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Corporate Environmental Responsibility: A Legal Origins Perspective

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Abstract In this study, we examine the determinants of corporate environmental responsibility (CER), as well as the relationship between legal systems and CER as measured by a unique set of global environmental cost data. Results of our analyses show that firms' legal origins affect CER, which requires a long-term management perspective. Specifically, our results indicate that civil law firms exhibit significantly higher levels of CER than common law firms. In addition, results of an auxiliary test suggest that manager shareholding has a significant, nonlinear relationship with CER. The association between a firm's legal origin and its CER performance remains robust after controlling for the effects of managerial ownership and issues related to endogeneity. Our findings imply that although the majority of corporate law studies in the past few decades provide support for the common law system emphasizing the maximization of shareholder value and investor protection, the civil law system stressing the maximization of stakeholder wealth and the importance of CER may become more influential in the coming decades as CER becomes central to firms' operations.

Keywords Legal origins · Corporate environmental responsibility (CER) · Managerial ownership

Introduction

Until a decade ago, corporate managers were primarily oriented toward the maximization of shareholders' profits. They considered that expenditures or investments related to stakeholders' value maximization and not directly related to profit maximization, at least in the short run, were the costs to be minimized. More recently, however, business leaders have encountered increasing public concern regarding their firms' social responsibility and the sustainability of their business methods. For example, managers have faced growing public demand for firms to reduce the pollutants they produce and increase the degree to which they engage in environmentally responsible activities. In this vein, corporate environmental responsibility (CER) has been increasingly gaining recognition as one of the most important factors in firms' long-term value and sustainability.[1] In a 2010 survey by Accenture and the United Nations Global Compact (UNGC), more than 90 % of

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[1] A real-world example of CER is summarized in General Electric's (GE) Sustainability Commitments Report. GE's CER programs include dredging the Hudson River and removing sediment, engaging in water-related Kaizen-Blitz activities to reduce water consumption, optimizing energy use, reducing greenhouse gas emissions, and reducing air pollution excesses and reportable spills. GE's CER activities also include programs that educate employees, local communities, and NGO members about the environment, health, and safety.

managers reported believing that CER is a critical factor for their companies' long-term survival and value. Further, many corporate managers claimed that they invested in new technologies to achieve environmental sustainability within 5 years. These managers also realize that by engaging in socially responsible activities, they can generate favorable perceptions about their companies, thereby cultivating consumer loyalty and increasing sales (Mohr et al. 2001). However, in contrast to the recognition and application of CER-related issues in industry, the concept of CER has received relatively little attention within academia.

Although studies on CER are scarce, scholars show a consistent interest in the more general concept of corporate social responsibility (CSR). This focus has resulted in a large number of CSR studies in the fields of business management and economics. Taken together, these studies explain why corporate managers should consider broad CSR activities when designing and deciding upon corporate strategies. For example, many studies empirically examine how CSR affects firm performance (or value) and the costs of capital, both of which are of great concern to shareholders and stakeholders (Barnea and Rubin 2010; Baron 2009; Beurden and Gossling 2008; Makni et al. 2009). Most of these studies emphasize the positive role of CSR, showing that it is positively correlated with firm performance and can significantly enhance a firm's long-term value (Beurden and Gossling 2008; Deng et al. 2013; Luo and Bhattacharya 2006). The studies also show that investment in CSR improves the market's perceptions of the risk a firm poses, allowing the financial market to offer lower risk premiums (i.e., lower cost of capital) on equity. This, in turn, can positively affect firm performance or value (Albuquerque et al. 2013; Boutin-Dufresne and Savaria 2004; El Ghoul et al. 2011; Hong and Kacperczyk 2009; Lee and Faff 2009).

The concept of CER has been developed as one particular dimension of CSR. Consequently, CER is now recognized as an important subset of CSR (El Ghoul et al. 2011; Jo et al. 2015). Kitzmueller and Shimshack (2012) explain that CER is the outcome dimension of CSR, suggesting that the former is more specific and less abstract than the latter. Given its specificity, the authors argue that one can measure CER more precisely than the vague concept of CSR. They also find that stakeholders' environmental preferences make CER an important part of corporate strategy and that CER investments are significantly related to corporate profits and sustainability. Despite the clear importance of CER (as a subdomain of the CSR index) academic research, however, has largely neglected its study. Few studies explore CER-related issues, and unlike the consensus that has emerged regarding the positive effect of CSR on firm performance or value, extant CER studies have thus far failed to provide consistent findings concerning CER's role and effectiveness. For example, Derwall et al. (2005), Konar and Cohen (2001), Miles and Covin (2000), and Russo and Fouts (1997) all argue that environmental management (e.g., reduction of pollution emissions) and environmental responsibility positively affect the future performance of firms. Other studies, however, claim that CER does not increase firms' values and is often abused by managers in order to build personal reputations (Brammer et al. 2006; Gray and Shadbegian 1993; Walley and Whitehead 1994). Further, prior studies on CER focus primarily on the roles and results of CER activities. Despite the fundamentality and scholastic immediacy of the determinants of CER, very few studies explore these issues. In short, the empirical study of CER studies is at an early stage.[2]

Against this contextual backdrop, we try to answer a single, important research question: What factors affect a firm's environmental responsibility? Unlike prior studies' attempts to relate management decisions and internal business issues to CER activities (Barnea and Rubin 2010; Baron 2009), we focus on firms' "legal origins". Legal origins are fundamental factors (La Porta et al. 2008; Spamann 2009; Watson 1974) that form the foundations of business environments, management philosophies, corporate governance structures, and investor protection systems. All of these can individually and collectively affect firms' decisions on long-term and major investments such as CER investments. Given this possibility, we examine whether firms' CER levels vary as a function of the legal systems on which they are based. We also attempt to explain this relationship after controlling for managerial ownership, which is related to overall CSR/CER levels (Berrone et al. 2010; David et al. 2007; Neubaum and Zahra 2006; Schnatterly 2003; Walls et al. 2012).

Our interest in firms' legal origins arises from observations of traits that have shaped civil and common law systems. Some innovative studies in the field of law and finance investigate the influence of these legal systems on management decisions and corporate governance. For example, Almeida and Wolfenzon (2006), Boubakri et al. (2005), La Porta et al. (1998), and La Porta et al. (1999) claim that civil law firms are typically characterized by

[2] Although several studies seek to determine the factors that affect CER activities, they investigate topics that are too narrow and specific to support an overall conclusion. For example, Eckberg and Blocker (1996) argue that conservative religious beliefs are negatively related to environmental concern. Using survey data from 17 interviews with professional sports teams and league executives, Babiak and Trendafilova (2011) suggest that strategic motives and institutional pressures are the main drivers of the adoption of green management practices. In contrast to this study, our study identifies more fundamental determinants of CER activities using global environmental costs data.

concentrated ownership structures in the form of pyramids and multiple share classes.[3] Concentrated ownership structures, which have a high level of manager shareholding, can increase managers' incentives to expand firms' long-term investments and performances by fostering incentive alignments between owners and managers (Jensen and Meckling 1976). In contrast, minority shareholders normally hold substantial portions of ownership (decentralized ownership structure), and outside investors are more prominent in common law firms than in civil law firms. In addition, the legal protection of outside investors and/or minority shareholders (who generally have short-term perspectives) is of more importance in common law countries (La Porta et al. 1998, Solomon and Solomon 1999, Talbot 2013). Given the differences between civil law and common law systems, we predict that whereas civil law firms' ownership structures and investor protection can increase CER investments, those of common law firms may discourage CER activities. We base this prediction on the notion that although CER activities are typical mechanisms for enhancing firms' long-term performance and value, they often require substantial initial investments that sacrifice short-term profits (Hart and Ahuja 1996; Makni et al. 2009).

In another consideration of the association between firms' legal origins and their long-term investments (i.e., CER investments), we also consider the intrinsically differential philosophies between civil law and common law firms. Whereas the civil law system emphasizes stakeholder-centered ideologies, the common law system emphasizes shareholder-centered ideologies and the protection of investor rights. As the result of these respective foci, managers of civil law firms are likely to prioritize stakeholder interests and managers of common law firms tend to accentuate short-term profits and avoid damaging the wealth and rights of outside investors (Hansmann and Kraakman 2000; La Porta et al. 1998, 2008; Pistor 2006). Engaging in CER activities requires long-term perspectives that account for the interests of various stakeholders, including local communities, customers, employees, and society in general. Therefore, CER levels in civil law firms with stakeholder-centered ideologies can be higher than CER levels in common law firms, which tend to adopt extreme shareholder-centered ideologies. Further, common law firms tend to be more attentive to minority shareholders with short-term goals and little information with which to make management decisions.[4] Thus, under the common law system, short-term investors can resist managerial decisions that (i) are based on a long-term perspective, and (ii) require the sacrifice of short-term profits. Moreover, the investors can discourage CER investments that demand substantial initial expenditures (despite their long-term necessity). In these ways, the shareholder-centered ideologies of common law firms impinge on the firm's environmental responsibility activities.

Our examination of the relationship between legal origins and CER is also justified by the fundamentality of legal origins. Modern history on colonization and conquest shows that most countries adopt their legal systems involuntarily (La Porta et al. 2008). Further, when countries acquire their legal systems, they do not consider the economic consequences with regard to corporate governance, investor protection, and flexibility of management decisions, a priori. Therefore, the adoption of legal systems is a representative example of involuntary transmission, and the legal origin of a firm can be regarded as an exogenous and fundamental factor.

To test our hypotheses about the relationship between a firm's legal origin and its decisions related to CER activities, we empirically analyze the possible links between CER and legal origins through rigorous methodologies and a worldwide dataset. Although a firm's legal system is a critical determinant of how managers run their respective businesses, past research in this domain ignores this relationship. Most notably, to the best of our knowledge, there has been no study to evaluate the association between a firm's legal origin and its CER activities. This study aims to fill this gap. In testing our research hypotheses, we also control for manager ownership, which past research (e.g., Walls et al. 2012) demonstrates has an effect on CSR/CER-related investments. In addition, we mitigate concerns related to endogeneity that can arise due to the possibility of reverse causality. For the actual analysis, we use Trucost environmental cost data as a proxy measure of CER activity. Because the Trucost data provide exact dollar amounts associated with firms' environmental costs, we can accurately (and quantitatively) estimate the degree to which a firm is environmentally responsible. More

[3] A pyramidal ownership structure embodies a top-down chain of control in which firm owners are located at the top of the pyramid. In a multiple-share class structure, investors are classified into groups according to their voting practices. These structures allow managers to reinforce their control through shareholdings with superior voting rights (DeAngelo and DeAngelo 1985).

[4] Although some "dedicated" investors (e.g., large investors) often discourage myopic management decisions (Bushee 1998), minority shareholders and outside investors are typically more interested in short-term profits than the long-term performance or sustainability of the companies in which they invest. This short-term focus often induces management to make myopic decisions that discourage long-term investments (Porter 1992, Solomon and Solomon 1999, Talbot 2013). In turn, the lack of critical information for making long-term management decisions can harm firm value (Bainbridge 2006). Relative to civil law countries, the rights of outside investors and minority shareholders are better protected, and shareholders' decisions are often given greater emphasis, than in common law countries (La Porta et al. 1998, 2008).

specifically, we collect 17,956 firm-year observations from 27 countries for the period between 2003 and 2012. By using data from multiple countries over a decade, we seek to overcome the limitations of prior literature's single-country and short-term analyses. In addition, to mitigate problems associated with endogeneity (which prior studies have overlooked), we employ a two-step generalized method of moments (GMM) approach.

Our analyses reveal that common law firms perform better in terms of CER than civil law firms, indicating that a firm's legal origin affects its CER, suggesting that CER requires a long-term management perspective and enhances stakeholder value maximization. This key finding has a number of implications. First, concentrated ownership structures (characterized by a high level of manager shareholding) among firms in civil law countries can drive firm managers to make long-term investment decisions that improve their long-term performance. It follows that managers of civil law firms who believe that CER will ultimately increase their firms' long-term value are likely to invest in CER activities to a greater degree than managers of common law firms. In contrast, an overemphasis on the preferences of minority shareholders (who usually pursue short-term profit maximization in common law countries) can discourage long-term investment in CER, which often sacrifices firms' long-term goals. Second, firms in civil law systems that emphasize the interests and rights of stakeholders (including local and global communities, customers, employees, and governments) tend to experience less resistance when investing in CER. However, managers of common law firms that prioritize shareholders' rights can face greater resistance when investing in CER, as these expenditures are often criticized as unnecessary and detrimental to short-term shareholder value (Coffee 1999; Hansmann and Kraakman 2000; Karmel 1991; La Porta et al. 2000; Perotti and Thadden 2003).

Moreover, our auxiliary test provides evidence to suggest that manager ownership significantly affects a firm's environmental responsibility, but that this relationship is nonlinear. The results of a two-step GMM estimation show that when a firm is characterized by a low degree of manager ownership, CER monotonically increases in parallel with managerial ownership. In contrast, when a firm is characterized by a degree of manager ownership that is sufficiently high to effectively protect the owner's position and management rights, then the relationship between manager ownership and CER becomes an inverse one. This nonlinear relationship implies that manager incentives to maximize long-term firm value increase to an optimal level of managerial ownership; beyond this inflection point, these incentives tend to decrease. This result indicates that, the legal system, importance of which prior studies have overlooked, is one of the key determinants of CER decisions after considering the effects of manager ownership.

Our results further elucidate the role of firms' legal origins and the possible advantages of the civil law system for enabling long-term investment decisions. Most academics and market practitioners have championed the maximization of shareholder wealth and a diversified ownership structure as important for firm value. They have usually taken for granted that common law systems are superior to civil law systems in terms of corporate governance and firm value, all else being equal (Cheffins 2002; Hansmann and Kraakman 2000; Klapper and Love 2004; La Porta et al. 2002). Unlike past research on the topic, our empirical results indicate that relative to the common law system, the civil law system may increase the extent to which a firm embraces environmental responsibility. This, in turn, can have a positive effect on that firm's long-term value and sustainability. Our results also suggest that concentrated ownership structures and stakeholder-centered ideologies are advantages of the civil law system, as they can facilitate long-term investments (i.e., CER investments) and discourage managerial emphasis on the short-term and corporate myopia. Given these findings, we expect that the unique philosophy on which the civil law system is based can induce firms to exert greater effort toward improving their environmental performance than their counterparts that operate under common law systems.

To address these issues more thoroughly, we have organized the remainder of the study into interrelated sections. In "Legal Families, Corporate Environmental Responsibility, and Ownership Structure" section, we develop research hypotheses by explaining the history and implications of legal families and exploring the possible relationships between legal origins, CER, business philosophies, investor protection, and ownership structures. Following, we describe our data, as well as the methods we use to analyze those data in "Empirical Design and Data" section. In "Empirical Results" section, we present the empirical results of these analyses. Finally, in "Discussion" and "Conclusions" sections, we respectively discuss our results and limitations, and offer some concluding remarks.

Legal Families, Corporate Environmental Responsibility, and Ownership Structure

Civil law tradition originated from ancient Roman law, which used statutes, comprehensive codes, and the expertise of legal scholars to formulate rules. These conventions have been followed by "specific" and "bright line" rules in modern civil laws, which leave little room for subjective interpretation. French civil law was established during the French Revolution and the regime of Napoleon Bonaparte.

Napoleon wanted a centralized state, and as a function of that, sought to change property rights without input or interference from judges. As a result, French civil law became integral to an active centralized government. As a consequence of Napoleon's military conquests in the colonial period, the tenets of French civil law spread to other major European nations, as well as Africa, the Indochina peninsula, and Oceania. Owing to French influence, lawmakers in these regions have tended to develop their respective legal systems on the basis of French civil law. Modern traditions associated with German civil law, which also derived from Roman law, were formed when Bismarck unified Germany in 1897. Although German civil law was not as widely adopted as French civil law (Germany had fewer colonies to which to spread their legal traditions), it nonetheless forms the foundation of the legal systems in major emerging countries, including China, Japan, Korea, and Hungary. In contrast to French and German civil laws, Scandinavian civil law is not derived directly from Roman law. Although Scandinavian civil law shares the basic elements of the civil law family outlined above, Nordic countries formed the prototype of Scandinavian civil law in the eighteenth century.

Common law, the history of which dates back to the British Empire, was formed by judges resolving specific legal disputes. Unlike the civil law family that emerged in its image, each of which was developed by legal scholars, common law traditions and precedents are derived from judicial decisions. As the British Empire expanded into multiple colonies, so too did its common law traditions. Because the British Empire and United States were major global economic powers in the 19th and 20th centuries, the common law tradition and its ideology served as the foundation of modern capitalism and corporate laws, which now set the standard for corporate management and operations, especially in the United Kingdom, Australia, and the North American region.

The different historical backgrounds of civil and common laws have generated significant differences in investor rights' protection and managers' discretion in countries that adhere to these discrepant legal traditions. Compared to civil law courts, common law courts are characterized by less formalism of judicial procedures and greater judicial independence (La Porta et al. 2008). The lower degree of formalism within common law systems is complemented by "greater security of property rights". For example, if managers decide to impinge upon outside investors' rights, legal costs associated with this decision can become substantial, and their firms may be forced to endure substantial uncertainty due to the judicial arbitrariness of common law courts. Thus, the vague fiduciary duty principles, judicial arbitrariness, and broad standards of common law courts discourage managers from infringing on outside investors and/or minority shareholders' rights. In contrast to common law countries, civil law countries provide firm managers with greater decision-making flexibility and offer weak protection to outside investors and/or minority shareholders (La Porta et al. 1998, 2000). Evidences produced by previous studies on the topic indicate that the bundles of rights enjoyed by shareholders and investors vary by legal jurisdiction.

Variations in firms' legal origins can afford decision-making rights to the individual or to the collective and as a result, can influence a firm's decisions and subsequent activities. Pistor (2006) argues that corporate decision-making is based on a stakeholder model in civil law countries and a shareholder value model in common law countries. More specifically, rights of initiation in British and American laws (i.e., the common law jurisdictions) are firmly vested with individual shareholders. Therefore, key managerial decisions are likely to reflect shareholder opinions and benefits. In contrast, in civil law countries, corporate interests are not exclusive to shareholders, but instead include the interests of other stakeholders as well.

Coupled with an emphasis on shareholder-centered ideologies, the protection of investor rights offered by common law courts results in greater participation among minority shareholders and a more diffuse ownership structure (La Porta et al. 1998, 1999, 2000, 2008).[5] The inherent differences of firms in countries with different legal origins highlight the importance of exploring a firm's legal basis as a determinant of its corporate governance norms and practices, particularly in terms of managerial ownership structure. This study is also inspired by the distinct characteristics and objectives of dominant owners/managers and minority shareholders. As the convergence-of-interests hypothesis indicates, owners/managers are more likely to increase long-term investments as a means to improve their firms' long-term value in accordance with the degree to which they own their respective firms (Jensen and Meckling 1976; Lee and O'Neill 2003).

Porter (1992) explains that dominant owners/managers seek long-term appreciation, and their goals and objectives are more relationship-driven (rather than transaction-driven). In the same vein, Solomon and Solomon (1999) find that minority shareholders usually pursue objectives that maximize profits in the short-run, but are detrimental to the long-term growth of and future investment in their firms. Similarly, Talbot (2013) claims that minority shareholders are not typically concerned with or involved in a company's long-term viability, but instead demand the pursuit of

[5] La Porta et al. (1998) claim that when investor rights are well-protected, small investors may purchase corporate shares at sufficiently high prices to induce corporations to issue new shares and open the stocks to the public. High demand for corporate shares by shareholders can accelerate the decentralization of firms' ownership.

short-term profit maximization goals. These assertions suggest that dominant owners/managers have a greater incentive to engage in ongoing information-gathering about "their" firms and make long-term investment decisions geared toward improving the firm's long-term value. They are also consistent with the incentive effects of managerial ownership emphasized by Jensen and Meckling (1976). Minority shareholders and outside investors that play crucial roles in common law firms are more likely to be oriented toward short-term gains and embrace corporate myopia. This is because they are naturally sensitive to the timing of buying and selling shares, firms' measurable attributes, and transaction-driven goals instead of gathering information that can promote long-term growth.

The associations between legal systems, investor rights' protection, ownership structures, and ideologies motivate us to examine the possible link between firms' legal origins and CER decisions that require management personnel to adopt long-term perspectives.[6] We predict that within civil law firms, owners/managers can easily make CER investment decisions because these firms are characterized by concentrated ownership structures and incentives to increase long-term value and sustainability. In contrast, firms in common law countries (characterized by strong mechanisms for investor protection and investor participation) emphasize the short-term goals of outside investors and/or minority shareholders. This emphasis may discourage investment in CER because when investor rights are well protected, they can impede long-term projects, which hinders their pursuit of short-term profit maximization (Hart 1995).[7]

The differential ideologies of the civil and common law systems also lend credence to the possibility of a link between a firm's legal origin and its engagement in CER investments and activities. As outlined above, whereas the common law system emphasizes the importance of shareholder rights and interests, the civil law system is more geared toward corporate stakeholders (Hansmann and Kraakman 2000; La Porta et al. 1997, 1998, 2008; Pistor 2006). Among common law firms, the perception that corporate directors and executives are legally bound to maximize shareholder value is widespread. Thus, they run the maximization of minority shareholders' value with short-term and the profit-based goals which often consider CER investments as unnecessary expenditures (Brammer et al. 2006; Karnani 2012). Given this, managers in common law firms may feel more pressure from outside investors and/or minority shareholders when they consider investing in CER-related activities. In contrast, managers in civil law firms that adhere to stakeholder-centered ideologies are subjected to less pressure when they consider engaging in CER activities if they believe that doing so will ultimately benefit the stakeholder groups.[8] For these reasons, we offer a primary research hypothesis (Hypothesis 1) concerning the influence of a firm's legal origin on its CER level.[9]

Hypothesis 1 The CER levels in firms operating in civil law countries are higher than those in firms operating in common law countries.

Business management and economics researchers have documented the effect of ownership structure on long-term investment decisions. Given this relationship, in addition to evaluating our main hypothesis, we also perform an auxiliary test to examine the effect of manager ownership on CER. Moreover, we explore whether the relationship between legal systems and CER remains intact when managerial ownership is included in the explanatory model.

There exist several empirical studies on the relationship between managerial ownership and environmental performance. For example, Berrone et al. (2010) compare the environmental performance of family and non-family public firms in the United States. They find that family-controlled public firms protect stakeholder wealth through sound environmental performance. Moreover, they show

[6] Sharfman and Fernando (2008) and El Ghoul et al. (2011) argue that firms can reduce the risks and costs of capital through long-run environmental management. Hart and Ahuja (1996) and Makni et al. (2009) further show that CER investment is necessary to improve a firm's long-term performance and value, and establish a basis for sustainable growth.

[7] Modigliani and Miller (1958) and Hart (1995) further argue that the shares typically give (minority) shareholders the right to change directors and managers that impinge on investors' rights and force higher dividend payments that reduce investment in long-run projects.

[8] Firms that engage in CER activities achieve the long-term goal of reputation building, which can positively affect both consumer purchases and investments in the company (Mohr et al. 2001). CER can also reduce the risks that firms face. Boutin-Dufresne and Savaria (2004) and Lee and Faff (2009) argue that low CSR/CER firms exhibit significantly higher idiosyncratic risk than do high CSR/CER firms. In addition, Albuquerque et al. (2013) find that low CSR/CER firms are subject to higher systematic risk than their high CSR/CER counterparts. Finally, CER activities can lower regulatory risk and reduce the cost of capital (Heinkel et al. 2001; El Ghoul et al. 2011).

[9] The foundational and descriptive research in the law and finance literature (e.g., La Porta et al., 1998) describes and analyzes the legal systems in which firms operate. Specifically, this research explores the legal protection of investor rights, the quality of law enforcement, and the relationship between ownership concentration and investor protection. Although we explore the significant differences of business environments, management philosophies, corporate governance structures, and investor protections in common law and civil law countries and use these to interpret the possible link between firms' legal origins and their CER investments, some sub-dimensions of each legal system are not distinctly differentiated between civil and common law countries (see "Discussion"). Thus, we only focus on the clearly distinct and different attributes of legal systems for motivating the Hypothesis 1.

that within non-family firms, managerial ownership negatively affects environmental performance. Similarly, Walls et al. (2012) offer several reasons to believe that ownership structure significantly influences environmental performance and investment. First, substantial investment and long-term strategic decisions are necessary to develop and engage in environmental initiatives (Hart and Ahuja 1996). This is because CER investments are risky and have a substantial effect on a firm's capital structure. Second, engagement in CER extends a firm's influence beyond its organizational boundaries including its supply chains across stakeholder groups (Hart 1995; Marcus and Geffen 1998).

According to the convergence-of-interests hypothesis of Jensen and Meckling (1976), there exists a positive relationship between the degree to which a manager has ownership of his/her company and the tendency for him/her to improve their firms' long-term performance and value. Barker and Mueller (2002) and Jensen and Murphy (1990) also find that long-term investment is also positively related to managerial shareholdings, as increased manager ownership mitigates agency costs. Thus, increased managerial ownership fosters greater alignment between the incentives of owners and managers, thereby inducing managers to pursue strategies geared toward long-term investment and value. Further, Ryan and Wiggins (2002) and Wu and Tu (2007) argue that firms that provide managers with stock-based compensation are likely to increase spending on R&D aimed at sustaining long-term growth. Similarly, Mahoney and Thorne (2005) find that long-term compensation schedules for corporate executives mitigate environmental weaknesses and increase environmental responsibility. Assuming that increased stock ownership by managers results (in part) from a long-term compensation schedule, these studies suggest that firms tend to expend greater resources on CER activities when their managers have a larger ownership stake.

However, in accordance with the entrenchment hypothesis, Fama and Jensen (1983) argue that managers are more likely to entrench and satisfy themselves after obtaining a greater ownership share in the firm, thereby precluding the risk of endangering their employment. In response to these two contradictory hypotheses (i.e., the convergence-of-interests and entrenchment hypotheses), Morck et al. (1988), McConnell and Servaes (1990), and McConnell and Servaes (1995) argue that managerial ownership is related to firm value, but that this relationship is not linear in kind. To reconcile the two contradictory hypotheses, and in agreement with Morck et al. (1988), McConnell and Servaes (1990), and McConnell and Servaes (1995), our second hypothesis predicts a nonlinear relationship between managerial ownership and CER (see Fig. 1).

Hypothesis 2 A CER level is positively related to managerial ownership to the point at which managers' positions are entrenched, after which CER level and managerial ownership are inversely related.

Although the aforementioned studies indicate that managerial ownership structures significantly affect CSR/CER levels, the literature fails to identify the factors that affect investment decisions related to a firm's environmental responsibility. We believe that a firm's legal origin, which shapes its management philosophies (e.g., stakeholder-centered ideologies prevail in civil law countries), serves as the basis for that firm's business ethics and attitudes. Consequently, we believe that a firm's legal origin significantly influences its corporate goals and long-term investment decisions. From this, it follows that the legal origin of the nation in which a firm operates may be a stronger predictor of CER than managerial ownership. If

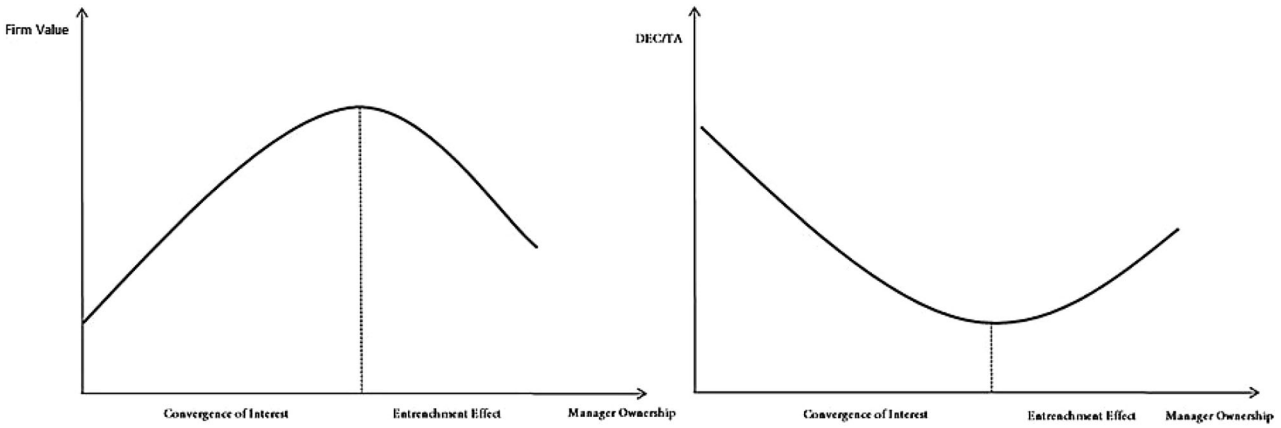

Fig. 1 Nonlinear relationship between firm value (DEC/TA) and managerial ownership. This figure presents the nonlinear relationship between firm value (DEC/TA) and managerial ownership. The *y*-axis is firm value (DEC/TA), and the *x*-axis is manager ownership. The *dotted line* indicates the optimal breakpoint of manager ownership when firms have the highest (lowest) firm value (DEC/TA)

Table 1 Summary statistics

	Mean	Median	SD	Min	P25	P75	Max
DEC/TA	1.985	0.235	5.131	0.000	0.079	1.300	37.862
MAN_OWN	1.025	0.000	4.600	0.000	0.000	0.061	33.220
GDPC	10.301	10.533	0.833	6.607	10.396	10.699	11.509
GDPCG	1.416	1.681	3.499	−9.115	−0.022	2.764	16.278
Prof	12.375	11.050	8.155	−18.010	7.008	16.268	42.909
Grow	10.922	7.036	19.014	−29.086	0.074	16.295	115.220
Size	8.343	8.330	1.585	4.521	7.326	9.364	13.437
Tobin's Q	1.195	0.969	1.078	0.017	0.421	1.543	6.664

This table provides the mean, median, standard deviation, minimum value, first quartile, third quartile, and maximum value for the variables used in our empirical tests

this prediction is correct, we should be able to identify the significant influence of legal origins after controlling for the influence of manager ownership structure. Therefore, we propose a final hypothesis.

Hypothesis 3 The association between a firm's legal origin and its CER level is robust, even after controlling for the effects of managerial ownership.

Empirical Design and Data

Sample Construction

To examine the relationship between CER levels and legal origins and identify the link between CER levels and manager ownership, we employ the following databases: (a) Trucost, which provides direct environmental costs for listed manufacturing firms around the world; (b) Worldscope, which provides financial statement data; and (c) S&P Capital IQ, which contains information on manager ownership, real GDP per capita, and real GDP per capita growth. We use unbalanced panel data from 27 countries covering the period from 2003 to 2012. Our sample comprises 17,956 firm-year observations, 9811 of which relate to nine common law countries and 8145 of which relate to 18 civil law countries. Among the firm-year observations from civil law countries, 1756 relate to eight French civil law countries, 5647 relate to six German civil law countries, and 742 relate to four Scandinavian civil law countries (for more detail on these countries, see Appendix Table 12).

Table 1 provides summary statistics for the variables we use in our empirical tests, which are univariate and multivariate regression analyses. As measures for CER levels, we use a dollar-amount evaluation of direct environmental costs obtained from the Trucost database. This measure is generally used by recent studies, including Thomas et al. (2007), Dawkins and Fraas (2011), and Jo et al. (2015). The mean (median) value of direct environmental costs to total assets (denoted as DEC/TA) is 1.99 % (0.24 %).

Table 2 shows the differentiated patterns between firms with and without manager ownership. In column 1 of Table 2, the mean DEC/TA decreases over time for the total sample of firms, possibly due to growing appreciation for the significance of environmental management. In columns 2 and 3, the decreasing pattern of DEC/TA is more pronounced for firms with manager ownership than for firms without. These patterns are clearly illustrated in Fig. 2, which shows the decreasing pattern of the mean DEC/TA for the total sample and for firms with manager ownership in comparison to firms without.

Direct Environmental Costs

Several studies use the environmental cost data of Trucost to estimate firms' levels of environmental responsibility. For instance, Jo et al. (2015) use environmental cost data as an evaluation measure for CER because firms can increase CER levels (reduce environmental costs) by increasing their corporate investments in environmental responsibility through expenditures on cleaning technology or environmental R&D. We also use the direct environmental cost data from Trucost to evaluate CER levels.[10] Trucost analyzes the environmental performances of approximately 4000 firms by calculating international environmental costs. To our knowledge, the Trucost database is the only source that provides the dollar amounts of companies' environmental costs. This database applies a standard model by integrating the usage and emissions of over 700 environmental resources. The database also uses a global input/output model based on detailed government census

[10] Our untabulated results show a significantly negative relationship between our ratios of direct environmental costs to total assets and the environmental management scores from ASSET4 (Thomson Reuters). Our results indicate that environmental management scores are likely to be higher when firms have a lower ratio of environmental costs to total assets. Thus, the evidence suggests that our environmental cost data can be used as a proxy for CER level.

Table 2 Environmental costs and managerial ownership

	DEC/TA		
	Total sample (Obs. = 17,956)	Firms with manager ownership (Obs. = 8850)	Firms without manager ownership (Obs. = 9106)
2003	3.407	7.176	3.340
2004	2.728	2.814	2.722
2005	2.844	2.908	2.820
2006	2.602	2.608	2.600
2007	2.570	2.705	2.493
2008	2.533	2.629	2.459
2009	2.427	2.454	2.394
2010	2.149	1.876	2.623
2011	2.406	1.772	3.554
2012	1.060	0.825	2.019
Mean	2.250	1.778	2.709

This table provides the change in DEC/TA (%) over time in the total sample for firms with and without manager ownership

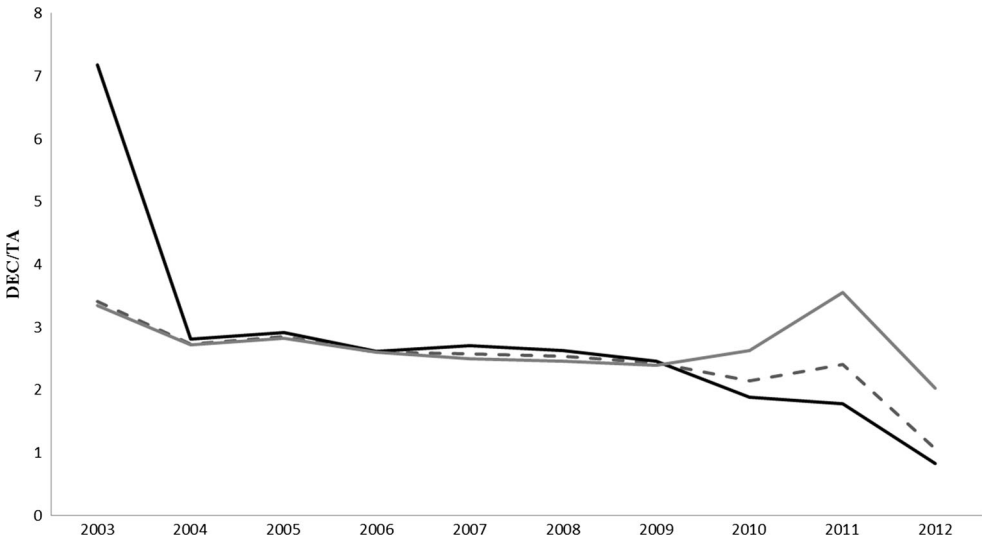

Fig. 2 Environmental costs and manager ownership. This figure presents the decreasing pattern of environmental costs. The *y*-axis is DEC/TA, and the *x*-axis is year. The *dotted line* shows the decreasing pattern of the mean DEC/TA for the total sample; the *solid black line* shows the decreasing pattern of the mean DEC/TA for firms with manager ownership; and the *solid gray line* shows the pattern for mean DEC/TA for firms without manager ownership

and survey data regarding resource use, pollutant releases, industry overviews, and national economic accounts.[11]

In addition, the Trucost environmental profiling model accounts for 464 industries worldwide, tracks over 100 environmental impacts, and examines the interactions and cash flows among sectors in order to map each one's supply chain (Trucost Methodology Overview 2008). The quantity data are converted into dollar amounts by multiplying each environmental impact by its social damage cost. The direct environmental costs include the following six: those incurred from greenhouse gases (GHGs), water use, waste disposal, land and water pollutants, air pollutants, and natural resource use.[12]

The CER data used in earlier studies are generally based on ratings or binary figures, usually from U.S. firms. For example, Russo and Fouts (1997) use Franklin Research and Development Corporation (FRDC) data, which estimates CER levels through simple environmental ratings. To calculate CSR (or CER) scores, Kim and Statman (2012), Deng et al. (2013), and Di Giuli and Kostovetsky (2014) use the KLD database that provides only binary

[11] The input/output model developed by Leontief (1970) uses information on the amount of resources required to produce a unit of output and where this output is sold. Trucost compiles a standard model by integrating the use and emissions of over 700 environmental resources.

[12] An online appendix with detailed descriptions for each component of direct environmental costs is available online at the Trucost web site (www.trucost.com).

figures. However, Trucost offers a large sample of countries' environmental costs in U.S. dollars. Thus, we can estimate the level of a firm's environmental responsibility more accurately than the FRDC and KLD datasets used in earlier studies.

Empirical Model and Variable Measurement

To test our hypotheses on the relationships between CER levels and legal origins and between CER levels and manager ownership, we estimate Eq. (1) given below:

$$\begin{aligned} \mathrm{DEC/TA} = {} & \beta_0 + \beta_1 \mathrm{Common} + \beta_2 \mathrm{Civil} + \beta_3 \mathrm{French} \\ & + \beta_4 \mathrm{German} + \beta_5 \mathrm{Scandinavian} \\ & + \beta_6 \mathrm{MAN\_OWN} \\ & + \beta_7 \mathrm{MAN\_OWN\_SQ} + \beta_8 \mathrm{GDPC} \\ & + \beta_9 \mathrm{GDPCG} + \beta_{10} \mathrm{Prof} + \beta_{11} \mathrm{Grow} \\ & + \beta_{12} \mathrm{Size} + \mathrm{Year}\ \&\ \mathrm{Industry\ fixed\ effects} \\ & + \varepsilon, \end{aligned} \tag{1}$$

where the dependent variable, DEC/TA, is defined as the direct environmental costs scaled by total assets. The direct environmental costs can reflect CER levels because firms can reduce their environmental costs through CER investments (Jo et al. 2015). Our hypothesis predicts a significantly positive common law association with DEC/TA and a significantly negative civil law association with DEC/TA. We also expect a significantly negative association between managerial ownership and DEC/TA, and a significantly positive association between squared managerial ownership and DEC/TA. However, the different legal origin associations with DEC/TA will remain robust after controlling for the manager ownership and its squared term.

This section defines the independent variables used in our study. Common is a dummy variable taking the value of 1 if a firm belongs to a common law country. Civil is a dummy variable taking the value of 1 if a firm belongs to a civil law country. The civil law countries comprise French, German, and Scandinavian civil law countries. French is a dummy variable taking the value of 1 if a firm belongs to a French civil law country. German is a dummy variable taking the value of 1 if a firm belongs to a German civil law country. Scandinavian is a dummy variable taking the value of 1 if a firm belongs to a Scandinavian civil law country. MAN_OWN is the percentage of shares owned by the manager. MAN_OWN_SQ is the square of MAN_OWN. GDPC is the natural logarithm of real GDP per capita, which reflects the scale and general traits of each economic development (Chan et al. 2005). GDPCG is the natural logarithm of the real GDP per capita growth. Prof is firm profitability, measured by earnings before interest and taxes (EBIT) divided by total assets. Grow is the firm's average rate of growth in sales over the most recent 3-year period. Size is the natural logarithm of total assets in millions of dollars. Finally, we control for year- and industry-fixed effects with robust standard errors clustered at the firm level or the robust standard errors of White (1980) or Newey and West (1987). However, in Eq. (1), since country-fixed effects would be perfectly correlated with legal origin dummies, we do not include them in our regressions.

Empirical Results

In this section, we examine whether legal origins matter for the reduction of environmental costs (i.e., increasing CER levels) and whether firms with greater manager ownership seek to lower environmental costs. We also empirically investigate whether the relationship between legal origins and environmental costs remains intact when the manager ownership factor is considered. To answer these research questions, we design our empirical analysis as follows. First, we conduct univariate tests comparing the DEC/TA values of common law firms with those of civil law firms. We also run univariate tests comparing the DEC/TA values of firms with manager ownership against those without. Second, we carry out multivariate regression analyses in which we regress DEC/TA on legal origins and control variables, including manager ownership and its squared term, with robust standard errors clustered at the firm level. Third, to mitigate possible endogeneity concerns, we use the two-step generalized method of moments (GMM). We also perform various robustness tests to confirm our primary results.

Univariate Analysis

Table 3 presents the *t*-tests and Wilcoxon rank-sum tests that show the differences in the DEC/TA means and medians between common law and civil law firms. Table 3 shows that, on average, common law firms incur a DEC/TA of 2.84 % and civil law firms have a DEC/TA of only 1.54 %. The mean DEC/TA of common law firms is thus greater than that of civil law firms, and the mean difference in DEC/TA is statistically significant at the 1 % level. While the median difference is insignificant, the median DEC/TA of common law firms is higher than that of civil law firms.

Table 4 provides the univariate test results showing the differences in DEC/TA between common law and civil law firms over time. In 2003, common law firms have a DEC/TA of 4.18 %, but civil law firms incur a DEC/TA of

Table 3 Univariate tests of DEC/TA between legal origins

Mean	(1) Common law (Obs. = 9811)	(2) Civil law (Obs. = 8145)	(1)–(2) Difference (*T-Stat*)
DEC/TA	2.839	1.540	1.299*** (10.373)
Median	(1) Common law	(2) Civil law	(1)–(2) Difference (*Z-Stat*)
DEC/TA	0.244	0.227	0.017 (0.037)

This table presents the mean and median comparison tests across subsamples of common law and civil law groups. The differences in the means are evaluated using *t*-statistics, and the differences in the medians (Wilcoxon rank-sum test or Mann–Whitney two-sample statistic) are evaluated using *z*-statistics

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

Table 4 Univariate tests of the differences in environmental costs between common law firms and civil law firms

Year	DEC/TA		
	Common law (Obs. = 9811)	Civil law (Obs. = 8145)	Difference
2003	4.181	2.170	2.011*** (3.16)
2004	3.518	1.759	1.759*** (4.03)
2005	3.857	1.659	2.197*** (5.00)
2006	3.419	1.627	1.792*** (4.58)
2007	3.276	1.728	1.548*** (3.73)
2008	3.278	1.628	1.650*** (3.91)
2009	3.056	1.688	1.368*** (3.13)
2010	2.702	1.480	1.221*** (3.17)
2011	2.944	1.766	1.178*** (2.27)
2012	1.138	0.969	0.169* (1.65)

This table provides the mean differences in DEC/TA (%) of the common law and civil law groups over time. The differences in the means are evaluated using *t*-statistics (in parentheses)

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

2.17 %. However, the mean DEC/TA of common law firms is 3.28 % (1.14 %) in 2007 (2012) and that of civil law firms is 1.73 % (0.97 %) in 2007 (2012). Thus, the mean differences in DEC/TA between the two types of firms are 2.01 % for 2003, 1.55 % for 2007, and 0.17 % for 2012. All DEC/TA means are greater for common law firms than for civil law firms from 2003 to 2012 and are statistically significant. Figure 3 shows the time-series variations of mean DEC/TA between common law and civil law firms. They reveal that all of the DEC/TA means of common law firms are greater than those of civil law firms over time.

Overall, Tables 3 and 4 show that, although the mean differences in DEC/TA between the firms with different legal origins have decreased over time, common law firms still have a significantly higher level of direct environmental costs in relation to total assets than civil law firms. These findings support the argument of our main hypothesis that CER levels in civil law firms are higher than those in common law firms, possibly because the tendency to engage in long-term investments is more pronounced in civil law firms. Meanwhile, common law firms, which emphasize shareholder interest to a greater extent than other stakeholder benefits, appear to regard CER investments that are intended to lower environmental costs as unnecessary expenditures detrimental to shareholders' short-term maximization (Brammer et al. 2006; Karnani 2012).

Panel A of Table 5 shows the univariate test that compares the DEC/TA values for common law and civil law firms depending on managerial ownership (i.e., firms with or without manager ownership). Our results show that DEC/TA levels are higher for common law firms than civil law firms whether they have manager ownership or not. However, statistically significant differences in average DEC/TA appear for firms with and without manager ownership at approximately −1.74 % for common law firms and −0.71 % for civil law firms. Panel B of Table 5 displays the empirical findings regarding the effects of different levels of managerial ownership on DEC/TA. The mean (median) DEC/TA is 1.78 % (0.19 %) for firms with manager ownership compared to 2.71 % (0.30 %) for firms without. Interestingly, DEC/TA decreases if management has a higher level of equity ownership.

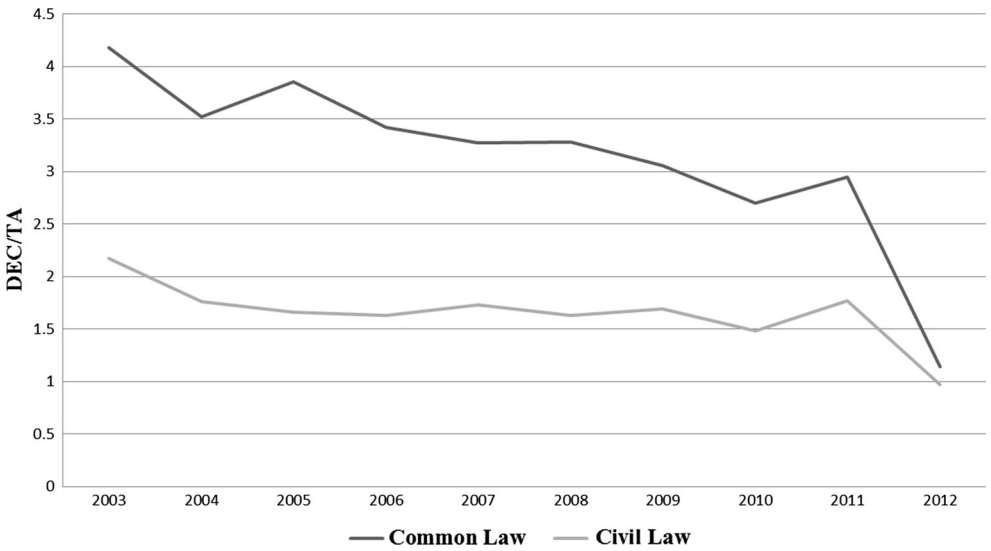

Fig. 3 Differences in environmental costs between common law firms and civil law firms for each year. This figure presents the time-series variations in mean DEC/TA for common law and civil law firms. The *y*-axis is DEC/TA and the *x*-axis is year. The *black line* shows the variation in mean DEC/TA for common law firms. The *gray line* shows the variation in mean DEC/TA for civil law firms

Table 5 Univariate tests for legal origins and manager ownership

	Firms with manager ownership (Obs. = 8850)	Firms without manager ownership (Obs. = 9106)	Difference
Panel A. Legal origins and manager ownership			
Common law	2.131*** (0.105)	3.875*** (0.192)	−1.744*** (0.219)
Civil law	1.095*** (0.079)	1.802*** (0.091)	−0.707*** (0.120)
Difference	1.036*** (0.132)	2.073*** (0.213)	
	Firms with manager ownership	Firms without manager ownership	Difference (*T*-Stat/*Z*-Stat)
Panel B. Direct environmental costs and manager ownership			
Mean	1.778	2.709	−0.931*** (−7.45)
Median	0.191	0.300	−0.109*** (−19.90)
	Firms with over 3 % manager ownership	Firms without manager ownership	Difference (*T*-Stat/*Z*-Stat)
Mean	0.776	2.709	−1.933*** (−9.84)
Median	0.076	0.300	−0.224*** (−34.26)
	Firms with over 7 % manager ownership	Firms without manager ownership	Difference (*T*-Stat/*Z*-Stat)
Mean	0.648	2.709	−2.061*** (−10.12)
Median	0.065	0.300	−0.235*** (−35.14)
	Firms with over 10 % manager ownership	Firms without manager ownership	Difference (*T*-Stat/*Z*-Stat)
Mean	0.605	2.709	−2.104*** (−10.07)
Median	0.058	0.300	−0.242*** (−35.56)

Panel A presents the univariate test of DEC/TA (%) between the common law and civil law groups. Panel B shows the univariate test for the percentage of shares owned by the manager. DEC/TA (%) denotes the direct environmental costs to total assets. The differences in the means are evaluated using *t*-statistics, and the differences in the medians (Wilcoxon rank-sum test or Mann–Whitney two-sample statistic) are evaluated using *z*-statistics

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

For example, the mean (median) DEC/TA is 0.78 % (0.08 %) for firms with more than 3 % manager ownership, 0.65 % (0.07 %) for firms with more than 7 % manager ownership, and 0.61 % (0.06 %) for firms with more than 10 % manager ownership. Consistent with the views of Jensen and Meckling (1976) and Lee and O'Neill (2003),

Table 6 Regression results of legal origins on environmental costs

	DEC/TA					
	(1)	(2)	(3)	(4)	(5)	(6)
Common	0.981*** (7.73)					
Civil		−0.981*** (−7.73)				
French			−1.287*** (−6.01)			−1.610*** (−7.29)
German				−0.514*** (−3.74)		−0.795*** (−5.59)
Scandinavian					−0.513* (−1.69)	−0.925*** (−3.00)
GDPC	−0.996*** (−12.28)	−0.996*** (−12.28)	−1.050*** (−12.70)	−0.946*** (−11.68)	−0.936*** (−11.50)	−1.048*** (−12.65)
GDPCG	0.019 (0.94)	0.019 (0.94)	0.002 (0.08)	0.040** (1.97)	0.030 (1.52)	0.001 (0.07)
Prof	0.461 (0.56)	0.461 (0.56)	1.273 (1.55)	0.785 (0.94)	1.292 (1.57)	0.636 (0.77)
Grow	−0.008** (−2.50)	−0.008** (−2.50)	−0.006* (−1.90)	−0.007** (−2.06)	−0.006* (−1.89)	−0.008** (−2.44)
Size	−0.030 (−0.70)	−0.030 (−0.70)	−0.029 (−0.68)	−0.063 (−1.50)	−0.067 (−1.60)	−0.012 (−0.29)
Cons	11.256*** (11.37)	12.237*** (12.27)	12.223*** (12.20)	11.534*** (11.62)	11.178*** (11.25)	12.617*** (12.53)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,543	17,543	17,543	17,543	17,543	17,543
Adj. R^2	0.126	0.126	0.124	0.123	0.123	0.126

This table presents the estimation results from regressing DEC/TA (%) on legal origins and controls for 17,543 firm-year observations from 27 countries covering 2003 to 2012. *t*-statistics appear in brackets

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

our evidence indicates that increases in manager ownership can facilitate long-term investments such as CER investments, which then reduce environmental costs. Overall, the results of Table 5 support our predictions about the relationships between CER levels and legal origins and between CER levels and manager ownership.

Multivariate Analysis

To examine the associations between DEC/TA and legal origins and between DEC/TA and manager ownership, and to investigate if our DEC/TA relationship with legal origins remains intact, we regress DEC/TA on legal origins, the percentage of manager shareholding, its squared term, and other control variables. The level of CER is measured by DEC/TA. Each regression includes year- and industry-fixed effects as indicated. Because firm-fixed or country-fixed effects would be perfectly correlated with the categories of the legal origin dummy, we do not adopt either of them in our regressions. In models 1 and 2 of Table 6, we explore the effects of legal origins on environmental costs. We find a significantly positive relationship between DEC/TA and the common law dummy and a significantly negative relationship between DEC/TA and the civil law dummy. In other words, our results show a significantly negative relationship between CER level and the common law dummy, whereas they show a significantly positive relationship between CER level and the civil law dummy.

We further investigate the effect of each sub-component of civil law on DEC/TA in models 3 to 6, presented in Table 6. These sub-components include (a) French civil law, (b) German civil law, and (c) Scandinavian civil law. As with the aggregate civil law and DEC/TA relationship, we find significant and negative coefficients on each sub-component of civil law, indicating that civil law firms (including French, German, and Scandinavian civil law firms) have significantly lower environmental costs relative to total assets than common law firms.[13] To explore whether our core evidence is robust, we also conduct a Fama–MacBeth analysis with Newey–West standard error and perform random effects with robust standard errors clustered at the firm level (see Tables 7 and 8). Consistent with the evidence presented earlier, we find a significantly positive relationship between DEC/TA and the common law dummy. Our results further confirm a significantly negative relationship between DEC/TA and civil law (and its sub-components of French, German, and Scandinavian civil laws).[14] Overall, our findings show that civil law firms incur a lower level of DEC/TA (i.e., a higher level of CER) than common law firms. Thus, our results support our main hypothesis.

[13] Our legal origin relationship with DEC/TA remains intact when we use robust standard errors clustered at the firm level.

[14] Although the Scandinavian civil law dummy and DEC/TA have an insignificant relationship in model 5 of Table 8 (with a *t*-value of -1.00), they have a statistically significant and negative relationship in all other main and robustness tests.

Table 7 Regression results of legal origins on environmental costs: Fama–MacBeth analysis

	DEC/TA					
	(1)	(2)	(3)	(4)	(5)	(6)
Common	1.692*** (6.57)					
Civil		−1.692*** (−6.57)				
French			−1.343*** (−11.03)			−2.012*** (−8.66)
German				−1.319*** (−5.79)		−1.695*** (−5.89)
Scandinavian					−0.418** (−3.08)	−1.110*** (−5.79)
GDPC	−1.248*** (−6.65)	−1.248*** (−6.65)	−1.301*** (−7.30)	−1.176*** (−6.94)	−1.156*** (−8.10)	−1.311*** (−6.40)
GDPCG	0.043 (1.56)	0.043 (1.56)	−0.001 (−0.03)	0.075** (2.58)	0.060 (1.37)	0.020 (0.81)
Prof	−4.243* (−1.85)	−4.243* (−1.85)	−3.128 (−1.43)	−4.201 (−1.77)	−3.131 (−1.39)	−4.300* (−1.86)
Grow	0.006 (0.62)	0.006 (0.62)	0.010 (0.98)	0.008 (0.82)	0.011 (1.04)	0.007 (0.63)
Size	0.211*** (3.41)	0.211*** (3.41)	0.178*** (4.53)	0.146** (2.75)	0.134*** (3.40)	0.222*** (3.69)
Cons	13.085*** (7.06)	14.777*** (7.45)	14.903*** (7.72)	14.153*** (8.03)	13.524*** (9.04)	15.406*** (7.04)
Newey–West S.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,543	17,543	17,543	17,543	17,543	17,543
Adj. R^2	0.032	0.032	0.025	0.028	0.023	0.033

This table presents the results of the Fama–MacBeth estimation for 17,543 firm-year observations from 27 countries covering 2003 to 2012. *t*-statistics appear in brackets and are based on Newey–West standard errors

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

Adjusting Sample Composition

The heterogeneity of the number of firm-year observations across countries can influence the legal origins–DEC/TA association. This section suggests ways to mitigate the potential sample composition bias. First, in models 1 to 3 of Table 9, we estimate a weighted least squares (WLS) regression where the weight is the inverse of the number of firm-year observations per country. Second, we re-estimate the prior regressions after excluding the U.S. sample (which has the largest number of firm-year observations) in models 4 to 6. Third, we also re-conduct the prior regressions after removing the countries with the top three largest numbers of firm-year observations (i.e., the U.S., U.K., and Japanese samples) in models 7 to 9. In Table 9, consistent with our earlier empirical regression results, we find a significantly positive common law association with DEC/TA and a significantly negative civil law (and sub-components of civil law) association with DEC/TA. Thus, after mitigating the sample composition bias, our results clearly support the prediction that civil law firms incur a lower level of DEC/TA than common law firms.

Two-Step Generalized Method of Moments (GMM) Analysis

One of our concerns in this analysis is the potential for an endogeneity problem due to reverse causality between the legal origin dummy variables and DEC/TA.[15] In Table 10, we alleviate this potential endogeneity concern by using a two-step GMM estimation and report the results of Hansen *J*-test statistics with *p*-values of 0.213-0.835. The Hansen's *J*-test result, used to test the over-identification restrictions, indicates that we should not reject the hypothesis and that our instruments are valid.[16]

In this section, we also control for the effects of managerial ownership on DEC/TA and the potential nonlinear relationship between DEC/TA and manager ownership. To consider this relationship, we use variables for the percentage of manager shareholding (MAN_OWN) and its square term (MAN_OWN_SQ) in Table 10. Our two-step GMM model extends the linear regression of Morck et al. (1988) and McConnell and Servaes (1990, 1995), allowing the coefficients on the manager ownership variables to determine their optimal breakpoints.

We find a significantly negative relationship between DEC/TA and MAN_OWN and a significantly positive relationship between DEC/TA and MAN_OWN_SQ. These results suggest that the initial decrease in DEC/TA as

[15] The legal origin (i.e., common law, civil law, French civil law, German civil law, and Scandinavian civil law) dummies are exogenously determined. Thus, we do not need to use the two-step GMM estimation in Tables 6, 7, 8, and 9. However, Table 10 uses a two-step GMM because manager ownership might be endogenously determined.

[16] MAN_OWN and MAN_OWN_SQ are used as instrumental variables for the third and fourth lagged periods in the two-step GMM.

Table 8 Regression results of legal origins on environmental costs: Random effects analysis

	DEC/TA					
	(1)	(2)	(3)	(4)	(5)	(6)
Common	1.006*** (4.36)					
Civil		−1.006*** (−4.36)				
French			−0.877*** (−3.65)			−1.244*** (−4.36)
German				−0.767*** (−3.41)		−0.974*** (−3.87)
Scandinavian					−0.267 (−1.00)	−0.684** (−2.32)
GDPC	−0.910*** (−4.13)	−0.910*** (−4.13)	−0.919*** (−4.12)	−0.876*** (−4.01)	−0.864*** (−3.92)	−0.930*** (−4.13)
GDPCG	−0.026* (−1.74)	−0.026* (−1.74)	−0.025 (−1.62)	−0.017 (−1.13)	−0.019 (−1.24)	−0.028* (−1.76)
Prof	0.982 (0.47)	0.982 (0.47)	1.32 (0.65)	1.014 (0.49)	1.309 (0.64)	0.988 (0.48)
Grow	0.001 (0.36)	0.001 (0.36)	0.002 (0.54)	0.002 (0.50)	0.002 (0.58)	0.001 (0.36)
Size	−0.08 (−0.91)	−0.08 (−0.91)	−0.078 (−0.87)	−0.104 (−1.17)	−0.099 (−1.11)	−0.075 (−0.84)
Cons	12.392*** (5.71)	13.398*** (5.94)	13.070*** (5.84)	12.984*** (5.84)	12.568*** (5.70)	13.571*** (5.91)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Observations	17,543	17,543	17,543	17,543	17,543	17,543
Adj. R^2	0.019	0.019	0.015	0.016	0.013	0.020

This table presents the results of the random effects estimation for 17,543 firm-year observations from 27 countries covering 2003 to 2012. *t*-statistics appear in brackets and are based on robust standard errors adjusted for clustering by firm

***, **, and * denote statistical significance at the 1, 5, and 10 % levels, respectively

manager ownership rises can reflect the managers' greater incentives to maximize long-term value as their stakes in their firms increase, a finding that is in accordance with the convergence-of-interests hypothesis. However, beyond the optimal ownership level, increases in manager ownership are likely to be associated with conditions conducive to the entrenchment of incumbent management hypothesis. The nonlinear relationship between DEC/TA and manager ownership is illustrated in Fig. 4. This evidence is broadly consistent with the views of Morck et al. (1988) and McConnell and Servaes (1990, 1995) who argue that manager ownership has a concave relationship with firm value. For models 1 to 12, shown in Table 10, our results consistently indicate that civil law firms (i.e., French, German, and Scandinavian civil law firms) have significantly lower DEC/TA than common law firms, after alleviating the endogeneity concerns and controlling for the managerr ownership variables. Overall, these results support hypotheses 1, 2, and 3.

Additional Tests for the Effect of CER on Firm Value

So far, we have examined whether legal origins matter for the reduction of environmental costs and have investigated whether the relationships between legal origins and DEC/TA remain intact when managerial ownership is considered. Now, as shown in Table 11, we investigate whether CER investment increases firm value in the long run because we assume that such investment is one of the major long-term investments that enhance long-term firm performance and consequently increase firm value (Hart and Ahuja 1996; Makni et al. 2009). Thus, we use lagged DEC/TA variables to explore the long-term effects on firm value. LAG1_DEC/TA is the direct environmental costs to total assets at time *t*-1 and LAG2_DEC/TA is the direct environmental costs to total assets at time *t*-2. Following Hail and Leuz (2006), we regress Tobin's Q on DEC/TA and the control variables, including year-, industry-, and country-fixed effects, with robust standard errors clustered at the firm level. Models 1, 2, 4, and 5 of Table 11 show that the DEC/TA at times *t*-1 and *t*-2 have statistically significantly negative coefficients when the variables are used separately.[17]

However, when the DEC/TA at times *t*-1 and *t*-2 are estimated with all variables at the same time (in models 3 and 6), only the coefficient on DEC/TA at time *t*-2 is significant and negative. These results show that lowering environmental costs through CER investments tends to increase firm value, but the effect takes at least 2 years to become apparent. Thus, our findings indicate that our assumption about CER investments being long-term investments is reasonable.[18] These results also support a

[17] We also find the same results when using year- and firm-fixed effects with robust standard errors clustered at the firm level. In addition, we find that the results are qualitatively identical in all tests after mitigating possible endogeneity problems in our untabulated GMM results.

[18] Table 11 supports the interpretation that managers of civil law firms have a greater tendency to make long-term investment decisions (i.e., CER investments) in order to enhance firm value and foster sustainable growth.

Table 9 Robustness tests for sample composition

	DEC/TA								
	Weighted least squares			Excluding U.S. firms			Excluding U.S., U.K., and Japanese firms		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Common	0.942*** (7.71)			1.027*** (3.39)			1.774*** (3.73)		
Civil		−0.942*** (−7.71)			−1.027*** (−3.39)			−1.774*** (−3.73)	
French			−1.450*** (−5.68)			−1.743*** (−4.41)			−2.669*** (−4.77)
German			−0.844*** (−6.34)			−0.816*** (−2.59)			−1.266** (−2.55)
Scandinavian			−0.946** (−2.57)			−0.875** (−2.52)			−1.961*** (−3.69)
GDPC	−0.989*** (−10.93)	−0.989*** (−10.93)	−1.020*** (−11.07)	−1.039*** (−4.08)	−1.039*** (−4.08)	−1.102*** (−4.22)	−0.814*** (−2.95)	−0.814*** (−2.95)	−0.867*** (−3.10)
GDPCG	0.007 (0.33)	0.007 (0.33)	−0.003 (−0.17)	0.031** (1.98)	0.031** (1.98)	0.010 (0.69)	0.001 (0.07)	0.001 (0.07)	−0.038** (−2.02)
Prof	−1.058* (−1.68)	−1.058* (−1.68)	−1.003 (−1.60)	2.629 (1.33)	2.629 (1.33)	2.861 (1.44)	3.016 (1.21)	3.016 (1.21)	3.511 (1.39)
Grow	−0.002 (−0.74)	−0.002 (−0.74)	−0.002 (−0.68)	−0.010 (−1.46)	−0.010 (−1.46)	−0.009 (−1.42)	−0.020** (−2.41)	−0.020** (−2.41)	−0.020** (−2.45)
Size	−0.007 (−0.20)	−0.007 (−0.20)	0.001 (0.04)	0.099 (1.36)	0.099 (1.36)	0.122* (1.67)	−0.064 (−0.62)	−0.064 (−0.62)	0.010 (0.09)
Cons	11.357*** (10.99)	12.300*** (11.64)	12.572*** (11.76)	10.285*** (3.86)	11.312*** (4.20)	11.764*** (4.28)	9.752*** (3.49)	11.526*** (4.11)	11.616*** (4.08)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Observations	17,543	17,543	17,543	13,236	13,236	13,236	8497	8497	8497
Adj. R^2	0.160	0.160	0.161	0.105	0.105	0.106	0.099	0.099	0.101

This table presents robustness tests for the sample composition from regressing DEC/TA (%) on legal origins and controls. *t*-statistics appear in brackets and are based on robust standard errors adjusted for clustering by firm

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

Table 10 Robustness tests for endogeneity: Generalized method of moment results

	DEC/TA											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Common	1.646*** (10.85)	1.714*** (10.49)										
Civil			−1.646*** (−10.85)	−1.714*** (−10.49)								
French					−1.380*** (−8.44)	−1.369*** (−8.30)					−2.018*** (−10.74)	−2.039*** (−10.84)
German							−1.242*** (−7.98)	−1.317*** (−7.90)			−1.611*** (−9.36)	−1.696*** (−10.02)
Scandinavian									−0.411*** (−3.05)	−0.415*** (−3.06)	−1.119*** (−7.04)	−1.148*** (−7.17)
MAN_OWN	−0.053*** (−4.47)	−0.273*** (−7.19)	−0.053*** (−4.47)	−0.273*** (−7.19)	−0.054*** (−4.54)	−0.230*** (−6.27)	−0.053*** (−4.48)	−0.256*** (−6.87)	−0.056*** (−4.73)	−0.234*** (−6.38)	−0.052*** (−4.35)	−0.268*** (−7.35)
MAN_OWN_SQ		0.008*** (6.24)		0.008*** (6.24)		0.006*** (5.15)		0.007*** (5.91)		0.006*** (5.27)		0.008*** (6.34)
GDPC	−1.358*** (−8.38)	−1.328*** (−7.70)	−1.358*** (−8.38)	−1.328*** (−7.70)	−1.392*** (−8.36)	−1.357*** (−7.68)	−1.298*** (−8.05)	−1.263*** (−7.40)	−1.297*** (−8.03)	−1.253*** (−7.31)	−1.393*** (−8.35)	−1.361*** (−8.21)
GDPCG	0.012 (0.74)	0.005 (0.36)	0.012 (0.74)	0.005 (0.36)	0.002 (0.14)	−0.003 (−0.18)	0.036** (2.24)	0.031* (1.95)	0.022 (1.35)	0.016 (1.02)	0.007 (0.43)	0.002 (0.12)
Prof	−3.979*** (−3.12)	−5.169*** (−4.37)	−3.979*** (−3.12)	−5.169*** (−4.37)	−2.880** (−2.30)	−3.833*** (−3.34)	−3.677*** (−2.91)	−4.820*** (−4.13)	−2.767** (−2.22)	−3.659*** (−3.21)	−4.007*** (−3.15)	−5.199*** (−4.81)
Grow	−0.001 (−0.01)	0.004 (0.76)	−0.001 (−0.01)	0.004 (0.76)	0.006 (0.97)	0.010* (1.82)	0.003 (0.51)	0.007 (1.34)	0.006 (1.07)	0.010* (1.95)	0.001 (0.03)	0.004 (0.80)
Size	0.187*** (3.51)	0.195*** (3.75)	0.187*** (3.51)	0.195*** (3.75)	0.169*** (3.11)	0.174*** (3.27)	0.128** (2.37)	0.134** (2.53)	0.119** (2.18)	0.124** (2.32)	0.201*** (3.75)	0.208*** (3.97)
Cons	14.400*** (7.61)	14.133*** (7.07)	16.046*** (8.29)	15.847*** (7.67)	15.767*** (8.08)	15.471*** (7.47)	15.472*** (8.07)	15.216*** (7.46)	15.060*** (7.88)	14.656*** (7.23)	16.296*** (8.30)	16.077*** (8.24)
Hansen's *J*-Stat. (*p* value)	0.775	0.213	0.775	0.213	0.773	0.287	0.835	0.232	0.764	0.276	0.775	0.385
Observations	10,810	10,810	10,810	10,810	10,810	10,810	10,810	10,810	10,810	10,810	10,810	10,810

This table reports the robustness results of DEC/TA (%) against legal origins, MAN_OWN, and second-order (quadratic) MAN_OWN covering 2003 to 2012 using the two-step generalized method of moment (GMM). Diagnostic statistics are reported for instruments of over-identification restrictions (the *p*-values for Hansen's *J*-statistics are reported). The Hansen test of over-identifying restrictions is a test with the joint null hypothesis that instrumental variables are valid (i.e., uncorrelated with error terms). *z*-statistics appear in brackets

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

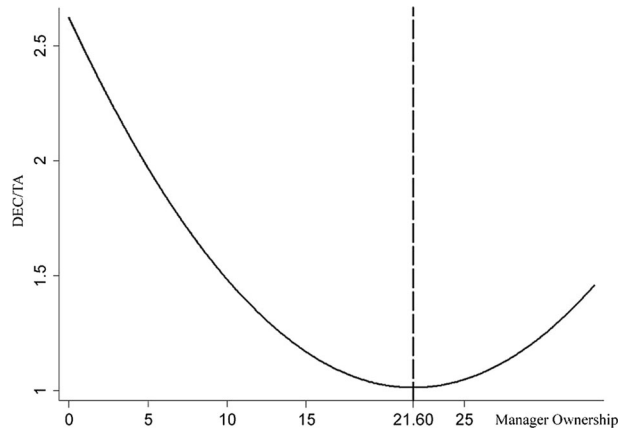

Fig. 4 Relationship between DEC/TA and managerial ownership. This figure presents the nonlinear relationship between DEC/TA and managerial ownership. The *y*-axis is DEC/TA and the *x*-axis is manager ownership. The *dotted line* indicates the estimated optimal breakpoint (21.60 %) of manager ownership when firms have the lowest DEC/TA

reputation-building hypothesis that good environmental management can improve firm value by generating reputational advantages (Weber et al. 2008; Guenster et al. 2011; Jo et al. 2015).

Discussion

The main objective of this article is to identify and develop an understanding of the cross-country determinants of CER engagement of firms. More specifically, in this paper, we focus on the link between a country's legal system and the CER activities of the firms that operate within it. To evaluate this association, we use "direct environmental cost" data from Trucost as a proxy for CER.

Previous studies on nations' legal origins, ownership structures, and management decisions serve as the impetus behind this research. All of these potential determinants have undergone substantial empirical research in the fields of business management and economics, but have not been linked or investigated in a unified framework. Past researchers argue that the ownership structures of civil law firms are more concentrated (i.e., a high degree of manager shareholding) than are common law firms, and suggest that civil and common laws embody different philosophies, investor protections, and corporate goals. Whereas the common law system emphasizes the maximization of shareholder value and the protection of minority shareholder rights, the civil law system emphasizes stakeholder value and the facilitation of long-term decision-making among dedicated owners. Given that CER investments require a dedication to long-term management, these legal philosophies suggest a possible link between the legal systems to which firms adhere and their respective CER activities.

We also integrate insights from studies within corporate finance, law, strategic management, and business ethics to inform our research hypotheses. Our results suggest that civil law firms exhibit significantly higher levels of CER than common law firms, because CER engagement requires a long-term management perspective to improve a firm's long-term value. Moreover, the environment management is more likely to maximize stakeholder wealth than shareholder wealth. The relationship between legal origins and CER is robust even after controlling for the effects of managerial ownership and possible endogeneity issues. The results of this study are notable given that they reflect the role of legal origin in a firm's decision to pursue CER—an analysis that past research has not undertaken.

Despite the academic and practical contributions of this study, it suffers from a few limitations. First, in spite of the utility of the Trucost data, it may be subject to certain types of error in its calculation of environmental cost reductions related to firms' CER engagements. It is also possible that legally mandated environmental standards can affect environmental costs. Given this, it is difficult to distinguish internalized operating costs from environmental costs. Second, although past research shows that managerial ownership is one of the key determinants of CER (and also CSR) investments, other forms of ownership (e.g., minority shareholding, institutional ownership) can affect engagement in CER. The limitations of our data restricted us such that we could only control for managerial ownership. Future research can redress this shortcoming by evaluating the effects of other types of corporate ownership on CER. Third, because our methods and data are exclusively geared toward evaluating the link between legal origins and CER, we cannot evaluate the effect of legal origins on other dimensions of CSR activity relative to CER. It would benefit future researchers to investigate the relationships between a firm's legal origin and other CSR subdomains. Fourth, although we link firms' legal origins and CER investments by focusing the significant distinction of the degrees to which they protect investors, ownership structures, and business philosophies between civil and common law firms, we do not consider the role of regulatory enforcement environments when interpreting our results. This is mainly because the law enforcement is not clearly distinct between civil law and common law countries. For example, while the quality of law enforcement is highest in Scandinavian and German civil law countries, it is lowest in French civil law countries and moderate in common law countries. Therefore, this kind of factor, though it partially characterizes the legal regimes, may not be appropriate to explain the observed variability of CER investments between civil and common law countries, while other traits of the legal systems, which show clear distinctions depending on firms' legal origins, are used to logically interpret the outcomes.

Table 11 Regression results of environmental costs on firm value

	Tobin's Q					
	(1)	(2)	(3)	(4)	(5)	(6)
LAG1_DEC/TA	−0.317** (−1.97)		−0.020 (−0.19)	−0.293** (−1.97)		0.009 (0.08)
LAG2_DEC/TA		−0.559*** (−5.43)	−0.549*** (−4.61)		−0.521*** (−5.59)	−0.534*** (−4.67)
GDPC	0.401*** (19.54)	0.402*** (17.88)	0.409*** (17.90)	0.627*** (5.95)	0.551*** (5.61)	0.609*** (5.34)
GDPCG	0.001 (0.29)	0.002 (1.14)	0.002 (1.13)	0.002 (0.93)	0.004** (2.30)	0.003** (1.98)
Prof	3.104*** (15.68)	2.815*** (12.80)	2.865*** (12.92)	3.019*** (15.78)	2.753*** (12.94)	2.807*** (13.09)
Grow	0.001 (1.07)	0.001 (1.19)	0.001 (0.98)	0.001 (1.36)	0.001 (1.28)	0.001 (1.06)
Size	−0.128*** (−9.68)	−0.152*** (−9.53)	−0.153*** (−9.42)	−0.114*** (−9.59)	−0.119*** (−8.28)	−0.120*** (−8.20)
Cons	−2.762*** (−13.10)	−2.024*** (−8.39)	−2.097*** (−8.57)	−5.000*** (−4.50)	−3.684*** (−3.48)	−4.304*** (−3.51)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-fixed effects	No	No	No	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Observations	14,244	11,535	11,294	14,244	11,535	11,294
Adj. R^2	0.184	0.197	0.198	0.186	0.196	0.198

This table presents the estimation results from regressing Tobin's Q on $DEC_{t-1(t-2)}/TA_{t-1(t-2)}$ with control variables. Tobin's Q is estimated as the sum of the book value of assets and the market value of equity minus the book value of equity divided by the book value of assets. *t*-statistics appear in brackets and are based on robust standard errors adjusted for clustering by firm

***, **, and * denote statistical significance at the 1, 5 and 10 % levels, respectively

Despite these limitations, our study makes important contributions to the CER literature. First, although corporate environmental responsibility is becoming more important in firms' decision-making, little research has explored (a) how managers decide the degree to which to engage in CER activities and investments, and (b) what factors affect these decisions. Our empirical findings related to the association between legal origins and CER represent an important first attempt to understand the cross-country determinants of CER engagement. Second, our findings imply that although support for the common law system has dominated corporate law studies for decades, the civil law system has clear advantages over the common law system in terms of firms' environmental activities and investments.

Conclusions

Using Trucost's environmental cost dataset, we examine the relationships between a firm's legal origin, managerial ownership, and CER investments and activities. Our results indicate that legal origins affect the degree to which a firm invests in CER. Our results further show that on average, firms that operate in civil law nations invest in CER to a significantly higher degree than firms in common law countries. We additionally show that the degree to which a firm's manager has ownership over the firm significantly affects that CER investments, and this relationship is nonlinear. Interestingly, the relationship between a firm's legal origin and its CER investments remains robust after controlling for managerial ownership. These results also remain robust when we utilize Fama–MacBeth, random effects, WLS, and two-step GMM models. Taken together, these results indicate that firms in civil law countries do, in fact, invest in CER to a greater extent than firms in common law countries.

To the best of our knowledge, this study represents a first attempt to examine the role of firms' legal origins in the degree to which they are environmentally responsible. Given its novelty, this study has important economic and business implications. Foremost, most academics and market practitioners have adhered to a "benefits-and-efficiency" philosophy espoused by common law firms. This perspective has historically emphasized the importance in maximizing shareholder value. However, since the corporate scandals involving common law firms like AIG, Arthur Andersen, Enron, and WorldCom, companies have come to realize the importance of business ethics and social responsibility, both of which affect a firm's sustainability and long-term value (Chih et al. 2008). In addition, damage done to the environment by some common law oil companies (e.g., Chevron case[19]) has led investors and consumers to take great interest in environmental responsibility (Mohr et al. 2001; Castaldo et al. 2009). Thus, the emphasis on CER is a manifestation of emerging concern for sustainable corporate value and the consideration of the interests of not only shareholders, but also customers, communities, and the wider environment. Our findings reflect these concerns and suggest that the civil law system, which stresses stakeholder-centered ideologies, has some advantages over the common law system in promoting CER. Given this, as environmental responsibilities

[19] The American oil company, Chevron, was fined $9.5 billion for its pollution of the Lago Agrio oilfield in the Amazon region.

become increasingly essential to the ways in which firms operate, the traits and philosophies associated with civil law are likely to receive greater attention.

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Appendix

See Table 12.

Table 12 Legal origins and countries

Legal origins	Obs.
Common law countries	
Australia	905
Canada	536
Hong Kong	603
India	560
Malaysia	261
Singapore	176
Thailand	154
United Kingdom	2252
United States	4364
Common law total observations	9811
Civil law countries	
French civil law	
Belgium	87
France	580
Italy	260
Mexico	139
Netherlands	214
Philippines	111
Spain	244
Turkey	121
German civil law	
Austria	113
Germany	534
Japan	2531
South Korea	1170
Switzerland	216
Taiwan	1083
Scandinavian civil law	
Denmark	89
Finland	226
Norway	155
Sweden	272
Civil law total observations	8145
Total observations	17,956

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