Renewable Governance: Good for the Environment?

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We test the impact of firms' corporate governance structures (G) on firms' environmental performance (E) in an international sample. We find strong evidence that better governance improves firms' environmental performance, including in settings where environmental risks are most salient. Governance mechanisms that focus on board renewal through enhanced investor power in director elections or appointment of female directors are associated with the greatest improvements. Quasi-exogenous shocks to these board renewal mechanisms support a causal interpretation—that is, G drives E. Female directors have a stand-alone impact, as the positive female director effect holds when we directly control for director characteristics.

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1. Introduction

Institutional investors are increasingly concerned about environmental sustainability. In the survey of Krueger, Sautner, and Starks (2019), institutional investors state that environmental risks have financial implications for their portfolio firms and that these risks have begun to materialize. Further, investors state that engagement is important to address these risks, and more so than divestment. The core investor concern is captured in the theoretical framework of Bénabou and Tirole (2010)—insiders, when short-term oriented, will not invest enough today to mitigate future environmental risks.

The control rights outsiders obtain with ownership should provide influence over corporate actions such as improving environmental performance, and cause insiders to pay attention to their concerns. However, the extensive international corporate governance literature shows that it is naïve to expect higher ownership stakes to automatically provide outsiders with greater control. Control rights are meaningful only when there is effective governance. Thus, in this paper we hypothesize that outside investors need effective governance to be present if, through engagement, they seek to improve environmental sustainability in the firms they hold.

We address this hypothesis using a sample of 3,297 firms from 41 countries. First, we ask whether governance mechanisms (G) drive firms' subsequent environmental performance (E)—that is, does G come before E? To the extent this is true, investors should prioritize engagements to improve governance and not just focus directly on environmental engagements. Second, we ask what specific aspects of governance provide the greatest impact in terms of improved environmental performance? By addressing these questions we provide a roadmap that investors can use to maximize the environmental performance returns from their engagement efforts.

We first explore the impact of G on E by measuring governance using 'traditional' methods. Outside investors will mostly or fully lack control rights when firms are owned and controlled by a family or other blockholder. Therefore, our first traditional governance measure is whether a firm is blockholder controlled. Next, following Aggarwal, Erel, Stulz, and Williamson

(2008), we measure governance using an index that features indicator variables for six specific line items deemed to be important at that time (e.g., "Is a majority of the board independent?"; "Is the CEO the chair of the board?").

As the opening paragraph points out—there appears to be a growing gap between outside investors and insiders on the importance of taking concrete actions to address environmental risks. To change firm policies there may be a need to use not just traditional governance but also 'contemporary' governance mechanisms that plausibly renew the mindset of the board.

To achieve board renewal, as Bebchuk and Hamdani (2017) note, investors now ask for refinements of the voting process in order to nominate and elect their preferred directors. Investors go beyond asking solely for independence, given the incentives nominally independent directors may have to side with insiders (e.g., Coles, Daniel, and Naveen, 2014). The first board renewal mechanism that we study is the adoption of majority voting rules, which require that a board member receives more than 50% of the votes cast (compared to a requirement to receive a plurality of votes cast), as this makes it easier for outside investors to prevent insiders' candidates from joining the board (e.g., Cunat, Gine, and Guadelupe, 2012; Ertimur, Ferri, and Oesch, 2013; Doidge, Dyck, Mahmudi, and Virani, 2019).

We study forced board renewal, coming from both investor and societal pressures, as a second contemporary governance mechanism. As Brav, Jiang, Partnoy, and Thomas (2008) and Becht, Franks, Grant, and Wagner (2017) note, replacing directors is frequently required to achieve policy changes when a wide gap in thinking exists between investors and insiders. A significant example of forced board renewal around the world is the concerted effort to increase female board representation, and thus, we employ female board representation as a proxy for board renewal. Ahern and Dittmar (2012) find that female board members are less likely than male board members to be insiders (and thus more independent) and are younger, while Kim and Starks (2016a) find that skill sets of boards are enhanced by female directors, including governance skills.

These two contemporary governance mechanisms have a further advantage—in some countries in our sample outside pressures forced adoption of either majority voting rules or female board representation. These quasi-exogenous shocks to contemporary governance mechanisms help us to identify the impact of governance on firms' environmental performance.

For our tests that examine whether G impacts E we obtain data on firms' environmental performance from Thomson Reuters ASSET4. We use both their proprietary-weighted environmental *z*-score as well as an equally-weighted score of line items that we construct ourselves. We obtain data on governance mechanisms from ASSET4 and many other sources. We report here results based on our baseline regression that includes both traditional and contemporary governance mechanisms in one specification.

Relative to widely held firms, firms with a family blockholder have 10% (8%) lower environmental performance when measured with the ASSET4 *z*-score (equally-weighted score). Thus, when insiders, who are likely to be short-term oriented, are also firmly entrenched, environmental performance suffers. When we measure governance based on the six-item traditional governance index, we find that adding a good-governance line item increases a firm's environmental performance by 3% (2%). This evidence indicates that traditional governance mechanisms matter for environmental performance.

Using measures of board renewal, we find that when outsiders have greater control rights arising from the adoption of majority election provisions, environmental performance improves by 7% (6%). Further, when measuring board renewal with the introduction of a female director, environmental performance increases by 14% (12%). Clearly, contemporary governance is also important for firms' environmental performance. In fact, adopting either of these contemporary governance mechanisms is estimated to improve environmental performance by two to four times as much as adopting one additional traditional governance mechanism.

A natural concern with a causal interpretation is that an omitted factor affects both the strength of governance and a firm's performance (e.g., Hermalin and Weisbach, 2003). We address

such endogeneity concerns through additional tests. To control for time-invariant unobserved firm characteristics, we estimate firm fixed effects specifications and confirm that when a firm improves either its traditional or contemporary governance, it subsequently has stronger environmental performance. Next, as mentioned earlier, we identify quasi-exogenous shocks to contemporary governance mechanisms in some countries—that is, exogenous pressures that drive firms to 'adopt majority voting' or to 'add a female director.' We estimate difference-in-differences specifications, comparing the subsequent environmental performance of firms affected by the 'treatment' to otherwise similar unaffected firms. In these sub-samples, firms that adopt majority voting increase their environmental performance by 10% (9%) and firms that add one or more female directors increase their environmental performance by 8% (5%). These tests support a causal interpretation that improving governance leads to higher subsequent environmental performance.

Next, we conduct additional tests to understand whether the relationship between G and E holds in settings where environmental risks are likely more salient. We first focus on countries with low environmental performance. In these countries the scope for improvement is the largest but at the same time investors will need to overcome local societal norms that tolerate weak average environmental performance. Our tests show that better governance generates environmental returns in this challenging setting, and this is particularly true for contemporary governance mechanisms aimed at renewing the mindset of the board.

We then investigate family firms as these have significantly weaker environmental performance. In our international sample families control 23% of the firms. We find that better governance as measured by the traditional governance index does not impact the environmental performance of family-controlled firms. We also find that family firms with majority voting do not have better environmental performance. These two results are perhaps not surprising as family insiders likely have enough voting rights to effectively have full control of the firm and its board.

However, board renewal as measured by having a female director does matter—family firms with a female director have significantly higher environmental performance.

Third, we test whether governance matters for specific components of environmental performance including those that are more material to investors. Fourth, we examine the impact of governance in subsets of industries identified as 'dirty.' In these tests, all governance mechanisms remain statistically significant with comparable coefficients.

Finally, before drawing conclusions about the statistically significant relation between board member gender and environmental performance, we conduct additional robustness tests. We find an incremental positive impact on environmental performance in firms with more than one female director, or as the percentage of female directors increases. This supports an interpretation that the impact is related to gender and not something else.

We next tackle the issue of whether the positive impact of female board members on environmental performance is attributable to specific characteristics that might be correlated with gender. Ahern and Dittmar (2012), for example, document in their sample that compared to existing male directors, new female directors have significantly less CEO experience, are younger, and are more highly educated. Further, they find that after controlling for these characteristics, there is no longer a robust relationship between female board membership and performance. We obtain similar director characteristics data for each director in our sample. We find similar differences in characteristics between female and male board members; however, when we control for these differences in our regression models we continue to find a significant positive impact of director gender.

There is a persistent strong positive effect of having a female director on firms' environmental performance across all our regressions. This is a powerful and intriguing result. We conjecture, based on extant research, that this positive impact could arise from any of three broad reasons: female directors as new board members shake up the type of 'groupthink' as discussed in Janis (1972); they bring new unobserved corporate governance skills (Kim and Starks (2016a);

and/or females have stronger innate preferences for other-regarding behavior such as making environmental investments that have positive social externalities (Adams and Funk, 2012; Cronqvist and Yu, 2017). Unfortunately, existing data do not allow us to differentiate between these explanations in our international sample of firms.

Taken together, this evidence provides investors with a roadmap to use if they seek to improve the environmental performance of firms around the world. Investors that prioritize governance improvements will generate improvements in E, as we find that all forms of G improve E. Further, we find the greatest returns from engagements that focus on renewing the mindset of the board.

Our paper adds to a large literature on corporate social responsibility (CSR)/ESG.[1] Within this broad literature, surprisingly few studies have explored the impact of governance on environmental or social performance, and all of these focus on traditional governance metrics. Krueger (2015) finds that firms with agency problems (as proxied by leverage and liquidity) benefit less from positive CSR changes. Ferrell, Liang, and Renneboog (2016) explore whether agency problems affect firms' CSR scores, assuming governance directly affects compensation, and thus can indirectly impact E and S scores. El Ghoul, Guedhami, Kwok, and Wang (2016) find that family blockholding negatively impacts environmental performance in East Asia, while Hsu, Liang, and Matos (2019) find evidence of a positive relationship between government blockholding on environmental performance that occurs primarily in emerging markets. By investigating board renewal mechanisms alongside traditional governance mechanisms, we show that both types of governance changes matter independently. Equally important, we can make causal inferences from governance to environmental performance because of plausible exogenous shocks to board renewal mechanisms during our sample period.

[1] See, e.g., Hong and Kacperczyk (2009), Edmans (2011), Liang and Renneboog (2017), Hong and Liskovich (2017), Cronqvist and Yu (2017), Hart and Zingales (2017), Lins, Servaes, and Tamayo (2017).

Our paper also extends existing work that explores the performance implications of majority voting rules (e.g., Cunat, Gine, and Guadelupe, 2012; Ertimur, Ferri, and Oesch, 2013; Doidge et al., 2019) and female board participation (e.g., Adams and Ferreira, 2009; Adams and Funk, 2012; Ahern and Dittmar, 2012; Kim and Starks, 2016a) by showing the impact of these governance structures for firms' environmental performance. Our findings on the positive impact of board renewal in family-controlled firms is particularly interesting for the literature on family control, which finds limited ability for governance to offset negative impacts of family ownership (e.g., Morck, Wolfenzon, and Yeung, 2005; Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon, 2007; Lins, Volpin, and Wagner, 2013).

Finally, our findings have practical importance for investors, analysts, and academics interested in materiality—that is, which specific reporting items matter for both environmental and financial performance (e.g., Khan, Serafeim, and Yoon, 2016; Christensen, Hail, and Leuz, 2019). Our paper demonstrates that measured environmental performance is at least partly the result of prior governance choices, so any effort to define what is material when it comes to environmental performance should take into account the direct impact of governance.

2. Governance Mechanisms and Firms' Environmental Performance

Before turning to the empirical evidence, we develop hypotheses regarding connections between governance mechanisms and firms' environmental performance, building on the theoretical framework of Bénabou and Tirole (2010).[2]

Consider an investment choice to improve environmental performance, controlled either by an entrenched insider or by an outsider, that requires a current cash outlay for some long-term benefit. Bénabou and Tirole (2010) highlight two frictions that make the identity of the decision-maker relevant for environmental performance. First, insider short-termism can arise from well-known compensation and career concerns (e.g., Stein, 1989; Edmans, Gabaix, and Jenter, 2017),

[2] The nuances they ascribe to overall CSR performance apply directly to the stand-alone environmental component of CSR.

where managers place a disproportionate focus on current performance.[3] Second, insiders and outsiders can also receive non-pecuniary utility from environmental investments, such as a 'warm halo' effect from endearing themselves to the community.

Entrenched insiders will choose a *higher* level of environmental performance than outsiders only if insiders have both negligible short-termism and place a higher value on the non-pecuniary benefits of environmental performance than outsiders (e.g., Masulis and Reza, 2015). Under these strong assumptions, better governance that conveys greater power to outside investors should lower firms' environmental performance. In all other cases, better governance increases firms' environmental performance. If insiders and outsiders value the non-pecuniary benefits similarly, better governance improves outsiders' control rights, allowing them to reduce insider short-termism. This positive impact of outsider control on environmental performance will be even greater when outsiders place a higher value on the non-pecuniary benefits from environmental investments than insiders. Notably, the resulting environmental investments are not necessarily NPV enhancing, as the outsiders have an incentive to seek overinvestment because of the weight they place on non-pecuniary factors.

3. Sample and Summary Statistics

3.1. Environmental Performance Variables

We obtain data on firms' environmental performance from the Thomson Reuters ASSET4 ESG database. ASSET4 analysts acquire information from annual reports, corporate sustainability reports, NGOs, and news sources for large, publicly traded companies around the world, at annual frequency. Thomson Reuters states that reported data items are chosen to maximize company coverage, timeliness of reporting, data availability, quality, and perceived materiality for investors. Consistent coverage of firms begins in 2004, with coverage for a few countries starting in 2009.

[3] Short-termism also emerges when family owners are insiders, as family owners consume private benefits that similarly depend disproportionately on current cash flows (e.g., Kalcheva and Lins, 2007).

We use data from the first year of coverage through year-end 2015 for our analysis.[4] All variable definitions and data sources are provided in Table A1 in the Appendix.

ASSET4 evaluates firms' environmental commitments in three areas: Emission Reduction, Resource Reduction, and Product Innovation. Within each area, ASSET4 analysts identify specific line items (e.g., "Are the firm's greenhouse gas emissions/sales below the industry median in that year?"), with 70 items in total. There is no obvious correct weighting scheme of these line items that an investor should use. We use two weighting approaches for our main tests. As our first measure we use the proprietary-weighted aggregate scores that ASSET4 provides to investors (ASSET4 *z*-scores). These rank-based scores range from 0 to 100 and measure the environmental performance relative to all other companies in a given year. For our second measure, we first transform all line items into indicator variables such that a 'one' corresponds to better environmental performance (e.g., a below-median greenhouse gas emission firm would get a 'one') and construct an equally-weighted performance measure. That is, we sum up the indicator variables in each of the three environmental categories, divide by the number of available indicators, and take an average across the three areas to produce equally-weighted aggregate environmental performance scores (see Appendix Table A2 for details).

3.2. Governance Variables

Our primary variables of interest are governance mechanisms that plausibly increase the power of outside investors. As with environmental performance, ASSET4 provides a large number of governance line items and we use it as our primary source of data for governance mechanisms. We start with a comprehensive 'kitchen-sink' governance score based on almost 40 line items. Next, we focus on several specific traditional governance mechanisms that the international corporate governance literature has shown to be important. Finally, we investigate contemporary

[4] While data providers differ in their methodologies for measuring environmental performance, Dyck et al. (2019) consider three different sources for environmental performance data—ASSET4, Bloomberg, Sustainalytics—and show that their findings are generally not affected by use of alternative sources. Similarly, Ferrell, Liang, Renneboog (2016) also find that their results are robust to several alternative ESG data sources.

governance mechanisms that 'renew' the thinking of the board and are of growing interest to investors and academics.

3.2.1. Aggregate Governance Score

ASSET4 classifies its governance line items into five categories: Board Functions, Board Structure, Compensation Policy, Shareholder Rights, and Vision and Strategy. The 'Vision and Strategy' line items, however, relate to a firms' sustainability choices—as such, we exclude these from our tests of the determinants of firms' environmental performance (e.g., "Is the company's CSR report published in accordance with the GRI guidelines?").[5] As with our equally-weighted environmental performance metric, we convert the remaining 38 governance line items into indicator variables, take the average of all line items within each of the remaining four governance categories, and take the average across these category scores (see Appendix Table A3 for details). This ASSET4 Governance measure ranges from zero to one.

3.2.2. Traditional Governance Mechanisms

Outside investors will mostly or fully lack control rights when firms are owned and controlled by a family or other blockholder. Therefore, our first measure is whether a firm is blockholder controlled. It is challenging to systematically identify family and other blockholders across time in an international sample. We measure blockholder control by combining detailed firm-level ownership data from ASSET4, Datastream, Orbis (Bureau van Dijk), and the Global Family Business Index (obtained from Center for Family Business at the University of St. Gallen, Switzerland). We group all firms into three categories: firms controlled by a family, firms controlled by nonfamily blockholders, and widely held firms without a controlling blockholder (details of the process are in Appendix Table A1). The controlling blockholder type that is most relevant for our study is whether a firm is family controlled because of short-termism concerns as

[5] In addition, we exclude one line item from the 'Compensation' category (whether the firm has implemented sustainability compensation incentives).

discussed in Section 2. Ample evidence shows that private benefits for families come from current cash flows or cash holdings. Thus, family insiders will be less willing to use current cash to make potential value-enhancing investments, as such spending will limit their private benefits.[6]

Next, following Aggarwal, Erel, Stulz, and Williamson (2008), we construct a traditional governance index based on several governance mechanisms they argued, at that time, 'have received the most attention in the academic literature and from observers.' These mechanisms are Board Independence: the board has more than 50% independent directors; Board Size: the board has more than five members but less than sixteen; CEO/Chairman Separation: the roles of the CEO and chairman are separated; Board Structure: directors are elected individually (no staggered board); Audit Committee Independence: the audit committee is composed solely of independent directors; and Stock Classes: only one class of common stock (all shares have equal voting rights; no dual classes).[7] We obtain these data from ASSET4 and BoardEx.

We note that these traditional governance mechanisms rely in large part on an increased role for independent directors.[8] More recent research, however, points out that under existing arrangements for electing directors, independent directors are often co-opted by insiders. One reason for this is because independent directors are appointed by, or feel an obligation to, insiders (e.g., Shivdasani and Yermack, 1999; Coles, Daniel, and Naveen, 2014; Bebchuk and Hamdani, 2017).[9] Biases in decision making emphasized in the behavioral economics literature can

[6] For example, markets put a lower value on corporate cash holdings when firms have entrenched insider/family control, indicating a fear that cash will be consumed for private benefits (Kalcheva and Lins, 2007). Similarly, transfer pricing schemes that involve trading between public companies overwhelmingly have private benefits created from current (rather than future) cash flows (Cheung, Rau, and Stouraitis, 2006; Desai, Dyck, and Zingales, 2007; Jiang, Lee, and Yue, 2010). Further, family-controlled firms have been shown to both underperform and be unwilling to make current investments particularly during periods where cash holdings are most valuable (Lemmon and Lins, 2003; Lins, Volpin, and Wagner, 2013).

[7] We do not include a measure (Auditor Ratification: auditors are ratified at most recent annual meeting) that was in the Aggarwal et. al. (2008) index, as it is not available in ASSET4.

[8] This is obvious in the traditional governance index of Aggarwal et al. (2008). Three items explicitly focus on board independence (board has more than 50% independent directors, board has an independent Chair, audit committee is 100% composed of independent directors) and a number of the other items are related.

[9] As an example, Bebchuk and Hamdani (2017) state "these arrangements provide controllers with decisive power to appoint independent directors and decide whether to retain them, independent directors have significant incentives to side with the controller and insufficient countervailing incentives to protect public investors in conflicted situations" (p. 1274).

compound this problem.[10] As an example, in boards subject to 'groupthink', the desire for unanimity both overrides 'their motivation to realistically appraise alternative courses of action' (Janis, 1972) and can cause group members to ignore ethical or moral consequences (Janis, 1971).

3.2.3. Contemporary Mechanisms of Board Renewal

One key component of our paper is that we go beyond traditional governance to explore the impact of contemporary governance mechanisms that plausibly renew the mindset of the board. As the opening paragraph of our paper points out—there appears to be a growing gap between outside investors and insiders on the importance of taking concrete actions to address environmental risks. With a large gap between the collective board attitude and the investors' attitude toward a policy, then there may be a need to change the people on the board for outsiders to have greater power over firm actions. For example, replacing one or more board members is an important mechanism used by activists to change firm policies (e.g., Brav et al., 2008; Becht et al., 2017).

To achieve board renewal, Bebchuk and Hamdani (2017) note that investors have focused on three ways to refine the voting process for directors: nominating committees composed of independent directors, majority voting, and giving investors enhanced proxy access. Of these, we focus on the majority voting mechanism as we have available data around the world (from ASSET4), there is significant variation in the use of this mechanism across firms, and, as described in Section 4, we have variation across time in firm adoption of this mechanism driven by external factors and not environmental performance concerns.

Traditionally, in director elections shareholders could vote either 'for' or 'withhold' their vote (which was equivalent to not voting), and in most cases the vote is for a slate of directors. Around the world investors have been asking regulators, stock exchanges, as well as firms themselves to adopt majority voting policies. Such policies allow individual directors to be listed

[10] See, for example, Tversky and Kahneman (1971, 1972), Shiller (1981), Barberis and Thaler (2003), Gennaioli and Shleifer (2010).

on the proxy, and directors that fail to receive a majority of the votes cast would submit their resignation (while counting withheld votes as votes cast negatively). For our tests, Majority Election is an indicator variable that equals one if the company's board members are generally elected with a majority vote, and zero otherwise.

An alternative route to board renewal is to force board turnover. Doing so brings directors with new thinking more aligned with outside investors, and the injection of a new director's view can help overcome groupthink. Two ways to force board turnover are to impose age or term limits on board members and to enforce diversity requirements on boards. Internationally, a significant example of forced board renewal are policies to increase female board representation.

Around the world, a large number of regulators and investors have pushed for more female involvement in a variety of ways including 'hard' measures such as regulatory mandates that specify gender quotas and 'soft' measures including regulatory initiatives demanding firms comply-or-explain against gender targets as well as investor coalition requests for enhanced female board representation. As Adams and Ferreira (2009) describe, this push stems from two beliefs, both related to governance: first, board quality will be improved by drawing from the broader talent pool that includes women; second, as they note "[…] because they do not belong to the 'old boys club,' female directors could more closely correspond to the concept of the independent director emphasized in theory" (p. 292).

There is evidence that increased female board representation significantly impacts governance. Adams and Ferreira (2009), for example, study US firms and find greater board attendance and a higher sensitivity of CEO turnover to financial performance when women are on the board. Among Norwegian firms, Ahern and Dittmar (2012) find that females added to the board are less likely than male board members to be insiders (and, thus, more independent), and have higher levels of education, are younger, and have less experience. Kim and Starks (2016a)

focus on director skills sets in US firms and find that female directors bring skill diversity to the board, and in particular sets of expertise currently missing, one of which is corporate governance.[11]

Finally, in some regression specifications we introduce an indicator that a firms' board has *not* been renewed, based on data on the average age and tenure of the board. In the UK, for example, when board members' tenure exceeds nine years, they are no longer considered independent and can no longer serve on key board committees such as the audit and compensation committees (UK Corporate Governance Code, 2016). Old age provides another plausible indicator of stale thinking. We combine these two indicators, categorizing boards as 'Old or Stale' using an indicator variable that equals one if either at least 50% of directors have tenure greater than nine years or at least 20% of the directors are over 70 years old, and zero otherwise.[12]

3.3. Final Sample and Descriptive Statistics

We obtain financial statement and stock market valuation data, institutional holdings, and US cross-listed status from Worldscope, Datastream, Factset Ownership, ADR lists, and CRSP as controls. Our final sample consists of 20,531 firm-year observations and covers 3,297 firms from 41 countries during the period 2004-2015.

In Panel A of Table 1 we report summary statistics for firms' environmental performance, governance mechanisms, and other characteristics. There is significant variation in firms' environmental performance and governance structures across countries, industries, and time. As we describe below, in all our tests we control for most of these sources of variation with fixed effects. Regarding firms' environmental performance, the average ASSET4 Environmental *z*-Score is 54.1 and the average Equally-weighted Environmental Score is 39.1, where a perfect score would be 100 for each of the two measures. Turning to the governance variables, 23% of our

[11] The evidence of the impact of adding females to the board and increasing board diversity on firm performance is mixed. Adams and Ferreira (2009), Ahern and Dittmar (2012), and Adams, Akyol, and Verwijmeren (2018) find negative effects, while others report positive impacts (e.g., Kim and Starks, 2016b, find diversity increases performance related to M&A decisions).

[12] Unfortunately, we cannot construct a firm level measure capturing mandatory director term limits that could identify a stale board in our sample. Such mandatory tenure limits are infrequent and only present in 6.5% of our sample firms.

sample firms are controlled by a family. The average firm has 3.7 out of the 6 traditional governance mechanisms (i.e., more than 50% of the board is independent, separation of chair and CEO, etc.). Majority election is present in 55% of our sample firms and 60% of firms have at least one female board member.

In Panel B of Table 1, we report average environmental performance and governance measures for our sample firms by country. To facilitate comparisons across countries, we report summary statistics for the cross-section in year 2012. The countries where firms have the highest environmental performance are all European (e.g., France, Finland, Spain, and Sweden are ranked in the top five for the two measures of environmental performance). Countries where firms' environmental scores are lowest are concentrated in Asia, Australia, and Africa. The four countries with the greatest fraction of family firms are Mexico, Portugal, Turkey and Russia, whereas family firms are relatively rare in Singapore, New Zealand, Japan, and Taiwan. Traditional Governance is strongest in Canada, UK, and Finland. More than 70% of firms domiciled in the UK, Canada, and Australia elect their directors with a majority vote, while no more than 40% of firms have such a rule in Japan, South Korea, and Egypt. In terms of female board members, all firms in Finland, Israel, Norway, and Sweden have at least one female board member, while less than 20% of firms do so in Japan and South Korea.

4. Does Better Governance Improve Firms' Environmental Performance?

4.1. Baseline Tests of the Impact of G on E

Our baseline tests in Table 2 examine the relation between corporate governance and firms' environmental performance using the following specification:

$$Log\left(Score_{it}\right) = \alpha + \beta' X_{it-1} + \gamma' Y_{it-1} + \Lambda + \varepsilon_{it}, \quad (1)$$

where the dependent variable is the log of one of the environmental scores of firm *i* in year *t*, X_{it-1} are measures of corporate governance in firm *i* in year *t-1*, Y_{it-1} are a set of firm-level controls in

year *t-1*, and Λ are year, country, and industry fixed effects.[13] Our main variables of interest are the corporate governance measures. Given the importance of blockholder control, all specifications include the dummy variables Family and Other Blockholder control. In model 1 we test for the importance of governance using the catch-all ASSET4 Governance measure. In model 2 we use the traditional governance index of Aggarwal et. al. (2008). Models 3 through 5 include contemporary governance measures that capture different aspects of board renewal. Model 6 includes both the traditional governance index and contemporary governance measures.

We use logs of environmental scores to obtain better distributional properties and to reduce the impact of outliers.[14] For firm-level control variables we use firm size (log of assets), cash, asset tangibility, leverage, profitability, institutional ownership, and whether a firm is cross-listed on a major US stock exchange. We include firm size as prior literature has shown it to be related to ownership structures, and larger firms may be subject to more external pressures. Hong, Kubik, and Scheinkman (2012) suggest that financial slack also explains environmental adoption. Following them, we include cash, asset tangibility, and leverage to capture credit constraints, and profitability to capture the impact of performance. Cross-listing captures broad ownership and governance structures. Institutional ownership is included as Dyck, Lins, Roth, and Wagner (2019) find that institutional investors are a factor in environmental performance around the world. Given the substantial variation across countries, we include country fixed effects to ensure that any relation between environmental performance and control rights is identified by within-country variation. We also include industry and time fixed effects. We cluster standard errors by country.

The tests in Table 2 show a significant and economically important relationship between governance and firms' environmental performance. Panel A reports the results using ASSET4 *z*-

[13] Environmental variables reflect data available to ASSET4 analysts that covers the firm's fiscal year. A score for fiscal year 2010, for example, would reflect items that occurred during the 2010 fiscal year as well as information contained in the company annual report and any company sustainability reports published after the fiscal-year end early 2011. Thus, our baseline model with 2011 environmental scores would have fiscal-year-2010 right-hand-side variables.

[14] Our main results are unaffected if we use the raw scores rather than the log scores. Our results are also similar when we use industry×year or country×year fixed effects.

scores as the dependent variable. In model 1, we test for the importance of both the traditional governance measure of Family and Other Blockholder control, and the broadest overall governance measure, ASSET4 Governance. We find a negative and statistically significant (*p*-value < 1%) coefficient on Family.[15] The coefficient implies that when insiders are fully entrenched, as is the case in family-controlled firms, environmental performance levels are 9.8% below those in otherwise similar widely held firms. Conversely, the coefficient on ASSET4 Governance is positive and statistically significant (*p*-value < 1%). Considering this measure, a one standard deviation improvement in governance is associated with an increase in environmental performance of 11.4% (computed as 0.815 × 0.14).

The ASSET4 metric is a kitchen-sink measure that contains both traditional and contemporary governance mechanisms. To isolate the importance of traditional governance mechanisms, in model 2 we use the Aggarwal et. al. (2008) traditional governance index. Again, we find a positive and significant impact (*p*-value < 5%) of governance on environmental performance. The coefficient indicates that a firm that adds one additional traditional governance mechanism (e.g., separating the role of CEO and Chairman) is predicted to increase its environmental performance by 3.3%. In model 3 we get a sense of the importance of renewed thinking on the board for environmental performance. The coefficient on Old or Stale Board is negative and significant (*p*-value < 1%). Firms that do not have an old or stale board have an 8% higher environmental performance. In model 4 we assess the importance of providing outside investors with greater power over director selection through majority voting. The coefficient on Majority Election is positive and significant (*p*-value < 1%) showing that when investors have this power, firms have an 8.4% higher environmental performance. Finally, in model 5 we assess the importance of female board representation, which is a proxy for board renewal as it is often the result of both investor and societal pressures. The coefficient on Female Director is positive and

[15] We note that in this specification, the coefficient on Other Blockholder is significant at the 10% level. Because the coefficient is not significantly different from zero in any other specification in this or other tables, we do not emphasize it.

significant (p-value < 1%) and indicates that adding one or more female board members to an all-male board would increase firms' environmental performance by 14.2%.

In model 6 of Table 2 we include the proxies of board renewal as measured by Majority Election and Female Director alongside the traditional governance index and blockholder control in one specification. These measures could be correlated, and including them all in one specification helps us assess whether each measure has a unique impact on firms' environmental performance (or whether one measure dominates). The results show that all governance mechanisms have an independent and significant impact on firms' environmental performance. We find that when outsiders have greater control rights arising from the adoption of majority election provisions, environmental performance improves by 7%. Further, when measuring board renewal with the introduction of a female director, environmental performance increases by 14%. Of particular interest, adopting either of these contemporary governance mechanisms is estimated to improve environmental performance by two to four times as much as adopting one additional traditional governance mechanism.

Panel B of Table 2 shows that the results are similar when we use the Equally-weighted Environmental Score as our dependent variable. As for the control variables, in both panels we find that larger firms, more profitable firms, and firms with greater tangibility show stronger environmental performance. Consistent with Dyck et al. (2019), firms with higher institutional ownership generally have better environmental performance.

4.2. Firm Fixed Effects

Our next tests aim at supporting a causal interpretation that corporate governance influences firms' environmental performance. To address the concern of omitted variables, we first introduce firm fixed effects specifications. These specifications control both for time-invariant unobservable firm characteristics, and as before, time-varying observable firm characteristics.

For these tests, we keep only those observations where the governance variables are time-varying during the sample period. The premise in these tests is similar to that of prior studies of

activist engagements in which an initial governance improvement in a target firm facilitates a specific performance outcome (e.g., Becht et al., 2017). Such a within-firm specification is relatively demanding in terms of power as entrenchment-reducing governance structures are generally sticky over time.

The results are shown in Table 3 and confirm our prior conclusions—when outsiders in a firm gain more control as a result of the introduction of better traditional and contemporary governance mechanisms, firms' future environmental performance improves. We continue to find strong statistical significance (p-value < 5% in all cases). Not surprisingly, the implied economic impact is attenuated but still sizable.

4.3. Causality and Quasi-exogenous Shocks

To further address causality, we seek exogenous shocks to corporate governance mechanisms that are not simultaneously shocks to firms' environmental performance. Board renewal mechanisms have the potential to provide such shocks, as in some countries in our sample outside pressures forced adoption of either majority voting rules or female board representation. There are no such shocks for family control and we could not find compelling exogenous shocks for the other governance mechanisms during our sample period.[16]

Canada provides a good example of a majority voting adoption shock and offers a laboratory to test whether 'forced' changes in majority voting lead to subsequent changes in firms' environmental performance. As detailed in Doidge et al. (2019), the driving force behind firms' adoption of majority voting was the creation of the Canadian Coalition for Good Governance (CCGG) that had as its first major campaign a request for firms to adopt a majority voting policy. Starting from a situation in which very few firms had majority voting in Canada, in 2005 and 2006 the CCGG contacted firms through letters and phone calls, requesting they adopt this change. Over

[16] It is perhaps not surprising that we find no shocks to traditional governance mechanisms as Fauver, Hung, Li, and Taboada (2017) study performance changes after quasi-exogenous board reforms across 41 countries, but most of these major board reforms occurred in the late 1990s and early 2000s, which pre-dates our sample period.

the next two years, Doidge et al. (2019) report substantial increases in firm adoption and provide results that support a causal interpretation that majority voting adoption was driven by the CCGG. Also of importance, at this time the CCGG investor group took no steps to request that firms increase their environmental performance.

In Table 4, we test whether this shock that increased majority voting adoption leads to subsequent increases in firms' environmental performance. To that end, we use a difference-in-differences specification spanning the 2004 to 2008 period, that is, two years before and two years after the initiative to push firms to adopt majority voting policies. We define treated firms as those that adopted majority voting either in 2006 or 2007, and control firms as those that did not change their majority voting policy during the 2004 to 2008 period. Control firms capture any secular trend to increase environmental performance. We require that treated and control firms have at least one observation before and after the adoption years and drop the year of the initiative (2006). Further, to make sure the results are not driven by other major changes in the firm, we exclude any firms in which there was a change in family control, other-blockholder control, or cross-listing status. All specifications include year fixed effects and firm fixed effects to control for time-invariant firm characteristics.

The specifications in models 1 and 2 of Panel A of Table 4 compare changes in treated firms relative to changes in control firms. Focusing on the interaction of the treated firm dummy with the Post Majority Election Adoption variable, we find a positive and significant coefficient. In terms of economic significance, the effects on environmental performance of the plausibly exogenous change in majority voting is sizable—a firm that adopts majority voting increases its environmental performance by 30% (24%).

These results based on the Canada sub-sample support a causal interpretation from control rights to firms' environmental performance. We build on this same identification approach and select countries where a substantial number of firms adopt majority director election rules in a short time period. For these tests, we adopt a stringent selection criterion, requiring that the

percentage of firms with majority voting increases by at least 20 percentage points in a single year. Ten countries meet this criterion. We posit that such significant changes in a short time period are likely driven by some external push from investor groups, regulators or both. In Appendix Table A4 we list the country, year, and percentage change in majority voting. We note that by limiting the number of countries and the years we focus on, we address the concern that the majority voting effects derive from some omitted variables.

We follow a similar empirical approach in models 3 and 4 of Panel A of Table 4 performing a difference-in-differences analysis around the two years before and two years after the quasi-exogenous shocks to adopt majority voting, while excluding Canada. Treated firms are again the firms that adopted majority voting following the shock and control firms are those that did not change their majority voting policy during the time period considered. The adoption of majority voting is again associated with a positive and significant increase in firms' environmental performance. Models 5 and 6 repeat the analysis for broader sample, including Canada, finding that firms that adopt majority voting increase their environmental performance by 10% (9%) in the two years following the adoption of a majority voting provisions.

We next turn to quasi-exogenous shocks to female board representation, in Panel B of Table 4. Exogenous pressures to encourage firms to increase female board representation include regulator-mandated female quotas, introduced first in Norway in 2003 (preceding our sample period), and as of 2018 in place in a number of largely European countries. Exogenous pressures also come from investor group demands, often accompanied by softer regulatory pressures to increase disclosures about policies regarding diversity. We note that, in general, mandated quota tests lack power in our sample because a large majority of the treated firms already had at least one female director at the start of our sample period.

For our first tests of external-pressure-driven changes in female board representation we turn to the UK, for which female board representation was initially low, and where there was a powerful and successful push to increase female board representation (that was not a quota). In

2011, Lord Davies published his Women on Boards review that made ten recommendations regarding disclosure and policies on diversity, including a recommendation that FTSE 100 firms should have 25% female board representation no later than the year 2015. The effort was supported by investor groups such as the Association of British Insurers which disclosed that it would now start monitoring female board representation.

For our tests, we use a difference-in-differences specification spanning the 2009 to 2015 period, that is, two years before and two years after the pressure to add more female board members (2011 and 2012). We define treated firms as those that added a female director in 2011 or 2012, and control firms as those that did not change their status of having at least one female director during the 2009 to 2015 period (they either had at least one female director in all years or in none of the years). We require that treated and control firms are present for all six years. We verify that for the UK firms in our sample, the externally driven pressure did make a difference, with 22% more firms with at least one female board member in 2013 compared to 2011.

In models 1 and 2 of Panel B of Table 4, the key variable of interest is the Post Female Board Representation indicator variable that we interact with the treated firms' indicator variable for those firms that add one or more female directors to the board. The positive and significant coefficient on the interaction term in both models 1 and 2 provides support for a causal interpretation that adding a female board member increases firms' environmental performance. The implied economic impact is 5% to 8% higher environmental performance.

As before, to increase the sample size for our quasi-exogenous shock tests, we identify countries that experience a substantial increase in having at least one female board member in a short period of time. We use a threshold increase of 10 percentage points in a given year (this represents a substantial one-year increase, as the majority of sample firms (63%) have already at least one female director). This criterion yields nine countries in total, including the UK.

We report the results of these difference-in-differences tests in models 3 and 4, while excluding the UK. For this larger sample, results are similar. Models 5 and 6 repeat the analysis

for the broader sample, including the UK. Adding a female board member as a result of a plausibly exogenous shock is estimated to increase environmental performance by 5% to 8%.

Overall our results suggest that governance mechanisms are positively related to firms' environmental performance, with firm fixed effects regressions and quasi-exogenous tests supporting a directional interpretation—that is, G drives E. In addition, we also find that governance mechanisms that help renew the board are more important than traditional governance measures for firms' E performance.

5. Does Governance Matter Where Environmental Performance is More Salient?

In this section, we conduct additional tests to understand whether the relationship between G and E holds in settings where environmental risks are likely more salient. We first focus on countries that are expected to have, or actually do have, weaker environmental performance and thus the benefit of improvement is greatest. Next, we investigate family firms as these have significantly weaker environmental performance. Third, we test whether governance matters for specific components of environmental performance including those that are more material to investors. Finally, we examine the impact of governance in subsets of industries identified as 'dirty.'

5.1. Countries with Weak Environmental Performance

In Table 5, we report results of our baseline tests, using three procedures to split countries into those that have low or high expected or actual environmental performance. We focus on countries with low performance. In these countries risks are most salient and the scope for improvement is the largest. At the same time, however, sustainability-oriented investors will need to overcome local societal norms that place little emphasis on environmental improvement. Panel A presents results using the ASSET4 z-scores and Panel B for the equally-weighted scores.

First, in models 1 and 2, we provide a simple split based exclusively on the firms in our sample and their country-level average environmental scores. Next, in models 3 and 4, we split

countries based on their Environmental Performance Index (EPI) score, using the median country splits introduced in Dyck et. al. (2019). The EPI measures a country's overall environmental performance (i.e., not based solely on firms in the ASSET4 sample), and will be stronger in countries where there is greater environmental regulation and/or stronger societal attitudes towards improving the environment. These data are obtained from the Yale Center for Environmental Law, Yale University, and the Center for International Earth Science Information Network, Columbia University. Finally, in models 5 and 6, we compare countries outside of Continental Europe with Continental European counties. Environmental social norms are relatively stronger in Continental Europe.[17] Norms regarding the environment arguably provide a measure of the magnitude of non-pecuniary benefits towards the environment in the Benabou and Tirole (2010) framework.

The results we are most interested in are the coefficients on the governance variables in models 1, 3, and 5, that feature firms from countries with low environmental performance. As is to be expected, the coefficient on family control is strong and negative as in our baseline tests. Of more interest are the coefficients on the traditional and contemporary governance variables. Do sustainability-oriented investors have a chance, through better governance, to improve environmental performance when both insider short-termism *and* societal norms that place little emphasis on the environment are against doing so? The answer is 'yes.'

Across models 1, 3, and 5, we find strong and significant positive coefficients for the contemporary governance mechanisms—majority voting and having a female director. The coefficients on Traditional Governance are also positive and statistically significant in models 1 and 3 (in model 5 it has a *p*-value of 11%). Thus, taken together, our tests show that better governance generates environmental returns in the challenging settings where both environmental

[17] Barber, Morse, and Yasuda (2019) report for Europe a stronger preference for investments that generate 'impact,' consistent with higher European values towards externalities on the Hofstede (2011) cultural dimensions of having a collective agenda versus individualistic agenda, having a long term view of society, and having more restraint versus being indulgent. Dyck et. al. (2019) conduct a similar Europe vs. other countries split.

risks are most pronounced, and societal norms tolerate low environmental performance. This is particularly true for governance mechanisms that are aimed at renewing the mindset of the board.

Also of interest, the coefficients in models 2, 4, and 6 show that in settings where environmental risks are arguably not as severe, there is still some evidence that contemporary governance matters, generally with lower magnitudes and significance levels.

5.2. Entrenched Family Control

Our prior tests have shown that family control is negatively related to firms' environmental performance around the world. Given that 23% of our sample firms are family controlled, sustainability-minded investors who want to move the needle on environmental performance should be interested in whether governance mechanisms are also effective in family firms.

To address this question, we specifically examine the impact of governance in family firms and compare it to the impact of governance in nonfamily-controlled firms. To this end, we re-estimate model 6 of Table 2 and include interactions between Family and the governance mechanisms Traditional Governance, Majority Elections, and Female Director.

Table 6 reports the results of each governance measure for family firms as well as for nonfamily-controlled firms (Widely Held/Other). For family-controlled firms, the reported numbers are the sum of the coefficient estimates for a particular governance measure and its interaction with Family. For the nonfamily-controlled firms, the reported coefficients of a particular governance measure are equal to the coefficient estimate on the stand-alone governance variable.

In both models 1 and 2, we find that better governance as measured by the traditional governance index does not impact the environmental performance of family-controlled firms. We also find that family firms with majority voting do not have better environmental performance. These two results are perhaps not surprising. Family firm insiders likely have enough voting rights to effectively have full control of the firm and its board. That is, family firm insiders likely control enough votes to allow them to get their 'family-friendly' directors elected even under a majority

voting rule. However, governance does matter when it comes to board renewal as measured by having a female director—family firms with a female director have significantly higher environmental performance (*p*-value < 1%). In fact, the model 1 coefficient implies that a female director improves the environmental performance of a family firm by 12.4%, an impact almost identical to that in our baseline specification on the full sample of firms in Table 2, model 6. This is consistent with female board members, who are more likely new to the board, being less prone to 'local' thinking of established board members, and potentially having other preferences. We discuss this below in Section 7.

Turning to the bottom half of the table, the results show that both traditional and contemporary governance mechanisms have strong and significant impacts on widely held/other firms, which is expected given the results in Table 2.

5.3. 'Material' Environmental Performance Measures

Next, we test whether governance matters for specific components of environmental performance including those that are arguably most material. In models 1 through 6 of Table 7 we use as dependent variables the environmental performance scores from the three ASSET4 categories—Emission Reduction, Resource Reduction, and Product Innovation—that constitute the two aggregate environmental performance measures (see Table 1). One might argue, for example, that reducing emissions and resources used in the production process of a firm are more material for investors than product innovation. In model 7 of Table 7 we introduce as a dependent variable what we call a 'Material Environmental Score.' This score is based on the subset of ASSET4 line items that are material according to the Sustainability Accounting Standards Board (SASB) Materiality Map. These items are industry specific.[18] Using these alternative dependent variables, we re-estimate the baseline specification of model 6 of Table 2. We find that governance

[18] This classification by SASB is to our knowledge the most comprehensive attempt yet to classify sustainability issues by whether or not they are likely to affect the financial or operating performance of firms. The SASB classification was published in November 2018, we use the pre-publication online version as of December 2017. See materiality.sasb.org.

mechanisms matter for environmental performance for all environmental category scores as well as for the Material Environmental Score, with coefficients similar in magnitude and significance as those from the baseline specification. Our interpretation is that the strong impact we find of corporate governance on environmental performance applies very broadly and is not concentrated in specific environmental performance categories.

5.4. 'Dirty' Industries

Environmental performance improvement should be more salient in industries with higher levels of environmental impacts. Accordingly, in this section we focus on the impact of governance for environmental outcomes in plausibly 'dirty' industries. In these industries, improving environmental performance is likely to be the most costly and insider short-termism problems are therefore likely to be substantial. We use two different criteria to split the industries. First, we use the ASSET4 Environmental *z*-scores, categorizing as dirty the five SIC Divisions (out of 9) that have the lowest average environmental scores. These SIC Divisions are Agriculture, Forestry, Fishing; Mining; Services; Retail Trade; and Wholesale Trade. Second, we define dirty industries more narrowly using the SASB categorization of industries by the degree to which environmental performance scores are material. Dirty industries, according to SASB standards, include the SIC Divisions Agriculture, Forestry, Fishing; Mining; and Services. Panel A of Table 8 details the mapping and summary statistics by SIC Division, and shows significant differences across industries in firms' environmental performance.[19]

Using the broad categorization of industries that are dirty, model 1 of Panel B shows that family control and contemporary governance mechanisms continue to significantly impact environmental performance in dirty industries, and model 3 shows that traditional governance also has a significant impact. We find the governance impact to be more muted when we use a narrow

[19] Note that family-controlled firms are not concentrated in 'dirty' industries (using the broad classification, families account for 23% of firms in 'dirty' industries and 22% in 'clean' industries). This helps to address a potential concern that the lower environmental performance of family firms that we have reported is a result of families choosing to control firms in 'dirty' industries rather than 'clean' ones.

categorization of industries deemed to be dirty. In this smaller sub-sample, the coefficients on all governance variables are generally similar but are only significant for the female director indicator. This result could stem either from entrenched insiders being more reluctant to listen to outsiders' requests for environmental performance when the short-term costs of improving environmental performance are likely to be high, or from a lack of power.

Overall, the tests in this section show that G affects E where environmental risks are likely more salient, with family control and having a female board member being important in all cases.

6. Is Gender a Fundamental Driver of Board Renewal?

Before drawing conclusions about the statistically significant relation between board member gender and environmental performance, we conduct additional robustness tests. First, we examine whether the effect is attributable only to the first female board member or increases with additional female directors. It is unlikely that some unobservable (to us) shock to the firm happens at the same time that every additional female board member is appointed. Thus, if we find a robust relationship for additional female board members, it is more likely the impact is related to gender and not something else.

In models 1 and 3 of Table 9, we include an indicator variable equal to one when a firm has one female director, and another indicator variable for firms with more than one female director. As shown in Table 1, 31% of firms have one female director and 29% have two or more female directors. In models 2 and 4 we include the variable percentage of directors that are female.

From model 1, firms with one female director have 11% higher E scores, while those with two or more female directors have 19.4% higher E performance. Both coefficients are significant at the 1% level. The positive and significant coefficient on the percentage of female directors in model 2 is also consistent with more female directors leading to greater firm E performance. These results support an interpretation that board gender drives environmental performance.

We next tackle the issue of whether the positive impact of female board members on environmental performance is attributable to specific characteristics that might be correlated with

gender. Ahern and Dittmar (2012), for example, document in their sample that compared to existing male directors, new female directors have significantly less CEO experience, are younger, and are more highly educated. Further, they find that after controlling for these characteristics, there is no longer a robust relationship between female board membership and performance.

However, given that our focus is specifically on environmental performance, it is possible that gender has a unique stand-alone effect. Behavioral economics research shows that women in general (not specifically female board members) have stronger 'other regarding' preferences than men (e.g., Andreoni and Vesterlund, 2001; Adams and Funk, 2012; Thaler, 2016; Cronqvist and Yu, 2017). Thus, women may seek to improve a firm's environmental performance for this reason.

We obtain director characteristics data for each director in our sample from BoardEx. Following Ahern and Dittmar (2012), we explore six director characteristics: whether the director has CEO experience; if the director has a higher education degree other than an MBA; if the director has an MBA degree; director age; tenure as a board member; and whether the director shares a last name with someone else on the board (a rough measure of whether a firm has family members on the board). We then aggregate the director characteristics at the firm-year level. Similar to Ahern and Dittmar (2012), in our international sample when we compare newly-hired female directors to newly-hired male directors, female directors have less CEO experience, are more educated, are younger, and less frequently share a last name with someone else on the board.[20] Thus, these significant differences create the possibility that characteristics rather than gender drive the positive impact of female directors on environmental performance.

In Table 10, we first examine the impact on environmental performance of board characteristics, without including any governance metrics. Model 1 shows that greater board-level CEO experience and attainment of higher education other than an MBA are associated with

[20] The reported differences are statistically significant controlling for industry, year, and country, with the following *p*-values: CEO experience (11.06), have higher education degree other than an MBA (5.8), have MBA (2.6), age (20.7), share same last name (7.8). We don't find a significant difference in previous board tenure. The differences are even greater if we compare newly-hired female board members to existing male board members (rather than newly-hired male board members).

significantly stronger environmental performance. We include our core governance mechanisms along with these firm-level board characteristics in model 2 (an analogous specification to our baseline model 6 of Table 2). If firms that appoint female directors exhibit systematically different board characteristics, which in turn are related to environmental performance, those characteristics should subsume the female director effect. This is not the case. The coefficient on female director remains statistically significant and is slightly larger in magnitude.

Because more CEO experience and higher education other than an MBA are associated with higher E performance (see model 1), in models 3 and 4 we focus specifically on those female directors that have low levels of CEO experience and low levels of higher education. We use 'Low' ('High') indicator variables that are equal to one if a female director has CEO experience or higher education equal to or lower (higher) than the average of all other board members in that firm in that year, and zero otherwise. If CEO experience and higher education drive the results, gender should have no direct impact for female directors with relatively low levels of either of these. In models 3 and 4 we find a positive and strongly significant coefficient on the Low CEO experience indicator and the Low higher education indicator. This indicates that a female director, independent of her other characteristics, strongly influences a firms' environmental performance.

We also address the possibility that an omitted variable, environmental controversies, drives both the appointment of the first female director and the improvement in environmental performance.[21] In untabulated models, we test whether the appointment of a female director is related to prior-year environmental controversies (measured using ASSET4's environmental controversies indicators; see Appendix Table A2). We find no significant relationship, with *p*-values ranging from 0.39 to 0.95.

We conclude this section by noting that while earlier regressions in the paper show that traditional governance delivers environmental performance benefits, there is a more substantial

[21] As an example, Nike, Inc. faced considerable outside pressure with the global boycott campaign due to apparent human rights violations during the 1990s. In response, the firm significantly improved its ESG performance, including the appointment of a female board member.

impact on firms' environmental sustainability when there is board renewal. Moving to a majority election rule for voting for directors arguably will correspond to a board renewing its thinking as directors will have to take more seriously the concerns of a firm's entire investor base as they can lose their jobs without a majority of their votes. But a perhaps stronger measure is changing the board such that it includes a female director as this almost certainly allows for a change in the mindset of the board. We conjecture, based on extant research, that the strong coefficient on female director could arise from any of three broad reasons: female directors as new board members shake up groupthink, they bring new corporate governance skills, and they have innate preference for other-regarding behavior. Unfortunately, existing data do not yet allow us to differentiate between these explanations in an international sample of firms.[22]

7. Conclusion

With a large gap between the collective board attitude and investors' attitude toward environmental risks, to change firm policies investors may need not only 'traditional' governance but also 'contemporary' governance mechanisms that plausibly renew the mindset of the board. We test for the importance of both of these governance channels in a large cross-country sample.

Our tests show that corporate governance drives firms' environmental performance. We find that family firms have weaker environmental performance. Also, firms with well-established traditional governance mechanisms, such as board independence or the separation of the roles of CEO and Chairman, demonstrate stronger environmental performance. We find the greatest improvement in environmental performance when investors are able to renew the mindset of the board by adopting contemporary governance mechanisms. Based on our regression models, firms that adopt a majority director election provision or add one or more female directors on the board

[22] For example, outside the US firms are rarely required to disclose detailed director-specific skill sets similar to those required under Regulation S-K rules since 2009 (see, e.g., Adams, Akyol, and Verwijmeren, 2018). Another competing hypothesis we cannot completely rule out is that the appointment of female board members systematically coincides in time with broader changes occurring inside the board. The firm fixed effects and quasi-exogenous shock models suggest that this is unlikely as there is little attenuation of the female board member effect.

improve firms' environmental performance by two to four times as much as adopting an additional traditional governance mechanism.

These findings, that investor power leads to improved environmental performance, are consistent with a view that firms improve E because investors are asking for it. The theoretical framework suggests this push comes from investors constraining insider short-termism and/or from investors putting a high value on non-pecuniary benefits from E investments.

The results in this paper have important implications for institutional investors that want to push firms towards improving their environmental performance. They provide a roadmap which suggests that these investors should not focus on aggregate measures of ESG, or even E as a stand-alone measure. Instead, they should focus on improving governance mechanisms first, since doing so contributes to improvements in firms' environmental (E) performance. And, in particular, investors should focus on any mechanism that is capable of renewing the mindset of the board.

The significant differences in the power of contemporary governance mechanisms compared to traditional ones when we examine firms' environmental performance may be useful for future research. Conclusions drawn in the governance literature have almost exclusively focused on traditional governance such as director independence. Given our results, it would be interesting to see how previously-studied corporate policies are impacted by contemporary governance mechanisms.

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Table 1
Descriptive Statistics

This table shows descriptive statistics of environmental scores, measures of corporate governance, and other key variables. Panel A shows summary statistics for the full sample. Panel B shows country averages for the year 2012 and the number of observations for the year 2012 and the full sample. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All variables are described in Appendix Table A1.

Panel A: Summary Statistics

Variable	Mean	Median	SD	Obs
ASSET4 Environmental *z*-Score	54.1	57.6	31.3	20,531
Equally-weighted Environmental Score	39.1	36.7	21.2	20,531
Material Environmental Score	32.2	29.6	23.9	12,975
ASSET4 E Category *z*-scores				
Emission Reduction	54.6	57.7	31.4	20,531
Resource Reduction	54.8	61.9	31.3	20,531
Product Innovation	50.1	40.7	31.3	20,531
Equally-weighted E Category Scores				
Emission Reduction	44.9	43.5	21.9	20,531
Resource Reduction	30.8	23.1	24.1	20,531
Product Innovation	46.9	50.0	24.7	20,531
Family	0.225	0.000	0.418	20,531
ASSET4 Governance	0.559	0.567	0.140	20,531
Traditional Governance	3.652	4.000	1.431	20,531
Board Independence	0.466	0.000	0.499	20,531
Board Size	0.840	1.000	0.367	20,531
CEO-Chairman Separation	0.655	1.000	0.475	20,531
Board Structure	0.331	0.000	0.471	20,531
Audit Committee Independence	0.615	1.000	0.487	20,531
Stock Classes	0.744	1.000	0.436	20,531
Old or Stale Board	0.193	0.000	0.395	17,435
Majority Election	0.548	1.000	0.498	20,531
Female Director	0.596	1.000	0.491	20,531
One Female Director	0.311	0.000	0.463	20,531
Two+ Female Directors	0.286	0.000	0.452	20,531
Percent Female Directors	0.103	0.091	0.111	20,531
Log(Total Assets)	8.669	8.558	1.810	20,531
Cash	0.126	0.088	0.125	20,531
Tangibility	0.308	0.256	0.261	20,531
Leverage	0.236	0.221	0.173	20,531
Profitability	0.056	0.051	0.086	20,531
Other Blockholder	0.067	0.000	0.249	20,531
Institutional Ownership	0.241	0.197	0.177	20,531
Cross-list	0.110	0.000	0.312	20,531

Panel B: Summary Statistics by Country

Country	Environmental Scores		Governance Variables						Obs	
	ASSET4 *z*-Score	Equally-weighted Score	Family	ASSET4 Gov	Traditional Gov	Old or Stale Board	Majority Election	Female Director	Year 2012	Full Sample
Australia	33.2	28.3	0.13	0.79	4.11	0.17	0.71	0.56	272	2,105
Austria	59.4	46.3	0.27	0.80	3.40	0.00	0.58	0.87	15	142
Belgium	57.2	44.3	0.38	0.71	3.13	0.21	0.61	0.83	24	242
Brazil	57.5	44.6	0.33	0.56	3.84	0.33	0.52	0.54	57	360
Canada	40.1	32.6	0.19	0.81	5.43	0.38	0.74	0.59	230	2,023
Chile	39.5	32.0	0.35	0.41	3.00	0.53	0.42	0.29	17	108
China	31.7	26.8	0.29	0.68	2.57	0.06	0.53	0.53	120	783
Colombia	40.4	34.2	0.20	0.60	3.90	0.17	0.50	0.50	10	57
Denmark	68.3	50.7	0.28	0.96	4.00	0.04	0.58	0.88	25	187
Egypt	18.3	18.1	0.36	0.09	2.18	0.00	0.36	0.55	11	60
Finland	80.9	62.1	0.17	0.29	5.38	0.00	0.62	1.00	24	264
France	81.9	63.3	0.49	0.70	2.11	0.21	0.54	0.99	89	870
Germany	70.5	56.0	0.28	0.81	2.03	0.13	0.58	0.93	72	541
Greece	59.0	47.0	0.50	0.38	2.56	0.20	0.49	0.81	16	152
Hong Kong	36.6	30.5	0.45	0.65	2.83	0.35	0.55	0.60	106	941
India	50.2	42.3	0.33	0.41	3.05	0.39	0.46	0.53	80	529
Indonesia	46.3	36.6	0.29	0.29	3.25	0.08	0.46	0.46	28	194
Ireland	49.2	41.6	0.13	0.73	4.67	0.20	0.70	0.87	15	152
Israel	42.1	33.7	0.53	0.60	4.00	0.47	0.56	1.00	15	101
Italy	60.8	49.9	0.26	0.72	3.00	0.36	0.59	0.72	43	422
Japan	67.2	54.3	0.04	0.38	2.22	0.24	0.36	0.12	350	2,134
Luxembourg	62.6	45.6	0.57	1.00	4.00	0.29	0.62	0.57	7	64
Malaysia	41.5	33.8	0.36	0.64	3.62	0.40	0.55	0.57	42	278
Mexico	45.4	35.8	0.77	0.38	3.81	0.63	0.44	0.46	26	192
Netherlands	67.9	52.2	0.18	0.85	3.91	0.06	0.70	0.73	33	337
New Zealand	44.2	34.2	0.10	1.00	4.70	0.11	0.69	0.80	10	129
Norway	68.1	52.0	0.18	0.53	4.53	0.00	0.63	1.00	17	152
Philippines	43.9	34.9	0.11	0.26	3.32	0.68	0.46	0.37	19	126
Poland	35.9	30.9	0.17	0.78	2.83	0.00	0.49	0.78	23	149
Portugal	73.4	57.5	0.58	0.67	2.58	0.17	0.60	0.67	12	120
Russia	46.8	36.3	0.53	0.31	4.31	0.17	0.48	0.53	32	239
Singapore	41.9	35.3	0.11	0.55	4.23	0.31	0.61	0.50	44	426
South Africa	50.2	39.4	0.12	0.92	4.16	0.09	0.65	0.92	119	582
South Korea	67.4	53.2	0.37	0.36	3.27	0.03	0.40	0.10	59	307
Spain	75.4	57.3	0.31	0.79	2.26	0.26	0.57	0.88	42	427
Sweden	75.6	57.5	0.40	0.30	4.73	0.08	0.60	1.00	40	417
Switzerland	57.7	45.3	0.33	0.86	3.91	0.21	0.60	0.57	58	509
Taiwan	54.4	43.2	0.05	0.32	2.75	0.15	0.43	0.48	75	418
Thailand	53.4	42.8	0.21	0.88	3.58	0.33	0.55	0.79	24	151
Turkey	57.9	44.7	0.54	0.38	3.25	0.10	0.45	0.54	24	151
UK	60.6	45.9	0.18	0.91	5.26	0.06	0.72	0.76	277	2,990
Overall	54.1	39.1	0.23	0.56	3.65	0.19	0.55	0.60	2,602	20,531

Table 2
Do Governance Mechanisms Affect Firms' Environmental Performance?

This table reports regression estimates of environmental scores on governance mechanisms and control variables. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: ASSET4 Environmental *z*-Scores

	ASSET4 Environmental *z*-Scores $_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
Family $_{t-1}$	-0.098***	-0.103***	-0.097***	-0.109***	-0.112***	-0.102***
	(-3.12)	(-3.30)	(-3.12)	(-3.57)	(-3.79)	(-3.29)
ASSET4 Governance $_{t-1}$	0.815***					
	(6.00)					
Traditional Governance $_{t-1}$		0.033**				0.026**
		(2.68)				(2.07)
Old or Stale Board $_{t-1}$			-0.080***			
			(-3.81)			
Majority Election $_{t-1}$				0.084***		0.072***
				(3.34)		(2.77)
Female Director $_{t-1}$					0.142***	0.135***
					(4.66)	(4.55)
Log (Total Assets) $_{t-1}$	0.231***	0.230***	0.230***	0.228***	0.221***	0.217***
	(11.24)	(11.34)	(10.15)	(11.03)	(11.42)	(11.35)
Cash $_{t-1}$	-0.072	-0.068	-0.039	-0.078	-0.065	-0.066
	(-1.00)	(-0.93)	(-0.58)	(-1.09)	(-0.90)	(-0.90)
Tangibility $_{t-1}$	0.190***	0.194***	0.235***	0.197***	0.194***	0.194***
	(2.86)	(2.95)	(3.54)	(3.03)	(3.19)	(3.20)
Leverage $_{t-1}$	-0.133	-0.132	-0.203***	-0.132	-0.123	-0.122
	(-1.39)	(-1.37)	(-2.99)	(-1.38)	(-1.30)	(-1.28)
Profitability $_{t-1}$	0.312**	0.294**	0.258**	0.302**	0.274**	0.272**
	(2.55)	(2.36)	(2.13)	(2.49)	(2.30)	(2.24)
Other Blockholder $_{t-1}$	0.069*	0.055	0.044	0.051	0.050	0.056
	(1.76)	(1.40)	(1.19)	(1.23)	(1.30)	(1.46)
Institutional Ownership $_{t-1}$	0.177	0.197*	0.221**	0.218**	0.212**	0.173
	(1.52)	(1.81)	(2.10)	(2.03)	(2.09)	(1.63)
Cross-list $_{t-1}$	-0.073*	-0.061	-0.075*	-0.061	-0.046	-0.061
	(-1.85)	(-1.54)	(-1.92)	(-1.56)	(-1.21)	(-1.58)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	20,531	20,531	17,435	20,531	20,531	20,531
Adjusted R^2	0.456	0.451	0.469	0.451	0.455	0.458

Panel B: Equally-weighted Environmental Scores

	Equally-weighted Environmental Scores $_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
Family $_{t-1}$	-0.073***	-0.078***	-0.075***	-0.082***	-0.084***	-0.077***
	(-2.93)	(-3.11)	(-2.96)	(-3.36)	(-3.56)	(-3.10)
ASSET4 Governance $_{t-1}$	0.662***					
	(6.10)					
Traditional Governance $_{t-1}$		0.025**				0.020**
		(2.64)				(2.03)
Old or Stale Board $_{t-1}$			-0.051***			
			(-3.02)			
Majority Election $_{t-1}$				0.068***		0.059***
				(3.33)		(2.76)
Female Director $_{t-1}$					0.111***	0.106***
					(5.14)	(5.04)
Log (Total Assets) $_{t-1}$	0.200***	0.199***	0.199***	0.198***	0.192***	0.189***
	(13.05)	(12.98)	(11.70)	(12.73)	(13.01)	(12.94)
Cash $_{t-1}$	0.007	0.011	0.049	0.002	0.013	0.012
	(0.11)	(0.15)	(0.76)	(0.03)	(0.19)	(0.17)
Tangibility $_{t-1}$	0.173***	0.176***	0.206***	0.179***	0.177***	0.177***
	(3.52)	(3.64)	(4.32)	(3.72)	(3.95)	(3.94)
Leverage $_{t-1}$	-0.129*	-0.128*	-0.173***	-0.128*	-0.121*	-0.120*
	(-1.81)	(-1.80)	(-3.43)	(-1.81)	(-1.73)	(-1.70)
Profitability $_{t-1}$	0.262**	0.247**	0.223**	0.253**	0.231**	0.230**
	(2.52)	(2.34)	(2.12)	(2.46)	(2.29)	(2.25)
Other Blockholder $_{t-1}$	0.032	0.020	0.012	0.017	0.016	0.021
	(1.04)	(0.65)	(0.42)	(0.52)	(0.54)	(0.68)
Institutional Ownership $_{t-1}$	0.103	0.121	0.138*	0.136*	0.132*	0.101
	(1.19)	(1.54)	(1.75)	(1.71)	(1.77)	(1.32)
Cross-list $_{t-1}$	-0.034	-0.024	-0.028	-0.024	-0.012	-0.024
	(-1.21)	(-0.83)	(-0.97)	(-0.84)	(-0.46)	(-0.87)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	20,531	20,531	17,435	20,531	20,531	20,531
Adjusted R^2	0.533	0.528	0.545	0.529	0.532	0.535

Table 3
Governance Mechanisms and Firms' Environmental Performance: Firm Fixed Effects

This table reports firm fixed effects regression estimates of environmental scores on governance mechanisms and control variables. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. We drop firms with time-invariant governance measures. Control variables (Family and all other firm controls) are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: ASSET4 Environmental *z*-Scores

	ASSET4 Environmental *z*-Scores				
	(1)	(2)	(3)	(4)	(5)
ASSET4 Governance	0.166**				
	(2.48)				
Traditional Governance		0.014**			
		(2.34)			
Old or Stale Board			-0.024**		
			(-2.15)		
Majority Election				0.048***	
				(3.14)	
Female Director					0.030**
					(2.05)
Controls	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Obs	20,196	16,099	6,169	9,947	7,739
Adjusted R^2	0.856	0.857	0.864	0.825	0.834

Panel B: Equally-weighted Environmental Scores

	Equally-weighted Environmental Scores				
	(1)	(2)	(3)	(4)	(5)
ASSET4 Governance	0.090**				
	(2.43)				
Traditional Governance		0.010**			
		(2.36)			
Old or Stale Board			-0.015*		
			(-1.87)		
Majority Election				0.032***	
				(3.62)	
Female Director					0.019*
					(1.96)
Controls	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Obs	20,196	16,099	6,169	9,947	7,739
Adjusted R^2	0.906	0.906	0.911	0.886	0.891

Table 4
Governance Mechanisms and Firms' Environmental Performance: Quasi-natural Experiments

This table reports regression estimates of environmental scores for years surrounding quasi-exogenous shocks to majority director election rules and female board representation. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. Panel A shows results for countries for which there was significant outside pressure to adopt majority director election rules. Models 1 and 2 focus on Canada and the initiative of the CCGG to increase majority voting adoption (Doidge et al., 2019) leading to significant changes in firm adoptions in 2006 and 2007. Treated firms adopt majority voting in 2006 or 2007; control firms do not change majority voting policies during the 2004 to 2008 period. Models 3 and 4 includes all countries in which the fraction of firms that have majority director elections increased by more than 20 percentage points in a single year (event year), excluding Canada. Models 5 and 6 repeats models 3 and 4, for all countries. Further details are in Appendix Table A4. Panel B shows results for countries for which there was significant outside pressure for greater female board representation. Models 1 and 2 focus on the UK and the 2011 Women on Boards review published by Lord Davies. Treated firms add women to the board in 2011 or 2012; control firms do not change their status of having or not having at least one female director during the 2009 to 2015 period. Models 3 and 4 includes all countries in which the fraction of firms that have female board representation increased by more than 10 percentage points in a single year, excluding the UK. Models 5 and 6 repeat models 3 and 4, for all countries. Further details are in Appendix Table A4. All specifications include two years before and after the event years. Firms that change family control, other-blockholder control, or cross-listing status are excluded. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Quasi-exogenous Shocks to Majority Director Election Rules

	Single Country Experience		Broad Sample Excl. Canada		Broad Sample	
	ASSET4 E *z*-Scores	Equally-weighted E Scores	ASSET4 E *z*-Scores	Equally-weighted E Scores	ASSET4 E *z*-Scores	Equally-weighted E Scores
	(1)	(2)	(3)	(4)	(5)	(6)
Post Majority Election Adoption × Treated	0.299**	0.236**	0.076*	0.059*	0.104**	0.085***
	(2.34)	(2.43)	(1.80)	(1.91)	(2.58)	(2.82)
Log (Total Assets)	-0.077	-0.008	0.109	0.082	0.088	0.074
	(-0.60)	(-0.09)	(1.58)	(1.55)	(1.39)	(1.51)
Cash	-0.238	-0.011	-0.274	-0.110	-0.317	-0.139
	(-0.34)	(-0.02)	(-1.24)	(-0.68)	(-1.41)	(-0.88)
Tangibility	0.955	0.661	-0.184	-0.171	-0.073	-0.085
	(1.24)	(1.12)	(-0.86)	(-1.11)	(-0.37)	(-0.61)
Leverage	-0.856*	-0.701*	0.157	0.161	-0.032	0.001
	(-1.91)	(-2.00)	(0.62)	(0.89)	(-0.14)	(0.01)
Profitability	-0.083	0.232	0.157	0.047	0.101	0.049
	(-0.15)	(0.55)	(0.85)	(0.35)	(0.56)	(0.36)
Institutional Ownership	0.294	0.484*	0.270	0.218	0.275	0.297**
	(0.76)	(1.74)	(1.30)	(1.39)	(1.41)	(1.99)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	197	197	1,057	1,057	1,254	1,254
Adjusted R^2	0.812	0.855	0.814	0.852	0.820	0.865
Countries in Sample	Canada		Australia, Austria, Belgium, Denmark, Ireland, Italy, Spain, Switzerland, UK		Australia, Austria, Belgium, Canada, Denmark, Ireland, Italy, Spain, Switzerland, UK	

Panel B: Quasi-exogenous Shocks to Female Board Representation

	Single Country Experience		Broad Sample Excl. the UK		Broad Sample	
	ASSET4 E *z*-Scores	Equally-weighted E Scores	ASSET4 E *z*-Scores	Equally-weighted E Scores	ASSET4 E *z*-Scores	Equally-weighted E Scores
	(1)	(2)	(5)	(6)	(3)	(4)
Post Female Board Representation × Treated	0.082*	0.049**	0.085*	0.055*	0.080***	0.050**
	(1.89)	(2.32)	(2.27)	(2.09)	(3.77)	(3.21)
Log (Total Assets)	0.011	0.010	0.041	0.022	0.024	0.016
	(0.16)	(0.25)	(0.96)	(0.73)	(0.85)	(0.82)
Cash	-0.078	-0.027	-0.063	-0.006	-0.096**	-0.027
	(-0.69)	(-0.35)	(-1.11)	(-0.14)	(-2.80)	(-0.99)
Tangibility	0.279	0.217	-0.131	-0.017	-0.075	0.016
	(0.74)	(1.14)	(-1.52)	(-0.29)	(-1.11)	(0.37)
Leverage	0.050	-0.044	0.022	-0.016	0.018	-0.035
	(0.27)	(-0.40)	(0.17)	(-0.14)	(0.23)	(-0.51)
Profitability	0.112	0.036	-0.020	-0.015	0.005	-0.006
	(0.55)	(0.32)	(-0.24)	(-0.22)	(0.07)	(-0.11)
Institutional Ownership	0.211	0.106	0.048	0.143***	0.058	0.107***
	(1.13)	(0.78)	(0.31)	(4.10)	(0.56)	(4.31)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	936	936	1,374	1,374	2,310	2,310
Adjusted R^2	0.879	0.935	0.919	0.952	0.910	0.949
Countries in Sample	UK		Australia, Austria, Germany, Greece, Italy, Malaysia, Portugal, Switzerland		Australia, Austria, Germany, Greece, Italy, Malaysia, Portugal, Switzerland, UK	

Table 5
The Effect of Governance in Countries with Weak Environmental Performance

This table reports regression estimates of environmental scores on governance mechanisms and control variables for firms grouped by their countries' environmental social norms. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. We sort firms into low and high country-level environmental performance groups. In models 1 and 2, we split the sample based on country-level average Environmental ASSET4 z-scores (and Equally-weighed Environmental Scores) using the sample median as a cutoff. In models 3 and 4, we employ below- or above-median cutoffs on a country's Environmental Performance Index score as used in Dyck et. al. (2019). The Environmental Performance Index (EPI) is obtained from the Yale Center for Environmental Law, Yale University, and the Center for International Earth Science Information Network, Columbia University. In models 5 and 6, we compare countries outside of Continental Europe with Continental European counties where environmental social norms are high. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: ASSET4 Environmental *z*-Scores

	ASSET4 Environmental *z*-Scores					
	Low Country-level ASSET4 E *z*-Scores	High Country-level ASSET4 E *z*-Scores	Low Environmental Protection Index	High Environmental Protection Index	Outside Continental Europe Countries	Continental Europe Countries
	(1)	(2)	(3)	(4)	(5)	(6)
Family	-0.138**	-0.065	-0.117***	-0.103*	-0.131***	-0.066
	(-2.78)	(-1.72)	(-3.01)	(-2.02)	(-4.06)	(-1.49)
Traditional Governance	0.039**	0.013	0.032*	0.028	0.026	0.021
	(2.55)	(0.96)	(2.01)	(1.65)	(1.65)	(1.10)
Majority Election	0.075*	0.067**	0.087***	0.033	0.086***	0.028
	(1.83)	(2.28)	(2.90)	(1.57)	(2.88)	(0.81)
Female Director	0.124***	0.141***	0.154***	0.115*	0.143***	0.059
	(2.88)	(5.90)	(4.58)	(2.21)	(4.25)	(1.43)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	9,296	11,234	14,087	6,444	15,384	5,147
Adjusted R^2	0.419	0.392	0.455	0.441	0.448	0.452

Panel B: Equally-weighted Environmental Scores

	Equally-weighted Environmental Scores					
	Low Country-level Equally-weighted E Scores	High Country-level Equally-weighted E Scores	Low Environmental Protection Index	High Environmental Protection Index	Non-continental Europe Countries	Continental Europe Countries
	(1)	(2)	(3)	(4)	(5)	(6)
Family	-0.100**	-0.051*	-0.085**	-0.075*	-0.094***	-0.055
	(-2.47)	(-1.76)	(-2.67)	(-2.01)	(-3.62)	(-1.42)
Traditional Governance	0.029**	0.008	0.025**	0.017	0.023*	0.011
	(2.56)	(0.77)	(2.07)	(1.30)	(1.89)	(0.84)
Majority Election	0.053	0.061**	0.070***	0.035	0.067**	0.038
	(1.60)	(2.48)	(2.85)	(1.67)	(2.61)	(1.41)
Female Director	0.096***	0.112***	0.115***	0.093**	0.111***	0.056*
	(3.06)	(6.69)	(4.76)	(2.64)	(4.61)	(1.90)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	9,296	11,234	14,087	6,444	15,384	5,147
Adjusted R^2	0.463	0.507	0.518	0.585	0.512	0.559

Table 6
The Effect of Governance on Family-controlled Firms' Environmental Performance

This table shows overall effects of governance mechanisms on firms' environmental performance for firms with different blockholders (family-controlled vs. widely held/other). Each regression model includes an indicator variable for whether a firm is controlled by a family, the governance mechanisms in question, an interaction term between the family indicator and the governance mechanisms, and controls. The reported coefficient estimate on Family is the sum of the coefficient estimates on the governance measure and the interaction between the family indicator variable and the governance measure. The reported coefficient on Widely Held/Other is the coefficient estimate on the standalone governance variable. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Product Innovation, and Resource Reduction). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	ASSET4 Environmental *z*-Scores	Equally-weighted Environmental Scores
	(1)	(2)
Family		
Traditional Governance	0.007	0.004
	(0.39)	(0.32)
Majority Election	0.037	0.023
	(0.80)	(0.65)
Female Director	0.124***	0.105***
	(3.08)	(3.22)
Widely Held/Other		
Traditional Governance	0.031**	0.024**
	(2.08)	(2.09)
Majority Election	0.083***	0.070***
	(2.84)	(2.82)
Female Director	0.138***	0.106***
	(4.15)	(4.63)
Controls	Yes	Yes
Country Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Obs	20,531	20,531
Adjusted R^2	0.458	0.535

Table 7
Alternative Environmental Performance Measures

This table reports regression estimates of alternative environmental performance measures on governance mechanisms and control variables. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental Category *z*-scores are standardized scores, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measure firms' environmental performance relative to other companies in a given year for the categories Emission Reduction, Resource Reduction, and Product Innovation. The Equally-weighted Environmental Category Scores for the categories Emission Reduction, Resource Reduction, and Product Innovation are calculated as the sum of all indicator variables in each category divided by the number of reported items times 100. The Material Environmental Score measures each firm's environmental performance using only those line items from ASSET4 that are material according to the SASB Materiality Map. Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	Environmental Category Scores						Material Environ-mental Scores
	ASSET4			Equally-weighted			
Categories	Emission Reduction	Resource Reduction	Product Innovation	Emission Reduction	Resource Reduction	Product Innovation	
	(1)	(3)	(2)	(4)	(6)	(5)	(7)
Family	-0.100***	-0.103***	-0.082**	-0.019***	-0.016**	-0.022***	-0.129**
	(-3.57)	(-3.21)	(-2.52)	(-3.20)	(-2.13)	(-3.14)	(-2.05)
Traditional Governance	0.026**	0.030**	0.010	0.003	0.001	0.005*	0.028
	(2.29)	(2.23)	(1.05)	(1.14)	(0.59)	(1.87)	(1.56)
Majority Election	0.072***	0.067**	0.059***	0.017***	0.020***	0.021***	0.062*
	(2.73)	(2.28)	(3.09)	(3.66)	(4.69)	(3.66)	(1.80)
Female Director	0.112***	0.146***	0.071***	0.023***	0.016***	0.029***	0.118***
	(3.94)	(4.01)	(4.87)	(5.58)	(4.35)	(4.46)	(4.19)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	20,531	20,531	20,531	20,531	20,531	20,531	12,975
Adjusted R^2	0.429	0.379	0.420	0.542	0.491	0.482	0.525

Table 8
Governance Mechanisms and Firms' Environmental Performance in Dirty and Clean Industries

This table shows summary statistics (Panel A) and regression estimates (Panels B) of environmental scores on governance measures and control variables for firms grouped by industries with low and high environmental performance. Industries are classified as 'dirty' and 'clean' based on average industry-level ASSET4 Environmental *z*-scores and the SASB materiality map. The first classification is based on industry-level ASSET4 Environmental *z*-scores; SIC Divisions ABFGI are classified as 'dirty' sectors because they are below or equal to the median of 46.7 and SIC Divisions CDEFH are 'clean' sectors. The second classification is based on the SASB materiality map. We map the 11 sub-categories from the SASB sections pertaining to environmental performance (Environment and Business Model and Innovation) and construct our own score as 2 points if classified as "material for more than 50% of industries in the sector", 1 point if "material for less than 50% of industries" and 0 points if "issue not likely to be material for any industries". These scores suggest that the sectors that are most material ('dirty') are SIC Divisions ABI. SIC Divisions CDEFH are considered as 'clean' industries. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental z-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and t-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Summary Statistics

SIC Division	Industry Name / Classification	Averages								Obs	
		ASSET4 E *z*-score	Equally-weighted E Score	Family	ASSET4 Gov	Traditional Gov	Old or Stale Board	Majority Election	Female Director	Year 2012	Full Sample
A	Agriculture, Forestry, Fishing	39.9	30.5	0.43	0.58	3.66	0.26	0.66	0.36	18	124
B	Mining	38.3	28.4	0.14	0.65	4.39	0.21	0.67	0.41	330	2,387
C	Construction	53.7	37.4	0.28	0.52	3.10	0.22	0.44	0.55	116	928
D	Manufacturing	66.8	47.9	0.26	0.53	3.49	0.20	0.50	0.56	873	6,825
E	Transport., Comm., Utilities	56.8	39.9	0.21	0.54	3.48	0.17	0.56	0.66	383	3,059
F	Wholesale Trade	46.7	33.0	0.20	0.56	3.69	0.13	0.51	0.64	69	501
G	Retail Trade	47.7	34.4	0.38	0.57	3.77	0.22	0.56	0.70	151	1,245
H	Finance, Insurance, Real Estate	49.4	37.2	0.15	0.55	3.53	0.18	0.55	0.70	425	3,441
I	Services	40.9	29.3	0.25	0.61	3.95	0.20	0.59	0.62	237	2,021
ABFGI	'Dirty' Industries, ASSET4	41.7	30.3	0.23	0.61	4.05	0.21	0.61	0.55	805	6,278
CDEH	'Clean' Industries, ASSET4	59.6	42.9	0.22	0.54	3.48	0.19	0.52	0.62	1,797	14,253
ABI	'Dirty' Industries, SASB	39.5	28.8	0.19	0.63	4.17	0.21	0.64	0.51	585	4,532
CDEFH	'Clean' Industries, SASB	58.3	41.9	0.23	0.63	3.50	0.19	0.52	0.62	2,017	15,999

Panel B: Regressions Based on 'Dirty' and 'Clean' Industries

'Dirty'/'Clean' Industry Classification	ASSET4 Environmental *z*-Scores		Equally-weighted Environmental Scores		ASSET4 Environmental *z*-Scores		Equally-weighted Environmental Scores	
	Industry-level ASSET4 Environmental *z*-scores				SASB Materiality Map			
SIC Divisions	'Dirty' ABFGI	'Clean' CDEH	'Dirty' ABFGI	'Clean' CDEH	'Dirty' ABI	'Clean' CDEFGH	'Dirty' ABI	'Clean' CDEFGH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family	-0.091**	-0.107**	-0.067**	-0.077**	-0.073	-0.109***	-0.051	-0.079**
	(-2.28)	(-2.67)	(-2.35)	(-2.35)	(-1.49)	(-2.84)	(-1.48)	(-2.55)
Traditional Governance	0.028	0.022*	0.021*	0.017*	0.024	0.023*	0.021	0.017*
	(1.53)	(1.79)	(1.73)	(1.75)	(1.26)	(1.78)	(1.62)	(1.71)
Majority Election	0.090**	0.082***	0.064*	0.069***	0.078	0.082***	0.056	0.069***
	(2.05)	(3.03)	(1.81)	(3.11)	(1.46)	(2.78)	(1.30)	(2.87)
Female Director	0.133***	0.128***	0.095***	0.107***	0.141***	0.124***	0.096***	0.105***
	(4.20)	(3.66)	(4.07)	(3.94)	(5.81)	(3.64)	(5.79)	(4.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	6,278	14,253	6,278	14,253	4,532	15,999	4,532	15,999
Adjusted R^2	0.512	0.414	0.573	0.493	0.542	0.419	0.591	0.500

Table 9
Alternative Measures of Female Board Representation

This table reports regression estimates of environmental scores on governance measures, alternative measures of female board representation, and control variables. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	ASSET4 Environmental *z*-Scores		Equally-weighted Environmental Scores	
	(1)	(2)	(3)	(4)
Family	-0.103***	-0.102***	-0.078***	-0.077***
	(-3.36)	(-3.30)	(-3.16)	(-3.11)
Traditional Governance	0.027**	0.025*	0.020**	0.019*
	(2.14)	(2.02)	(2.12)	(1.96)
Majority Election	0.072***	0.076***	0.060***	0.062***
	(2.77)	(2.92)	(2.76)	(2.92)
One Female Director	0.110***		0.084***	
	(3.86)		(4.08)	
Two+ Female Directors	0.194***		0.156***	
	(5.01)		(5.87)	
Percent Female Directors		0.552***		0.452***
		(3.54)		(4.13)
Controls	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Obs	20,531	20,531	20,531	20,531
Adjusted R^2	0.459	0.457	0.537	0.534

Table 10
Governance Mechanisms and Firms' Environmental Performance: Female Skill Splits

This table reports regression estimates of environmental scores on board characteristics, female director characteristics, governance mechanisms, and control variables. The dependent variables are the natural logarithm of environmental scores. The ASSET4 Environmental *z*-score is a standardized score, calculated by and obtained from Thomson Reuters ASSET4 ESG, and measures firms' environmental performance relative to other companies in a given year. The Equally-weighted Environmental Score is the average of three category scores (Emission Reduction, Resource Reduction, and Product Innovation). Appendix Table A2 describes the indicator variables used to calculate the environmental scores. The board characteristics CEO Experience, Higher Education, MBA, Age, Tenure, and Same Name are the average across all board members in a given firm-year. The below (above) median female characteristics are indicator variables equal to one if there is a new female board member in a given year whose characteristics are equal to or less (greater) than the average of all board members in that year, and zero otherwise. All other variables are described in Appendix Table A1. Control variables are included but not reported. The sample period is 2004-2015. All variables are winsorized at the 1st and 99th percentiles. All right-hand side variables are lagged by one year. Standard errors are clustered at the country-level and *t*-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	ASSET4 Environmental *z*-Scores				Equally-weighted Environmental Scores			
Female Characteristics Grouping Variable			CEO Experience	Higher Education			CEO Experience	Higher Education
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female Director		0.145***				0.117***		
		(5.31)				(6.48)		
CEO Experience	0.216***	0.220***			0.180***	0.185***		
	(3.15)	(3.58)			(3.76)	(4.39)		
Higher Education	0.128*	0.090			0.107*	0.078		
	(1.83)	(1.31)			(1.69)	(1.23)		
MBA	-0.029	-0.056			-0.021	-0.042		
	(-0.22)	(-0.44)			(-0.20)	(-0.42)		
Age	-0.142	-0.081			-0.129	-0.082		
	(-1.20)	(-0.65)			(-1.49)	(-0.90)		
Tenure	0.005	0.004			0.004	0.004		
	(1.14)	(1.18)			(1.21)	(1.29)		
Same Name	-0.003	0.001			-0.002	0.001		
	(-0.85)	(0.28)			(-0.57)	(0.48)		
Female Characteristics								
Below Median Group			0.123***	0.129***			0.099***	0.104***
			(4.80)	(4.71)			(6.21)	(5.53)
Above Median Group			0.085***	0.067***			0.075***	0.059***
			(4.50)	(3.78)			(5.18)	(4.35)
Family		-0.104***	-0.097***	-0.097***		-0.081***	-0.074***	-0.074***
		(-3.36)	(-3.05)	(-2.97)		(-3.27)	(-2.86)	(-2.79)
Traditional Governance		0.024**	0.034**	0.034**		0.016*	0.025**	0.025**
		(2.09)	(2.59)	(2.56)		(1.79)	(2.45)	(2.44)
Majority Election		0.062**	0.061**	0.062**		0.052**	0.050**	0.050**
		(2.20)	(2.37)	(2.39)		(2.35)	(2.42)	(2.43)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	15,980	15,980	17,435	17,435	15,980	15,980	17,435	17,435
Adjusted R^2	0.455	0.467	0.478	0.478	0.538	0.550	0.555	0.555

Appendix

Table A1
Variable Descriptions and Data Sources

Variable	Description	Source
A. Environmental Performance Measures		
ASSET4 Environmental *z*-Score	Proprietary-weighted aggregate scores of environmental performance that ASSET4 provides to investors. These rank-based scores range from 0 to 100 and measure the environmental performance relative to all companies in a given year.	ASSET4 (from Thomson Reuters)
Equally-weighted Environmental Score	Aggregate score based of 70 line items of environmental commitments across three categories (emission reduction, resource reduction, and product innovation). Each line item is translated into an indicator variable such that a 'one' corresponds to better environmental performance (e.g., a below-median greenhouse gas emission firm would get a 'one'). Category scores are calculated as the sum of all indicator variables in each category divided by the number of reported items times 100. The Equally-weighted Environmental Score is the average of the category scores. Appendix Table A2 describes the indicator variables used to calculate the environmental scores.	ASSET4
Material Environmental Score	Follows the approach of the Equally-weighted Environmental Score. The score is based only on those line items from ASSET4 that are 'material' according to the SASB Materiality Map.	ASSET4, SASB
ASSET4 E Category *z*-scores	Category scores for emission reduction, resource reduction, and product innovation. These scores are proprietary-weighted aggregate category scores that ASSET4 provides to investors. These rank-based scores range from 0 to 100 and measure the environmental performance relative to all other companies in a given year.	ASSET4
Equally-weighted E Category Scores	Category scores for emission reduction, resource reduction, and product innovation. The scores are based on line items of environmental commitments across the three environmental categories. Each line item is translated into an indicator variable such that a 'one' corresponds to better environmental performance (e.g., a below-median greenhouse gas emission firm would get a 'one'). The category scores are calculated as the sum of all indicator variables in each category divided by the number of reported items times 100. Appendix Table A2 describes the indicator variables used to calculate the environmental scores.	ASSET4
B. Governance Mechanisms		
Family	Indicator variable that equals one if the firm is controlled by a family, zero otherwise. For each firm-year, we classify a firm as controlled by a family if any of the following conditions are met: 1) Orbis (Bureau van Dijk) identifies a family as the ultimate owner of the firm with a minimum controlling threshold of 25% (following Lins, Volpin, and Wagner, 2013); 2) Orbis identifies the ultimate owner to be a Nominee, Trust, or Trustee, and the firm has dual class shares (obtained from ASSET4); 3) Datastream reports a minimum family stake of 20%, or Datastream reports a minimum family stake of 5% and the firm has dual class shares; 4) the Global Family Business Index (obtained from Center for Family Business at the University of St. Gallen, Switzerland) reports the firm as family controlled. For each firm, we impute intermittent years as family controlled if a firm is classified as family controlled in at least one earlier and one later year. We further extend family control both backwards and forwards in time if ASSET4 indicates that the votes of a firm's largest blockholder are within 5% of the year during which a firm is known to be family controlled and the largest blockholder's stake is at least 20%.	ASSET4, Datastream, Orbis, Global Family Business Index
Widely Held	Indicator variable that equals one if the firm is not controlled by a blockholder, zero otherwise. For each firm-year, we classify a firm as widely held if any of the following conditions are met: 1) Orbis classifies the firm as known to be widely held and the firm is not classified as family controlled by the previous rules; 2) ASSET4 indicates the largest blockholder's stake is below 50%, or does not report any largest blockholder stake; 3) the firm is not classified as family controlled.	ASSET4, Datastream, Orbis

Other Blockholder	Indicator variable that equals one if the firm is not family controlled or widely held, zero otherwise. This category includes controlling blockholders that are non-financial firms (themselves widely held), financial investors, governments, banks, and insurance firms.	ASSET4, Datastream, Orbis
ASSET4 Governance	Aggregate score based of 38 line items of governance commitments across four categories (board function, board structure, compensation policy, shareholder rights). Each line item is translated into an indicator variable such that a 'one' corresponds to a better governance mechanism. Category scores are calculated as the sum of all indicator variables in each category divided by the number of reported items. The ASSET4 Governance is the average of the category scores. Appendix Table A3 describes the indicator variables used to calculate the governance scores.	ASSET4
Board Independence	Indicator variable that equals one if the board has more than 50% independent directors, zero otherwise.	ASSET4, BoardEx
Board Size	Indicator variable that equals one if the board has more than five but less than 16 members, zero otherwise.	ASSET4, BoardEx
CEO-Chairman Separation	Indicator variable that equals one if the CEO is not the chairman of the board of directors, zero otherwise.	ASSET4, BoardEx
Board Structure	Indicator variable that equals one if all board members are individually elected (no staggered board), zero otherwise.	ASSET4
Audit Committee Indep.	Indicator variable that quals one if the audit committee is composed only of independent directors, zero otherwise.	ASSET4
Stock Classes	Indicator variable that equals one if all shares of the company provide equal voting rights, zero otherwise.	ASSET4
Traditional Governance	Sum of the six indicator variables Board Independence, Board Size, CEO-Chairman Separation, Board Structure, Audit Committee Independence, Stock Class.	BoardEx, ASSET4
Old or Stale Board	Indicator variable that equals one if at least 20% of the directors is over 70 years old or if at least 50% of directors have a tenure greater than nine years, zero otherwise.	BoardEx
Majority Election	Indicator variable that equals one if the board members are generally elected with a majority vote, zero otherwise.	ASSET4
Female Director	Indicator variable that equals one if the firm has at least one female director, zero otherwise.	ASSET4, BoardEx
One Female Director	Indicator variable that equals one if the firm has one female director on the board, zero otherwise.	ASSET4, BoardEx
Two+ Female Directors	Indicator variable that equals one if the firm has two or more female directors on the board, zero otherwise.	ASSET4, BoardEx
Percent Female Directors	Number of female directors divided by the number of directors on the board.	ASSET4, BoardEx
C. Firm Characteristics		
Log(Total Assets)	Natural logarithm of total assets in US$ million.	Worldscope
Cash	Cash and cash equivalents divided by total assets.	Worldscope
Tangibility	Property, plant, and equipment divided by total assets.	Worldscope
Leverage	Total debt divided by total assets.	Worldscope
Profitability	Net income plus after-tax interest expenses divide by total assets.	Worldscope
Institutional Ownership	Total institutional ownership.	Factset
Cross-list	Indicator variable that equals one if the firm is cross-listed on a major US exchange, zero otherwise.	ADR lists, CRSP
D. Board Characteristics		
CEO Experience	Fraction of board members who have prior CEO experience.	BoardEx
MBA	Fraction of board members who hold an MBA.	BoardEx
Higher Education	Fraction of board members with non-MBA graduate degrees.	BoardEx
Same Name	Fraction of board members that have the same last name.	BoardEx
Age	Average age in years of all board members.	BoardEx
Tenure	Average board tenure in years of all board members.	BoardEx

Table A2
Thomson Reuters ASSET4 ESG Environmental Data

We create environmental indicator variables based on the Thomson Reuters ASSET4 ESG environmental indicator values (line items). Indicator values are the answers to Y/N questions, double Y/N questions, and numerical questions. We translate the answers to these questions into indicator variables. More specifically, for questions with a positive direction (i.e., a 'yes' answer or a greater number is associated with better environmental performance), we translate the answers to Y/N questions into 0 (N) and 1 (Y); the answers to double Y/N questions into 0 (NN), 0.5 (YN or NY), and 1 (YY); and the answers to numerical questions into 0 (value is less (or equal) than zero; or value is less (or equal) than the median; see also column 'Translation Numeric Values') and 1 (value is greater than zero; or value is greater than the median; see also column 'Translation Numeric Values'). For questions with a negative direction (i.e., a 'no' answer or a lower number is associated with better social performance), the opposite coding applies. The data are from the ASSET4 ESG database.

Items		Description	Direction	Question Type	Translation Numeric Values
A.	Emission Reduction				
1)	Biodiversity Controversies	Is the company under the spotlight of the media because of a controversy linked to biodiversity?	Negative	Y/N	
2)	Biodiversity Impact	Does the company report on initiatives to protect, restore or reduce its impact on native ecosystems and species, biodiversity, protected and sensitive areas?	Positive	Y/N	
3)	Cement CO2 Emissions	Total CO2 and CO2 equivalents emission in kilograms per tonne of cement produced.	Negative	Number	Median
4)	Climate Change Risks and Opportunities	Is the company aware that climate change can represent commercial risks and/or opportunities?	Positive	Y/N	
5)	CO2 Reduction	Does the company show an initiative to reduce, reuse, recycle, substitute, phased out or compensate CO2 equivalents in the production process?	Positive	Y/N	
6)	Discharge into Water System	Total weight of water pollutant emissions in tonnes divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
7)	Environmental Compliance	All real or estimated penalties, fines from lost court cases, settlements or cases not yet settled regarding environmental controversies in U.S. dollars.	Negative	Number	Zero
8)	Environmental Expenditures	Does the company report on its environmental expenditures or does the company report to make proactive environmental investments to reduce future risks or increase future opportunities?	Positive	Y/N	
9)	Environmental Management Systems	The percentage of company sites or subsidiaries that are certified with any environmental management system.	Positive	Number	Median
10)	Environmental Partnerships	Does the company report on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supragovernmental organizations that focus on improving environmental issues?	Positive	Y/N	
11)	Environmental Restoration Initiatives	Does the company report or provide information on company-generated initiatives to restore the environment?	Positive	Y/N	
12)	F-Gases Emissions	Does the company report on initiatives to recycle, reduce, reuse or phase out fluorinated gases such as HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) or SF6 (sulphur hexafluoride)?	Positive	Y/N	
13)	Greenhouse Gas Emissions	Total CO2 and CO2 equivalents emission in tonnes divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
14)	Hazardous Waste	Total amount of hazardous waste produced in tonnes divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
15)	Implementation	Does the company describe the implementation of its emission reduction policy through a public commitment from a senior management or board member? AND Does the company describe the implementation of its emission reduction policy through the processes in place?	Positive	Double Y/N	
16)	Improvements	Does the company set specific objectives to be achieved on emission reduction?	Positive	Y/N	
17)	Innovative Production	Does the company report on the concentration of production locations in order to limit the environmental impact during the production process? OR Does the company report on its participation in any emissions trading initiative? OR Does the company report on new production techniques to improve the global environmental impact (all emissions) during the production process?	Positive	Y/N	
18)	Monitoring	Does the company monitor its emission reduction performance?	Positive	Y/N	
19)	NOx and SOx Emissions Reduction	Does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulphur oxides) or NOx (nitrogen oxides) emissions?	Positive	Y/N	
20)	Ozone-Depleting Substances Reduction	Does the company report on initiatives to reduce, substitute, or phase out ozone-depleting (CFC-11 equivalents, chlorofluorocarbon) substances?	Positive	Y/N	
21)	Policy	Does the company have a policy for reducing environmental emissions or its impacts on biodiversity? AND Does the company have a policy for maintaining an environmental management system?	Positive	Double Y/N	
22)	Spill Impact Reduction	Does the company report on initiatives to reduce, avoid or minimize the effects of spills or other polluting events (crisis management system)?	Positive	Y/N	
23)	Spills and Pollution Controversies	Is the company directly or indirectly (through a supplier) under the spotlight of the media because of a controversy linked to the spill of chemicals, oils and fuels, gases (flaring) or controversy relating to the overall impacts of the company on the environment?	Negative	Y/N	
24)	Transportation Impact Reduction	Does the company report on initiatives to reduce the environmental impact of transportation of its products or its staff?	Positive	Y/N	
25)	VOC Emissions Reduction	Does the company report on initiatives to reduce, substitute, or phase out volatile organic compounds (VOC) or particulate matter less than ten microns in diameter (PM10)?	Positive	Y/N	
26)	Waste	Total amount of waste produced in tonnes divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
27)	Waste Recycling Ratio	Total recycled and reused waste produced in tonnes divided by total waste produced in tonnes.	Positive	Number	Median
28)	Waste Reduction	Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste, hazardous waste or wastewater?	Positive	Y/N	
B.	Resource Reduction				
1)	Cement Energy Use	Total energy use in gigajoules per tonne of clinker produced.	Negative	Number	Median
2)	Energy Efficiency Initiatives	Does the company report on initiatives to use renewable energy sources? AND Does the company report on initiatives to increase its energy efficiency overall?	Positive	Double Y/N	
3)	Energy Use	Total direct and indirect energy consumption in gigajoules divided by net sales or revenue in U.S. dollars.	Negative	Number	Median

4)	Environmental Resource Impact Controversies	Is the company under the spotlight of the media because of a controversy linked to the environmental impact of its operations on natural resources or local communities?	Negative	Y/N	
5)	Environmental Supply Chain Management	Does the company use environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners? AND Does the company report or show to be ready to end a partnership with a sourcing partner, if environmental criteria are not met?	Positive	Double Y/N	
6)	Green Buildings	Does the company have environmentally friendly or green sites or offices?	Positive	Y/N	
7)	Implementation	Does the company describe the implementation of its resource efficiency policy through a public commitment from a senior management or board member? AND Does the company describe the implementation of its resource efficiency policy through the processes in place?	Positive	Double Y/N	
8)	Improvements	Does the company set specific objectives to be achieved on resource efficiency? AND Does the company comment on the results of previously set objectives?	Positive	Double Y/N	
9)	Land Use	Does the company report on initiatives to reduce the environmental impact on land owned, leased or managed for production activities or extractive use?	Positive	Y/N	
10)	Materials	Total amount of materials used in tons divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
11)	Materials Recycled and Reused Ratio	The percentage of recycled materials of the total materials used.	Positive	Number	Median
12)	Monitoring	Does the company monitor its resource efficiency performance?	Positive	Y/N	
13)	Policy	Does the company have a policy for reducing the use of natural resources? AND Does the company have a policy to lessen the environmental impact of its supply chain?	Positive	Double Y/N	
14)	Renewable Energy Use	Total energy generated from primary renewable energy sources divided by total energy.	Positive	Number	Median
15)	Toxic Chemicals	Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances?	Positive	Y/N	
16)	Water Recycling	Does the company report on initiatives to reuse or recycle water? OR Does the company report on initiatives to reduce the amount of water used?	Positive	Y/N	
17)	Water Use	Total water withdrawal in cubic meters divided by net sales or revenue in U.S. dollars.	Negative	Number	Median
C.	Product Innovation				
1)	Animal Testing	Is the company endorsing guidelines on animal testing (e.g., the EU guideline on animal experiments)? OR Has the company established a programme or an initiative to reduce, phase out or substitute for animal testing?	Positive	Y/N	
2)	Eco-Design Products	Does the company report on specific products which are designed for reuse, recycling or the reduction of environmental impacts?	Positive	Y/N	
3)	Energy Footprint Reduction	Does the company describe initiatives in place to reduce the energy footprint of its products during their use?	Positive	Y/N	
4)	Environmental Asset Management	Does the company report on assets under management which employ environmental screening criteria or environmental factors in the investment selection process?	Positive	Y/N	
5)	Environmental Labels and Awards	Has the company received product awards with respect to environmental responsibility? OR Does the company use product labels (e.g., FSC, Energy Star, MSC) indicating the environmental responsibility of its products?	Positive	Y/N	
6)	Environmental Products	Does the company report on at least one product line or service that is designed to have positive effects on the environment or which is environmentally labelled and marketed?	Positive	Y/N	
7)	Environmental Project Financing	Is the company a signatory of the Equator Principles (commitment to manage environmental issues in project financing)? OR Does the company claim to evaluate projects on the basis of environmental or biodiversity risks as well?	Positive	Y/N	
8)	Environmental R&D	Does the company invest in R&D on new environmentally friendly products or services that will limit the amount of emissions and resources needed during product use?	Positive	Y/N	
9)	Environmental R&D Expenditures	Total amount of environmental R&D costs (without clean up and remediation costs) divided by net sales or revenue in U.S. dollars.	Positive	Number	Median
10)	GMO Free Products	Does the company make a commitment to exclude GMO ingredients from its products or retail offerings?	Positive	Y/N	
11)	Hybrid Vehicles	Is the company developing hybrid vehicles?	Positive	Y/N	
12)	Implementation	Does the company describe the implementation of its environmental product innovation policy?	Positive	Y/N	
13)	Improvements	Does the company set specific objectives to be achieved on environmental product innovation?	Positive	Y/N	
14)	Labelled Wood Percentage	The percentage of labelled wood or forest products (e.g., Forest Stewardship Council (FSC)) from total wood or forest products.	Positive	Number	Median
15)	Liquefied Natural Gas	Does the company develop new products and services linked to liquefied natural gas?	Positive	Y/N	
16)	Monitoring	Does the company describe, claim to have or mention the processes it uses to accomplish environmental product innovation?	Positive	Y/N	
17)	Noise Reduction	Does the company develop new products that are marketed as reducing noise emissions?	Positive	Y/N	
18)	Organic Products	Does the company report or show initiatives to produce or promote organic food or other products?	Positive	Y/N	
19)	Policy	Does the company have an environmental product innovation policy (eco-design, life cycle assessment, dematerialization)?	Positive	Y/N	
20)	Product Impact Controversies	Is the company under the spotlight of the media because of a controversy linked to the environmental impact of its products or services?	Negative	Y/N	
21)	Product Impact Minimization	Does the company reports about take-back procedures and recycling programmes to reduce the potential risks of products entering the environment? OR Does the company report about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use?	Positive	Y/N	
22)	Renewable Energy Supply	Total energy distributed or produced from renewable energy sources divided by the total energy distributed or produced.	Positive	Number	Median
23)	Renewable/Clean Energy Products	Does the company develop products or technologies for use in the clean, renewable energy (such as wind, solar, hydro and geo-thermal and biomass power)?	Positive	Y/N	
24)	Sustainable Building Products	Does the company develop products and services that improve the energy efficiency of buildings?	Positive	Y/N	
25)	Water Technologies	Does the company develop products or technologies that are used for water treatment, purification or that improve water use efficiency?	Positive	Y/N	

Table A3
Thomson Reuters ASSET4 ESG Governance Data

We create governance indicator variables based on the Thomson Reuters ASSET4 ESG governance indicator values (line items). Indicator values are the answers to Y/N questions, double Y/N questions, and numerical questions. We translate the answers to these questions into indicator variables. More specifically, for questions with a positive direction (i.e., a "yes" answer or a greater number is associated with better environmental performance), we translate the answers to Y/N questions into 0 (N) and 1 (Y); the answers to double Y/N questions into 0 (NN), 0.5 (YN or NY), and 1 (YY); and the answers to numerical questions into 0 (value is less (or equal) than zero; or value is less (or equal) than the median; see also column "Translation Numeric Values") and 1 (value is greater than zero; or value is greater than the median; see also column "Translation Numeric Values"). For questions with a negative direction (i.e., a "no" answer or a lower number is associated with better social performance), the opposite coding applies. The data are from the ASSET4 ESG database.

Items		Description	Direction	Question Type	Translation Numeric Values
A.	Board Functions				
1)	Policy	Does the company have a policy for maintaining effective board functions?	Positive	Y/N	
2)	Board Meeting Attendance	The average overall attendance percentage of board meetings as reported by the company.	Positive	Number	Median
3)	Succession Plan for Executives	Does the company have a succession plan for executive management in the event of unforeseen circumstances?	Positive	Y/N	
4)	External Consultants	Does the board or board committees have the authority to hire external advisers or consultants without management's approval?	Positive	Y/N	
5)	Audit Committee Independence	Percentage of independent board members on the audit committee as stipulated by the company.	Positive	Number	Median
6)	Audit Committee Management Independence	Does the company report that all audit committee members are non-executives?	Positive	Y/N	
7)	Compensation Committee Independence	Percentage of independent board members on the compensation committee as stipulated by the company.	Positive	Number	Median
8)	Compensation Committee Management Independence	Does the company report that all compensation committee members are non-executives?	Positive	Y/N	
9)	Nomination Committee Independence	Percentage of non-executive board members on the nomination committee.	Positive	Number	Median
10)	Nomination Committee Involvement	Percentage of nomination committee members who are significant shareholders (more than 5%).	Positive	Number	Median
B.	Board Structure				
1)	Policy	Does the company have a policy for maintaining a well-balanced membership of the board?	Positive	Y/N	
2)	Size of Board	Total number of board members which are in excess of ten or below eight.	Negative	Number	Median
3)	Background and Skills	Does the company describe the professional experience or skills of every board member? OR Does the company provide information about the age of individual board members?	Positive	Y/N	
4)	Board Diversity	Percentage of female on the board.	Positive	Number	Median
5)	Specific Skills	Percentage of board members who have either an industry specific background or a strong financial background.	Positive	Number	Median
6)	Experienced Board	Average number of years each board member has been on the board.	Positive	Number	Median
7)	Non-Executive Board Members	Percentage of non-executive board members.	Positive	Number	Median
8)	Independent Board Members	Percentage of independent board members as reported by the company.	Positive	Number	Median
9)	CEO-Chairman Separation	Does the CEO simultaneously chair the board or has the chairman of the board been the CEO of the company?	Negative	Y/N	
10)	Board Member Affiliations	Average number of other corporate affiliations for the board member.	Negative	Number	Median
11)	Individual Re-election	Are all board member individually subject to re-election (no classified or staggered board structure)?	Positive	Y/N	
C.	Compensation Policy				
1)	Policy	Does the company have a policy for performance-oriented compensation that attracts and retain the senior executives and board members?	Positive	Y/N	
2)	Compensation Improvement Tools	Does the company have the necessary internal improvement and information tools for the board members to develop appropriate compensation/remuneration to attract and retain key executives?	Positive	Y/N	
3)	CEO Compensation Link to Total Shareholder Return	Is the CEO's compensation linked to total shareholder return (TSR)?	Positive	Y/N	
4)	Total Senior Executives Compensation	The total compensation paid to all senior executives (if total aggregate is reported by the company).	Negative	Number	Median
5)	Shareholders Approval of Stock Based Compensation Plan	Does the company require that shareholder approval is obtained prior to the adoption of any stock based compensation plans?	Positive	Y/N	
6)	Individual Compensation	Does the company provide information about the total individual compensation of all executives and board members?	Positive	Y/N	
7)	Highest Remuneration Package	Highest remuneration package within the company in US dollars.	Negative	Number	Median
8)	Long Term Objectives	Is the management and board members remuneration partly linked to objectives or targets which are more than two years forward looking?	Positive	Y/N	

D.	Shareholder Rights				
1)	Policy	Does the company have a policy for ensuring equal treatment of minority shareholders, facilitating shareholder engagement or limiting the use of anti-takeover devices?	Positive	Y/N	
2)	Voting Cap Percentage	The percentage of maximum voting rights allowed or ownership rights.	Positive	Number	Median
3)	Majority Requirements for Election of Directors	Are the company's board members elected with a majority vote?	Positive	Y/N	
4)	Shareholders Vote on Executive Pay	Do the company's shareholders have the right to vote on executive compensation?	Positive	Y/N	
5)	Public Availability Corporate Statutes	Are the company's articles of association, statutes or bylaws publicly available?	Positive	Y/N	
6)	Veto Power or Golden Share	Does the biggest owner (by voting power) hold the veto power or own golden shares?	Negative	Y/N	
7)	State Owned Enterprise (SOE)	Is the company a State Owned Enterprise (SOE)?	Negative	Y/N	
8)	Voting Rights	Are all shares of the company providing equal voting rights?	Positive	Y/N	
9)	Anti Takeover Devices	The number of anti-takeover devices in place in excess of two.	Negative	Number	Zero

Table A4
Quasi-exogenous Shocks to Majority Voting and Female Board Representation

This table reports descriptive statistics for quasi-exogenous shocks at the country level for majority director election rules and female board representation.

Panel A: Quasi-exogenous Shocks to Majority Director Election Rules

Country	Event Years	Percentage of Firms with a Majority Director Election Rule	
		Change Over One Year	Change Over Two Years
Australia	2008	From 12% to 35%	From 12% to 44%
Austria	2007	24% to 53%	24% to 68%
Belgium	2007	13% to 42%	13% to 46%
Canada	2005/06	22% to 37%	22% to 51%
Denmark	2008	35% to 70%	35% to 83%
Ireland	2009	29% to 53%	29% to 56%
Italy	2007	27% to 62%	27% to 67%
Spain	2007	14% to 29%	14% to 43%
Switzerland	2007	43% to 64%	43% to 76%
UK	2008	14% to 35%	14% to 51%

Panel B: Quasi-exogenous Shocks to Female Board Representation

Country	Event Years	Percentage of Firms with at Least One Female Board Member	
		Change Over One Year	Change Over Two Years
Australia	2011	From 40% to 50%	From 40% to 55%
Austria	2011	63% to 73%	63% to 88%
Germany	2011	70% to 80%	70% to 91%
Greece	2010	56% to 71%	56% to 75%
Italy	2011	59% to 73%	59% to 83%
Malaysia	2012	50% to 60%	50% to 74%
Portugal	2009	31% to 46%	31% to 58%
Switzerland	2008	44% to 53%	44% to 56%
UK	2011	57% to 64%	57% to 76%

Panel C: Sources of Quasi-exogenous Shocks

Majority Director Election

Canada (2005/06), Canadian Coalition for Good Governance push to get Canadian firms to adopt majority voting in 2005/06 (Doidge et al., 2019).

UK (2006), Companies Act 2006 widely introduced appointment of board members by ordinary resolution.

Female Board Representation

UK (2011), Lord Davies, a Labour government minister, published a report telling FTSE 100 companies they should double the number of female directors by 2015. This report was met with enthusiastic support publicly and from a number of shareholder organization. For example, one of the UK's largest shareholder organizations, the Association of British Insurers, disclosed that it would start monitoring the number of women on FTSE boards. No formal rule on female board representation introduced.

Australia (2011), ASX Corporate Governance Council updated its Corporate Governance Principals and Recommendations for diversity in Australia, the Australian Institution of Company Directors pushed for an increase in the number of female board members. No formal rule on female board representation introduced.

Austria (2011), A gender quota (25%) for supervisory boards of companies in which the state has a majority stake introduced in 2011.

Germany (2011), A group of 18 multinational German firms publicly commit to promote women into leadership positions (May 2010). A bipartisan parliamentary group issues *Berliner Erklaerung* with the goal of introducing a 30% female board representation quota (December 2011).

Greece (2010), Start of the *National Programme for Substantive Gender Equality* (2010-2013).

Italy (2011), A gender quota (33%) for supervisory boards of companies introduced in 2011.

Malaysia (2012), A gender quota (30%) for supervisory boards introduced in 2011.