Family-Controlled Firms and Environmental Sustainability: All Bite and No Bark

Alexander Dyck
University of Toronto

Karl V. Lins
University of Utah

Lukas Roth
University of Alberta

Mitch Towner
University of Arizona

Hannes F. Wagner
Bocconi University

May 2024

Abstract

Families control a large swath of the world's publicly traded firms. Do they take environmental performance seriously? We test this in a sample of 3,832 firms from 35 countries. Using carbon emissions as the sustainability metric, the performance of family-controlled firms is not worse, and in some settings is better, than that of widely held firms. Using environmental scores based on qualitative metrics, family firms perform significantly worse. Our paper provides a completely new interpretation of prior evidence that family control is negatively related to environmental performance. Family-controlled firms take carbon emissions seriously and manage this potentially existential risk well.

Keywords: Carbon emissions, climate risks, family ownership, environmental metrics, environmental sustainability, materiality

JEL Classification: G32, G34, G54

Author contacts: adyck@rotman.utoronto.ca (corresponding author); karl.lins@eccles.utah.edu; lukas.roth@ualberta.ca; mitchtowner@email.arizona.edu; and hannes.wagner@unibocconi.it. We thank seminar participants at University of Arizona, University of Delaware, Laval University, McGill, University of Missouri, University of North Carolina at Chapel Hill, and University of Toronto for helpful comments and suggestions. We are grateful to the Social Sciences and Humanities Research Council of Canada, the BAFFI Centre on Economics, Finance and Regulation, the Michael Lee-Chin Family Institute for Corporate Citizenship, and the Innocenzo Gasparini Institute for Economic Research for financial support. None of the authors has a conflict of interest to declare.

Sorkin*: "How well do you think Berkshire Hathaway measures up against these (ESG) metrics and are they valuable metrics?"* Buffett: *"I think in reality we measure up well, but we don't participate in preparing reports for anybody that asks about it, … we keep expenses and needless reporting down to a minimum."*

—Andrew Ross Sorkin, journalist, and Warren Buffett, controlling shareholder of Berkshire Hathaway, Berkshire Hathaway Annual Meeting, May 4, 2019

I. Introduction

NOAA, NASA, and Copernicus all report that 2023 was the hottest year on record, with the rate of warming doubling since 1981, and increasing extreme weather events (NOAA, 2024; NASA, 2024; CCCS, 2024). With a changing climate, firms direct their attention to physical risks that affect production and distribution, to regulatory risks from governments' responses, and to technological and transition risks as business models need to adapt to innovation and changing consumer preferences. Understanding and managing climate-related risks and opportunities is important for firms, their investors, and society.

In this paper we ask whether family control affects a firm's environmental sustainability performance? Answering this question matters. Family ownership is generally the most common type of ownership globally (La Porta, Lopez-De-Silanes, and Shleifer, 1999; Aminadav and Papaioannou, 2020). As a result, family firms are significant contributors to climate change. Their influence is likely to increase as Copeland, Shapiro, and Taylor (2021) report that most global emissions growth now comes from developing countries, where family firms are the most common (Lins, 2003).

In a family-controlled firm, the family can dictate firm choices as they have substantial voting stakes and generally hold senior management or board positions. Two fundamental factors are at play in determining the impact of family control on environmental sustainability performance. First, because of their control rights, family owners can consume private benefits at the expense of minority shareholders. There is a large literature that documents the extent of these

private benefits generally, and their importance for family-controlled firms (e.g., La Porta et al., 1999; Dyck and Zingales, 2004; Villalonga and Amit, 2006). Second, families think across generations and are generally less diversified, with much of their wealth concentrated in their own firms. This should make families particularly sensitive to, and conservative towards, existential risks which could plausibly affect the ability of future family members to consume their private benefits of control (e.g., Lins, Volpin, and Wagner, 2013).

The impact of family ownership on a firm's environmental sustainability performance depends on which of these two factors dominates. Consider a standard environmental decision, where a firm considers investing today for possible future benefits. Here, the prevailing prediction from the international corporate governance research applies. Family-controlled firms' ability to consume private benefits from current cash flows reduces their incentive for such long-term investments. The impact of family ownership on environmental investments changes when facing an existential environmental risk. In this case, family owners, aiming to preserve long-term private benefits, will not want to have lower performance than other firms, and may potentially want to perform better.

We next discuss predictions for firms' environmental disclosures, which can differ from their environmental performance. External disclosure is costly, and information about a firm's environmental choices and performance is already known by family members given their positions in management or on the board. Absent a benefit, family firms are unlikely to provide outside investors with highly detailed information on their environmental choices. However, when it comes to performance regarding existential environmental risks, it is beneficial for a family firm to disclose sufficient information to regulators (or others that have the power to shut a firm down)

that their firm is indeed mitigating these risks. Thus, for existential environmental performance, family firms are predicted to disclose similarly to other firms.

Our paper tests these predictions for the way in which family ownership impacts environmental performance and environmental disclosure. To build our global sample, we start with commercially available data sources such as Bureau van Dijk (BvD) Orbis, Refinitiv, Datastream, and Worldscope, all of which provide data to trace the ownership of firms. We then manually research, categorize, and verify each firm's ultimate ownership with data from a variety of additional sources, including annual reports, internet searches, and country guides. Attempting to categorize ultimate ownership in any other way is insufficient, given the reported findings in Aminadav and Papaioannou (2020) that sources such as BvD have large numbers of misclassifications once a manual check is done.

Our final sample consists of 3,832 firms from 35 countries in 2022. In this sample, 45% of firms are widely held, and 55% are controlled in one way or another. The single largest controlling shareholder type is family, accounting for 39% of all sample firms, with 7% of firms held by government-controlled entities, 2% by various types of financial entities (hedge funds, private equity, and others), and 7% with opaque controlling shareholders for which, despite all efforts, the ultimate owner type of the controlling blockholder could not be established. We combine the last two categories and label them other-opaque firms.

A firm's carbon emissions are an important performance metric that speaks to whether a firm is managing its existential environmental sustainability risks. It constitutes a quantitative summary statistic that reflects the realized, material environmental sustainability choices made by a firm. The International Sustainability Standards Board (ISSB), an independent standard-setting body within the International Financial Reporting Standards (IFRS) foundation that issues

sustainability standards and metrics, issued its first detailed mandatory sustainability standards in June 2023. The headline metric in these standards is CO2 equivalent emissions (converting methane and other non-CO2 emissions into CO2 equivalents following the Greenhouse Gas Protocol). We use a firm's reported CO2-equivalent Scope 1 and Scope 2 emissions from Refinitiv. We assess both carbon intensity (emissions scaled by revenue) and raw carbon emissions (controlling for a measure of the firm's activity footprint) with controls for industry, country, and firm characteristics.

Consistent with our hypothesis that family-controlled firms will view quantitative carbon emissions as a potentially existential risk that is crucial to manage, we find two results. First, we find that the frequency of disclosure of carbon emissions is indistinguishable between family-controlled and widely held firms. Second, and more importantly, we find that the level of carbon emissions of family firms is also indistinguishable between family-controlled and widely held firms across all industries as well as in the subsample of industries which the ISSB classifies to be GHG-material industries, where existential risks are most pronounced.

We leverage our international sample to further investigate the importance of existential risks for family firms' environmental performance. Countries that have paid little attention to climate protection so far may eventually have to accede to the higher climate protection expectations contained in international agreements. Firms operating in such countries thus face a risk that could imperil their existence if they are unprepared, and they might seek to get ahead of the curve and reduce current carbon emissions to avoid being disciplined in case of future policy tightening. We test for this by creating country subsamples, where we split countries based on their scores on the Climate Change Performance Index (CCPI). In the low CCPI countries with a substantial risk of policy tightening, we find that family-controlled firms have approximately 20%

lower carbon emissions than widely held firms. This is consistent with family-controlled firms believing it is important to get well ahead of the regulatory curve to protect their private benefits of control in the long term.

A large industry has evolved that produces an "alphabet soup" of firms' Environmental, Social, and Governance (ESG) metrics and frameworks, all of which include a myriad of qualitative metrics. We turn our attention to these qualitative metrics for environmental sustainability performance that, while currently in use, are at the same time plausibly unrelated to existential risks. For such metrics, we have the clear prediction that family firms will have lower performance and disclosure.

We consider all 269 Refinitiv data items for environmental performance and construct an equally weighted score based on the 73 binary variables that predominantly indicate whether a firm has qualitative environmental policies and targets. Qualitative metrics, as noted in Bolton and Kacperczyk (2023), could be "mostly empty promises, a convenient way of appearing virtuous while putting off difficult and costly choices." These are precisely the metrics that controlling shareholder Warren Buffett, in the opening quote of the paper, directs his firm managers to avoid reporting. The family firms in our global sample are similarly insulated from outside pressure. We find, consistent with our prediction, that they perform significantly worse than widely held firms on these plausibly less-material environmental metrics.

Summarizing, our tests show that family-controlled firms take carbon emissions as seriously as other firms, and produce lower emissions where firms face a greater risk of climate policy tightening. They have developed a strong 'bite' on the environmental component that truly matters: managing existential carbon emissions risks. At the same time, family firms do not 'bark' much about arguably less material environmental performance components.

This positive perspective of family control when it comes to environmental sustainability contrasts with the takeaways from the prior literature. A number of papers, including El Ghoul, Guedhami, Wang, and Kwok (2016), Tufano, Villalonga, and Wang (2022), and Dyck, Lins, Roth, Towner, and Wagner (2023), show that family control is negatively correlated with environmental performance. These studies use commercially provided environmental scores to measure environmental performance, and the aggregate scores are based on carbon emissions, qualitative environmental metrics, and other variables.

In a final section of the paper, we reconcile our findings with those in the literature. Our paper provides a completely new interpretation of prior evidence that family control is negatively related to environmental scores. We hypothesize that this stems from rating agencies' environmental score weighting schemes. Specifically, our results suggest they may be placing a low weight on carbon emissions, where families perform well, and a high weight on qualitative metrics, where families perform poorly. To test this, we construct estimates of the weights that two prominent ESG data providers (Refinitiv and Sustainalytics) place on carbon emissions, and, consistent with our hypothesis, find the weightings to be very low (ranges from 2% to 10% depending upon measure and data provider).

Our paper sheds light on the public debate about both the materiality of environmental performance and the current validity of ESG scores.[1] Our findings suggest that carbon emissions are indeed material. Family-controlled firms manage this risk at least as well and sometimes better than other firms even though they do not have to, given their insulation from outside investor pressure. At the same time, our results suggest caution in drawing inferences from current commercially provided environmental scores. In the past, it may have been reasonable to use

[1] Prior papers have raised concerns about a disagreement between ESG data providers (e.g., Gibson, Krueger, and Schmidt, 2019; Berg, Koelbel, and Rigobon, 2022; Christensen, Serafeim, and Sikochi, 2022).

scores that capture myriad indicators of future long-term environmental performance, consistent with a roadmap to lower emissions. But today, if the overarching goal is to mitigate climate-change-related risks, scores that heavily weight quantitative carbon emissions levels themselves, not metrics based on a roadmap to them, are likely the best way to assess whether firms are managing their existential environmental sustainability risks.

II. Sample and Summary Statistics

This section describes our data sources and provides descriptive statistics for our sample. Our starting point is the universe of non-financial publicly traded firms with ESG data coverage in Refinitiv as of year-end 2022. Refinitiv, previously ASSET4 and recently renamed as LSEG, is a key ESG rating provider used by both practitioners and academia. We gather financial metrics for these firms from Worldscope. We require firms to have non-missing assets, non-zero revenue, and a minimum market capitalization of $100 million. We exclude firms incorporated in the U.S., Russia and China, and firms from countries where we have less than ten observations.[2] The final sample includes 3,832 firms from 35 countries.

A. Environmental Performance Metrics

We argue that carbon emissions constitute a plausible summary statistic for a firm's potential existential environmental sustainability risk today. The centrality of emissions is evident in the actions taken by the ISSB in June of 2023 to highlight climate risk and its measurement, mandating reporting of carbon emissions starting in 2024 for all firms subject to IFRS accounting

[2] We exclude the U.S. because IFRS, which requires a large number of mandatory environmental disclosures, do not apply to U.S. firms. We exclude Russia and China, given the difficulty for families to establish effective control rights in these settings.

standards. For all these reasons, several recent finance papers also focus on emissions as their key outcome variable (e.g., Shive and Forster, 2020; Bolton and Kacperczyk, 2023).

Our primary metric of emissions is reported total CO2 equivalent emissions (from Refinitiv[3]), which includes all GHG emissions and converts methane and other non-CO2 emissions into carbon equivalent emissions following the Greenhouse Gas Protocol. These carbon emissions are the sum of Scope 1 emissions (direct emissions from firm-owned or controlled sources) and Scope 2 emissions (indirect emissions from the generation of purchased energy). We do not use estimates of emissions, as the producers of estimates have discretion, such discretion produces variances across estimates, and estimates are less likely to be perceived by owners and regulators as a signal of existential risk for a firm as of 2022.[4] We use both measures of emissions intensity and unscaled carbon emissions.

Table 1, Panel A reports key emission metrics used in our tests. Three quarters of our sample firms report CO2 emissions in 2022.[5] The median firm in our sample emits the equivalent of 97,740 tons of CO2 per year. Median Scope 1 emissions are 31,182 tons, while Scope 2 emissions are 33,974 tons. The large standard deviation in emissions suggests the need to control for the intensity of activity used to generate these emissions, and to control for industry differences. We do both in our tests.

[3] Using Refinitiv rather than a different data provider for reported carbon emissions does not impact inferences from our tests. We compare reported carbon emissions values across multiple data providers and find virtually identical values, consistent with Busch, Johnson, Pioch and Kopp (2018) who find correlations of ~0.99 across five data providers for this metric.

[4] Consistent with discretionary model choices leading to differences in estimates, Busch et al. (2018) report much lower correlations across scores of three data providers that use estimates (0.79 for scope 1 and 0.63 for scope 2). Aswani, Raghunandan and Rajgopal (2024) discuss additional challenges with using estimates. We note that as of 2022 there are few firms that report Scope 3 emissions. Since we do not want to use estimates, we do not include Scope 3 emissions in our analysis.

[5] A precondition for an analysis of emissions is widespread availability of consistently reported data. The year 2022 provides the most complete sample of firms that report carbon emissions to date. As a point of reference, for a sample comparable to ours a decade earlier (2012), only 57% of firms reported carbon emissions.

Next, we describe our metrics for environmental sustainability performance that, while currently in use, are at the same time plausibly unrelated to existential risks. A large industry has emerged, including standard setters, NGOs, and rating agencies, that produce an "alphabet soup" of Environmental, Social, and Governance (ESG) metrics and frameworks, all of which include a large number of qualitative metrics. Edmans (2023) highlights concerns about such an alphabet soup: "focus is important, because there are literally hundreds of ESG metrics that companies could report. Not only would this divert a company's attention from actually creating value to reporting on value, it would ironically reduce transparency to investors and stakeholders as they won't know where to look."

We build on the Bolton and Kacperzyk (2023) approach, where they identify binary variables that are potentially 'mostly empty promises.'[6] To assess environmental performance from this different perspective, we consider all 269 Refinitiv data items for environmental performance and identify all binary variables that predominantly indicate disclosure of qualitative environmental policies and targets and use these to construct an equally weighted score based on 73 such binary variables. We cannot measure disclosure and performance separately because, at least since an update to Refinitiv's methodology in 2020, Refinitiv assigns a score of one if a firm has a certain environmental policy or target and a score of zero if a firm does not have such a policy or target or does not report at all (Berg, Fabisik, and Sautner, 2021). We use Refinitiv's polarity categorization where we convert all variables into positive environmental policies (e.g., whether the firm has a Policy for Water Efficiency). We add up all 73 binary metrics to create an overall qualitative environmental score. We repeat this procedure for Refinitiv's subcategories and

[6] The metrics they use are whether a firm has made a commitment to join the Science Based Targets initiative (SBTi), whether a firm has committed to a target that can be validated by the initiative, and by whether a firm reports emission targets to the Carbon Disclosure Project.

calculate qualitative scores for the subcategories resource use, emissions, and environmental innovation.[7]

In Table 1, we show that the median firm in our sample has a qualitative environmental score of 24 (out of a possible score of 73), with a qualitative resource use score of 6 (out of 28), a qualitative emissions score of 10 (out of 19), and a qualitative environmental innovation score of 7 (out of 26).

We also use environmental scores compiled and provided by Refinitiv that are based on both qualitative environmental data items and quantitative measures of environmental performance including emissions. The average (median) firm in the sample in 2022 has an overall Refinitiv environmental score of 49 (50). While the exact weightings on individual data items are proprietary (we discuss this in the final section of the body of our paper), we note that Refinitiv's environmental score has a 0.88 correlation with our qualitative environmental score that equally weights their 73 qualitative binary line items.

B. Establishing Controlling Blockholders

Our empirical analysis examines the association between ownership structure and environmental performance. The well-known complexity of ownership structures makes this manual process time-consuming. To build our global sample, we supplement commercial databases with hand collected data using a large variety of sources, including annual corporate reports, lists of family-controlled firms, internet searches, and country guides. Even today, attempting to categorize ultimate ownership in any other way is insufficient, given the reported

[7] Refinitiv has no missing values for 66 of the 73 data items. Refinitiv has missing values for 7 items and we assign a value of zero if they are not populated. Our results are the same if we restrict attention to the 66 fully-populated qualitative data items. The full list of data items is available in Table A2 in the Appendix.

findings in Aminadav and Papaioannou (2020). We focus on family ownership for the year 2022.[8] We pool all available data about shareholder structure from Refinitiv and Worldscope to construct an ex-ante probability of whether a given firm is widely held, or whether potentially controlling blockholders may exist. Then, going country by country and using the ex-ante probabilities to guide our effort, we research each firm manually.

We construct four categories of ultimate ownership: family-controlled, government-controlled, other opaque-controlled, and widely held. Other opaque-controlled includes firms controlled by private equity, hedge funds, venture capitalists, other types of blockholders, or cases where we know that blockholders exist, but the precise structure of ownership cannot be established. We classify a firm as family controlled if i) the sum of the shares owned by the family members exceeds those of any other shareholder and is greater than 20%, ii) the sum of family stakes exceeds those of any other shareholder, is greater than 10%, and family members hold the CEO or chair position, or iii) the sum of family stakes exceeds those of any other shareholder, is greater than 10%, and the firm has multiple voting class shares. Other firms are classified as blockholder-controlled if the largest shareholder owns at least 20% of the shares. Widely held firms are all remaining firms that are not blockholder-controlled.

To illustrate the complexity, consider two family firms in our sample: *Pfeiffer Vacuum Technology AG* is a small-cap German firm specializing in vacuum technology. It has a single class of common equity, and in December 2022, its largest shareholder *Pangea GmbH* holds a substantial 63% stake. *Pangea GmbH* is an investment vehicle owned by *Busch SE*, a public limited firm operating in the same industry and serving as a direct competitor. The ownership

[8] Prior papers have assembled information on ownership, but even the more recent ones do not provide hand-collected cross-sections for 2022; for example, family ownership around the world is measured for the year 2002 by Masulis, Pham, and Zein (2011), and up to the year 2012 by Aminadav and Papaioannou (2020).

structure is intricate because *Busch SE* is wholly owned by *Busch GBR*, a German law-based partnership. The Busch family, consisting of Ayhan and Karl Busch, along with their children Ayla, Sami, and Kaya Busch, completely owns *Busch GBR*. Consequently, the Busch family holds indirect control over *Pfeiffer Vacuum Technology AG*.

Canadian Utilities Limited is a large Canadian electric utility, where *Sentgraf Enterprises* commands 97.3% of the voting power, despite having only 2.5% of the total shares. Meanwhile, *ATCO*, another related entity, sees *Sentgraf* controlling 92.4% of votes and 10.1% of the company's total shares. *Sentgraf* is under the control of the Southern Family, led by CEO Nancy Southern, who is the daughter of the company's founder, Ron Southern. This intricate ownership arrangement underscores the concentrated decision-making authority within the Southern Family, particularly through *Sentgraf's* substantial voting power in both Canadian Utilities and *ATCO*.

Panel A of Table 1 shows summary statistics for the ownership types in our sample. We find that 45% of firms are widely held, 39% of firms are family-controlled, 7% of firms are government-controlled, and 9% are other opaque-controlled. In Panel B of Table 1 we report, by country, the incidence of the ownership types. There is substantial variation in how common family-controlled firms are around the world. Family ownership is highest in the Philippines and South Korea, where 84% and 83% of firms are family-controlled. The lowest incidence of family ownership is in Australia, Ireland, Japan, Taiwan, and the U.K., where family firms represent less than 20%. Figure 1 provides a country map of the incidence of family control around the world.

C. Industry and Country Classifications

Our paper conducts several tests in which we separate the sample by industry or country characteristics with a focus on settings where existential risks arising from carbon emissions are likely most pronounced. We first group firms into subsamples by how material GHG emissions

are for their industries. Specifically, we obtain data from the Sustainability Accounting Standards Board (SASB), which was folded into the ISSB, to identify material GHG industries. In the recently released 2023 mandatory standards (IFRS-S2), ISSB identifies 23 out of 72 industries as being industries in which GHG emissions are material and of utmost importance. We denote these industries as material GHG. These industries are generally in extractives and minerals, food and beverage, infrastructure, resource transformation, and transportation, with the full list provided in Table A1 in the Appendix. All other industries are identified as non-material GHG.

Panel C of Table 1 shows the differences in carbon emissions across these subsamples. The material GHG industry subsample has log emissions intensity of 5.4 and log of emissions of 13.4. In the non-material GHG industry subsample emissions are substantially lower, with approximately half the log emissions intensity of 2.8, and log of emissions of 10.3. Not surprisingly, firms in GHG industries are larger. There is substantial variation in ownership across both industry groupings. Family-controlled firms are more common in non-material GHG industries (42% versus 34%), while government-controlled firms are more common in material GHG industries (12% versus 4%).

We also create subsamples based on country characteristics. First, we seek to distinguish countries based on their current commitments to mitigate existential carbon emission risks. In countries that have paid little attention to climate protection, it is plausible that these countries will eventually have to accede to the high expectations in international agreements, and thus firms operating in such countries face a risk of significant change in expectations regarding carbon emissions. This could come about from domestic policy changes, from foreign government pressure through trade policy, or from pressure on firms from suppliers, customers, and other stakeholders. A significant change in carbon emission expectations could imperil the existence of

firms that are unprepared. Thus, in countries that have paid little attention to climate protection, firms might want to get ahead of the curve and reduce current carbon emissions to avoid being disciplined if future tightening occurs.

To measure a country's current commitment to climate protection, we use two metrics from the Climate Change Performance Index (CCPI) that is focused on creating transparency in climate policy and performance, facilitating comparisons of climate protection efforts relative to international standards. This index is created by Germanwatch and has been used in prior work by Bolton and Kacperczyk (2023). The first metric is the summary CCPI score, which is based on four categories: GHG emissions, renewable energy, energy use, and climate policy. This index has a possible range from zero (worst) to 100 (best). We group firms in subsamples based on the sample median score of 60, with all countries below this score identified as low CCPI countries. The second metric is the standalone GHG emissions component of the summary CCPI score (which comprises 40% of the summary score). We group firms in subsamples based on the sample median score of 25, with all countries below this score identified as low CCPI-GHG countries.[9]

In Panel B of Table 1, we report summary statistics for the CCPI and CCPI-GHG metrics for all sample countries. CCPI scores are highest in the Nordic countries, India, and the Philippines. CCPI scores are lowest in South Korea, Canada, Taiwan, and Malaysia. As the numbers indicate, an attractive feature of the CCPI metrics is that they are not highly correlated with a country's GDP per capita. For example, Australia, Canada, and Austria are low CCPI countries that have relatively high levels of GDP per capita.

Additionally, we measure a country's expected levels of private benefits of control using three additional metrics: Legal tradition (common law countries are associated with stronger

[9] CCPI scores are not available for Israel, Peru, and Singapore.

protection of property rights and clearer legal frameworks, which may influence the private benefits of control), the anti-self-dealing index (a high index value suggests a lower likelihood of self-dealing practices benefiting controlling shareholders; see, Djankov, LaPorta, Lopez-de-Silanes, and Shleifer, 2008), and the revised anti-director-rights index (higher index values indicate stronger protection of minority shareholder rights against controlling shareholders, potentially reducing the private benefits of control; see Djankov et al., 2008).

Panel B of Table 1 shows that nine of the countries in our sample are common law countries. The two indexes have similar patterns. The anti-self-dealing index values are highest in Malaysia, Singapore, Thailand, and the United Kingdom. The revised anti-director-rights index values are highest in Brazil, India, Malaysia, Singapore, and the United Kingdom. Based on the sample average, we denote countries as high anti-self-dealing and high revised anti-director-rights if their index values are at least 0.56 and 4, respectively.

III. Results

A. Carbon Emissions Disclosure and Performance

Table 2 seeks to examine whether ownership structure impacts carbon emissions disclosure and carbon emissions performance. Our first tests focus on disclosure. When it comes to an existential environmental risk, it is beneficial to disclose sufficient information to regulators or others that have the power to shut a firm down that their firm is indeed mitigating these risks. Thus, for existential environmental performance, family firms are predicted to disclose similarly to other firms. We find this to be the case.

In column 1 of Panel A of Table 2, we focus on the full sample of firms. We find an insignificant coefficient on family control which indicates that the frequency of disclosure of carbon emissions is indistinguishable between family-controlled and widely held firms (the

omitted mutually exclusive ownership category). The insignificant coefficient on family control also helps to rule out selection effects, which could apply, for example, if family-controlled firms on average had higher carbon emissions but chose not to report them. In column 2, we perform the same test, but focus only on the subsample of firms from countries that as of year 2022 do not have a mandate that firms above some threshold size must disclose their carbon emissions. This setting is particularly powerful as family firms are truly free to decide whether it is important to disclose carbon emissions to help mitigate a potential existential risk. We again find an insignificant coefficient on family control in this non-mandated-disclosure subsample.

We next test for the impact of ownership on carbon emissions. For these tests we are limited to the sample of firms that discloses emissions. The existing literature has no consensus as to how to appropriately measure emissions, with papers using emissions intensity (scaled emissions) or raw emissions.[10] Aswani et al. (2024) argue in favor of emissions intensity as the appropriate metric,[11] and further suggest that revenue-scaled carbon emissions is preferred to asset-scaled emissions given the stronger correlation between emissions and revenue.[12] To facilitate comparisons with the literature we report results using both emission intensity and raw emissions but focus our discussion on revenue-scaled emissions results.

To test for the impact of ownership on carbon emissions, we estimate models using the following baseline specification:

[10] See, for example, Shive and Forster (2020) and Bolton and Kacperczyk (2022).
[11] They note that using unscaled emissions 'is analogous to using net income rather than ratios such as return on assets (ROAs) to measure financial performance,' that 'the ratio of emissions to net sales the most commonly used metric in practice', and that it 'better captures a firm's emissions performance by avoiding mechanical correlations with firm size.'
[12] Aswani et al. (2024), using a sample of US firms, report a correlation of log Scope 1 emissions and log sales of 0.70 (compared to 0.46 for log assets). Focusing on Scope 2 emissions the correlations are 0.847 for log sales and 0.548 for log assets.

$$Log(Emissions) = \alpha + \beta' X_i + \gamma' Y_i + \Lambda + \varepsilon_i, \quad (1)$$

where the dependent variable is the log of total CO2 equivalent emissions of firm *i*, scaled by revenue or unscaled, X_i are ownership structure indicator variables for ownership by family, government, and other opaque, omitting widely held firms as the baseline category, Y_i are a set of firm-level controls, and Λ are individual country and industry fixed effects. We use logs for our dependent variables to obtain better distributional properties and to reduce the impact of outliers.

For firm controls we use firm size (log of assets), cash, asset tangibility, leverage, and profitability. 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. We control for financial slack as Hong, Kubik, and Scheinkman (2012) suggest that this helps explain the adoption of sustainability-oriented policies. To that end, we include cash, asset tangibility, and leverage to capture credit constraints and profitability to capture the impact of performance. Given the substantial variation across countries and industries, we include country and industry (72 SASB industry codes) fixed effects. In regressions with unscaled emissions as the dependent variable we also control for firms' revenue accounting that emissions depend heavily on sales. We cluster standard errors by country.

We find results consistent with our hypothesis that family-controlled firms will not want to perform worse than other firms when it comes to existential environmental risks. Specifically, in our baseline regressions in columns 3 and 4 of Panel A of Table 2, we find that family-controlled firms have carbon emissions that are indistinguishable from those of widely held firms (*t*-statistics ranging from 0.53 to 0.56). This is true in specifications using emissions intensity as a dependent variable (column 3) and for specifications with unscaled emissions (column 4). Taken together, these Panel A tests show a) that family firms are not worse than widely held firms at reporting

carbon emissions, and b) that family firms do not have higher carbon emissions than widely held firms.

In columns 1 through 4 of Panel B of Table 2, we assess whether family control affects carbon emissions where it matters most. We first focus on the subsample of firms from material GHG industries. Family-controlled firms comprise 34% of firms in material GHG industries, which is a substantial fraction (albeit lower than the 39% of firms controlled by family in the full sample). In material GHG industries, we continue to find insignificant results on the family-control dummy in columns 1 and 2 (*t*-statistics range from 0.13 to 0.21), indicating family-controlled firms take carbon emissions as seriously as other firms in a setting where the existential risk is most pronounced. These tests also help to alleviate potential concerns that the full sample results in Panel A of Table 2 may have been influenced by a relatively lower percentage of family firms in material GHG industries. In columns 3 and 4 of Panel B of Table 2, we report results for non-material GHG industries, again finding an insignificant coefficient on family, indicating no difference between family-controlled and widely held firms.

In columns 5 and 6 of Panel B of Table 2, we perform another subsample test, focusing on the subset of countries that had mandated disclosure of carbon emissions by year-end 2022.[13] An advantage of this subsample is that all firms must disclose emissions, alleviating potential concerns that family-controlled firms with worse emissions would choose not to disclose them. Again, we find results consistent with the hypothesis that family owners will not want to perform worse than other firms regarding existential risks, with an insignificant coefficient estimate on family (*t*-statistics range from -0.39 to -0.41).

[13] These countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Spain, and United Kingdom.

While this paper's focus is on family-controlled firms, we note several other takeaways from the results of Table 2. First, other opaque firms (which make up 9% of sample firms) behave differently than family-controlled firms. These firms have significantly higher carbon emissions than widely held firms, with 25% to 26% higher emissions, but the effect is concentrated in non-material GHG industries.[14] This shows that some types of entrenched control can be costly for carbon emissions. This finding is consistent with controllers of other opaque firms from non-material GHG industries holding their stakes for relatively shorter time periods than families and/or having a greater inclination to prioritize private benefits, as emissions reduction initiatives are likely to hurt cash flow by incurring upfront expenses for longer term benefits. We find this negative impact of other opaque firms on carbon emissions only in countries with high CCPI scores, where there is greater public commitment to climate protection.

Second, we note the impact of government control. Although one might make an argument that government-controlled firms interested in the long-run well-being of their citizens might be willing to overinvest in mitigating existential climate risks (see Hsu et al., 2023), we find that government owners are no different than widely held firms when it comes to carbon emissions. Finally, we note that larger firms (as measured by assets and revenue) as well as firms with more tangible assets have higher emissions.

B. Carbon Emissions Performance Across Countries

We next exploit variation in the Climate Change Performance Index (CCPI) scores across countries. In Table 3 we group firms into two subsamples based on their countries' CCPI scores to test whether family-controlled firms perform differently on carbon emissions in low CCPI

[14] Economic significance is calculated as $e^{coefficient} - 1$ for a logged dependent variable and a binary independent variable.

countries where the existential risks are plausibly larger. Panel A splits countries based on their aggregate CCPI score, and Panel B splits on the component of CCPI that is specific to GHG (CCPI-GGH). Overall, these subsample findings indicate that families manage existential risk.

Specifically, we find an economically meaningful negative and significant coefficient on family-controlled firms in low CCPI countries in columns 1 and 2 of Panel A of Table 3. That is, in countries where there is a substantial risk of policy tightening, family-controlled firms have significantly lower emissions—with coefficient estimates suggesting 20-24% lower emissions than widely held firms. This is consistent with families believing it is important to get ahead of the regulatory curve to protect their private benefits of control in the long term.

Columns 3 and 4 focus on high CCPI countries that have already taken substantial steps to address concerns about climate performance. In these countries, it is less important for families to be ahead of the curve as all firms will already have taken steps to improve their emissions performance. Indeed, we find an insignificant coefficient on family-controlled firms in this setting. In columns 5 and 6 we find a similar pattern of results when we split countries using only the GHG component of the CCPI rating in low CCPI-GHG countries. The negative coefficient on family is significant using unscaled emissions. Columns 7 and 8 again show an insignificant coefficient on family-controlled firms within high CCPI-GHG countries.

We are also interested in understanding if the impact of family ownership on carbon emissions choices is affected by the expected ability to extract private benefits. In all countries, there are some private benefits for controlling shareholders, and we have controlled for differences in expected private benefits by using country fixed effects. Under our hypothesis that carbon emissions choices are primarily viewed as a way of mitigating existential risk, we are implicitly assuming that the level of expected private benefits will not affect family-controlled firms'

emissions choices. Whether private benefits in a country are high or low, they are still present, and families will want to preserve them. Nonetheless it is possible that family firms' emissions choices are driven by the expected level of private benefits for families rather than the expected increase in policy tightening towards carbon emissions.

To assess whether this is the case, in Panel B of Table 3, we perform tests that split countries based on their expected level of private benefits. We use three private benefit metrics commonly employed in the literature. Specifically, we split countries into two subsamples based on legal origin (common law or not), the anti-self-dealing index (high or low), and the revised anti-director-rights index (high or low). We find that the relationship between family control and carbon emissions is insignificant in both the high and low private benefit countries for all three of these private benefit metrics. The coefficient on family remains insignificant in all the subsamples.

To summarize, the results in Table 3 are consistent with families making carbon emissions choices based on the existential risk from a country's potential climate policy tightening, rather than making carbon emissions choices because of expected private benefit levels.

C. Qualitative Environmental Metrics Plausibly Unrelated to Existential Risks

Having established that family firms do not have worse carbon emissions performance than widely held firms and are sometimes even better when existential risks are larger, we next analyze family firm performance on arguably less material qualitative environmental metrics that are currently in use. As noted above, these qualitative metrics do not speak to a firm's current carbon emissions and are thus unlikely to measure existential risks. For these qualitative metrics, we have a clear prediction that family-controlled firms will have a lower level of disclosure and/or performance.

We test whether family control impacts performance of qualitative environmental metrics in Table 4. We use the qualitative environmental score constructed based on all 73 binary data items, as well as the qualitative subsample scores specific to resource use, emissions, and environmental innovation. Our industry fixed effects are different in these tests. Berg et al. (2021) note that in 2020 Refinitiv introduced a new proprietary model whereby they assigned industry-specific weights to particular data items. Since this weighting is done at the industry level, it is important that we use the same industry classifications as Refinitiv. Thus, in these tests industry fixed effects are based on Refinitiv's 57 industry groupings. As in our previous tests, we also employ country fixed effects and firm controls.

In columns 1 through 4 of Table 4, we report results using the full sample of firms, while in columns 5 through 8 we use the CO2 reporting subsample. Across seven of the eight columns we find that family-controlled firms perform significantly worse than widely held firms on these arguably less material qualitative metrics, whether measured in aggregate or using the subsamples. In terms of economic magnitude, the coefficient estimate on family of -1.322 in column 1 implies a 5.5% lower qualitative environmental performance relative to the median score of 24.

Table 5 repeats these analyses for the subsamples in which we group firms by whether they are in material and non-material GHG industries (Panel A) and by their countries' CCPI score (Panel B). In Panel A, we find that the negative family-controlled effect on qualitative environmental metrics is present only in non-material GHG industries, where all environmental metrics are likely to be of less material importance. In Panel B, we find that the reluctance of family-controlled firms to disclose or perform well against qualitative environmental metrics exists in both low and high CCPI countries.

IV. Discussion

This paper shows that family-controlled firms take carbon emissions as seriously as other firms, and sometimes even more seriously. They apparently view carbon emissions as a potentially existential risk and clearly something that needs to be managed and mitigated. At the same time, family-controlled firms appear to care very little about plausibly less material environmental performance metrics. In this section, we reconcile our takeaways with the overall conclusions generally drawn from the prior literature that assesses the impact of family ownership on environmental performance.

The literature concludes that family control is bad for environmental sustainability because it consistently finds a strong negative relationship between family and a variety of environmental metrics (see, e.g., El Ghoul et al., 2016, Tufano et al., 2022, Dyck et al., 2023). In these papers, the environmental metrics tested are aggregate scores that combine various qualitative and quantitative metrics tied to a large number of environmentally related topics, including carbon emissions performance.

What might account for the differences between this paper's results and the conclusions from the prior literature? We first consider the possibility that the environmental performance of family firms in 2022 differs from earlier time periods that were the focus of the prior literature. Perhaps family firms were slow to respond to environmental concerns in the past but have recently changed their thinking. We test for this possibility in Table 6, using our 2022 cross-section and various Refinitiv environmental scores as dependent variables, for consistency with the prior literature. Table 6 shows that even focusing on 2022 data there remains a negative and significant correlation between family-controlled firms and Refinitiv environmental scores. The implied

magnitude of environmental underperformance is 12%, in line with prior results.[15] This family-controlled firm underperformance holds across metrics for all Refinitiv subcategories.

Having ruled out the first possible explanation, we now consider a second possibility: aggregated environmental scores might be an inappropriate metric to assess environmental performance in 2022. Commercial environmental score providers started producing environmental scores many years ago, when firm managers placed much less weight on environmental performance than their investors thought was warranted (see Krueger, Sautner, and Starks (2020) for survey results conducted in 2017-2018), and when there was a lack of clarity as to what the key environmental metrics should be and how they should be measured. Accordingly, environmental score providers collected a variety of indicators aimed at uncovering whether a firm and its board were seriously considering environmental concerns and were charting a potential path to better performance. In this context, it made sense to put significant weight on intentions and structural changes such as targets, policies, and commitments. An illustration of this perspective is found in the work of the Task Force on Climate-Related Financial Disclosure (TCFD). The inaugural TCFD report in 2017 emphasized the pathway to improved climate performance, starting with strategy, risk processes, and governance, with a low weight on quantitative metrics.

Today, international standard setting bodies have prioritized climate-related risks relative to other environmental risks and are more focused on quantitative metrics. This is possible in part because of the work of the SASB that developed industry-specific metrics. By 2023, the TCFD and SASB had been subsumed into the newly created ISSB, an independent standard-setting body within the IFRS foundation that issues sustainability standards and metrics. The ISSB issued its

[15] In non-tabulated tests, we find similar results using commercial environmental scores from MSCI, Sustainalytics, S&P, and Bloomberg.

first detailed sustainability standards in June 2023. These standards focus exclusively on climate-related disclosures, and countries that use IFRS and adopt the standards must implement the standards for fiscal-year 2024. The headline metric in these standards is carbon emissions.

We explore whether aggregate environmental scores are indeed placing a low weight on carbon emissions, where families perform well, and a high weight on qualitative metrics, where families perform poorly. First, we examine the year 2022 correlations between the aggregate qualitative environmental score we use in our tests and the Refinitiv environmental score. This correlation is very high at 0.88, which suggests these qualitative metrics drive environmental scores. In contrast, the correlation between the Refinitiv environmental score and our measure of carbon intensity and raw emissions is only 0.11 and 0.38, respectively. Second, we construct estimates of the weights that two prominent ESG data providers (Refinitiv and Sustainalytics) place on carbon emissions.

Table 7 reports the percentage weighting of GHG emissions in the environmental scores of Refinitiv and Sustainalytics. Panel A summarizes elements of Refinitiv's weightings, showing Refinitiv's disclosed weighting of emissions within the environmental score (column 1), the number of metrics used in the emissions category (column 2), and the number of quantitative metrics used in the emissions category (column 3). We use these data to construct a range of estimates for the possible weight of quantitative emissions in a firm's environmental score. The high-end estimate assumes that only quantitative environmental metrics have weight, and the low-end estimate assumes quantitative metrics are equally weighted with non-quantitative metrics. This procedure thus estimates the 'implied' weight of quantitative GHG metrics in environmental scores. We report results by industry, using Refinitiv's definition of ten macro industries, in each case reporting the various weights for the largest firm by market capitalization in that industry.

Panel B uses data from Sustainalytics for 2016. Sustainalytics provides greater transparency including the weight for the emissions category and the exact weights for quantitative and non-quantitative GHG metrics. For symmetry, when analyzing Sustainalytics data we report weight estimates for the same ten macro industries as Refinitiv, and also report their weight estimates across the full sample of all industries.

We indeed find that current commercial environmental scores place a very low weight on emissions and quantitative emissions, consistent with a stickiness in the percentage weighting of various items that do not directly speak to carbon emissions. For Refinitiv, the high-end estimate for quantitative carbon emissions weighting in environmental scores is 10% when averaged equally across industries (industries range from 2.4% to 16.1%), and the low-end estimate for quantitative carbon emissions is 1.9% (industries range from 0.3% to 2.7%). For Sustainalytics the high-end estimate for quantitative carbon emissions weighting in environmental scores is 10% when averaged equally across the ten industries (industries range from 5.0% to 19.4%), and the low-end estimate for quantitative carbon emissions is 5.4% (industries range from 2.5% to 15.9%).

The takeaway from these tests on carbon emission weightings is that if the overarching goal is to mitigate climate-change-related risks, as is strongly suggested by the actions taken by the ISSB, then rating agencies are currently placing surprisingly low weights on carbon emissions.

V. Conclusion

In this paper, we examine the relationship between family control and environmental disclosure and performance. We find that family-controlled firms have carbon emissions that are indistinguishable from those of widely held firms. This finding is consistent with families seeking to mitigate existential risks to the firm such that they can continue to choose to consume private benefits of control over the long run should they wish to do so. Further, we find that family-

controlled firms have significantly lower carbon emissions than widely held firms in countries where a government has not taken significant climate actions and there is thus a substantial risk of policy tightening in the future. This is consistent with family-controlled firms believing it is important to get well ahead of the regulatory curve to protect their private benefits of control in the long term.

Our paper also finds that, relative to widely held firms, family-controlled firms are significantly less likely to disclose and perform well against the myriad qualitative metrics that comprise a large component of ESG rating agency scores but arguably do not measure performance regarding existential environmental risk. A key result of our paper is that family firms tackle carbon emissions with actions and are simply not interested in producing formal policy statements or engaging in "box-checking" exercises. As such, family-controlled firms appear to prioritize truly material environmental sustainability over mere perception.

References

Aminadav, Gur, and Elias Papaioannou, 2020, Corporate control around the world, *Journal of Finance* 75, 1191-1246.

Aswani, Jitendra, Aneesh Raghunandan and Shiva Rajgopal, 2024, Are carbon emissions associated with stock returns?, *Review of Finance* 28, 75-106.

Berg, Florian, Kornelia Fabisik and Zacharias Sautner, 2021, Is history repeating itself? The (un)predictable past of ESG ratings, *Working Paper*, MIT.

Berg, Florian, Julian F. Koelbel, and Roberto Rigobon, 2022, Aggregate confusion: The divergence of ESG ratings, *Review of Finance* 26, 1315-1344.

Bolton, Patrick and Marcin Kacperczyk, 2023, Firm commitments, *NBER Working Paper* 31244.

Busch, Timo, Matthew Johnson and Thomas Pioch, 2018, Consistency of corporate carbon emission data, *Working Paper*, University of Hamburg Report WWF Deutschland, Hamburg.

Christensen, Dane, George Serafeim, and Anywhere Sikochi, 2022, Why is corporate virtue in the eye of the beholder? The case of ESG ratings, *The Accounting Review 97*, 147-175.

Copeland, Brian R., Joseph S. Taylor, and M. Scott Taylor, 2021, Globalization and the environment, *Working Paper*, National Bureau of Economic Research.

Copernicus Climate Change Service (CCCS), 2024, 2023 is the hottest year on record, with global temperatures close to the 1.5C limit, January 9, 2024.

Djankov, Simeon, Rafael LaPorta, Florencio Lopez-de-Silanes, and Shleifer, Andrei, 2008, The law and economics of self-dealing, *Journal of Financial Economics* 88, 430-465.

Dyck, Alexander, Karl V. Lins, Lukas Roth, Mitch Towner, and Hannes F. Wagner, 2023, Renewable governance: good for the environment?, *Journal of Accounting Research* 61, 279-327.

Dyck, Alexander, Karl V. Lins, Lukas Roth, and Hannes F. Wagner, 2019, Do institutional investors drive corporate social responsibility? International evidence, *Journal of Financial Economics* 131, 693-714.

Dyck, Alexander and Luigi Zingales, 2004, Private benefits of control: An international comparison, *Journal of Finance* 59, 537-600.

Edmans, Alex, 2023, The end of ESG, *Financial Management* 52, 3-17.

El Ghoul, Sadok, Omrane Guedhami, He Wang, and Chuck C.Y. Kwok, 2016, Family control and corporate social responsibility, *Journal of Banking & Finance* 73, 131-146.

Gibson, Rajna, Philipp Krueger, and Peter S. Schmidt, 2021, ESG rating disagreement and stock returns, *Financial Analysts Journal* 77, 104-127.

Hong, Harrison, Jeffrey D. Kubik, and Jose Scheinkman, 2012, Financial constraints on corporate goodness, *Working Paper*, Columbia University.

Hsu, Po-Hsuan, Hao Liang, and Pedro Matos, 2023, Leviathan Inc. and corporate environmental engagement, *Management Science* 69, 7719-7758.

Krueger, Philipp, Zacharias Sautner, and Laura T. Starks, 2020, The importance of climate risks for institutional investors, *Review of Financial Studies* 33, 1067-1111.

La Porta, Rafael, Florencio Lopez-De-Silanes, and Andrei Shleifer, 1999, Corporate ownership around the world, *Journal of Finance* 54, 471-517.

Lins, Karl V., 2003, Equity ownership and firm value in emerging markets, *Journal of Financial and Quantitative Analysis* 38, 159-184.

Lins, Karl, Paolo Volpin, and Hannes Wagner, 2013, Does family control matter? International evidence from the 2008-2009 financial crisis, *Review of Financial Studies* 26, 2583-2619.

Masulis, Ronald W., Peter Kien Pham, and Jason Zein, 2011, Family business groups around the world: Financing advantages, control motivations, and organizational choices, *The Review of Financial Studies* 24, 3556-3600.

National Oceanic and Atmospheric Administration (NOAA), 2024, "2023 was the world's warmest year on record, by far", January 12, 2024.

National Space Association Agency (NASA), 2024, "NASA Analysis Confirms 2023 as warmest year on record", January 12, 2024

Shive, Sophie, and Margaret Forster, 2020, Corporate governance and pollution externalities of public and private firms, *Review of Financial Studies* 33, 1296-1330.

Tufano, Peter, Belen Villalonga, and Boya Wang, 2022, Corporate ownership and ESG performance, *Working Paper*, Harvard Business School.

Villalonga, Benel and Raphael Amit, 2006, How do family ownership, control and management effect firm value?, *Journal of Financial Economics* 80, 385-417.

Figure 1
Family Control Around the World

This figure reports the incidence of family control for the 35 countries in our sample. Family control is manually verified for each firm and defined as follows: we classify a firm as family controlled if the sum of the shares owned by family members is greater than 20%, family members own at least 10% of the shares and have a position of CEO/Chair, or family members own at least 10% of the shares and the company has multiple voting share classes. We also require that family members own more shares than any other shareholder.

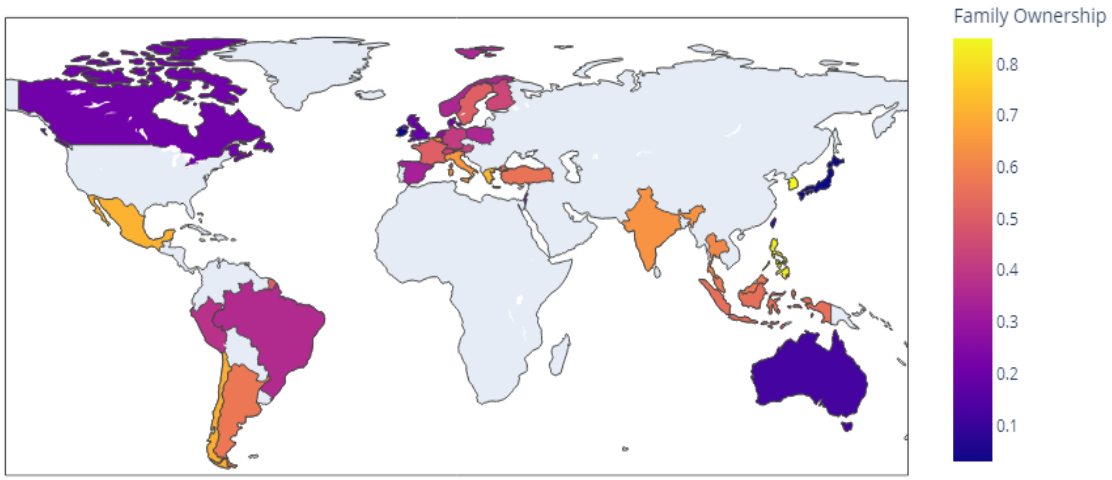

Table 1
Summary Statistics

This table shows summary statistics for our sample. All variables and industry classifications are described in Table A1 in the Appendix.

Panel A: Overall Summary Statistics

	Mean	Median	SD	N
A. Full Sample				
Family	0.39	0.00	0.49	3,832
Government	0.07	0.00	0.25	3,832
Other Opaque	0.09	0.00	0.29	3,832
Widely Held	0.45	0.00	0.50	3,832
Reports CO2e	0.75	1.00	0.43	3,832
B. Carbon Emissions Reporting Sample				
Family	0.36	0.00	0.48	2,868
Government	0.07	0.00	0.26	2,868
Other Opaque	0.09	0.00	0.29	2,868
Widely Held	0.48	0.00	0.50	2,868
Refinitiv Environmental Score	49.4	50.4	25.1	2,546
Resource Use Score	57.6	61.3	28.7	2,546
Emission Score	30.5	24.1	31.8	2,545
Environmental Innovation Score	55.2	58.3	29.1	2,546
CO2e	2,114,021	97,740	15,800,000	2,868
Log (CO2e)	11.40	11.49	2.87	2,868
Log (CO2e, Scope 1)	10.30	10.38	3.46	2,674
Log (CO2e, Scope 2)	10.13	10.45	2.80	2,682
Log (CO2e / Revenue)	3.70	3.59	2.22	2,868
Log (CO2e Scope 1/ Revenue)	2.61	2.37	2.76	2,652
Log (CO2e Scope 2/ Revenue)	2.48	2.62	2.06	2,658
Qualitative Environmental Score	23.29	24.00	8.91	3,832
Resource Use Category	9.50	10.00	4.36	3,832
Emissions Category	6.60	6.00	3.85	3,832
Environmental Innovation Category	7.19	7.00	2.28	3,832
Total Assets (in $ million)	9,319	2,223	26,534	3,832
Log (Total Assets)	21.58	21.52	1.64	3,832
Log (Revenue)	7.30	7.29	1.79	3,832
Cash	0.16	0.11	0.15	3,832
Tangibility	0.30	0.26	0.22	3,832
Leverage	0.26	0.24	0.34	3,832
Profitability	0.05	0.05	0.13	3,832

Panel B: Summary Statistics by Country for the Full Sample

Country	Ownership				Country-level Climate Change Performance		Other Country-level Variables					Total Assets (in $ million)		N
	Family	Govern-ment	Other Opaque	Widely Held	Overall	GHG	Common Law	Legal Tradition	Anti-self-dealing Index	Anti-director Index	Mandates Emissions Reporting	Median	Average	
Argentina	0.67	0.07	0.07	0.20	45.4	18.8	No	French	0.34	2.0	No	2,332	4,753	15
Australia	0.17	0.00	0.05	0.78	45.7	23.2	Yes	British	0.76	4.0	No	1,041	4,057	235
Austria	0.42	0.26	0.11	0.21	58.2	24.4	No	German	0.21	2.5	Yes	2,952	8,049	19
Belgium	0.61	0.06	0.11	0.22	55.0	25.3	No	French	0.54	3.0	Yes	2,760	10,846	36
Brazil	0.34	0.07	0.23	0.36	61.7	20.4	No	French	0.27	5.0	No	4,327	9,511	102
Canada	0.26	0.02	0.12	0.59	31.6	14.6	Yes	British	0.64	4.0	No	1,975	6,992	259
Chile	0.71	0.14	0.00	0.14	68.7	32.3	No	French	0.63	4.0	No	4,491	8,648	28
Denmark	0.23	0.06	0.25	0.46	75.6	29.8	No	Scand	0.46	4.0	Yes	1,666	6,421	48
Finland	0.39	0.11	0.11	0.39	61.1	25.4	No	Scand	0.46	3.5	Yes	1,226	4,211	54
France	0.53	0.07	0.13	0.28	57.1	27.0	No	French	0.38	3.5	Yes	6,157	25,039	138
Germany	0.48	0.07	0.10	0.35	65.8	28.5	No	German	0.28	3.5	Yes	2,679	17,300	178
Greece	0.68	0.26	0.00	0.05	60.3	25.7	No	French	0.22	2.0	Yes	2,715	4,513	19
India	0.61	0.11	0.07	0.20	70.3	31.2	Yes	British	0.58	5.0	No	718	3,342	462
Indonesia	0.55	0.18	0.12	0.16	57.2	19.7	No	French	0.65	4.0	No	2,849	4,375	51
Ireland	0.14	0.00	0.00	0.86	51.4	20.2	Yes	British	0.79	5.0	Yes	7,812	13,158	43
Israel	0.48	0.06	0.13	0.39	na	na	Yes	British	0.73	4.0	No	1,393	4,268	31
Italy	0.65	0.20	0.10	0.05	50.6	23.2	No	French	0.42	2.0	Yes	2,055	9,719	88
Japan	0.06	0.01	0.08	0.85	42.1	21.4	No	German	0.50	4.5	No	6,879	18,188	413
Luxembourg	0.40	0.00	0.20	0.40	65.1	32.2	No	French	0.28	2.0	Yes	3,781	8,559	25
Malaysia	0.63	0.18	0.06	0.13	38.6	13.4	Yes	British	0.95	5.0	No	1,143	3,088	124
Mexico	0.68	0.00	0.00	0.32	55.8	27.4	No	French	0.17	3.0	No	3,639	6,694	57
Netherlands	0.24	0.00	0.19	0.57	70.0	27.2	No	French	0.20	2.5	Yes	4,020	15,999	54
Norway	0.34	0.09	0.18	0.39	67.5	29.5	No	Scand	0.42	3.5	Yes	1,635	6,725	56
Peru	0.33	0.22	0.00	0.44	na	na	No	French	0.45	3.5	No	2,020	2,659	18
Philippines	0.84	0.04	0.04	0.08	70.7	33.8	No	French	0.22	4.0	No	6,661	9,734	25
Poland	0.35	0.39	0.13	0.13	44.4	20.5	No	Socialist	0.29	2.0	Yes	3,360	7,394	23
Singapore	0.51	0.27	0.00	0.22	NA	NA	Yes	British	1.00	5.0	No	3,009	8,218	55
South Korea	0.83	0.06	0.01	0.09	30.0	14.0	No	German	0.47	4.5	No	5,924	17,504	140
Spain	0.31	0.09	0.25	0.35	63.4	27.8	No	French	0.37	5.0	Yes	4,684	15,691	55
Sweden	0.46	0.02	0.07	0.45	69.4	32.9	No	Scand	0.33	3.5	No	796	3,247	185
Switzerland	0.46	0.06	0.08	0.41	61.9	27.8	No	German	0.27	3.0	No	1,941	8,997	120
Taiwan	0.13	0.05	0.06	0.76	36.9	12.7	No	German	0.56	3.0	No	2,947	7,636	149
Thailand	0.64	0.17	0.02	0.18	61.4	30.4	Yes	British	0.81	4.0	No	1,596	4,701	113
Turkey	0.55	0.18	0.21	0.05	43.8	22.3	No	French	0.43	3.0	No	1,943	5,840	56
U.K.	0.19	0.01	0.14	0.67	62.4	31.0	Yes	British	0.95	5.0	Yes	1,481	8,464	354

Panel C: Summary Statistics by Industry for Carbon Emissions Reporting Sample.

	Mean	Median	SD	N
A. Non-Material GHG Industries				
Family	0.42	0.00	0.49	2,618
Government	0.04	0.00	0.20	2,618
Other Opaque	0.09	0.00	0.29	2,618
Widely Held	0.45	0.00	0.50	2,618
Reports CO2e	0.72	1.00	0.45	2,618
Refinitiv Environmental Score	48.14	48.9	25.73	1,780
Log (CO2e)	10.35	10.55	2.49	1,878
Log (CO2e / Revenue)	2.81	2.89	1.82	1,878
Total Assets (in $ million)	7,996	1,870	25,298	2,618
B. Material GHG Industries				
Family	0.34	0.00	0.48	1,214
Government	0.13	0.00	0.33	1,214
Other Opaque	0.09	0.00	0.29	1,214
Widely Held	0.44	0.00	0.50	1,214
Reports CO2e	0.82	1.00	0.39	1,214
Refinitiv Environmental Score	52.17	54.25	23.29	766
Log (CO2e)	13.39	13.58	2.47	990
Log (CO2e / Revenue)	5.38	5.60	1.92	990
Total Assets (in $ million)	12,173	3,469	28,825	1,214

Table 2
Family-Controlled Firms and GHG Emissions Disclosure and Performance

This table shows regression estimates of measures of firms' GHG reporting and emissions on ownership variables, control variables, and country and industry fixed effects. The dependent variables are whether the firm reports CO2 equivalent emissions and the log of total CO2 equivalent emissions (scaled by revenue and raw emissions). Industry fixed effects are based on SASB Industry Classifications. The sample year is 2022. Panel A reports results for the full sample. Panel B reports splits by industry-level GHG emission intensity using SASB classifications and for the subsample of firms from countries with mandated carbon disclosure legislations. All variables are described in Tables A1 in the Appendix. 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: Full Sample

	Reports CO2e		Log (CO2e / Revenue)	Log (CO2e)
	Full Sample	Countries Without Mandated Carbon Disclosure Legislation		
	(1)	(2)	(3)	(4)
Family	-0.031	-0.039	0.040	0.042
	(-1.13)	(-1.13)	(0.53)	(0.56)
Government	-0.087	-0.115	-0.032	-0.036
	(-1.66)	(-1.71)	(-0.16)	(-0.17)
Other Opaque	-0.030	-0.048	0.233**	0.223**
	(-0.89)	(-0.95)	(2.28)	(2.24)
Log (Total Assets)	0.013	0.036**	0.145***	0.348***
	(0.87)	(2.66)	(7.94)	(4.75)
Log (Revenue)	0.077***	0.083***		0.782***
	(8.15)	(7.68)		(10.21)
Cash	-0.064	0.091	-0.219	-0.310
	(-0.69)	(0.82)	(-0.92)	(-1.30)
Tangibility	0.131***	0.149***	2.793***	2.703***
	(2.95)	(3.44)	(7.99)	(7.69)
Leverage	-0.000	-0.001	0.129	0.052
	(-0.02)	(-0.07)	(0.46)	(0.18)
Profitability	0.083	0.042	-0.653	-0.395
	(1.17)	(0.43)	(-1.61)	(-0.94)
Country FE	Yes	Yes	Yes	Yes
SASB Industry FE	Yes	Yes	Yes	Yes
N	3,832	2,637	2,863	2,863
Adjusted R^2	0.294	0.291	0.584	0.753

Panel B: Splits by Industry-level GHG Emissions Intensity

	GHG Material Industries		Non-GHG Material Industries		Countries Mandating Carbon Disclosures	
	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)
	(1)	(2)	(3)	(4)	(5)	(6)
Family	0.041	0.025	0.026	0.034	-0.057	-0.055
	(0.21)	(0.13)	(0.32)	(0.42)	(-0.41)	(-0.39)
Government	-0.271	-0.280	0.119	0.097	0.369	0.369
	(-0.79)	(-0.82)	(0.51)	(0.42)	(1.62)	(1.60)
Other Opaque	0.254	0.232	0.194*	0.188*	0.104	0.102
	(1.42)	(1.32)	(1.73)	(1.71)	(0.73)	(0.72)
Log (Total Assets)	0.178***	0.377**	0.118***	0.334***	0.159***	0.197*
	(4.77)	(2.53)	(4.94)	(4.57)	(6.00)	(1.96)
Log (Revenue)		0.797***		0.762***		0.959***
		(5.28)		(10.63)		(10.22)
Cash	1.109*	0.932	-0.743**	-0.820***	-0.562	-0.563
	(1.93)	(1.57)	(-2.55)	(-2.81)	(-1.41)	(-1.39)
Tangibility	2.985***	2.805***	2.747***	2.731***	3.043***	3.016***
	(5.95)	(6.14)	(6.25)	(6.09)	(5.67)	(5.83)
Leverage	0.399	0.354	-0.009	-0.113	0.955*	0.933*
	(0.69)	(0.63)	(-0.02)	(-0.28)	(1.99)	(1.93)
Profitability	1.217	1.487	-1.381***	-1.112***	-1.153**	-1.108**
	(1.22)	(1.51)	(-3.66)	(-3.00)	(-2.61)	(-2.26)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
SASB Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	989	989	1,872	1,872	1,051	1,051
Adjusted R^2	0.430	0.658	0.407	0.687	0.595	0.790

Table 3
Family-Controlled Firms and GHG Emissions: Country-Level Splits

This table provides subsample analysis of regression estimates of measures of firms' GHG emissions on ownership variables, control variables, and country and industry fixed effects. The subsamples are based on a country's score on the Climate Change Performance Index (CCPI), a standardized framework used to compare the climate performance of 63 countries and the EU. In Panel A, columns 1-4, we construct subsamples using the overall CCPI score which is based on four categories: GHG Emissions, Renewable Energy, Energy Use and Climate Policy. In Panel A, columns 5-8, we construct subsamples using the CCPI subcategory based on GHG emissions only. We split the 32 countries by their CCPI scores into two groups of 16 (three of our 35 sample countries—Israel, Peru, and Singapore—have no CCPI score available). In Panel B, we split the sample by legal origin (common law vs. non-common law), and by the sample median of the anti-self-dealing index (Djankov et al., 2008) and the revised anti-director index (Djankov et al., 2008). The dependent variables are total CO2 equivalent emissions (scaled by revenue and raw emissions). Industry fixed effects are based on SASB Industry Classifications. The sample year is 2022. All variables are described in Tables A1 in the Appendix. 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: Splits by the Climate Change Performance Index

	CCPI				GHG Component of the CCPI			
	Low CCPI		High CCPI		Low CCPI		High CCPI	
	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family	-0.262**	-0.268**	0.135	0.135	-0.223	-0.238*	0.097	0.102
	(-2.63)	(-2.78)	(1.56)	(1.62)	(-1.60)	(-1.81)	(1.08)	(1.16)
Government	-0.283	-0.300	0.068	0.077	-0.206	-0.227	0.027	0.035
	(-0.76)	(-0.82)	(0.31)	(0.33)	(-0.50)	(-0.56)	(0.12)	(0.15)
Other Opaque	-0.069	-0.074	0.377***	0.357***	0.207	0.190	0.242*	0.231
	(-0.44)	(-0.47)	(3.63)	(3.79)	(1.26)	(1.22)	(1.75)	(1.72)
Log (Total Assets)	0.113***	0.282**	0.171***	0.426***	0.113***	0.327**	0.171***	0.389***
	(3.56)	(2.22)	(8.21)	(5.27)	(3.13)	(2.46)	(8.58)	(4.81)
Log (Revenue)		0.818***		0.724***		0.770***		0.765***
		(5.99)		(8.99)		(5.18)		(9.55)
Cash	0.271	0.124	-0.452	-0.473	0.231	0.068	-0.243	-0.289
	(0.69)	(0.29)	(-1.43)	(-1.46)	(0.54)	(0.15)	(-0.93)	(-1.05)
Tangibility	2.729***	2.663***	2.927***	2.805***	2.760***	2.675***	2.934***	2.832***
	(4.56)	(4.45)	(7.31)	(6.98)	(4.49)	(4.32)	(7.36)	(7.09)
Leverage	-0.161	-0.213	0.496	0.380	-0.483	-0.517	0.740*	0.626
	(-0.39)	(-0.52)	(1.36)	(0.94)	(-1.47)	(-1.61)	(2.03)	(1.56)
Profitability	-1.519**	-1.202*	-0.278	-0.035	-1.252*	-0.859	-0.377	-0.172
	(-2.61)	(-1.82)	(-0.48)	(-0.06)	(-2.09)	(-1.23)	(-0.67)	(-0.30)
SASB Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,420	1,420	1,371	1,371	1,302	1,302	1,489	1,489
Adjusted R^2	0.569	0.718	0.631	0.792	0.555	0.709	0.626	0.789

Panel B: Splits by the Expected Level of Private Benefits of Control

	Legal Origin				Anti-self-dealing Index				Revised Anti-director-rights Index			
	Common Law		Non-Common Law		High		Low		High		Low	
	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)	Log (CO2e / Revenue)	Log (CO2e)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Family	0.147	0.137	-0.037	-0.019	0.143	0.133	-0.050	-0.035	0.121	0.113	-0.111	-0.077
	(1.04)	(1.00)	(-0.38)	(-0.21)	(1.14)	(1.09)	(-0.48)	(-0.34)	(1.14)	(1.10)	(-0.79)	(-0.56)
Government	-0.446	-0.460	0.273	0.262	-0.141	-0.155	0.097	0.096	-0.243	-0.250	0.289	0.286
	(-0.90)	(-0.95)	(1.39)	(1.30)	(-0.33)	(-0.36)	(0.54)	(0.51)	(-0.71)	(-0.74)	(1.47)	(1.36)
Other Opaque	0.254*	0.249*	0.221	0.209	0.307**	0.304**	0.141	0.128	0.244**	0.240**	0.144	0.121
	(2.22)	(2.27)	(1.44)	(1.41)	(3.01)	(3.02)	(0.93)	(0.88)	(2.24)	(2.29)	(0.67)	(0.57)
Log (Total Assets)	0.158***	0.280*	0.136***	0.438***	0.145***	0.297**	0.155***	0.421***	0.137***	0.242**	0.147***	0.486***
	(5.82)	(2.11)	(5.13)	(5.73)	(5.03)	(2.47)	(5.70)	(5.26)	(4.69)	(2.25)	(4.42)	(6.25)
Log (Revenue)		0.866***		0.679***		0.834***		0.716***		0.885***		0.645***
		(6.98)		(8.31)		(7.15)		(8.63)		(8.42)		(8.07)
Cash	-0.138	-0.164	-0.129	-0.269	0.156	0.118	-0.339	-0.479	-0.487	-0.535*	0.135	0.020
	(-0.44)	(-0.52)	(-0.36)	(-0.74)	(0.42)	(0.33)	(-1.04)	(-1.44)	(-1.74)	(-1.83)	(0.28)	(0.04)
Tangibility	2.108***	2.051***	3.370***	3.293***	2.241***	2.181***	3.539***	3.451***	2.369***	2.323***	3.970***	3.859***
	(6.87)	(7.58)	(5.92)	(5.57)	(4.93)	(4.91)	(6.72)	(6.32)	(5.84)	(5.85)	(5.80)	(5.24)
Leverage	0.009	0.007	0.130	-0.043	-0.053	-0.085	0.115	-0.021	-0.010	-0.015	0.283	0.019
	(0.02)	(0.01)	(0.34)	(-0.11)	(-0.12)	(-0.19)	(0.29)	(-0.05)	(-0.03)	(-0.04)	(0.54)	(0.03)
Profitability	-0.800*	-0.648	-0.606	-0.260	-1.091**	-0.877*	-0.322	-0.080	-0.781**	-0.633	-0.416	-0.112
	(-2.27)	(-1.44)	(-0.73)	(-0.34)	(-2.59)	(-1.94)	(-0.39)	(-0.10)	(-2.22)	(-1.47)	(-0.42)	(-0.12)
SASB Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,096	1,096	1,761	1,761	1,283	1,283	1,575	1,575	1,807	1,807	1,050	1,050
Adjusted R^2	0.612	0.766	0.593	0.764	0.585	0.741	0.613	0.789	0.575	0.746	0.633	0.793

Table 4
Family-Controlled Firms and Disclosure/Performance for 'Less Material' Environmental Items

This table shows regression estimates of measures of firms' less material environmental performance on ownership variables, control variables, and country and industry fixed effects. The dependent variable is the qualitative environmental score (columns 1 and 5), and the qualitative environmental score in the subcategories resource use (columns 2 and 6), emissions (columns 3 and 7), and environmental innovation (columns 4 and 8). The first four columns include all sample firms, and the last four columns focus on the subset of firms that report CO2 emissions. Industry fixed effects are based on Refinitiv Industry Classifications. All variables are described in Tables A1 in the Appendix. The sample year is 2022. 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.

	Full Sample				CO2e Reporting Sample			
	Qualitative Environmental Score				Qualitative Environmental Score			
	Overall	Resource Use	Emissions	Environmental Innovation	Overall	Resource Use	Emissions	Environmental Innovation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family	-1.322***	-0.623***	-0.546***	-0.153*	-0.766**	-0.405***	-0.325**	-0.036
	(-5.08)	(-5.00)	(-4.18)	(-1.77)	(-2.72)	(-3.79)	(-2.16)	(-0.32)
Government	-1.203	-0.841*	-0.172	-0.190	-0.017	-0.301	0.298	-0.014
	(-1.34)	(-1.89)	(-0.43)	(-1.17)	(-0.03)	(-0.79)	(1.16)	(-0.08)
Other Opaque	-1.212***	-0.480***	-0.522***	-0.210*	-0.834**	-0.309	-0.311**	-0.213
	(-3.25)	(-2.79)	(-2.82)	(-1.96)	(-2.22)	(-1.46)	(-2.39)	(-1.53)
Log (Total Assets)	1.981***	0.880***	0.801***	0.299***	1.848***	0.806***	0.748***	0.294***
	(10.28)	(9.24)	(8.51)	(8.59)	(9.41)	(7.49)	(8.12)	(7.05)
Log (Revenue)	1.255***	0.610***	0.512***	0.133***	1.006***	0.463***	0.401***	0.142***
	(6.81)	(6.49)	(7.32)	(3.39)	(5.46)	(4.57)	(4.91)	(3.13)
Cash	1.377	0.217	0.965*	0.196	1.276	0.196	1.108***	-0.028
	(1.09)	(0.39)	(1.71)	(0.65)	(1.55)	(0.36)	(3.73)	(-0.08)
Tangibility	2.241**	1.255***	1.425***	-0.438*	1.379*	0.761**	1.127***	-0.509*
	(2.56)	(3.06)	(3.37)	(-1.70)	(2.02)	(2.29)	(3.12)	(-1.77)
Leverage	0.376**	0.170*	0.128	0.078	0.012	0.109	-0.057	-0.040
	(2.24)	(1.79)	(1.58)	(1.35)	(0.01)	(0.24)	(-0.16)	(-0.15)
Profitability	2.330*	1.200**	1.077*	0.053	2.907*	1.309*	1.449**	0.148
	(1.95)	(2.11)	(1.91)	(0.24)	(1.97)	(1.79)	(2.13)	(0.45)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Refinitiv Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3,828	3,828	3,828	3,828	2,863	2,863	2,863	2,863
Adjusted R^2	0.544	0.484	0.467	0.448	0.489	0.424	0.382	0.457

Table 5
Family-Controlled Firms and Disclosure/Performance for 'Less Material' Environmental Items: Industry-Level and Country-Level Splits

The table provides subsample analysis of regression estimates of measures of firms' less material environmental performance on ownership variables, control variables, and country and industry fixed effects. Panel A constructs subsamples for industries that SASB classifies as GHG and non-GHG-material. Panel B constructs subsamples based on a country's score on the CCPI, a standardized framework used to compare the climate performance of 63 countries and the EU. In both panels, the dependent variables are the qualitative environmental score (columns 1 and 5), and the qualitative environmental score in the subcategories resource use (columns 2 and 6), emissions (columns 3 and 7), and environmental innovation (columns 4 and 8). Industry fixed effects are based on SASB Industry Classifications. All variables are described in Tables A1 in the Appendix. The sample year is 2022. 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: Industry Splits

	GHG Material Industries				Non-GHG Material Industries			
	Qualitative Environmental Score				Qualitative Environmental Score			
	Overall	Resource Use	Emissions	Env. Innovation	Overall	Resource Use	Emissions	Env. Innovation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family	-0.255	-0.152	-0.065	-0.038	-1.525***	-0.681***	-0.663***	-0.181**
	(-0.70)	(-0.60)	(-0.36)	(-0.31)	(-3.92)	(-3.99)	(-3.47)	(-2.07)
Government	0.031	-0.322	0.266	0.088	-1.739	-0.887*	-0.580	-0.272
	(0.04)	(-0.75)	(0.62)	(0.49)	(-1.57)	(-1.70)	(-1.31)	(-1.18)
Other Opaque	0.089	-0.080	0.053	0.116	-1.690***	-0.572***	-0.763***	-0.355***
	(0.17)	(-0.25)	(0.17)	(0.60)	(-3.39)	(-2.89)	(-2.93)	(-3.04)
Log (Total Assets)	2.015***	0.869***	0.924***	0.222***	1.966***	0.858***	0.756***	0.352***
	(6.58)	(5.83)	(6.09)	(2.99)	(9.12)	(7.45)	(7.39)	(7.22)
Log (Revenue)	1.192***	0.504***	0.555***	0.133**	1.293***	0.696***	0.480***	0.117**
	(4.29)	(3.82)	(3.64)	(2.37)	(5.90)	(5.73)	(6.14)	(2.41)
Cash	1.229	-0.367	2.273*	-0.677*	1.076	0.327	0.274	0.475
	(0.61)	(-0.32)	(2.02)	(-1.73)	(0.70)	(0.46)	(0.45)	(1.24)
Tangibility	0.590	0.324	1.568**	-1.302***	3.020***	1.724***	1.139**	0.157
	(0.42)	(0.48)	(2.31)	(-3.07)	(3.48)	(4.25)	(2.54)	(0.71)
Leverage	1.156	0.535	0.201	0.420	0.317*	0.146*	0.117*	0.054
	(0.95)	(0.77)	(0.41)	(1.07)	(1.81)	(1.70)	(1.75)	(0.64)
Profitability	-0.996	-0.397	0.202	-0.801	2.455*	1.211*	0.980	0.264
	(-0.56)	(-0.48)	(0.20)	(-1.56)	(1.75)	(1.90)	(1.56)	(0.95)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SASB Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,205	1,205	1,205	1,205	2,617	2,617	2,617	2,617
Adjusted R^2	0.566	0.476	0.522	0.398	0.548	0.504	0.432	0.478

Panel B: Country Splits by CCPI Score

	Low CCPI				High CCPI			
	Qualitative Environmental Score				Qualitative Environmental Score			
	Overall	Resource Use	Emissions	Env. Innovation	Overall	Resource Use	Emissions	Env. Innovation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Family	-1.484***	-0.734**	-0.524**	-0.226	-1.168***	-0.548***	-0.498**	-0.123
	(-3.19)	(-2.87)	(-2.55)	(-1.27)	(-3.52)	(-4.04)	(-2.58)	(-1.41)
Government	-0.474	-0.356	0.151	-0.269	-1.935	-1.263**	-0.446	-0.225
	(-0.54)	(-0.65)	(0.41)	(-0.95)	(-1.52)	(-2.35)	(-0.72)	(-1.00)
Other Opaque	-1.369**	-0.382	-0.757**	-0.231	-0.845	-0.450*	-0.224	-0.171
	(-2.44)	(-1.50)	(-2.91)	(-1.07)	(-1.73)	(-1.92)	(-1.28)	(-1.27)
Log (Total Assets)	2.393***	0.990***	1.001***	0.402***	1.665***	0.768***	0.655***	0.241***
	(10.69)	(6.67)	(10.01)	(7.25)	(7.50)	(7.58)	(5.78)	(6.39)
Log (Revenue)	1.086***	0.543***	0.455***	0.088	1.443***	0.711***	0.570***	0.162***
	(3.96)	(3.54)	(4.33)	(1.46)	(7.04)	(7.70)	(6.05)	(3.67)
Cash	1.766	0.847	0.931	-0.012	2.309**	0.055	1.619***	0.634**
	(0.71)	(0.80)	(0.92)	(-0.02)	(2.54)	(0.08)	(4.04)	(2.62)
Tangibility	1.519	1.130	1.222	-0.833**	3.311***	1.413***	1.800***	0.098
	(0.99)	(1.72)	(1.44)	(-2.55)	(4.42)	(3.67)	(6.33)	(0.39)
Leverage	0.473	0.735	0.011	-0.273	0.409**	0.156	0.136*	0.117***
	(0.43)	(1.43)	(0.02)	(-1.08)	(2.30)	(1.51)	(1.91)	(3.77)
Profitability	0.804	0.747	0.481	-0.424	3.136*	1.411*	1.313	0.411*
	(0.51)	(0.86)	(0.65)	(-1.60)	(2.11)	(2.05)	(1.66)	(1.80)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SASB Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,839	1,839	1,839	1,839	1,876	1,876	1,876	1,876
Adjusted R^2	0.578	0.507	0.484	0.533	0.522	0.472	0.468	0.380

Table 6
Family-Controlled Firms and Refinitiv Environmental Scores

This table shows regression estimates of aggregate measures of firms' environmental performance on ownership variables, control variables, and country and industry fixed effects. The dependent variable is the log of overall Refinitiv environmental score (column 1), and the log of its three subcomponents resource use, emissions, and environmental innovation (column 2-4). Industry fixed effects are based on Refinitiv Industry Classifications. All variables are described in Tables A1 in the Appendix. The sample year is 2022. 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.

	Log (Refinitiv Environmental Score)			
	Overall	Resource Use	Emissions	Environmental Innovation
	(1)	(2)	(3)	(4)
Family	-0.123***	-0.162**	-0.182***	-0.137***
	(-3.04)	(-2.30)	(-2.85)	(-2.99)
Government	-0.111	-0.137	-0.089	-0.203
	(-1.40)	(-0.91)	(-0.89)	(-1.65)
Other Opaque	-0.149***	-0.296*	-0.179*	-0.096*
	(-2.88)	(-1.90)	(-1.93)	(-1.73)
Log (Total Assets)	0.086***	0.184***	0.048	0.106***
	(3.06)	(3.99)	(1.26)	(3.28)
Log (Revenue)	0.162***	0.158***	0.203***	0.173***
	(5.72)	(3.25)	(6.13)	(4.82)
Cash	-0.138	0.243	-0.247	-0.249
	(-0.67)	(0.71)	(-0.91)	(-1.25)
Tangibility	0.118	-0.635***	0.280**	0.196
	(1.04)	(-2.75)	(2.14)	(1.32)
Leverage	0.057***	0.167***	0.022	0.062*
	(4.29)	(7.03)	(1.32)	(1.95)
Profitability	0.206	0.122	0.300	0.313
	(1.01)	(0.37)	(1.38)	(1.35)
Country FE	Yes	Yes	Yes	Yes
Refinitiv Industry FE	Yes	Yes	Yes	Yes
N	2,544	2,544	2,544	2,544
Adjusted R^2	0.346	0.364	0.307	0.299

Table 7
Assessing the Weight on Carbon Emissions in Environmental Scores

This table reports the percentage weighting of GHG emissions in the environmental scores of Refinitiv and Sustainalytics. Both panels report results for ten macro industries using the largest firm by market capitalization in each industry. Panel A uses data from Refinitiv for 2022; the data provider discloses the weight of emissions within the environmental score (column 1), the number of individual data items within emissions (column 2) and the number of quantitative metrics in emissions (column 3). We report the implied weight of quantitative GHG metrics, assuming equal weighting of all metrics in emissions (column 4). Panel B uses data from Sustainalytics for 2016; the data provider discloses all individual data items within the environmental score and the weights of all individual data items. We report the weight of all data items that are related to GHG emissions (column 1) and all data items that are quantitative measures of GHG emissions (column 2).

Panel A: Refinitiv Implied Weight of Carbon Emissions in E Scores (2022)

Macro Industry	Top Company, by Market Capitalization	Weight of Emissions in Environmental Score	Number of Data Items in Emissions	…of which Quantitative Metrics of GHGs	Implied Weight of Quantitative GHG Metrics of GHGs of Total Environmental Score
		(1)	(2)	(3)	= (1) × (2) / (3)
Basic Materials	Linde	12.7%	24	5	2.6%
Utilities	Nextera Energy	15.8%	23	4	2.7%
Energy	Exxon Mobil	11.0%	26	6	2.5%
Consumer Non-cyclicals	Berkshire Hath.	10.6%	23	5	2.3%
Real Estate	Prologis	16.1%	14	2	2.3%
Healthcare	Eli Lilly	9.3%	23	5	2.0%
Consumer Cyclicals	Amazon	12.7%	14	2	1.8%
Industrials	Caterpillar	8.5%	20	4	1.7%
Technology	Microsoft	3.1%	14	2	0.4%
Financials	JPMorgan Chase	2.4%	14	2	0.3%
Average		10.2%			1.9%

Panel B: Sustainalytics Disclosed Weight of Carbon Emissions in E Scores (2016)

Macro Industry	Top Company by Market Capitalization	Weight of all GHG Data Items in Environmental Score	Weight of Quantitative Metrics of GHGs in Environmental Score
		(1)	(2)
Basic Materials	BASF	9.3%	5.3%
Utilities	Nextera Energy	19.4%	15.9%
Energy	Exxon Mobil	7.4%	3.0%
Consumer Non-cyclicals	Berkshire Hath.	10.9%	5.5%
Real Estate	Simon Property Group	5.0%	2.5%
Healthcare	Johnson & Johnson	10.8%	4.3%
Consumer Cyclicals	Amazon	7.1%	2.9%
Industrials	United Parcel Service	10.0%	5.7%
Technology	Apple	9.5%	5.4%
Financials	JPMorgan Chase	6.7%	3.3%
Average		9.6%	5.4%

Appendix

Table A1
Variable Descriptions and Data Sources

This table reports variable definitions and data sources. Unless otherwise stated, all data are as of fiscal year end 2022.

Variable	Description	Source
A. Ownership		
Family	A dummy variable equal to one if a firm is classified as controlled by a family (as of December 2022). Control requires that the sum of the shares owned by family members is greater than 20% or that family members own at least 10% of the shares and the company has multiple voting class shares, and the sum is greater than any other shareholder.	Manual classification
Government	A dummy variable equal to one if the largest shareholder of the firm owns at least 20% of the firm and is the government or a sovereign wealth fund (as of December 2022).	Manual classification
Other Opaque	A dummy variable equal to one if the largest shareholder owns at least 20% of the firm and is a private equity fund, hedge fund, venture capital fund, other type of blockholder, or if ownership cannot be established (as of December 2022).	Manual classification
Widely Held	A dummy variable equal to one if a firm is not classified as Family, Government, or Other Opaque (as of December 2022).	Manual classification
B. Environmental Performance		
Refinitiv Environmental Score	Proprietary-weighted aggregate score of environmental performance; score ranges from 0 to 100.	LSEG/Refinitiv
Resource Use	Category score, based on measures of a firm's use of resources.	LSEG/Refinitiv
Emission	Category score, based on measures of a firm's emissions.	LSEG/Refinitiv
Environmental Innovation	Category score, based on measures of a firm's environmental innovations.	LSEG/Refinitiv
Reports CO2e	A dummy variable equal to one if a firm reports CO2 equivalent emissions.	LSEG/Refinitiv
Log (CO2e)	Log of total CO2 equivalent emissions in tonnes; includes Scope 1 and Scope 2 emissions; includes CO2 and CO2 equivalent (CH4, N2O, HFCS, PFCS, SF6, NF3).	LSEG/Refinitiv
Log (CO2e, Scope 1)	Log of total Scope 1 CO2 equivalent emissions in tonnes.	LSEG/Refinitiv
Log (CO2e, Scope 2)	Log of total Scope 2 CO2 equivalent emissions in tonnes.	LSEG/Refinitiv
Log (CO2e / Revenue)	Log of total CO2 equivalent emissions in tonnes scaled by revenue in millions of US$.	LSEG/Refinitiv, Worldscope
Log (CO2e Scope 1/ Revenue)	Log of total Scope 1 CO2 equivalent emissions in tonnes scaled by revenue in millions of US$.	LSEG/Refinitiv, Worldscope
Log (CO2e Scope 2/ Revenue)	Log of (Scope 2 CO2 equivalent emissions in tonnes over net total revenue in millions of US$).	LSEG/Refinitiv, Worldscope
Qualitative Environmental Score	The sum of all 73 binary environmental data items reported as "Yes" by a firm; "Yes" indicates the better direction of environmental performance for all data items (binary items' polarity is inverted where necessary).	LSEG/Refinitiv
Resource Use	…as above, only considering 19 binary environmental data items that indicate a firm's use of resources.	LSEG/Refinitiv
Emissions	…as above, only considering 16 binary environmental data items that indicate a firm's emissions.	LSEG/Refinitiv
Environmental Innovation	…as above, only considering 23 binary environmental data items that indicate a firm's environmental innovations.	LSEG/Refinitiv

GHG Material Industries	Extractives and Minerals Processing (Construction Materials, Coal Operations, Oil & Gas - Exploration and Production, Iron and Steel Producers, Oil & Gas - Midstream, Metals and Mining, Oil & Gas – Refining and Marketing), Food and Beverage (Agricultural Products, Food Retailers & Distributors, Meat, Poultry & Dairy), Infrastructure (Electric Utilities & Power Generators and Waste Management), Renewable Resources & Alternative Energy (Biofuels and Pulp & Paper Products), Resource Transformation (Chemicals and Containers & Packaging), Technology & Communications (Semiconductors), Transportation (Air Freight & Logistics, Airlines, Cruise Lines, Marine Transportation, Rail Transportation, and Road Transportation).	SASB
C. Other Firm Characteristics		
Log (Total Assets)	Log of (total assets)	Worldscope
Log (Revenue)	Log of (revenue)	Worldscope
Cash	Cash over total assets	Worldscope
Tangibility	PP&E over total assets	Worldscope
Leverage	Long-term debt over total assets	Worldscope
Profitability	Net income over total assets	Worldscope

Table A2
Less Material Sustainability Metrics: Binary Environmental Variables from Refinitiv

This table reports the list of all Refinitiv binary variables and whether they are fully populated.

	Data Item	Fully Populated
A. Resource Use Category		
1	Climate Related Risks Assessment Process	No
2	Transition Plan Financial Planning	Yes
3	Transition Plan Scope 3 Emissions	Yes
4	Transition Plan Time Horizon Coverage	Yes
5	Transition Plan Offsets	Yes
6	Financial Exposure to Transition Risk	Yes
7	Financial Exposure to Physical Risk	Yes
8	Scope 1 and 2 Paris Agreement Aligned	No
9	Scope 1, 2, and 3 Paris Agreement Aligned	No
10	Intensity Scope 1 and 2 Paris Agreement Aligned	No
11	Intensity Scope 1, 2, and 3 Paris Agreement Aligned	No
12	Portfolio Alignment	Yes
13	Environment Management Team	Yes
14	Environment Management Training	Yes
15	Policy Water Efficiency	Yes
16	Policy Energy Efficiency	Yes
17	Policy Sustainable Packaging	Yes
18	Policy Environmental Supply Chain	Yes
19	Targets Water Efficiency	Yes
20	Targets Energy Efficiency	Yes
21	Environmental Materials Sourcing	Yes
22	Toxic Chemicals Reduction	Yes
23	Renewable Energy Use	Yes
24	Green Buildings	Yes
25	Environmental Supply Chain Management	Yes
26	Env Supply Chain Partnership Termination	Yes
27	Land Environmental Impact Reduction	Yes
28	Environmental Supply Chain Monitoring	Yes
29	Resource Reduction Policy	Yes
30	Resource Reduction Targets	Yes
31	No Environmental Controversies	Yes
B. Emissions Category		
32	Policy Emissions	Yes
33	Targets Emissions	Yes
34	Biodiversity Impact Reduction	Yes
35	NOx and SOx Emissions Reduction	Yes
36	VOC Emissions Reduction	Yes
37	Particulate Matter Emissions Reduction	Yes
38	Waste Reduction Initiatives	Yes
39	e-Waste Reduction	Yes
40	Emissions Trading	Yes
41	Environmental Partnerships	Yes
42	Environmental Restoration Initiatives	Yes
43	Staff Transportation Impact Reduction	Yes
44	Climate Change Commercial Risks Opportunities	Yes
45	Environmental Investments Initiatives	Yes
46	Internal Carbon Pricing	Yes
47	Policy Nuclear Safety	Yes

C. Environmental Innovation Category

48	Eco-Design Products	Yes
49	Environmental Products	Yes
50	Noise Reduction	Yes
51	Hybrid Vehicles	Yes
52	Environmental Assets Under Mgt	Yes
53	Equator Principles	Yes
54	Environmental Project Financing	Yes
55	Labeled Wood	Yes
56	Organic Products Initiatives	Yes
57	Take-back and Recycling Initiatives	Yes
58	Product Environmental Responsible Use	Yes
59	No GMO Products	Yes
60	Agrochemical Not 5% Revenue	Yes
61	No Animal Testing	Yes
62	No Animal Testing Cosmetics	Yes
63	Animal Testing Reduction	Yes
64	Renewable/Clean Energy Products	Yes
65	Water Technologies	Yes
66	Sustainable Building Products	Yes
67	Green Capex	Yes
68	Green Capex Target	Yes
69	Green Revenues Target	Yes
70	No Nuclear	No
71	Product Impact Minimization	No
72	Real Estate Sustainability Certifications	No
73	Fossil Fuel Divestment Policy	Yes