098*	0.248	0.101*	0.262	0.093**	0.251	0.103*
SE(ES)	-0.307	0.214	-0.307	0.222	-0.215	0.192	-0.362	0.232
CEP	-0.037	0.014**	-0.037	0.015*	-0.025	0.011*	-0.045	0.015**
CFP	0.033	0.013*	0.033	0.013*	0.018	0.010.	0.023	0.014
REACT	-0.108	0.024***	-0.108	0.025***	-0.081	0.018***	-0.106	0.026***
CAUSAL	0.010	0.008	0.010	0.008	0.007	0.006	0.009	0.009
NoAUTHOR	0.039	0.006***	0.039	0.007***	0.026	0.005***	0.041	0.007***
MILLENIUM	-0.277	0.087**	-0.277	0.088**	-0.237	0.085**	-0.258	0.092**
DATERANGE	0.003	0.002	0.003	0.002	0.003	0.002*	0.003	0.002
NoFIRMS	-0.000	0.000*	-0.000	0.000.	-0.000	0.000**	-0.000	0.000.
X1980s	-0.220	0.085**	-0.220	0.087*	-0.184	0.083*	-0.228	0.088**
X1990s	-0.150	0.083.	-0.150	0.084.	-0.168	0.081*	-0.169	0.085*
X2000s	0.109	0.032***	0.109	0.033**	0.080	0.028**	0.071	0.039.
MLTNAT	0.131	0.026***	0.131	0.028***	0.119	0.021***	0.138	0.029***
NoCOUNT	-0.010	0.002***	-0.010	0.002***	-0.010	0.001***	-0.011	0.002***
MLTSECT	0.041	0.022.	0.041	0.023.	0.044	0.017**	0.046	0.023*
DVLP	0.273	0.070***	0.273	0.073***	0.163	0.058**	0.280	0.076***
G8	-0.036	0.021.	-0.036	0.022	-0.041	0.017*	-0.028	0.023
BRICS	-0.212	0.050***	-0.212	0.051***	-0.141	0.045**	-0.211	0.052***
ASIA	-0.164	0.062**	-0.164	0.065*	-0.103	0.048*	-0.173	0.067*
AFRICA	0.121	0.083	0.121	0.085	0.093	0.079	0.135	0.085
US	0.079	0.018***	0.079	0.019***	0.048	0.014***	0.076	0.020***
SMALL	0.020	0.018	0.020	0.019	0.004	0.014	0.010	0.020
SERV	-0.081	0.021***	-0.081	0.022***	-0.065	0.017***	-0.074	0.023**
RD	0.027	0.020	0.027	0.021	0.014	0.015	0.012	0.025
AD	0.027	0.022	0.027	0.023	0.036	0.017*	0.029	0.025
CAP	-0.088	0.018***	-0.088	0.019***	-0.062	0.013***	-0.076	0.022***
SIZE	-0.042	0.016**	-0.042	0.016*	-0.042	0.013**	-0.032	0.017.
SMPL	0.033	0.019.	0.033	0.020.	0.028	0.015.	0.036	0.022.
HTRG	-0.022	0.021	-0.022	0.022	-0.018	0.016	-0.037	0.024
ENDO	-0.022	0.014	-0.022	0.015	-0.012	0.011	-0.014	0.016
AIC	-693.056		-690.426		-1,063.669		-542.618	
BIC	-540.722		-538.092		-916.041		-395.119	
Observations	863		863		776		773	

This table presents the final results of the fixed-effects and mixed-effects weighted least squares meta-regression analyses (MRA). The dependent variable in each MRA is the intensity of the CEP-CFP relation measured by the partial correlation *r* as ES. Model (6) through (9) correspond to model (5) from the results section. Thus, all these models include solely the moderating factors that remain after applying the general-to-specific approach. Therein, after each re-estimation the most insignificant variable is dropped from the model until the remaining test statistics are consistently larger than 1. However, they differ in terms of random-effects estimation or the underlying sample. Model (6) uses the maximum-likelihood estimator (ML) and model (7) the Bayes estimator (BE) for the random-effects calculation. The sample in model (8) excludes to highest and lowest 5% of effect sizes extracted from primary studies. The last model uses only effect sizes from published papers and excludes grey literature.

. $p < 0.1$
* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

Figure 1: Chronological development of the CEP-CFP relation

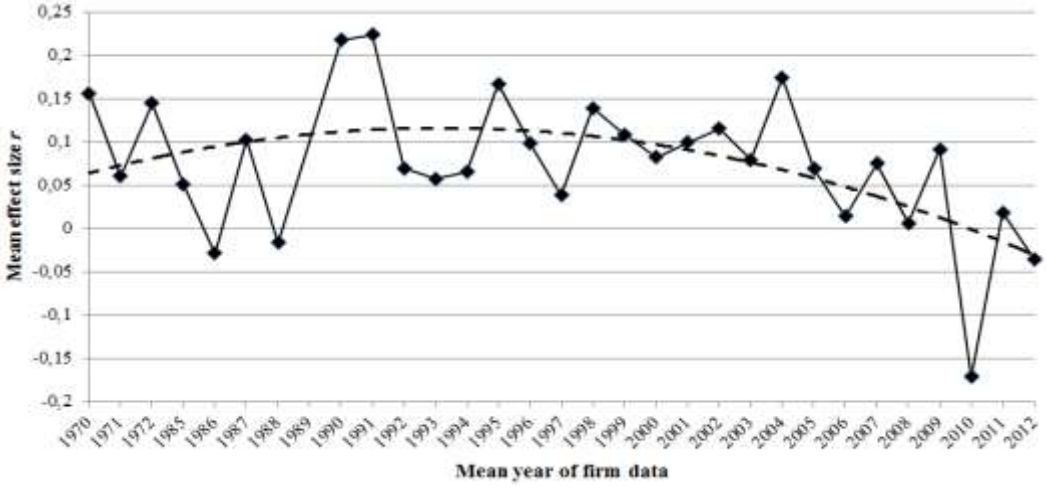
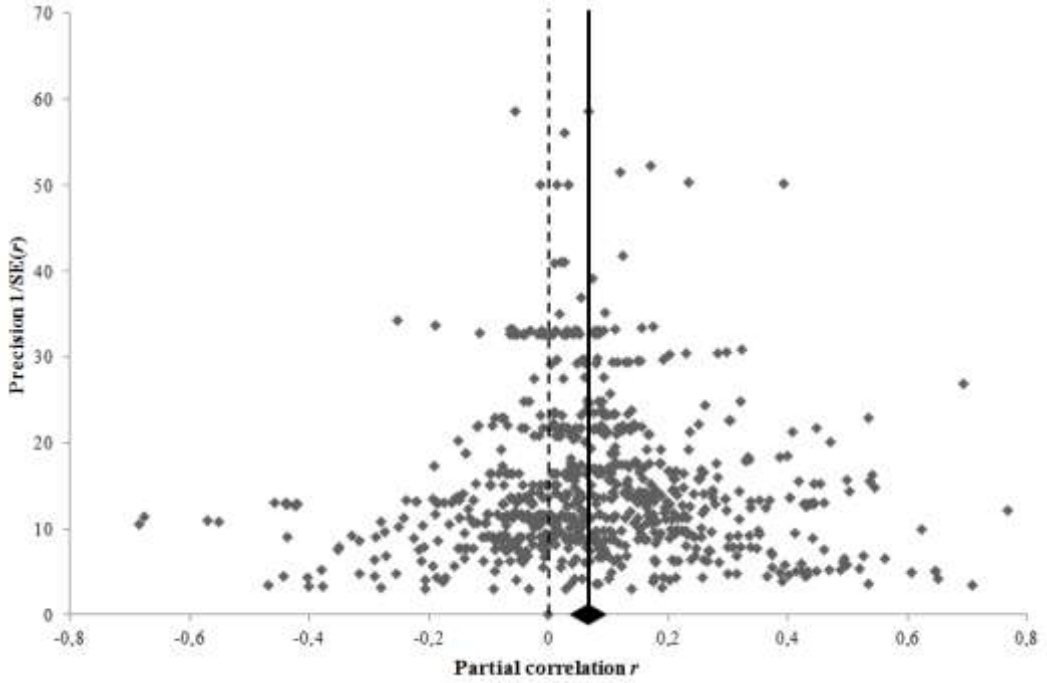


Figure 2: Funnel plot of the CEP-CFP relation



Appendices

Appendix A: Detailed overview of the study sample with its references

Study code	Number of Citations	Number of effect sizes	Mean number of firm observations	Mean number of firm year observations	Analyzed industries	Analyzed countries	Time coverage
Agan et al. 2014	2	1	314	314	SIC 15-17, SIC 20-39	Turkey	2012-2012
Aggarwal and Dow 2012	3	3	598	598	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 70-89	Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Ireland, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK, US	2008-2008
Al-Tuwaijri et al. 2004	772	4	198	198	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1994-1994
Alvarez 2012	11	8	89	312	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49	Australia, Brazil, China, France, Germany, Italy, Japan, Netherlands, Russia, Spain, South Korea, Sweden, Switzerland, Thailand, UK, US	2006-2007
Ameer and Othman 2011	67	3	98	98	SIC 10-14, SIC 15-17, SIC 20-39, SIC 52-59, SIC 70-89	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, UK, US	2009-2009
Ann et al. 2006	123	1	45	45	na	Malaysia	2004-2004
Arafat et al. 2012	3	1	33	33	SIC 20-39	Indonesia	2009-2009
Aragón-Correa et al. 2013	9	8	164	164	SIC 20-39	Austria, Belgium, Bulgaria, Canada, Czech, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Lithuania, Macedonia, Netherlands, Norway, Poland, Portugal, Russia, Slovak Republic, Spain, Sweden, Switzerland, UK, Ukraine, US	2012-2012
Arora and Cason 1995	483	1	302	302	SIC 20-39,	US	1990-1990
Balabanis et al. 1998	285	4	56	112	na	UK	1988-1989
Barth and McNichols 1994	324	14	850	4883	SIC 20-39, SIC 40-49	US	1982-1991
Berman et al. 1999	1674	1	81	486	SIC 20-39	US	1991-1996
Berrone and Gomez-Mejia 2009	238	24	469	2276	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1997-2003
Bhat 1998	6	3	179	717	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1987-1990
Bhat 1999	24	2	234	234	SIC 20-39	US	1990-1990

Bird et al. 2007	252	9	347	3405	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1991-1996
Busch and Hoffmann 2011	57	9	174	174	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49	Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Greece, Hungaria, Italy, Ireland, Japan, Malaysia, Netherlands, Norway, Portugal, Russia, Spain, South Korea, Sweden, Switzerland, Thailand, UK, US	2008-2008
Campbell et al. 1998	59	8	186	588	SIC 20-39	US	1987-1993
Campbell et al. 2003	45	2	60	329	SIC 20-39	US	1989-1992
Carter et al. 2000	319	1	437	437	SIC 20-39	US	1995-1995
Céspedes-Lorente & Galdeano-Gómez, 2004	19	3	85	425	SIC 01-09	Spain	1997-2001
Chan, 2005	98	1	332	332	SIC 20-39	China	1996-1996
Chen and Metcalf 1980	280	12	18	72	SIC 20-39	US	1968-1973
Clarkson et al. 2004	29	4	29	219	SIC 20-39	US	1989-2000
Clelland et al. 2000	57	3	241	724	SIC 20-39	US	1991-1993
Clemens 2006	116	1	76	76	SIC 20-39	US	2003-2003
Cohen et al. 1997	299	2	372	372	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1988-1988
Conelly and Limpaphayom 2004	3	4	120	120	SIC 01-09, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Thailand	2002-2002
Cordeiro and Sarkis 1997	250	4	523	523	SIC 20-39	US	1992-1992
Cordeiro and Sarkis 2008	31	2	172	172	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1996-1996
Cormier and Magnan 1997	180	2	26	144	SIC 10-14, SIC 20-39	Canada	1986-1991
Cormier et al. 1993	131	3	74	222	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49	Canada	1986-1988
Craig and Dibrell 2006	142	2	176	704	SIC 01-09, SIC 10-14, SIC 15-17 SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	US	2005-2008
Darnall 2009	43	6	2167	2167	SIC 15-17, SIC 20-39	Canada, France, Germany, Hungaria, Japan, Norway, US	2003-2003
Darnall et al. 2008	222	1	1355	1355	SIC 20-39	Canada, Germany, Hungaria, US	2003-2003
Day et al. 1997	2	12	15	56	SIC 01-09	US	1989-1989
De Burgos-Jiménez et al. 2013	7	44	186	186	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	UK	2003-2003

Delmas and Nairn-Birch 2011	12	14	1003	3043	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 60-67, SIC 70-89	US	2004-2008
Dooley and Lerner 1994	63	4	86	86	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 60-67, SIC 70-89	US	1989-1989
Dowell et al. 2000	856	1	107	428	SIC 10-14, SIC 20-39	US	1994-1997
Earnhart and Lizal 2006	67	5	463	1127	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	Czech	1993-1998
Earnhart and Lizal 2007	12	12	436	1063	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	Czech	1996-1998
Eiadat et al. 2008	116	1	119	119	SIC 20-39	Jordan	2007-2007
Elsayed 2006	61	1	173	865	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	UK	1995-1999
Elsayed and Paton 2005	174	12	227	1009	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	UK	1994-2000
Elsayed and Paton 2009	45	2	227	921	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	UK	1994-2000
Ferron 2012	4	8	552	2834	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 52-59, SIC 60-67, SIC 70-89	Brazil	1996-2008
Filbeck and Gorman 2004	140	2	24	72	SIC 40-49	US	1997-1999
Fiori et al. 2012	37	1	25	75	na	Italy	2004-2006
Fujii et al. 2013	28	8	283	1628	SIC 20-39	Japan	2006-2008
Galbreath 2006	76	3	38	38	SIC 10-14, SIC 20-39, SIC 40-49, SIC 52-59, SIC 60-67	US	2001-2001
Galbreath 2011	26	4	151	151	SIC 10-14, SIC 20-39, SIC 40-49, SIC 52-59, SIC 60-67	US	2004-2004
Galdeano-Gómez 2008	23	2	56	336	SIC 01-09	Spain	1997-2002
Ghisetti and Rennings 2014	14	25	1063	1063	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Germany	2006-2010
González-Benito and González-Benito 2005	250	1	186	186	SIC 20-39	Spain	2002-2002
Graves and Waddock 1999	38	4	87	520	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51,	US	1991-1995

					SIC 52-59, SIC 60-67, SIC 70-89		
Greening 1995	35	2	57	57	SIC 40-49	US	1992-1992
Guenster et al. 2005	250	7	154	1232	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1997-2004
Hart and Ahuja 1996	1187	36	85	296	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1988-1989
Hassel et al. 2005	163	2	71	329	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 60-67, SIC 70-89	Sweden	1998-2000
Heras-Saizarbitoria et al. 2011	66	5	196	588	SIC 15-17, SIC 20-39, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Spain	2000-2005
Hibiki and Managi 2010	18	2	402	804	SIC 20-39	Japan	2003-2004
Hillman and Keim 2001	1956	1	308	616	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1995-1996
Horváthová 2012	17	22	135	237	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Czech	2004-2008
Huang 2010	30	1	297	594	SIC 20-39	Thailand	2006-2007
Hughes 2000	222	18	54	84	SIC 40-49	US	1986-1986
Inoue and Lee 2010	133	6	126	2134	SIC 40-49, SIC 70-89	US	1991-2007
Iwata and Okada 2011	60	84	167	463	SIC 20-39	Japan	2004-2008
Jo and Harjoto 2011	175	3	1677	6479	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1993-2004
Johnston 2005	29	4	107	494	SIC 20-39	US	1988-1996
Judge and Elenkov 2005	106	4	31	31	SIC 20-39	Bulgaria	2002-2002
Karagozoglu and Lindell 2000	119	1	83	83	SIC 20-39	US	1995-1995
Kassinis and Soteriou 2005	184	1	104	104	SIC 70-89	Australia, France, Germany, Greece, Italy, Portugal, Spain, UK	1999-1999
Katakeda et al. 2012	9	10	1089	1089	SIC 20-39	Japan	2007-2007
Khanna and Damon 1999	634	2	75	702	SIC 20-39	US	1988-1993
Kim and Statman 2011	24	8	494	1609	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99	US	1996-1996
King and Lenox 2001	687	1	652	4483	SIC 20-39	US	1987-1996
King and Lenox 2002	637	12	559	2299	SIC 20-39	US	1991-1996
Kock et al. 2012	38	4	377	603	SIC 20-39	US	1998-2000
Konar and Cohen 1997	28	1	414	520	SIC 20-39	US	1989-1992
Konar and Cohen 2001	792	4	233	233	SIC 20-39	US	1989-1989
Lee er al. 2014	2	4	200	1241	SIC 10-14, SIC 15-17, SIC 20-39,	Korea	2011-2012

Levy 1995	143	3	73	243	SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89, SIC 91-99 na	Australia, Belgium, Canada, France, Germany, Italy, Netherlands, Sweden, Switzerland, UK, US	1987-1989
Llach et al. 2013	16	1	374	374	SIC 70-89	Spain	2010-2010
Lucas and Wilson 2008	13	2	1228	1228	SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	2004-2004
MacDonald and Maher 2013	9	3	3322	17388	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 70-89	na	2000-2009
Magness 2007	3	1	6	51	SIC 20-39	Canada	1993-2002
Mahoney and Roberts 2007	142	2	298	525	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Canada	1997-2000
Makni et al. 2009	133	4	174	174	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 52-59, SIC 60-67, SIC 70-89	Canada	2004-2005
Matsumura et al. 2014	21	3	256	1356	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	2006-2008
McKendall et al. 1999	83	2	150	750	SIC 20-39	US	1983-1987
Melo 2012	3	1	624	3085	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	2001-2007
Menguc and Ozanne 2005	208	1	140	140	SIC 20-39	Australia	2003-2003
Menguc et al. 2010	73	1	150	150	SIC 20-39	na	2008-2008
Mohn 2006	3	43	131	670	SIC 20-39	Japan	1999-2003
Morris 1997	39	4	68	204	SIC 15-17, SIC 20-39	US	1991-1993
Muhammad et al. 2015	0	12	76	379	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 70-89	Australia	2001-2007
Nakamura et al. 2001	276	2	64	193	SIC 20-39	Japan	1994-1996
Nakao et al. 2007	155	14	263	749	SIC 20-39	Japan	2002-2003
Nehrt 1996	295	1	44	396	SIC 20-39	Brazil, Canada, Finland, Portugal, Spain, Sweden, US	1983-1991
Ngwakwe 2008	31	1	30	300	SIC 20-39	Nigeria	1997-2006
Nishitani 2009	84	1	433	2222	SIC 20-39	Japan,	1996-2004
Nishitani et al. 2011	26	2	426	2728	SIC 20-39	Japan	2001-2008
Nyirenda et al. 2013	1	6	9	9	SIC 10-14	South Africa	2011-2011
Ozanne and Menguc 2000	4	1	150	150	SIC 20-39	New Zealand	1998-1998
Pan et al. 2014	3	24	76	2780	SIC 10-14, SIC 20-39, SIC 40-49	China	2010-2013
Pujari et al. 2003	272	1	134	134	SIC 20-39	UK	2001-2001
Qi et al. 2014	5	2	234	4914	SIC 10-14, SIC 20-39, SIC 40-49	China	1990-2010

Qian 2012	0	8	84	168	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 60-67, SIC 70-89	Australia	2009-2010
Ragothaman and Carr 2008	20	4	82	82	SIC 20-39	US	2000-2000
Ramanathan and Akanni 2010	2	3	136	136	na	UK	2008-2008
Rodríguez and Cruz 2007	121	1	80	80	SIC 70-89	Spain	2000-2000
Russo and Fouts 1997	2885	4	243	365	na	US	1991-1991
Sabri 2013	0	2	10	130	na	Malaysia	1999-2011
Salama 2005	80	10	201	402	na	UK	2000-2001
Sarkis and Cordeiro 2001	167	2	482	964	SIC 20-39	US	1992-1993
Scholtens and Zhou 2008	35	2	289	4046	na	US	1991-2004
Schreck 2011	79	6	239	239	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	na	2006-2006
Semenova 2010	13	6	354	1679	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 60-67, SIC 70-89	Greece, US	2003-2008
Semenova and Hassel 2008	28	2	563	3204	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	2002-2006
Sharfman and Fernando 2008	261	1	267	267	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	2001-2002
Sinkin et al. 2008	75	6	296	296	SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Australia, Brazil, China, France, Germany, Italy, Japan, Netherlands, Russia, Spain, South Korea, Sweden, Switzerland, Thailand, UK, US	2003-2003
Sotorrío and Sánchez 2008	74	2	40	80	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 52-59, SIC 60-67, SIC 70-89	US	2003-2004
Spicer 1978	78	1	18	18	SIC 20-39	US	1972-1972
Sueyoshi and Goto 2009	31	12	167	1875	SIC 40-49	US	1989-2001
Tatsuo 2010	5	6	43	43	SIC 20-39	Japan	2006-2006
Telle 2006	123	2	75	898	SIC 20-39	Norway	1990-2001
Thomas 2001	88	12	131	917	SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 60-67, SIC 70-89	UK	1985-1997
Van Der Laan et al. 2008	123	2	473	1809	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1997-2002
Wagner 2005	167	18	62	186	SIC 20-39	Germany, Italy, Netherlands, UK	1995-1997
Wagner 2010	87	2	358	2478	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	US	1992-2003
Wagner and Schaltegger 2004	158	20	143	143	SIC 20-39	Germany, UK	2001-2001
Wagner et al. 2002	205	6	37	55	SIC 20-39	Germany, Italy, Netherlands, UK	1995-1997
Wahba 2008	152	2	156	381	SIC 20-39	Egypth	2003-2005

Walker and Wan 2012	44	2	103	206	SIC 01-09, SIC 10-14, SIC 20-39, SIC 40-49	Canada	2008-2009
Walls et al. 2011	36	6	184	184	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49	US	2003-2003
Yamaguchi and van Kooten 2008	2	18	19	110	SIC 01-09	Canada, US,	1996-2005
Yang et al. 2011	188	8	193	193	SIC 20-39	Argentina, Australia, Belgium, Brazil, Canada, China, Denmark, Estonia, Greece, Hungaria, Italy, Ireland, Israel, Netherlands, New Zealand, Norway, Portugal, Sweden, Turkey, UK, Venezuela, US	2005-2005
Zeng et al. 2011	28	4	52	52	SIC 20-39	China	2009-2009
Zhang et al. 2008	131	1	89	89	SIC 20-39	China	2004-2004
Zhang et al. 2013	8	4	84	371	SIC 20-39	China	2006-2010
Ziegler et al. 2007	100	2	212	1272	SIC 01-09, SIC 10-14, SIC 15-17, SIC 20-39, SIC 40-49, SIC 50-51, SIC 52-59, SIC 60-67, SIC 70-89	Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, UK	1996-2001

This table gives a brief overview of the 142 primary studies integrated in the analysis. The first column lists the study codes followed by the number of citations which are coded on July 2, 2015 based on the information of Google Scholar. The third column contains the number of effect sizes that are extracted from the respective study. The averaged number of firm observations and the averaged number of firm year observations on which the single effect sizes in the respective primary studies are based on are shown subsequently in column 4 and 5. The last three columns describe the sample of the primary studies concerning industry sectors, countries and analyzed date range. These information refer to the union of data that are analyzed, several studies provide analyses of subgroups.

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Appendix B: Source of the papers included in the meta-analysis

Journal	Number of studies	Impact factor
Accounting Forum	1	0.6
Accounting, Organizations and Society	1	1.672
Asian Business and Management	1	0.1
Brazilian Administration Review	1	0.17
Business & Society	2	1.468
Business Strategy and the Environment	10	2.542
Canadian journal of forest research	1	1.683
Corporate Social Responsibility and Environmental Management	2	2.321
Ecological Economics	5	2.72
Ecotoxicology	1	2.706
Energy Policy	2	2.575
Environmental and Resource Economics	5	1.426
European Accounting Review	1	0.654
European Business Review	1	0.4
European Environment	1	0.5
European Financial Management	1	1.158
European Journal of Operations Research	1	1.843
European Management Journal	1	1.222
Family Business Review	1	5.528
Hospitality Management	1	na
Interfaces	1	0.42
International Journal of Environmental Studies	1	0.24
International Journal of Humanities and Social Sciences	1	0.981
International Journal of Management	1	na
International Journal of Operations & Production Management	1	1.736
International Journal of Production Economics	1	2.752
International Journal of Value-Based Management	1	na
Issues in Social and Environmental Accounting	1	na
Journal of Accounting and Public Policy	4	0.547
Journal of Accounting Research	1	2.384
Journal of Business Ethics	12	1.326
Journal of Business Finance and Accounting	1	1
Journal of Business Research	4	1.48
Journal of Cleaner Production	8	3.844
Journal of Comparative Economics	1	1.17
Journal of Corporate Citizenship	1	0.7
Journal of Environmental Economics and Management	3	2.394
Journal of Environmental Management	2	2.723
Journal of Environmental Planning and Management	1	1.367
Journal of Industrial Ecology	1	3.227
Journal of International Management	1	1.648
Journal of Leadership. Accountability & Ethics	1	na
Journal of Management and Organization	2	0.594
Journal of Management Studies	2	3.763
Journal of Organizational Management Studies	1	na
Journal of World Business	1	2.388
Land Economics	1	1.338
Management Decision	1	1.429
Management of Environmental Quality: An International Journal	1	0.26
Management Science	2	2.482
Managing Global Transitions	1	0.7
Omega: International Journal for Management Science	1	4.376
Organization & Environment	1	1.386
Part of Book	1	na
Production and Operations Management	1	1.439
Public Administration Review	1	1.973
Review of Quantitative Finance and Accounting	1	0.6
Service Business	1	0.645
Social Responsibility Journal	1	0.23
Strategic Management Journal	3	3.341
Structural Change and Economic Dynamics	2	0.4
Sustainability	1	0.942
Sustainable Development	2	1.242
The Academy of Management Journal	3	6.448
The Academy of Management Annual Meeting Proceedings	1	na
The Accounting Review	4	2.267
The International Journal of Organizational Analysis	1	0.23
The Review of Economics and Statistics	1	2.749
Tourism Management	1	2.554
Transnational Corporations	1	0.1
Transportation Research	1	2.006
Working and Conference Papers	12	0

Appendix C: Temporal distribution of primary studies

Study year	Number of studies
1978	1
1980	1
1993	1
1994	2
1995	3
1996	2
1997	7
1998	3
1999	5
2000	6
2001	6
2002	2
2003	2
2004	6
2005	11
2006	8
2007	7
2008	16
2009	6
2010	8
2011	14
2012	9
2013	9
2014	6
2015	1

Appendix D: Coding manual

For MILLENIUM the joined measurement period of CEP and CFP is taken as a basis. If a study investigates the relationship between the two constructs using disjoint datasets in the case of a lagged variable, the outer limits of the two periods are used. The period from 1970 through 1979 as well as from 2010 until present are not investigated separately, as there are not enough data given to provide meaningful results. The moderator variables explaining regional differences group the data on the basis of the economic situation as well as the geographic location. The latter allows an examination of single continents referring to cultural differences. The grouping by economic situation ranges from developing countries (DVLP), over emerging economies (BRICS) through leading industrialized nations (G8). The developing countries are derived from the latest recommendations from the Federal Ministry for Economic Cooperation and Development (BMZ)[4]. The constituents of the "Group of Eight" are Canada, France, Germany, Italy, Japan, Russia, UK, and the USA. "BRICS" corresponds to Brazil, Russia, India, China and South Africa. Single industries are not tested in the analysis as only the minority of retrieved studies investigates a single country. SMALL indicates all datasets whose constituents are judged to have a smaller market capitalization than one billion dollars which is approximately the lower limit of the S&P 500. This is assessed to be a reasonable classification in terms of investment suitability, liquidity, and public interest. The decision is based on information about total assets, market capitalization, number of employees, industry sector and country. For the control variable AD the measures of advertising intensity and visibility, which is alternatively used in literature and measures e.g. the extent of being represented in newspapers or other media, are pooled. RISK combines firm level beta and leverage ratio which are used equivalently in literature. Control variables that appear less than 50 times in the underlying sample of effect sizes are eliminated. This guarantees a sufficient statistical validity. The exact number is derived from the underlying dataset which shows a break at this point. All integrated control variables are observed at least 135 times. SMPL indicates whether a study applies a simple regression approach like an ordinary, weighted or generalized least squares model. If a study considers heterogeneity through fixed or random effects, they are indicated by HTRG. Studies that incorporate endogeneity between CEP and CFP in their statistical approach or by lagged variables are marked as by ENDO.

[4] Data from the following countries are indicated by the DVLP variable in this paper: Argentina, Brazil, China, Egypt, Indonesia, Jordan, Korea, Macedonia, Malaysia, Nigeria, Tunisia, Turkey, Thailand, Ukraine and Venezuela

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