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RESEARCH ARTICLE

Are family firms green?

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Abstract This study examines environmental management practices of 1690 family and nonfamily firms from 29 countries and 19 industrial sectors over an 8-year period. We show that the family effect on firm environmental management practices ranges substantially, from extremely negative to no effect at all. Moreover, the magnitude of the effect depends on the type of firm, the industrial context, the type of economy, and the stages of the business cycle. This study offers a novel understanding of the extreme heterogeneity of environmental management practices of family businesses and serves as a springboard for future research aiming to better understand the environmental strategies of publicly traded firms with concentrated ownership structures. It also provides important and novel evidence for policymakers, investors, and business owners, particularly for firms with different ownership and management structures.

Plain English Summary Environmental management practices have been playing an increasingly prominent role in business strategy. However, in facing climate change and global warming, family firms, with their idiosyncratic characteristics, may react in unique ways. We have conducted an international study of 1690 family and nonfamily firms from 2007 to 2014 and found that environmental management practices vary substantially across different types of family firms, which tend to be over-represented among groups with both the poorest and most superior outcomes. We argue that family firm managers

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and consultants should consider strengthening the environmental pillar of strategy to keep up with competitors and become "green champions." Moreover, regulators should consider family governance tendencies in establishing more stringent environmental policies and regulations, particularly in low-income countries and problematic concentrated industries. Investors too must pay attention to firm ownership and ownership structure in evaluating environmentally related business opportunities.

Keywords Family firms · Environmental management practices · Environmental performance · Family business

JEL Classification G30 · G34 · Q00 · Q50 · Q53

1 Introduction

Growing pressures on firms around the world from climate change have caused environmental management practices to play an increasingly prominent role in business conduct (European Environmental Agency, 2011; United Nations, 2013; Bansal & DesJardine, 2014; Buysse & Verbeke, 2003). However, family firms, with their idiosyncratic characteristics (Chua et al., 1999, 2012), may react in unique ways. Whereas renowned firms like Patagonia, Body Shop, and IKEA are at the forefront in fighting a global warning (Vayrynen & Heaps, 2020; Winston, 2019), others like Volkswagen, Fiat Chrysler, and Exxon have been forced to pay multimillion dollar settlements due to environmental misconduct (Dennis & Eliperin, 2019; Siano et al., 2017).

Family firms—the most ubiquitous form of business in every world economy (La Porta et al., 1999)—are particularly interesting subjects for studying environmental management practices for two major reasons. First, their non-economic goals shape their strategic decisions more than is the case for nonfamily firms (Gomez-Mejia et al., 2007, 2011; Pinelli et al., 2023). As suggested by Le Breton-Miller and Miller (2016) and Miller and Le Breton-Miller (2021), these may take the form of both extremely positive and extremely negative environmental management practices. Second, research in family business has paid far less attention to environmental policies versus those regarding governance, social, and financial performance (Evert et al., 2016; Yu et al., 2012). In addition, the few studies on the environmental behavior of family businesses focus on average effects on a single outcome (Berrone et al., 2010; Huang et al., 2009; Richards et al., 2017), neglecting potentially informative as well as extreme heterogeneity.

This study examines a spectrum of family effects on internal and external environmental management practices. Specifically, it explores pollution prevention, green supply chain management, and green product development practices by employing a longitudinal sample of 1690 publicly traded firms from 29 countries and 19 industrial sectors.

We find that environmental management practices vary substantially across different groups of family firms, which tend to be over-represented in groups with both the poorest and most superior outcomes. We also identify moderating contingencies relating to their behavior. Specifically, the negative effect of family influence on environmental management practices is reduced for older and smaller family firms, and those with more independent and external owners. Moreover, family firms in high-income countries and those with stringent environmental laws also have better environmental management practices. Finally, industry dirtiness, industry concentration, and stages of business cycle also mitigate these family effects.

Our study relates to the growing literature on the environmental outcomes of family business and contributes to it in three important ways. First, this is the first study to explicitly account for the "fat-tailed" nature of family firm environmental management practices by using quantile regression (Koenker, 2004; Miller & Le Breton-Miller, 2021; Waldmann, 2018). Unlike standard least squares regressions, quantile regressions drop the assumption that practices are similar at upper and lower percentiles of a distribution and allow testing for firm heterogeneity to obtain a fuller assessment of environmental conduct.

Second, we augment prior knowledge on the antecedents of corporate environmental management practices by demonstrating the importance of a concentrated ownership structure and examining both internal and external environmental management practices. We thereby provide insights into family influence on the adoption of pollution prevention, green product development, and green supply chain management practices using a large longitudinal

sample of listed firms from 29 countries and 19 industrial sectors. In so doing, we respond to calls such as those from Aguilera et al. (2021) to advance research into the interplay between owners and the natural environment.

Third, we contribute to the debate in regulatory, business, and academic communities on the adoption of environmental management practices by publicly traded firms (Roston 2019; Hollis, 2019). By identifying heterogeneous family effects on the adoption of these practices and their extreme variations across types of family firms, industries, countries, and stages of business cycle, we address the calls from Le Breton-Miller and Miller (2016) and Miller and Breton-Miller, 2021), and provide incentive for policy-makers to enforce environmental policies and regulations for publicly traded firms around the world.

2 Theory and hypotheses

2.1 Family firms and environmental management practices

The United Nations has put forward an agenda of 17 goals to achieve sustainable development, called the 2030 Agenda for Sustainable Development—an international call to fight climate change, poverty, peace, inequality, the protection of land and marine ecosystems, and global partnerships. Although strategic plans to incorporate these goals are challenging for organizations, their adoption in business contexts is critical for society and businesses and for the future of the planet (Berrone et al., 2023). Unlike other sustainability initiatives, the 2030 Agenda emphasizes that its successful development requires international collaboration among all stakeholders, including firms at the forefront of the program (Gutierrez et al., 2022) contributing to such development (Rosati & Faria, 2019). Despite their importance for the future of society, the economy, and the planet, the adoption of environmental management practices poses challenges for family business owners who must face uncertainty and complexity (Ferraro et al., 2015).

Research at the intersection of family business and environmental management addresses the topic mainly from a socioemotional wealth (SEW) perspective (Mariani et al., 2023; Hsueh et al., 2023), leaving more specific theorizing and practical implications to be explored. Some research emphasizes the role of optimal governance configurations in the successful implementation of environmental management practices, such as combinations of family ownership, management and first generational involvement (Agostino & Ruberto, 2021; Ernst et al., 2022; Samara et al., 2018), and how competition and the State can catalyze environmental behavior of family businesses (Bendell, 2021). However, prior literature has focused on average effects (Dekker & Hasso, 2016; Dou et al., 2017; Memili et al., 2018), thereby providing an overly aggregate portrayal of the environmental behavior of family firms. The assumption that a "family effect" remains the same across different environmental management practice intensities ignores potentially important heterogeneity (Miller & Le Breton-Miller, 2021). Some family firms may be exceptional environmental abusers (Simms, 2010), while others are stellar environmental performers (Vayrynen & Heaps, 2020), or alternately, very much like others (Uhlaner et al., 2004). Indeed, we find that as a class, the heterogeneity of family firms exceeds that of their nonfamily counterparts across the spectrum, showing equivalence among the most positive exemplars, but inferiority among the poorer corporate citizens.

Furthermore, studies typically examine one type of environmental management practice (Berrone et al., 2010; Huang et al., 2009; Richards et al., 2017), again neglecting heterogeneity (Endrikat et al., 2014). Attention to differences across practices is essential as investments in environmental management practices reach $600 billion per year worldwide (Paul, 2019). In this study, we focus on both internal and external environmental management practices. Specifically, we develop a theoretical framework to explain extremes in family firm environmental behavior drawing on three perspectives—stewardship, SEW, and resource-based theory (Barney, 1991; Gomez-Mejia et al., 2007; Miller & Le Breton-Miller, 2005b).

2.2 Double-edged family effects on environmental management practices

2.2.1 The family firm positives

Environmental management practices are activities that a firm undertakes to reduce its negative environmental footprint (Ortiz-de-Mandojana & Bansal,

2016; Mauch et al., 2006; Testa et al., 2018a, 2018b). These have become increasingly important as they represent the ways in which firms mitigate harm to the environment (European Environmental Agency, 2011; United Nations, 2019; Bansal & DesJardine, 2014).

Practices such as pollution prevention and green supply chain management enable a firm to limit waste and emissions from operations, thereby often reducing production costs (Hart & Milstein, 2003). These practices can improve technological capacity and eco-efficiency, and exploit superior learning and absorptive capacities, which are especially critical benefits for family firms due to their typically more limited access to capital (Brinkerink, 2018; Zahra, 2012).

Furthermore, internal environmental management practices can help achieve first-mover advantage and increase competitiveness (Sarkis, 2003). As a result, pollution prevention and green supply management practices have been shown to boost stock prices (Bose & Pal, 2012) and financial performance (Golicic & Smith, 2013; Nishitani et al., 2011). These effects can be particularly important for family firms, which tend to have a poorer image with investors, and thus benefit more from higher market valuations and more persistent profitability than nonfamily firms (Amit & Villalonga, 2020).

Another benefit from adopting green practices is that they avoid unnecessary litigation due to environmental externalities (Ambec & Lanoie, 2008). Because family firms strive to be more socially responsible than others to preserve longstanding family and firm reputations in the communities in which they are deeply rooted, they may work especially assiduously to avoid such litigation (Campopiano & De Massis, 2015; Cui et al., 2016). In fact, firm and family reputation and legacy can be augmented via superior environmental management practices (Kansikas, 2015). Reputation is also important for family firms in their attempts to raise capital.

Other practices, such as green product development, enable firms to better meet the expectations of stakeholders such as customers, suppliers, NGOs, regulators, and communities, again leading to enhanced legitimacy and reputation (Hart & Milstein, 2003). Once more, this is particularly relevant for family businesses, many of which are unusually embedded within and attached to their local markets and communities, and that tend to form longer-term relationships with their stakeholders (Gómez-Mejía et al., 2010; Le Breton-Miller & Miller, 2016).

Finally, the production of green products requires that firms minimize non-renewable resource usage, eliminate toxic materials, and prevent waste (Albino et al., 2009). In so doing, it creates opportunities, ranging from the discovery of novel technologies, to opening new markets (Dangelico et al. 2013), particularly attractive for those family businesses seeking to achieve growth to accommodate additional family members in the business (Kellermanns & Hoy, 2017; Miller & Le Breton-Miller, 2006). The above rationales suggest that family firms may tend to have extremely positive environmental orientations (Miller & Le Breton-Miller, 2021).

2.2.2 The family firm negatives

Of course, as a group, some family businesses also have characteristics that cause them to eschew progressive environmental management practices. Such state of the art practices can be costly and demand continual investment (Clark et al., 2018; Rossi et al., 2017). The related financial constraints can be particularly severe for family firms that often have less access to financial capital than nonfamily firms (Chua et al., 2018; Wu et al., 2007). This effect can be especially severe in low-income countries with primitive capital markets and weak financial intermediaries (La Porta et al., 1997; Sarkar & Singh, 2010).

Also, not every firm has the competences and human capital to successfully adopt advanced environmental management practices (Dal Maso et al., 2020; Sharma & Sharma, 2011). Many family firms lack human capital because family top executives are drawn from a smaller talent pool than in nonfamily firms (Bertrand & Schoar, 2006; Mehrotra et al., 2013; Miller et al., 2014). This is often aggravated by nepotism (Pérez-González, 2006). Thus, some family executives lack the skills and experience to successfully develop and implement environmental management practices.

Furthermore, family firms often pursue *non-economic* goals to preserve family SEW thereby forgoing economic goals (Gomez-Mejia et al., 2007, 2011). SEW goals include family control of the firm,

careers for relatives, funds for offspring, prestige in the community, etc. Accordingly, some family firms risk financial losses to avoid SEW losses, the latter of which may result from pursuing costly and risky environmental management practices. This may discourage environmental investments (Block, 2012; Gómez-Mejía et al., 2010).

Board oversight from representatives of the broader community, the professions, and government can be an important limit to poor environmental conduct. But some family firms have boards dominated by family members whose family or economic preferences trump environmental concerns (Galbreath, 2017). Finally, given their discretion, long careers, and community influence, some family firm owners and leaders have a good deal of influence with local government officials and regulators (Amore & Bennedsen, 2013; Xu et al., 2013). They may be capable of skirting environmental regulations, and thereby procure more private benefits for the family (Bertrand & Schoar, 2006). The above rationales suggest that family firms may tend to have extremely negative environmental orientations (Miller & Le Breton-Miller, 2021).

2.2.3 *Comparing positives and negatives*

Given this double-edged sword for and against the pursuit of enlightened environmental management practices by family businesses, we argue that there are reasonable rationales for anticipating both unusually negative *and* unusually positive behaviors among family versus nonfamily firms. This is compounded by the unusual discretion family members have to translate family priorities related to the environment into corporate executive action (Miller & Le Breton-Miller, 2021). Thus, we predict that among all firms with superior environmental management practices, family firms are likely to be ahead of the pack vis-à-vis their nonfamily counterparts. Conversely, among firms with weak environmental management practices, family firms are likely to be worse than their nonfamily counterparts. Therefore, we propose a baseline hypothesis to capture these very positive and very negative environmental extreme behaviors of family businesses.

Hypothesis 1 (H1): *Family firms will adopt both more and fewer pro-environmental management practices than other firms with most and least such practices, respectively.*

2.3 Moderating hypotheses

Given the exploratory nature of our research, we adopt a fact-based approach to discover patterns in our data of the moderating roles of firm, industry, country, and business cycle conditions on family firm environmental behavior (Guldiken et al., 2019; Hambrick, 2007; Miller, 2007). The above moderators may affect the relationships between family control as manifested by both inferior and superior environmental management practices investments (EMPI), respectively.

2.3.1 *Moderating organizational characteristics*

Stakeholder pressures can affect the propensity to adopt favorable environmental management practices (Gutierrez et al., 2022; Kassinis & Vafeas, 2006; Walls et al., 2012). Specifically, ownership by independent directors of family businesses (i.e., those with very negative environmental behaviors) may reduce negative extremes in environmental conduct as there will be less family discretion and less secrecy. Institutional investors may have similar effect, moderating positively the relationship between family influence and environmental management practices. Where families with very positive environmental behaviors in the normal course, these governance influences may have little impact.

H2: *For family firms with very negative environmental behaviors, independent director and institutional ownership will attenuate the negative relationship between EMPI and family influence.*

2.3.2 *Moderating industry characteristics*

Industrial sectors range from clean to dirty, and that can affect environmental management practices. In dirty industries, there are typically fewer

institutional or stakeholder pressures to engage in environmentally responsible conduct. Thus, given the discretion and secrecy of family firms, those prone to negative environmental behaviors may avoid such conduct (Lucas & Noordewier, 2016; Miller & Le Breton-Miller, 2021), adopting fewer pro-environmental management practices in dirty versus clean industries. Similarly, family firms with very negative environmental behaviors in industries dominated by few players may have enough market power to resist green practices. Thus, family firms with such proclivities will invest less in EMPI in dirty and concentrated industries. EMPI by family firms with very positive environmental behaviors is likely to be less affected by these industry characteristics.

H3: *For family firms with very negative environmental behaviors, industry dirtiness and concentration will exacerbate the negative relationship between EMPI and family influence.*

2.3.3 Moderating country-level characteristics

Several works show that family business behavior can be influenced by national institutional and legal settings (Chen et al., 2023; Gomez-Mejia et al., 2023; Ortiz-de-Mandojana et al., 2016), particularly vis-à-vis high- vs. low-income economies (Duran et al., 2019). Family firms from the former tend to be more environmentally sensitive due to institutional and societal pressures to protect the natural environment (Berrone et al., 2010). Those from low-income economies, however, often display the opposite behavior (Itsubo et al., 2018). In economies with few environmental regulations, it may be more possible for family firms with very negative environmental behaviors have access to enough family wealth to skirt environmental regulations. EMPI by family firms with very positive environmental behaviors is likely to be less affected by these country level characteristics.

H4: *For family firms with very negative environmental behaviors, low-income economies and those with few environmental regulations will exacerbate the negative relationship between EMPI and family influence.*

2.3.4 Moderating stages of business cycle

Family business behavior can be influenced by the stage of the business cycle (Hansen et al., 2020; Wright & Kellermans, 2011), particularly in times of economic hardship compared to periods of economic stability (Baek et al.,2004; Minichilli et al., 2016). Given the elevated economic pressures in times of turmoil (Boiral, 2016; Delmas & Toffel, 2008; Sharma & Sharma, 2011), the least environmentally friendly family firms might be especially reluctant to invest in environmental practices under economic hardship. Again, family firms with very positive environmental behaviors may be less willing to abandon such practices.

H5: *For family firms with very negative environmental behaviors, periods of economic pressure will exacerbate the negative relationship between environmental management practices and family influence.*

3 Data and variables

3.1 Data

We used the ASSET4 full universe of data that covers constituents of principal stock indices from 58 countries over the period 2002–2014. It was uniquely gathered by Miroshnychenko, Barontini and Testa (2017), and reports key performance indicators (hereafter KPIs) of environmental management practices for publicly traded firms. The ASSET4 data have been used in the management and finance literatures (Aouadi & Marsat, 2018; Shaukat et al., 2016). These data were matched with the NRG Metrics (NRG) database's Family Firms dataset, covering publicly traded firms from 46 countries from 2007 to 2017. It was created by a team of expert analysts who manually entered, reviewed, and cross-checked data with senior analysts, who perform frequent random audits.[1] NRG has been validated in both management and finance literatures (Cho et al., 2019; Delis et al.,

[1] Customized software programs verify all levels of data entry for inconsistencies and errors. NRG sources publicly available documents such as annual reports, firm presentations, SEC filings, and press releases.

2019). We then collected financial and accounting data from Thomson Reuters (TR) Datastream, and deleted observations with missing data. Some firms were dropped due to inability to find a match with the firms in the ASSET4 database. Thus, our final dataset comprises 7974 firm-year observations for 1690 publicly traded companies from 29 countries[2] and 19 industrial sectors covering the period from 2007 to 2014.

Panels A and B of Table 1 show our sample's composition by geographical location and by industry group (two-digit ICB codes). The largest fraction of publicly traded firms belongs to the USA (some 29% of the sample) while other Anglo-Saxon countries (Australia, Canada, and the UK) represent around 24% of the sample. Thus, more than half of the firms come from the Anglo-Saxon countries. The rest of the sample is broadly distributed across European, Asian, South American, and African countries. Listed firms from industrial sectors dominate the sample (around 68% of the sample). The rest of the sample is from utilities, transportation, and other sectors.

Our sample provides several advantages. First, it has an unbalanced structure allowing mitigation of the survivorship bias (Elton et al., 1996). Second, our study period ends in 2014, ensuring that the family effect on firm environmental management practices is not confounded by the effect of 2015 Paris Agreement (United Nations, 2015). Third, our sample included listed firms only, providing a homogenous cluster of firms that avoids potential disparities between private and listed firms (Carney et al., 2015).

3.2 Environmental management practice index

To capture heterogeneity in internal and external firm environmental management practices, we construct an Environmental Management Practice Index (EMPI) using KPIs of such practices assigned to each firm by TR (see Table 2). The EMPI proxy is constructed in four steps.

First, we identified environmental management practices that capture pollution prevention in the literature: toxic chemicals reduction (Nishitani et al., 2011); emissions from transportation (Comoglio & Botta, 2012); nitrogen and sulfur oxide emissions (Hoque & Clarke, 2013); waste and e-waste reduction (Franchetti, 2011); particulate matter and volatile organic compounds emissions (Newbold, 2006); air emissions (Hart & Ahuja, 1996); and water and energy efficiency (Gusmerotti et al., 2012).

We then identified practices that capture environmental supply chain management: phasing out inefficient selection procedures (Handfield et al., 2005); adoption of environmental criteria to source or eliminate materials (Sarkis, 2003); efforts to lessen overall environmental impact (Srivastava, 2007); use of environmental criteria in the selection process of suppliers (Testa & Iraldo, 2010).

This was followed by the identification of environmental management practices aimed at reducing the environmental impact of products, such as eco-design practices (Zhu et al., 2005), products that promote cost-effective and environmentally preferable uses (Nissinen et al., 2007), and complying with environmental performance product standards (Testa et al., 2015).

Finally, we conducted a principal component factor analysis (PCFA) on pollution prevention, environmental supply chain management, and environmental product development practices that allowed us to discover their interrelationships and reduce them to a unifying *EMPI* variable. The PCFA revealed one factor with eigen value of 1.87 that explains 63% of the total variance. Adoption of an alternative definition of *EMPI* does not alter our main findings.

3.3 Family firm

Because a family's ownership stake and presence in management influence its actions and business strategy (Chua et al., 1999; Le Breton–Miller and Miller 2006), our *Family firm* dummy variable equals 1 for firms with equity ownership of the founding family and the presence of family members serving on the

[2] Our final sample covers the following countries: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, China, Indonesia, Ireland, Italy, Japan, South Korea, Malaysia, Mexico, Netherlands, Philippines, Poland, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the UK, and the USA.

Table 1 Sample distribution

Panel A. Distribution by geographical location			
Country	Nonfamily firms %	Family firms %	Total %
Australia	5.97	1.76	5.51
Austria	0.95	0.41	0.89
Belgium	0.86	0.83	0.86
Brazil	1.47	2.17	1.55
Canada	7.02	5.07	6.80
Denmark	1.22	0.52	1.14
Finland	1.63	1.45	1.61
France	4.42	13.75	5.44
Germany	4.42	3.62	4.34
China[a]	1.89	3.72	2.09
Indonesia	0.47	0.52	0.48
Ireland	0.70	2.59	0.91
Italy	1.67	2.28	1.73
Japan	11.83	3.93	10.97
South Korea	0.84	0.93	0.85
Malaysia	0.55	1.24	0.62
Mexico	0.38	1.03	0.45
Netherlands	1.88	0.93	1.78
Philippines	0.29	1.45	0.42
Poland	0.50	0.21	0.46
Singapore	1.50	0.72	1.41
South Africa	1.27	0.41	1.18
Spain	1.58	3.93	1.83
Sweden	2.01	2.28	2.04
Switzerland	2.44	5.17	2.74
Thailand	0.41	0.83	0.45
Turkey	0.62	1.65	0.74
UK	11.76	8.17	11.37
USA	29.44	28.44	29.33
Total	100.00	100.00	100.00

Panel B. Distribution by industry group (two-digit ICB codes)			
Industry group	Nonfamily firms %	Family firms %	Total %
Apparel	0.75	0.93	0.77
Automotive	2.07	3.52	2.23
Beverages	1.98	3.62	2.16
Chemicals	6.30	4.14	6.07
Construction	6.93	12.00	7.48
Diversified	4.41	5.58	4.54
Electrical	1.59	1.55	1.58
Electronics	12.16	10.96	12.03
Food	3.64	6.31	3.93
Machinery	5.92	1.86	5.48
Metal producers	6.94	6.51	6.89
Metal product manufacturing	2.10	1.96	2.08
Oil and gas	8.77	6.83	8.56

Table 1 (continued)

Paper	1.69	2.48	1.78
Printing and publishing	1.73	4.45	2.03
Textiles	0.46	0.31	0.44
Transportation	4.82	4.24	4.75
Utilities	12.22	4.24	11.34
Others	15.52	18.51	15.85
Total	100.00	100.00	100.00

[a]China is represented in our sample by listed firms from Hong Kong due to the poor quality of financial reporting in the rest of the country (Wang and Wu, 2011)

board of directors, otherwise 0. Following Miller et al. (2007), we excluded lone-founder firms. We used this binary operationalization of family business in our study for three reasons. First, it is preferable to adopting a specific ownership cutoff in an international sample of firms because ownership disclosure and reporting requirements differ substantially across jurisdictions (Leuz, 2010; Leuz & Wysocki, 2016). Second, binary operationalization is more intuitively meaningful than more complex measures of family business (Gomez-Mejia et al., 2023). Third, similar operationalizations of family firms have been validated in prior research (Anderson & Reeb, 2003). Our principal findings were also confirmed using alternative family business definitions.

3.4 Moderating variables

Stakeholder pressures may influence environmental management practices (Kassinis & Vafeas, 2006; Walls et al., 2012), so we include *Independent director ownership* (the number of shares held by the independent directors of the board) and *Institutional ownership* (the number of shares held by the institutional investors) variables. We employ the Herfindahl–Hirschman index (Nawrocki and Carter, 2010) for *Industry concentration* because in concentrated industries it is easier for powerful firms to neglect environmental management practices. To capture the level of industry dirtiness, we constructed the *Industry dirtiness* variable (the dummy variable that equals 1 if an industry falls into the category of the dirty industries,[3] otherwise 0) following the classification of Lucas and Noordewier (2016).[4] The differences between high-income and low-income economies are analyzed using a *Low-income economy* variable (the dummy variable that equals 1 if a country is classified as a low-income economy,[5] otherwise 0) following the classification of the World Bank (2021). To classify countries according to policy stringency, we adopted the Environmental Policy Stringency Index (*EPSI*) variable[6] (a country-specific, internationally comparable measure of stringency ranging from 0 (not stringent) to 6 (the highest degree)), adopted from Botta and Kozluk (2014). To examine whether the sign and magnitude of the family business effect vary across different stages of business cycle, we adopt a *Financial crisis* variable (dummy variable that equals 1 for the 2007–2011 period, otherwise 0).

[3] Lack of toxic emission data, particularly for non-US firms, did not allow us to construct a continuous proxy of industry dirtiness following Berrone and Gomez-Mejia (2009).

[4] Dirty industries are the following: chemicals (25); food (46); metal producers (52); metal product manufacturers (55); oil, gas, coal, and related services (58); paper (61); textiles (73); and utilities (82). Clean industries are the following: apparel (16); automotive (19); beverages (22); construction (28); diversified (31); electrical (37); electronics (40); machinery and equipment (49); printing and publishing (64); transportation (79); and miscellaneous (85) (Lucas & Noordewier, 2016).

[5] Low-income economies are the following: Brazil, Indonesia, Malaysia, Mexico, Philippines, South Africa, Thailand and Turkey. High-income economies are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, China, Ireland, Italy, Japan, South Korea, the Netherlands, Poland, Singapore, Spain, Sweden, Switzerland, the UK, and the USA (World Bank, 2021).

[6] The EPSI is based on the degree of stringency of 14 environmental policy instruments, primarily related to climate and air pollution. Stringency is defined as the degree to which environmental policies put an explicit or implicit price on polluting or environmentally harmful behavior (United Nations, 2019).

Table 2 Definition of environmental management practices

Variable	Description
Pollution Prevention (source: TR ASSET 4)	Emission and resource reduction KPIs: 1. Emissions (Does the company describe, claim to have or mention processes in place to improve emission reduction?-Yes = 1/No = 0); 2. Nitrogen oxides (NOx) and Sulfur Oxides (SOx) Emissions Reduction (Does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx or NOx emissions?-Yes = 1/No = 0); 3. Volatile Organic Compounds (VOC) Emissions Reductions (Does the company report on initiatives to reduce, substitute, or phase out VOC?-Yes = 1/No = 0); 4. Particular Matter Emissions Reductions (Does the company report on initiatives to reduce, substitute, or phase out particulate matter less than ten microns in diameter (PM10)?-Yes = 1/No = 0); 5. Waste Reduction Total (Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste?-Yes = 1/No = 0); 6. e-Waste Reduction (Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out e-waste?-Yes = 1/No = 0); 7. Staff Transportation Impact Reduction (Does the company report on initiatives to reduce the environmental impact of transportation used for its staff?-Yes = 1/No = 0); 8. Water Efficiency (Does the company describe, claim to have or mention processes in place to improve its water efficiency?-Yes = 1/No = 0); 9. Energy Efficiency (Does the company describe, claim to have or mention processes in place to improve its energy efficiency?-Yes = 1/No = 0); 10. Toxic Chemicals or Substances Reduction (Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances?-Yes = 1/No = 0);
Environmental Supply Chain Management (source: TR ASSET4)	Resource reduction KPIs: 1. Environmental Supply Chain (Does the company describe, claim to have or mention processes in place to include its supply chain in the company's efforts to lessen its overall environmental impact?-Yes = 1/No = 0); 2. Materials Sourcing Environmental Criteria (Does the company claim to use environmental criteria (e.g., life cycle assessment) to source or eliminate materials?-Yes = 1/No = 0); 3. Environmental Supply Chain Management (Does the company use environmental criteria (ISO 14001, energy consumption, etc.) in the selection process of its suppliers or sourcing partners?-Yes = 1/No = 0); 4. Environment Supply Chain Partnership Termination (Does the company report or show to be ready to end a partnership with a sourcing partner, if environmental criteria are not met?-Yes = 1/No = 0);
Environmental Product Development (source: TR ASSET4)	Product innovation KPIs: 1. Environmental Products (Does the company report on at least one product line or service that is designed to have positive effects on the environment, or which is environmentally labelled and marketed?-Yes = 1/No = 0); 2. Product Environmental Responsible Use (Does the company report about product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use?-Yes = 1/No = 0); 3. Eco-design Products (Does the company report on specific products which are designed for reuse, recycling or the reduction of environmental impacts?-Yes = 1/No = 0);

3.5 Control variables

We use a vector of control variables, common in the family firm literature, to account for firm-, industry-, country-, and time-level differences in our sample that can affect the environmental management practices of a firm.

First, high-growth firms spend considerable resources on expansion and may have weaker environmental management practices (Kim, & Lyon, 2011). Thus, *Growth* rate is included in our empirical model as a proxy of firm growth. There is also evidence that financially indebted firms spend less on environmental management practices (Mishra &

Table 3 Definition of control variables

Variable	Description	Source
Intangibles	Ratio of intangible assets to total assets	Datastream
Cash flows	Ratio of net income and noncash charges to total assets	Datastream
Leverage	Ratio of total debt to total assets	Datastream
Growth	Log-difference of net sales for firm *i* between time *t* and *t* – *1*	Datastream
Market performance	Beta coefficient is based on between 25 and 35 consecutive month end price changes and their relativity to local market index	Datastream
Lone-founder firm	Dummy variable that equals 1 for lone-founder firms and 0, otherwise	NRG Metrics
Firm size	Natural log of total assets	Datastream
Firm age	Natural log of the number years for which firm exists	Various sources
Industry dummies	Dummy variables that capture industry fixed effects, based on two-digit ICB codes	Datastream
Country dummies	Dummy variables that capture country fixed effects	Datastream
Time dummies	Dummy variables that capture time fixed effects	Datastream

Modi, 2013). Therefore, we constructed a proxy of financial *Leverage*. We also controlled for the ability to finance environmental management practices by including *Cash flows* (Lyon & Montgomery, 2015). *Market performance* was added to control for differences in stock market performance among our firms (Miller et al., 2007). Intangible resources can shape environmental management practices (Altomonte et al., 2014), so we constructed an *Intangible*s proxy. Moreover, due to substantial differences in the strategic behavior of family versus lone-founder firms (Miller et al., 2007, 2011), we distinguish the latter in our sample by including a dummy for *Lone-founder firm* in our model. In addition, we account for *Firm age* (the natural logarithm of years for which firm exists) and *Firm size* (the natural logarithm of total assets) as older and larger firms accumulate learning and resources that may enhance environmental management practices (Elsayed, 2006).

We controlled for systematic differences in environmental management practices across industrial sectors and stages of business cycle by including industry group (two-digit ICB codes) and time dummy variables in our model (Dess et al., 1990; Ducassy, 2012). In addition, several studies show that environmental management practices are shaped by institutional and legal characteristics of the country in which a firm operates (Kock & Min, 2015; Kock et al., 2012; Ortiz-de-Mandojana et al., 2016). Therefore, country dummies are included in our model.

All continuous control variables are winsorized at the 1% level in both tails to mitigate the effect of extremes values. Detailed definitions of our control variables and data sources are provided in Table 3.

3.6 Descriptive statistics and correlations

Panel A of Table 4 provides descriptive statistics for the entire sample. EMPI ranges substantially among our firms with a minimum value of –1.671 and a maximum of 2.269. Panel B of Table 4 presents descriptive statistics for the least environmentally friendly (10^{th} percentile of the EMPI) and the most environmentally friendly firms (90^{th} percentile of the EMPI) in our sample, according to their firm-, industry-, country-, and time-level characteristics. Analyzing differences in median values, we find that the least environmentally friendly firms are significantly smaller than the most environmentally friendly ($p < 0.015$). Furthermore, independent director ownership is significantly higher among the least than the most environmentally friendly firms ($p < 0.052$).

Table 5 reports the correlation matrix for the entire sample. We see that *EMPI* has a negative and significant correlation with *Family firm* ($p < 0.001$). The same holds for *Lone-founder firm* ($p < 0.001$). Variance inflation factors (VIFs) did not exceed 4 (O'Brien, 2007), suggesting that multicollinearity was not a problem in our estimations.

Figure 1 presents the probability density function of EMPI for family and nonfamily firms in our

Table 4 Descriptive statistics

Panel A. Whole sample

	Mean	Median	S.D	Min	Max
EMPI	−0.000	0.022	1.000	−1.671	2.269
Family firm	0.109	0.000	0.312	0.000	1.000
Lone − founder firm	0.091	0.000	0.288	0.000	1.000
Intangibles	0.194	0.130	0.195	0.000	0.753
Cash flows	0.105	0.094	0.065	−0.049	0.346
Growth	0.060	0.053	0.187	−0.595	0.796
Leverage	0.254	0.245	0.156	0.000	0.674
Market performance	1.023	0.970	0.566	−0.088	3.210
Institutional ownership	12.609	5.805	15.969	0.000	100.000
Independent director ownership	0.689	0.010	4.440	0.000	100.000
Firm size	16.459	15.981	2.399	10.398	25.158
Firm age	3.909	4.111	0.928	0.000	6.211
Industry concentration	0.076	0.051	0.090	0.012	1.000
Industry dirtiness	0.411	0.000	0.492	0.000	1.000
Low-income economy	0.059	0.000	0.235	0.000	1.000
EPSI	2.792	2.690	0.675	0.380	4.130
Financial crisis	0.428	0.000	0.495	0.000	1.000

Panel B. The least and the most environmentally friendly firms (10th and 90th percentiles of the EMPI)

	The least environmentally friendly firms			The most environmentally friendly firms		
	Mean	Median	S.D	Mean	Median	S.D
Family firm	0.071	0.000	0.267	0.094	0.000	0.292
Lone-founder firm	0.286	0.000	0.469	0.071	0.000	0.257
Intangibles	0.116	0.032	0.130	0.237	0.202	0.174
Cash flows	0.104	0.094	0.044	0.105	0.096	0.061
Growth	−0.029	0.069	0.190	0.026	0.026	0.132
Leverage	0.266	0.279	0.215	0.245	0.229	0.145
Market performance	1.299	1.020	0.789	0.977	0.980	0.371
Institutional ownership	18.254	5.515	23.216	12.489	6.300	15.341
Independent director ownership	0.269	0.275	0.262	0.885	0.000	6.483
Firm size	15.376	15.402	1.630	17.115	16.817	2.051
Firm age	3.830	3.871	0.788	4.091	4.376	0.867
Industry concentration	0.067	0.023	0.077	0.078	0.050	0.090
Industry dirtiness	0.286	0.000	0.469	0.301	0.000	0.459
Low-income economy	0.143	0.000	0.363	0.012	0.000	0.111
EPSI	2.682	2.580	0.375	2.964	3.020	0.519
Financial crisis	0.286	0.000	0.469	0.319	0.000	0.466

Country, industry, and time dummies are not shown. All the definitions of variables are provided in the section "Data and variables"

sample. We observe a pattern consistent with H1—that is, family firms have lower EMPI than their non-family counterparts who are also inferior to mediocre in EMPI. As for environmental champions, no clear advantage of family firms emerges from the raw data, as plotted in Fig. 1. However, importantly, results of Shapiro–Wilk and Shapiro-Francia normality tests strongly reject the normality of the EMPI distribution ($p < 0.000$).

Table 5 Correlations

	1	2	3	4	5	6	7	8	9
1. EMPI	1.000								
2. Family firm	−0.040***	1.000							
3. Lone-founder firm	−0.148***	−0.111***	1.000						
4. Intangibles	0.027*	0.022*	0.012	1.000					
5. Cash flows	−0.101***	0.024*	0.086***	−0.009	1.000				
6. Growth	−0.168***	0.004	0.108***	0.019*	0.208***	1.000			
7. Leverage	0.056***	−0.033***	−0.112***	0.080***	−0.242***	−0.052***	1.000		
8. Market performance	−0.065***	−0.035***	0.098***	−0.116***	−0.000	0.056***	−0.060***	1.000	
9. Institutional ownership	−0.007	−0.003	−0.001	0.007	−0.007	0.001	−0.005	0.007	1.000
10. Independent director ownership	−0.020*	0.142***	0.005	0.049***	0.023*	0.010	0.006	0.013	−0.016
11. Firm size	0.313***	−0.067***	−0.151***	−0.254***	−0.194***	−0.067***	0.182***	−0.037***	−0.013
12. Firm age	0.256***	−0.007	−0.248***	0.020*	−0.144***	−0.144***	0.081***	−0.078***	0.026*
13. Industry concentration	0.064***	0.030***	−0.045***	0.048***	−0.021*	−0.003	0.015	−0.090***	0.018*
14. Industry dirtiness	−0.096***	−0.059***	−0.056***	−0.245***	0.080***	0.051***	0.092***	0.051***	0.031***
15. Low-income economy	−0.047***	0.051***	−0.024*	−0.098***	0.067***	0.048***	0.052***	−0.057***	−0.016
16. EPSI	0.079***	0.013	0.056***	0.110***	−0.028*	−0.019*	−0.087***	0.080***	−0.005
17. Financial crisis	−0.068***	−0.023*	−0.031***	−0.012	0.010	−0.052***	0.001	−0.038***	0.018*
		10	11	12	13	14	15	16	17
10. Independent director ownership		1.000							
11. Firm size		−0.065***	1.000						
12. Firm age		0.016	0.174***	1.000					
13. Industry concentration		−0.007	−0.079***	0.020*	1.000				
14. Industry dirtiness		−0.043***	0.071***	−0.091***	0.027*	1.000			
15. Low − income economy		−0.038***	0.161***	−0.104***	0.237***	0.140***	1.000		
16. EPSI		0.036***	−0.296***	−0.012	0.073***	−0.040***	−0.565***	1.000	
17. Financial crisis		0.028***	0.056***	0.052***	0.017	−0.038***	−0.100***	−0.271***	1.000

Country, industry, and time dummies are not shown. All the definitions of variables are provided in the section "Data and variables"

*$p < 0.10$, *$p < 0.05$, ***$p < 0.01$

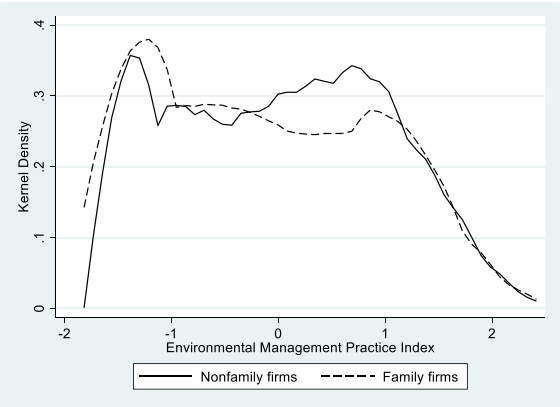

Fig. 1 Kernel density estimates of the EMPI for family and nonfamily firms (2007–2014)

4 Method

We estimate family influences on firm environmental management practices by considering the *entire distribution of EMPI*. In so doing, we employ a quantile regression estimator that allows us to explicitly model extremely positive and extremely negative environmental behaviors (Miller & Le Breton-Miller, 2021). Quantile regressions estimate conditional quantile functions (Le Cook & Manning, 2013; Waldmann, 2018), whereby quantiles of the conditional distribution of the EMPI are expressed as a function of family influence on business, accounting for firm-, industry-, country-, and time-level heterogeneity. Moreover, a quantile regression estimator accounts for the non-normal distribution of EMPI. Also, it is not restricted to regression against averages nor sensitive to extreme values of EMPI, and hence has greater explanatory value (Koenker, 2004). Our explanatory model is as follows:

$$Q_t(EMPI_{ic,t}) = \beta_0(\tau) + \beta_1(\tau)\,(Family\ firm_{ic}) + \beta_2(\tau)\,(Controls_{ic,t}) + d_t + c_i + i_i + e_{ic,t}$$

where τ refers to quantile level, i refers to firms, c refers to countries, t refers to years, $EMPI_{ic,t}$ is the proxy of environmental management practices of a firm; $Family\ firm_{ic}$ represents the proxy of family influence, $Controls_{ic,t}$ is a vector of control variables (*Lone founder firm*$_{ic}$, *Intangibles*$_{ic,t}$, *Cash flows*$_{ic,t}$, *Growth*$_{ic,t}$, *Leverage*$_{ic,t}$, *Market performance*$_{ic,t}$, *Institutional ownership*$_{ic,t}$, *Independent director ownership*$_{ic,t}$, *Firm size*$_{ic,t}$, and *Firm age*$_{ic,t}$), d_t represents year fixed effects, c_i captures country fixed effects, i_i stands for industry fixed effects (two-digit ICB codes), and $e_{ic,t}$ is an error term. Note that inclusion of the firm-level fixed effects was not feasible due to the very few changes in the *Family firm* variable.

5 Results

5.1 Univariate tests

Table 6 presents the median *EMPI* for family and nonfamily firms by firm type (panel A), the median *EMPI* for family and nonfamily firms by industry (panel B), the median *EMPI* for family and nonfamily firms by country economic development (panel C), and the median *EMPI* for family and nonfamily firms by stages of the business cycle (panel D).

In panel A, we see that the difference in median EMPI between family and nonfamily firms is statistically significant at the 1% level: family firms care less about environmental management practices than their nonfamily counterparts.

In panel B, we see that nonfamily firms, operating in industrial and utility industries, have higher *EMPI* than family firms ($p = 0.046$ and $p = 0.000$). This suggests that family firms are less likely to adopt environmental management practices when they operate in dirty, polluting industries. The difference in median *EMPI* between family and nonfamily firms operating in transportation industry is not statistically significant.

In panel C, we find that environmental management practices of family and nonfamily firms vary significantly across high-income and low-income countries. Specifically, we find that family firms have weaker environmental management practices than nonfamily firms ($p = 0.002$) in high-income economies. In contrast, family firms in low-income countries seem to be more environmentally sensitive than nonfamily firms ($p = 0.002$), perhaps to fill institutional voids (Brinkerink & Rondi, 2020).

In panel D, we find that EPI of family and nonfamily firms differ substantially across different stages of the business cycle. Specifically, family firms have poorer environmental management practices in normal economic times vis-à-vis nonfamily firms

Table 6 Univariate tests

	Family firms (1) Median EMPI	Nonfamily firms (2) Median EMPI	Difference (1)-(2) *p*-value
Panel A. Firm type	−0.188	0.053	0.000
Panel B. Type of industry			
Industrial sector	−0.130	0.007	0.046
Utility sector	−1.117	0.271	0.000
Transportation sector	−0.405	−0.185	0.100
Panel C. Country economic development			
High-income countries	−0.126	0.064	0.002
Low-income countries	−0.482	−0.094	0.002
Panel D. Stages of business cycle			
Normal economic period	−0.111	0.151	0.002
Financial crisis period	−0.335	−0.079	0.007

The results (*p*-value) of the non-parametric equality-of-medians tests of the EMPI by firm type (panel A), by industry type (panel B), by country economic development (panel C), and by stages of business cycle (panel D). Industrial firms include apparel, automotive, beverages, chemicals, construction, diversified, electrical, electronics, food, machinery, metal producers, metal product manufacturers, oil and gas, paper, printing, publishing, and textiles. High-income economies are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, China, Ireland, Italy, Japan, South Korea, the Netherlands, Poland, Singapore, Spain, Sweden, Switzerland, the UK, and the USA. Low-income economies are the following: Brazil, Indonesia, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. Normal economic period covers the 2011–2014 period. Financial crisis period covers the 2007–2010 period

($p=0.002$). During financial crises, family firms seem to have better environmental management practices than their nonfamily counterparts ($p=0.007$), perhaps because they are more sensitive to public scrutiny and societal pressures during tough economic times (Hacioğlu et al., 2017; Sharma et al., 2007).

5.2 Main results

5.2.1 Baseline hypothesis

Table 7 shows the results of the quantile regressions at the 10th, 25th, 50th, 75th, and 90th quantiles. According to H1, among the most (least) environmentally friendly firms, family environmental management practices are likely to be superior (worst). Results for the 90th (highest) percentile indicate that the coefficient for *Family firm* is indeed positive, but not significant (model 5: $\beta=0.085$; $p=0.177$). This implies that, among the top environmental firms, family firms are equally as good as the top nonfamily firms in their EMPI. However, they are not significantly better. Looking at the 10th quantile for EMPI, we find that *Family firm* is negative and statistically significant (model 1: $\beta=-0.204$; $p=0.000$). Thus, the impact of family status on environmental management practices is greatest among the least environmentally friendly firms: EMPI is 20% lower for family firms than their nonfamily counterparts. Thus, H1 is partially supported. Note that lone-founder firms' negative effect on EMPI remains negative and statistically significant across all the percentiles in all the models.

5.2.2 Robustness checks

We performed robustness tests to assess the sensitivity of our principal findings using alternative variable definitions and assessing possible endogeneity of family influence—see Table 8. First, we re-ran our main model using a continuous measure of family ownership (the ratio of the number of shares of all classes held by the family to total shares outstanding) as an alternative measure of family business (Gomez-Mejia et al., 2023). Panel A of Table 8 confirms our main findings. Next, we used a *Family-owned firm* variable (equal 1 for firms with equity ownership of the founding family, excluding lone-founder firms, 0 otherwise) and *Family-managed firm* variable (equal 1 for firms with family members serving on the board of directors, excluding lone-founder firms, 0 otherwise) (Soluk et al., 2021). Panel B of Table 8 confirms

Table 7 Main result

D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile	10th	25th	50th	75th	90th
Family firm	−0.204	−0.169	−0.079	−0.027	0.085
	(0.000)	(0.000)	(0.023)	(0.541)	(0.177)
Lone-founder firm	−0.093	−0.047	−0.140	−0.184	−0.180
	(0.000)	(0.041)	(0.000)	(0.000)	(0.000)
Intangibles	−0.199	−0.276	−0.233	−0.089	−0.065
	(0.000)	(0.000)	(0.000)	(0.194)	(0.241)
Cash flows	0.973	1.006	1.379	1.276	1.018
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Growth	−0.217	−0.307	−0.358	−0.470	−0.305
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	−0.232	−0.255	−0.293	−0.288	0.029
	(0.000)	(0.000)	(0.000)	(0.000)	(0.692)
Market performance	0.052	0.040	0.023	0.007	−0.048
	(0.000)	(0.004)	(0.145)	(0.668)	(0.004)
Institutional ownership	−0.000	0.000	0.000	0.000	−0.000
	(0.479)	(0.915)	(0.712)	(0.590)	(0.409)
Independent director ownership	0.002	0.001	−0.003	0.002	−0.003
	(0.487)	(0.335)	(0.006)	(0.416)	(0.159)
Firm size	0.332	0.374	0.370	0.319	0.257
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm age	0.060	0.084	0.064	0.058	0.030
	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)
Industry concentration	−0.445	−0.491	0.173	0.341	0.228
	(0.008)	(0.129)	(0.693)	(0.194)	(0.052)
Industry dirtiness	−0.913	−0.917	−1.276	−1.176	−0.806
	(0.051)	(0.000)	(0.000)	(0.000)	(0.000)
Low-income economy	−0.782	−0.559	−0.376	−0.206	0.336
	(0.001)	(0.000)	(0.011)	(0.559)	(0.000)
EPSI	−0.014	0.005	−0.012	−0.026	0.012
	(0.475)	(0.841)	(0.661)	(0.256)	(0.598)
Financial crisis	−0.505	−0.646	−0.823	−0.865	−0.828
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.291	−5.765	−4.771	−3.510	−2.369
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.195	0.295	0.314	0.271	0.243

The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. All the definitions of variables are provided in the "Data and variables" section

Table 8 Robustness checks

Panel A. Family ownership*					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile	10th	25th	50th	75th	90th
Family ownership	−0.830	−0.702	−0.548	0.034	0.298
	(0.000)	(0.000)	(0.000)	(0.811)	(0.132)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.303	−5.781	−4.689	−3.518	−2.433
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Panel B. Family-owned firms and family-managed firms**					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile	10th	25th	50th	75th	90th
Family-owned firm	−0.231	−0.218	−0.137	−0.006	0.052
	(0.000)	(0.000)	(0.007)	(0.921)	(0.293)
Family-managed firm	−0.164	−0.140	−0.056	−0.054	0.184
	(0.000)	(0.004)	(0.192)	(0.326)	(0.131)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.331	−5.775	−4.782	−3.515	−2.359
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Panel C. Alternative EMPI definition***					
D.V.:	$EMPI_{ALT}$	$EMPI_{ALT}$	$EMPI_{ALT}$	$EMPI_{ALT}$	$EMPI_{ALT}$
Model	(1)	(2)	(3)	(4)	(5)
Percentile	10th	25th	50th	75th	90th
Family firm	−0.213	−0.172	−0.104	−0.066	0.056
	(0.000)	(0.000)	(0.004)	(0.046)	(0.109)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−6.880	−6.522	−5.131	−4.024	−3.019
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974

*The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. *Family ownership* is the ratio of the number of shares of all classes held by the family to total shares outstanding

**The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. *Family-owned firm* is a dummy variable that equals 1 for firms in which exists equity ownership of the founding family (excluding lone-founder firms), 0 otherwise. *Family-managed firm* is a dummy variable that equals 1 for firms in which exists the presence of family members serving on the board of directors (excluding lone-founder firms), 0 otherwise

***The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. $EMPI_{ALT}$ variable is the average of a firm's KPIs for all environmental management practices (standardized to have a mean of 0 and standard deviation of 1)

Table 9 The moderating effects of organizational characteristics

Panel A. Independent director ownership stake					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.227	−0.207	−0.106	−0.068	0.022
	(0.000)	(0.000)	(0.006)	(0.144)	(0.754)
Independent director ownership	−0.003	−0.005	−0.009	−0.009	−0.015
	(0.082)	(0.000)	(0.000)	(0.000)	(0.000)
Family firm × independent director ownership	0.014	0.011	0.017	0.017	0.016
	(0.000)	(0.000)	(0.000)	(0.000)	(0.034)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.305	−5.753	−4.739	−3.580	−2.511
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.196	0.296	0.315	0.272	0.244
Panel B. Institutional ownership stake					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.222	−0.210	−0.152	−0.018	0.074
	(0.000)	(0.000)	(0.001)	(0.697)	(0.107)
Institutional ownership	−0.001	−0.001	−0.001	0.000	0.000
	(0.042)	(0.001)	(0.105)	(0.791)	(0.785)
Family firm × institutional ownership	0.000	0.004	0.004	−0.002	−0.002
	(0.846)	(0.169)	(0.036)	(0.206)	(0.638)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−6.864	−6.538	−5.144	−4.021	−3.032
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.195	0.295	0.315	0.271	0.243

The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. All the definitions of variables are provided in the "Data and variables" section

our main findings. Interestingly, the negative family effect is slightly larger for family-managed firms than for family-owned firms. Finally, we re-estimated our main model using an alternative definition of *EMPI*, calculated as the average of a firm's KPIs for all environmental management practices, and standardized with mean 0 and standard deviation 1 (Testa et al., 2018b). As shown in panel C of Table 8, results are in line with our main findings. Finally, we assessed potential bias from endogenous changes in the family governance model. Family business governance is very stable over time (Franks et al., 2012). In fact, changes in ownership structure were extremely rare

Table 10 The moderating effects of industrial characteristics

Panel A. Industry dirtiness					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.182	−0.090	0.012	0.057	0.197
	(0.000)	(0.116)	(0.815)	(0.259)	(0.000)
Industry dirtiness	−0.891	−0.922	−1.275	−1.155	−0.761
	(0.037)	(0.000)	(0.000)	(0.000)	(0.000)
Family firm × industry dirtiness	−0.072	−0.191	−0.228	−0.225	−0.285
	(0.156)	(0.007)	(0.002)	(0.017)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.348	−5.809	−4.810	−3.528	−2.405
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.195	0.296	0.315	0.271	0.244
Panel B. Industry concentration					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.124	−0.124	−0.017	0.022	0.140
	(0.000)	(0.011)	(0.729)	(0.690)	(0.032)
Industry concentration	−0.418	−0.539	0.488	0.347	0.206
	(0.009)	(0.129)	(0.190)	(0.080)	(0.463)
Family firm × industry concentration	−1.350	−0.718	−0.804	−0.761	−1.304
	(0.086)	(0.202)	(0.004)	(0.033)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.353	−5.808	−4.819	−3.536	−2.381
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.196	0.295	0.315	0.271	0.243

The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. All the definitions of variables are provided in the "Data and variables" section

in our sample during the study period. Specifically, moving from a family firm to a nonfamily type firm (and vice versa) accounts for 41 (36) out of the 7794 observations. This descriptive evidence suggests that the potential endogeneity of the family governance model in our research setting should not be a major concern. Therefore, given the low probability of endogenous changes in family business governance in our sample, a potential bias (if any) from these changes is likely to be low. In addition, the impact of large shareholders (including the controlling family) on organizational outcomes has been shown to be exogenous (Gugler & Weigand, 2003). Thus, we believe that the estimated effects are very unlikely to be affected by the endogeneity of family influence.

Table 11 The moderating effects of country-level characteristics

Panel A. Economic development					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.162	−0.157	−0.058	0.007	0.137
	(0.000)	(0.000)	(0.136)	(0.853)	(0.020)
Low-income economy	−0.488	−0.538	−0.357	0.265	0.349
	(0.000)	(0.000)	(0.129)	(0.503)	(0.000)
Family firm × low-income economy	−0.522	−0.389	−0.235	−0.654	−0.719
	(0.000)	(0.111)	(0.004)	(0.000)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.367	−5.791	−4.808	−3.554	−2.382
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.197	0.295	0.315	0.272	0.245
Panel B. Environmental policy stringency index					
D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.284	−0.232	−0.325	−0.675	−0.668
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
EPSI	−0.017	0.002	−0.009	−0.028	0.013
	(0.457)	(0.931)	(0.725)	(0.266)	(0.602)
Family firm × EPSI	0.030	0.022	0.090	0.235	0.264
	(0.222)	(0.467)	(0.003)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.290	−5.781	−4.795	−3.523	−2.347
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.195	0.295	0.315	0.272	0.245

The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. All the definitions of variables are provided in the "Data and variables" section

5.2.3 Moderating hypotheses

According to H2, ownership by independent directors will prevent negative extremes in environmental conduct, as also might institutional investors. Panel A of Table 9 indicates that among the worst environmental performers, family firms with independent directors have higher EMPI. Interestingly, presence of independent directors on the board also increases EMPI of family firms among the best environmental performers. But according to panel B of Table 9, institutional ownership does not affect family firm environmental behavior, perhaps because of its less direct involvement in business decisions. Hence, we find partial support for H2.

Table 12 The moderating effects of the stages of business cycle

D.V.:	EMPI	EMPI	EMPI	EMPI	EMPI
Model	(1)	(2)	(3)	(4)	(5)
Percentile:	10th	25th	50th	75th	90th
Family firm	−0.265	−0.181	−0.070	−0.032	0.206
	(0.000)	(0.001)	(0.154)	(0.681)	(0.009)
Financial crisis	−0.208	−0.253	−0.268	−0.232	−0.171
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Family firm × financial crisis	0.154	−0.060	−0.037	−0.066	−0.242
	(0.022)	(0.397)	(0.699)	(0.464)	(0.047)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Constant	−5.718	−6.452	−5.804	−4.122	−2.795
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	7974	7974	7974	7974	7974
Pseudo R^2	0.179	0.276	0.292	0.245	0.216

The coefficients and *p*-values (in parentheses) using the quantile regressions with robust standard errors. All the definitions of variables are provided in the "Data and variables" section

H3 hypothesizes that the negative effect of family influence on environmental management practices for family firms with very negative environmental behaviors will increase in dirty and concentrated industries where there is less regulatory control. Panel A of Table 10 shows that the interaction between *Family firm* and *Industry dirtiness* although not significant at the 10th percentile of EMPI is significant across other percentiles. Regarding industry concentration, panel B of Table 10 shows that both among poorest (and surprisingly the best) environmental performers, family firms in concentrated industries do indeed behave worse than those in less concentrated industries, providing partial support for H3.

Regarding H4 concerning country income level and environmental regulations, panel A of Table 11 confirms that among firms both with the poorest, and again best, environmental practices, family firms do less EMPI in low-income than high-income countries. Panel B of Table 11 shows that the interaction between *Family firm* and *EPSI* is positive and statistically significant at the 90th but not the 10th percentile. Interestingly, environmental policies seem to matter only for those family firms in the 50th or higher percentiles of the EMPI distribution. Thus, H4 is only partially confirmed.

Finally, regarding H5, Table 12 shows that in times of crisis, family firms with the poorest environmental practices actually do more EMPI, perhaps because of the elevated public scrutiny and societal pressure that often occur during tough times (Hacioğlu et al., 2017; Sharma et al., 2007). At the 90th percentile, family firms with the best practices reduce their environmental investments more during crisis. Hence, we find no support for H5.

Our exploratory moderation analysis detected several potentially significant moderating conditions of environmental, some in directions *not* anticipated. We hope this will spur others to explore these issues, both conceptually and empirically.

6 Discussion and conclusion

We have examined the environmental management practices of family and nonfamily firms in a large sample of publicly traded firms from 29 countries over an 8-year period. Our results reveal the variability of family effects on environmental management practices and identify moderating contingencies affecting this variability.

6.1 Theoretical implications

Several theoretical implications derive from this study. First, our results question the stewardship perspective at least regarding environmental management practices, demonstrating that internationally, most family firms invest less in environmental management practices. Therefore, the long-term stewardship perspective of family firms is thrown into question, at least regarding specific types of environmental management practices (Kappes & Schmid, 2013; Lumpkin & Brigham, 2011). However, interestingly, family firms are every bit the equals of others among the highest, greenest, environmental performers. This was not true for lone-founder firms, which underperformed across the board. These more nuanced findings suggest a more varied and conditioned representation of the environmental behavior of family businesses.

Another interesting aspect of our work is that it answers calls from scholars such as Aguilera et al. (2021) to bridge corporate governance and environmental management research to consider a wide *range* of internal and external environmental management practices. Importantly, it identifies variations across different firms for all levels of environmental commitment, conduct, countries, industries, and stages of business cycle, thereby addressing the appeals of Le Breton-Miller and Miller (2016) to pay more attention to context and heterogeneity, and the call from Miller and Breton-Miller, (2021) to study extreme behavior, in examining family firm conduct towards the environment. We hope this study serves as a springboard for future researchers aiming to better understand the environmental strategies of publicly traded firms with concentrated ownership structures.

Our results also contribute to the more general debate on the heterogeneity of family business behavior (Chua et al., 1999; Memili & Dibrell, 2019; Miller & Le Breton-Miller, 2006). Specifically, we show empirically that among family firms, there co-exist very different approaches to environmental management practices, ranging from extremely negative to equal to superior performers. Thus, heterogeneity of family business behavior occurs not only between different family firm types, but also within the same type of family firms.

Finally, our findings relate to the ongoing debate over the enforcement of national environmental policies and regulations for the corporate sector (Roston 2019; Hollis, 2019). Whereas these policies are currently undergoing substantial changes (Carattini et al., 2019; Clar & Steurer, 2019), our results suggest that firm governance must be taken into account in establishing the stringency of national environmental policies and regulations, particularly in low-income countries and concentrated industries. Such policies on pollution and other harmful corporate behavior can be used to improve family firms' environmental management practices, especially in the developing world.

6.2 Practical implications

Our study has important implications. Its results show that addressing environmental actions seems to be more important for both nonfamily firms and the most environmentally friendly family firms, whereas many other family firms tend to neglect environmental management practices. Thus, family firm managers and consultants should consider strengthening this pillar of corporate strategy to keep up with competitors and become environmental champions. Investors too must pay attention to firm ownership and ownership structure in evaluating business prospects related to the environment.

6.3 Limitations and future research directions

We do acknowledge the limitations of our work. Our sample covers only publicly traded firms; thus, we hope that others will extend this research to private firms, insulated from pressures from external blockholders and capital markets (Carney et al., 2015). Perhaps, *private* family firms with strong local roots (Baù et al., 2019) can embrace superior environmental management practices and be more persistent in their behavior than listed family firms under short-term pressure from public shareholders (Dekker & Hasso, 2016). Therefore, their local embeddedness coupled with their unique organizational capital (Sharma & Sharma, 2019; Soluk et al., 2021) and heterogeneous investment strategies deserve more attention. Moreover, the scope of our inquiry is limited. Although we found that many family firms do not appear to embrace stewardship of the natural environment, their pro-social conduct may take other forms such as community involvement and charity, high-quality offerings, and stable employment in times of crisis and politically risky environments (Arregle et al., 2007; Bennedsen et al., 2019; Gomez-Mejia et al., 2023; Miller & Le Breton-Miller, 2005a). Indeed, perhaps there is a trade-off among these different efforts at corporate social responsibility. Exploration of these issues would not only advance theorizing on family business but improve environmental policies and regulations for all private firms with concentrated ownership.

A final limitation is that our conclusions are based on secondary data. More fine-grained explanatory data will be essential to further condition our findings. Specifically, primary data or a combination of both primary and secondary data could yield more fine-grained results. Experimental studies could shed light on the causal drivers of our metrics (i.e., emissions, toxic chemicals, etc.) (Ketchen et al., 2007). Qualitative studies and mixed methods can reveal underlying motivations for critical organizational decisions by family business owners and managers (De Massis & Kammerlander, 2020; Soluk et al., 2022).

Another interesting area for researchers is to explore whether there is a discrepancy between public pronouncements and environmental management practices among family firms. Family firms are subject to enormous institutional and societal pressures (Sharma & Sharma, 2011) and may exaggerate their environmental beneficence, a problem recognized among *non*family firms (Delmas & Toffel, 2008; Kassinis & Vafeas, 2006). This has become more common, as evidenced by the growing number of greenwashing scandals (Testa et al., 2018a, 2018b; Thompson, 2019) and irresponsible corporate behavior internationally.

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Declarations

Competing interests The authors declare no competing interests.

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