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How Does Family Involvement Affect Environmental Innovation? A Socioemotional Wealth Perspective

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Abstract: The purpose of this study was to examine how family involvement affects the environmental innovation of firms. While prior studies have shown that family involvement can enhance environmental performance, these environmental performances have been portrayed as firm activities to prevent environmental issues, such as air pollution, CO_2 emissions, etc. We maintain that environmental performance should be more proactive and enable firms to transform their activities more fundamentally towards environmental protection. In this sense, we consider environmental innovation, i.e., technological development to address environmental issues, as a proactive measure enacting firm activities to address environmental issues. Furthermore, we determine whether and how family involvement can motivate firms to develop technologies for environmental performance. To illuminate this relation, we utilized a socioemotional wealth perspective, which provides useful insights into how family-controlled firms behave differently in comparison to non-family firms. Building on this socioemotional wealth approach, we suggest that family involvement helps firms engage in environmental innovation. In this study, we also explore how the positive link between family involvement and environmental innovation is dependent on family interlocks—the circumstance wherein a firm's family directors are affiliated with the boards of directors of other firms. Specifically, we suggest that an increase in a firm's family interlocks would strengthen the positive relationship between family involvement and environmental innovation. To test our ideas, we used a sample of 623 US public firms ranging from 1996 to 2010, which yielded 5047 firm-year observations. We find that family involvement facilitates the environmental innovation of firms. We also find that family interlocks intensify the positive effect of family involvement on environmental innovation. Finally, we discuss the theoretical and empirical implications of our results.

Keywords: family involvement; socioemotional wealth; environmental innovation; family interlocks

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1. Introduction

Organizations should respond effectively to changes in their environment to ensure superior performance and longevity [1–3]. Firms have endeavored to adapt to environmental issues in response to the burgeoning social interest in them. In this regard, scholars have explored how firms respond to environmental issues. While existing studies based on the isomorphic mechanisms of neo-institutional theory provide useful insights into the homogeneous responses of firms to social needs and interests [4,5], they do not adequately explicate why firms behave differently in such situations [6].

To solve this intriguing dilemma, recent studies have focused on family owners; these are powerful parties within firms and affect a firm's decision making and behavior. Family owners are likely to be guided by preserving their socioemotional wealth (SEW)—the stock of affective endowments that they have invested in the firm [7–9]. Specifically, family-controlled firms are likely to respond to environmental issues even if these reactions cannot

guarantee positive economic performance because they have a strong desire to construct a sense of family identity, preserve their reputation, and perpetuate the family dynasty [7].

Such differentiated behaviors of family firms are also reflected in innovation patterns [10–18]. Since innovation investment entails a long-term process that brings uncertain future payoffs and thereupon firms bear substantial risks for economic performance, it has been understood that family firms tend to avoid excessive investments into technological innovation, even though they are likely to make long-term decisions [12,19,20]. This is also true of innovation outcomes, such as patenting [18] or innovativeness [10]. While family firms tend to build up their capacity for innovation for the sake of family values [12], they are also likely to prevent themselves from being excessively innovative [21]. Therefore, we can ask, "what do family firms do for environmental innovation?" Environmental innovation includes activities to develop technologies to address any environmental issue [22,23]. Given that innovation requires firms to invest their resources in the long run, environmental innovation may be much riskier and more uncertain [23]. Further, in engaging in environmental innovation, family firms examine whether and how their family values can be embodied through investing in environmental innovation [24]. We still need to specify how family values affect environmental innovation.

In this study, we aim to extend and elaborate on this line of research. While prior studies based on SEW literature have utilized a dichotomous view of family-controlled firms and non-family firms to focus on the passive responses of firms to environmental interests and issues, this study explores how the extent of family involvement influences proactive behavior (represented by environmental innovation). Specifically, based on the SEW perspective, this study suggests that a firm will proactively pursue environmental innovation as family involvement increases. This is because the firm's awareness of the significance of socioemotional wealth is dependent on the level of family involvement. In other words, the higher the level of a firm's family involvement, the greater the firm's willingness to pursue environmental innovation so as to avoid a negligence-induced negative image and social stigma and to perpetuate the family's SEW. Second, this study investigates the boundary condition of the relationship between family involvement and environmental innovation. In this study, we suggest that environmental innovation triggered by family involvement is contingent on family interlocks because the affiliation of a firm's family members with the boards of directors of other firms can result in the emergence of new ideas and the incorporation of these other boards into the firm's processes. This contributes to enhancing the firm's absorptive capacity, which is regarded as a key factor of innovation. Therefore, we predict that the positive link between family involvement and environmental innovation will be strengthened as a firm's family interlocks increase.

The remainder of this paper proceeds as follows. First, to establish the theoretical foundation of this study, we review the literature on family business and SEW. Second, building on this theoretical foundation, we propose how a firm's family involvement influences its environmental innovation. We also explore the boundary condition of the main relationship through family interlocks. Third, we introduce the data and sample used in this study to test our ideas. Fourth, we present the empirical results of our theoretical model. Lastly, we discuss the theoretical and practical implications of our findings.

2. Literature Review

2.1. Family Control and SEW

To illuminate the heterogeneity of a firm's decisions and behaviors, it is necessary to understand its governance [25]. An important aspect of governance is whether a firm is owned and controlled by a family. In this respect, numerous scholars have investigated the behavioral differences between family-controlled firms and non-family firms [26,27].

Prior studies have suggested that family-controlled firms show a strong preference towards their families' affective needs compared to non-family firms [28]. According to the SEW perspective, family firms attempt to pursue non-economic utilities such as a positive family image and reputation, shared identity, and the perpetuation of the family

dynasty [7–9]. Specifically, family owners will strive to make strategic decisions that serve to protect their SEW, even if such decisions and behaviors might entail the risk of negative firm performance outcomes [7,25]. In other words, family firms behave differently in comparison to non-family firms.

For example, Berrone et al. [7] compared the environmental performance of US family and non-family firms and found that family firms strive for better environmental performance than non-family firms in order to protect their SEW. Similarly, many studies based on the SEW perspective have shown that family-controlled firms are willing to engage in non-economic endeavors such as philanthropic activities, community involvement, and corporate social responsibility (CSR) in order to preserve their SEW endowment, even though such activities may potentially incur financial losses [29–32]. Additionally, family firms have longer investment horizons to success than non-family firms because they are eager to hand over the perpetuation of the family dynasty to future generations [28,33–35].

As illustrated above, existing studies provide a better understanding of the heterogenous behaviors of firms. In this paper, we attempt to extend and elaborate on this line of research. Specifically, while prior studies have mainly utilized a dichotomous view of family-controlled firms and non-family firms to focus on the passive responses of firms to social issues, this study investigates how the level of family involvement affects a firm's proactive behavior (represented by environmental innovation).

2.2. Family Involvement and Environmental Innovation

Firms have attempted to respond to the burgeoning social interest in environmental issues. This study thus illuminates the impact of family involvement on a firm's environmental innovation as a proactive reaction to this interest in environmental issues. We predict that, as a firm's family involvement increases, it will proactively pursue environmental innovation in order to preserve its SEW.

First, public condemnation as a result of a firm's negligence regarding environmental issues results in a bad family reputation [35–39], which could directly lead to a loss of a family's SEW [40]. Therefore, a family-controlled firm facing a potential loss of SEW is likely to pursue environmental innovation, even if this attempt entails an increased risk of negative performance. Given that family members tend to make decisions to enhance family values in their firm, the loss of SEW could be perceived as a threat in persisting their business [7]. To make up for this loss, family-controlled firms tend to take more active actions, and we argue that such active actions can include technological development.

Second, the pursuit of environmental innovation as a firm's response to social needs requires the firm to adopt a long-term investment horizon and a risk-accepting attitude [41]. The fulfillment of these conditions depends on the degree of the firm's family involvement because its family members share a family group identity [42], which induces them to make decisions related to generational and patient investment to perpetuate their family dynasty [43]. Specifically, since any legitimacy gained from being responsive to environmental demands is likely to take an extended time to materialize [44], the long-term investment perspective resulting from a firm's family involvement can facilitate environmental innovation. Additionally, family involvement enables the firm to reconcile with the risks environmental innovation entails as it contributes to improving its SEW.

In sum, a firm's family involvement helps it to proactively engage in environmental innovation because it facilitates the preservation of the firm's SEW, improves the firm's image and reputation, and perpetuates the family dynasty. In other words, a firm with extensive family involvement is more likely to bear the cost and risk derived from pursuing environmental innovation. This is due to how the firm tends to believe that this short-term cost and risk is counterbalanced by the preservation of its SEW [7]. Thus, we suggest the following hypothesis:

Hypothesis 1 (H1). *A firm's family involvement is positively related to its environmental innovation.*

2.3. The Moderating Effect of Family Interlocks

This study also examines the boundary condition of the link between family involvement and environmental innovation. A firm's family involvement can be affected by its absorptive capacity, which is the ability of a firm to draw new external ideas, integrate them, and apply them to realize innovative outcomes [45–47]. Therefore, we pay attention to family interlocks—the circumstance wherein a firm's family directors are affiliated with the boards of directors of other firms.

Existing studies have suggested that knowledge, information, and novel ideas can be transmitted by board interlocks [48]. For instance, Oh and Barker [49] suggested that CEOs who are also part of the boards of directors of other firms are likely to follow the interlocked firms' research and development (R&D) strategies. In alignment with this, Lu, Mahmoudian, Yu, Nazari, and Herremans [50] argued that board interlocks are helpful in generating opportunities to attain and assimilate knowledge from interlocked firms. In other words, board interlocks serve as a potential facilitator in a firm's pursuit of transformative experiments [50].

However, access to external knowledge alone will not guarantee the advancement of the internal capabilities of a firm [47,50–52]. In this regard, Zahra and George [47] highlighted that appropriate governance and control mechanisms are necessary to internalize and embody the benefits of external knowledge within an organization's routines and processes. This study focuses on the role of family interlocks in implementing absorptive capacity as an important aspect of innovation. This is because a firm's family owners who are affiliated with other firms are likely to transplant their external knowledge into their firm so as to contribute to enhancing the value of the family firm. From the lens of resource dependence theory, the social norm for environmental protection or the importance of environmental performance can be infused into family-controlled firms through board interlocks [50]. By participating in the decision-making process in other firms, family members can learn of important environmental innovation and how this innovation be designed, implemented, and successfully achieved [50,51].

Thus, we suggest that the family interlocks of a firm will positively moderate the relationship between family involvement and environmental innovation. In other words, the environmental innovation prompted by a firm's family involvement is dependent on the firm's family interlocks. Therefore, we propose the following hypothesis:

Hypothesis 2 (H2). *As a firm's family interlocks increase, the positive relationship between its family involvement and environmental innovation will be strengthened.*

3. Methods

3.1. Sample and Data Collection

To test our ideas, we randomly sampled U.S. public firms. Although our arguments are based on the behaviors of family firms on environmental innovation, our sample was not based on the dichotomous categorization between family firms and non-family firms. This was implemented for two reasons. First, although family firms have been largely identified in terms of family ownership [26], such categorization cannot consider within-category heterogeneity. That is, with the categorical consideration, we cannot specify how family firms differ from one another. Regarding the second reason, if we only considered family firms, even though they are clearly defined without the loss of heterogeneity, the study may have fallen into a sample selection bias. While the sample firms were not randomly selected, the findings from the selective samples may not actually capture what the family firms behave in contrast to non-family firms. We thus randomly sampled firms from the database and considered the variables related to how family members are positioned in corporate governance as a criterion to discern to what extent the given firms were family-controlled.

Given this, we collected firm-level data on US public firms from 1996 to 2010 using multiple databases, such as Compustat, MSCI ESG (formerly KLD), ISS (formerly Riskmetrics), and the USPTO database. In building up the dataset for our empirical analyses, we

compiled the databases based on the data availability. After handling missing values, we finally used a sample of 623 US public firms (5047 firm-year observations) from 1996 to 2010 for our empirical analysis.

Table 1 shows the industry classification of our sample firms. Within the sample firms, SIC code 36 (Electronic and Other Electric Equipment), SIC code 28 (Chemicals and Allied Products), SIC code 35 (Industrial Machinery and Equipment), and SIC code 38 (Instruments and Related Products) made up large portions of the sample, at 14.28%, 12.20%, 10.91% and 10.43%, respectively.

Table 1. Industry classification of sample firms (N = 623).

SIC Code	Description	Frequency	SIC Code	Description	Frequency
10	Metal Mining	3 (0.48%)	40	Railroad Transportation	1 (0.16%)
13	Oil and Gas Extraction	14 (2.25%)	42	Trucking and Warehousing	3 (0.48%)
14	Nonmetallic Minerals, except Fuels	4 (0.64%)	45	Transportation by Air	3 (0.48%)
15	General Building Contractors	1 (0.16%)	47	Transportation Services	2 (0.32%)
16	Heavy Construction, except Building	1 (0.16%)	48	Communication	13 (2.09%)
20	Food and Kindred Products	17 (2.73%)	49	Electric, Gas, and Sanitary Services	29 (4.65%)
22	Textile Mill Products	2 (0.32%)	50	Wholesale Trade—Durable Goods	6 (0.96%)
23	Apparel and Other Textile Products	3 (1.48%)	51	Wholesale Trade—Nondurable Goods	1 (0.16%)
24	Lumber and Wood Products	3 (0.48%)	52	Eating and Drinking Places	1 (0.16%)
25	Furniture and Fixtures	8 (0.84%)	53	General Merchandise Stores	4 (0.64%)
26	Paper and Allied Products	13 (1.28%)	54	Food Stores	1 (0.16%)
27	Printing and Allied Products	5 (0.80%)	55	Automotive Dealers and Service Stations	2 (0.32%)
28	Chemicals and Allied Products	76 (12.20%)	56	Apparel and Accessory Stores	3 (0.48%)
29	Petroleum and Coal Products	6 (0.96%)	57	Furniture and Home-Furnishings Stores	3 (0.48%)
30	Rubber and Misc. Plastics Products	10 (1.61%)	58	Eating and Drinking Places	4 (0.64%)
31	Leather and Leather Products	5 (0.81%)	59	Misc. Retail	9 (1.44%)
32	Stone, Clay, and Glass Products	4 (0.64%)	73	Business Services	70 (11.24%)
33	Primary Metal Industries	12 (1.93%)	78	Motion Pictures	1 (0.16%)
34	Fabricated Metal Products	12 (1.93%)	79	Amusement and Recreation Services	1 (0.16%)
35	Industrial Machinery and Equipment	68 (10.91%)	80	Health Services	4 (0.64%)
36	Electronic and Other Electric Equipment	89 (14.29%)	82	Educational Services	1 (0.16%)
37	Transportation Equipment	24 (3.85%)	87	Engineering and Management Services	6 (0.96%)
38	Instruments and Related Products	65 (10.43%)	99	Non-Classifiable Establishments	1 (0.16%)
39	Misc. Manufacturing Industries	9 (1.44%)			

3.2. Measurement

3.2.1. Dependent Variable

The dependent variable was environmental innovation, which refers to the process of technological development to address environmental issues [53,54]. To capture a firm's environmental innovation, we considered patents in the areas related to environmental science as artifacts of environmental innovation processes. To identify the patents that were developed for environmental innovation, we followed the definition of Environmentally Sound Technology (EST) provided by the United States Patent Trademark Office (USPTO). Based on this, we first counted the number of EST patents filed by a firm in a given year. The EST patents were identified through the EST concordance (https://www.uspto.gov/web/patents/classification/international/est_concordance.htm, accessed on 26 November 2021), which is a broad guide for the classifications of ESTs. Specifically, EST patents were found in the areas of (a) alternative energy production, (b) energy conservation, (c) environmentally friendly farming, (d) environmental purification, protection, or remediation, and (e) regulation, design, or education.

After acquiring the number of EST patents filed by a firm to the USPTO, we normalized the EST patenting activities by dividing them by the total number of patents submitted by the firm in a given year. With cognizance of the fact that the innovation process for the environment is a contemporaneous action [55–57], we measured environmental innovation by calculating the sum of the proportions of a firm's EST patents in each five-year time window. Since the dependent variable in our empirical setting was right-skewed, we used a logarithm for the original variable.

3.2.2. Independent Variable

The independent variable was family involvement, which is defined as "the association of a family with the ownership, management, and governance of a business" [58] (p. 269). To capture family involvement, we considered (1) the voting power of family board members and (2) their ownership. Voting power was measured as the percentage of each family director's voting power within the board of a given firm [59]. Family board members with greater voting power have a larger stake in maintaining the firm's legacy and reputation. The ownership of family board members was measured as the ratio of the shares possessed by family members to the total number of shares.

3.2.3. Moderator

Family interlocks refer to the situation wherein a member of the family-controlled firm's board of directors also serves on the board of another firm [60]. We measured family interlocks as the ratio of family board members who also served on the boards of other firms to the total number of board members.

3.2.4. Control Variables

We controlled for unobserved heterogeneity of the sample firms and industry effects. For industrial characteristics, we considered industry return on assets (ROA) and industry-level environmental performance. Industry ROA was measured with the industry-averaged values of ROA by using the three-digit Standard Industrial Classification (SIC) code. Industry-level environmental performance was measured as the mean values of KLD (Kinder, Lydenberg, and Domini & Co.) ratings on the firms' environment-related activities within the three-digit SIC code. In addition, to control for firm-specific characteristics, we considered ROA, innovativeness, firm size, slack resources, financial leverage, R&D intensity, marking intensity, overall CSR, and board size. ROA was measured by dividing the firm's net income by its total assets. Innovativeness was measured as the number of patents filed by a firm to the USPTO. Firm size was measured as the total amount of its assets. Slack resources were computed by dividing the firm's current assets by its current liabilities. Financial leverage was calculated by dividing the firm's total debt (which is the sum of its short-term and long-term debt) by its total assets. R&D intensity was captured as a ratio of the firm's R&D expenditures to its total assets. Marketing intensity was measured as the ratio of the firm's selling, general, and administrative costs to its total revenue. Overall CSR was captured by subtracting the scores of the concerns from those of the strengths provided by the KLD data. Finally, the firm's board size was measured by calculating the number of its board members that were listed in the ISS database.

3.2.5. Estimation Model

We employed a fixed effect model to estimate environmental innovation with respect to family involvement and family interlocks using the Hausman test ($\chi^2 = 54.49$, $p = 0.000$). To address any possibilities of reverse causality, we used lagged predictors and control variables. To check if there might be a reverse causality issue between family involvement and environmental innovation, we conducted Granger causality tests and found no possible Granger causality from environmental innovation to family involvement ($t = -1.18$; $p = 0.239$). Moreover, in estimating our dependent variable, we computed robust standard errors of focal variables.

4. Results

Table 2 represents the descriptive statistics and correlations for the variables used in this study. As shown in Table 2, since the correlations among the variables were between low and moderate, multicollinearity did not seem to be an issue in our empirical model.

Table 2. Descriptive statistics and correlations.

N = 5047	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0.35	0.75														
2	0.70	2.17	−0.03													
3	−0.17	0.61	−0.15	0.03												
4	0.98	0.56	−0.11	0.06	0.09											
5	58.67	238.85	0.42	0.00	−0.03	−0.08										
6	65.69	203.94	0.38	−0.01	−0.23	−0.10	0.29									
7	2.26	1.93	−0.12	0.01	0.19	−0.18	−0.04	−0.18								
8	−0.05	3.15	0.01	0.00	−0.01	0.01	0.00	0.00	0.00							
9	0.04	0.06	0.10	0.00	0.21	−0.19	0.11	−0.10	0.30	0.00						
10	0.22	0.18	−0.06	0.03	0.32	0.47	−0.01	−0.16	0.04	0.01	0.28					
11	−0.32	2.28	0.08	0.00	0.21	0.01	0.22	−0.05	0.01	0.01	0.10	0.21				
12	9.19	3.50	0.19	0.00	−0.15	0.03	0.06	0.20	−0.24	0.01	−0.19	−0.10	0.03			
13	0.00	0.03	−0.01	0.00	0.01	−0.02	−0.01	0.01	−0.01	0.00	−0.02	−0.03	0.01	0.03		
14	0.02	0.11	0.01	0.01	−0.06	0.09	−0.04	0.09	−0.05	0.00	−0.09	0.00	−0.07	0.05	0.04	
15	0.02	0.10	0.02	0.01	−0.06	0.11	−0.04	0.11	−0.04	0.00	−0.09	0.02	−0.07	0.06	0.05	0.95

1. Environmental innovation, 2. Industry ROA, 3. Industry-level environmental performance, 4. ROA, 5. Innovativeness, 6. Firm size, 7. Slack resources, 8. Financial leverage, 9. R&D intensity, 10. Marketing intensity, 11. Overall CSR, 12. Board size, 13. Family interlocks, 14. Family voting power, 15. Family ownership.

To test our hypotheses, we employed a fixed-effects regression because the result of the Hausman test showed that the time-invariant unobserved characteristics of panels needed to be reflected in the empirical model ($\chi^2 = 54.49$, $p < 0.001$). Table 3 illustrates the estimation results. Model 1 only included the control variables and the moderator. In Models 2 and 3, our main independent variable—family involvement (measured as family voting power and family ownership, respectively)—was included. Models 4 and 5 examined the moderating effect of family interlocks.

Table 3. Fixed-effects estimation of environmental innovation with respect to family involvement.

	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	0.1639 **	0.1638 **	0.1634 **	0.1636 ***	0.1631 ***
	(0.0521)	(0.0520)	(0.0520)	(0.0520)	(0.0520)
–	–	−0.0010 *	−0.0010 *	−0.0010 *	−0.0010 *
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Industry env. perf.	0.0214	0.0213	0.0218	0.0221	0.0226
	(0.0184)	(0.0184)	(0.0185)	(0.0185)	(0.0185)
ROA	−0.0524+	−0.0512+	−0.0506+	−0.0508+	−0.0503+
	(0.0296)	(0.0296)	(0.0297)	(0.0296)	(0.0297)
Innovativeness	0.0004 **	0.0004 **	0.0004 **	0.0004 **	0.0004 **
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Firm size	0.0004 **	0.0004 **	0.0004 **	0.0004 **	0.0004 **
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Slack resources	−0.0092 **	−0.0091 **	−0.0092 **	−0.0090 **	−0.0091 **
	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)
Financial leverage	−0.0002 *	−0.0002 *	−0.0002 *	−0.0002 *	−0.0002 *
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
R&D intensity	−0.0956	−0.0881	−0.0841	−0.0873	−0.0832
	(0.2093)	(0.2092)	(0.2093)	(0.2092)	(0.2094)
Marketing intensity	0.3657 ***	0.3605 ***	0.3591 ***	0.3601 ***	0.3587 ***
	(0.0974)	(0.0973)	(0.0974)	(0.0974)	(0.0974)
Overall CSR	−0.0024	−0.0022	−0.0021	−0.0021	−0.0020
	(0.0048)	(0.0048)	(0.0048)	(0.0048)	(0.0048)
Board size	0.0078 **	0.0077 **	0.0077 **	0.0078 **	0.0077 **
	(0.0026)	(0.0026)	(0.0026)	(0.0026)	(0.0026)
Family interlocks	−0.0314	−0.0114	−0.0151	−0.2162 *	−0.2186 *
	(0.1032)	(0.1100)	(0.1089)	(0.1036)	(0.1034)

Table 3. *Cont.*

	Model 1	Model 2	Model 3	Model 4	Model 5
Family voting power		0.1804 *		0.1847 *	
		(0.0887)		(0.0887)	
Family ownership			0.1832+		0.1867+
			(0.0995)		(0.0995)
Family voting power * Family interlocks				1.4580 **	
				(0.5134)	
Family ownership * Family interlocks					1.4889 **
					(0.5248)
Firm dummies	YES	YES	YES	YES	YES
Year dummies	YES	YES	YES	YES	YES
Adj. R2	0.853	0.853	0.853	0.853	0.853

Note. The number of firm-quarter: 5047; the number of firms: 623. Robust standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

As exhibited in Models 4 and 5 in Table 3, we found that family involvement was positively related to environmental innovation ($\beta = 0.1847$, $p < 0.05$ for family voting power; $\beta = 0.1867$, $p < 0.1$ for family ownership). Furthermore, the models showed that family interlocks positively moderated the positive relationship between family involvement and environmental innovation ($\beta = 1.4580$, $p < 0.01$ for family voting power; $\beta = 1.4889$, $p < 0.01$ for family ownership).

5. Discussion and Conclusions

This paper aimed to explore the relationship between family involvement and environmental innovation. To illuminate this link, based on the SEW perspective, our study argues that a firm's family involvement induces the firm to pursue environmental innovation. From our empirical analysis, we found that the degree of a firm's family involvement was positively related to its environmental innovation. This suggests that family involvement in corporate decision-making processes can motivate the firm to engage in environmental innovation. Our findings propose that the possible tension between family-centered interests and long-term, risky, and uncertain decision making can be reconciled in pursuing technological development to address environmental issues around the firm. In fact, environmental innovation requires more complicated endeavors to be implemented [23,61,62]. Even though developing new technologies to address environmental issues itself may not be closely associated with family values, the socio-emotional wealth from the family board members makes the firms take more responsibility for environmental issues and more likely to take initiatives for overcoming the environmental challenges [63].

Based on this, this study also examined whether the positive effect of a firm's family involvement is contingent on family interlocks. We found that a firm's family interlocks positively moderated the positive link between its family involvement and environmental innovation. This suggests that the motivation for environmental innovation can be reinforced as family board members learn more about other companies [50,51]. By taking a seat in a firm as a board director and interacting with the board members in the firm, family members can learn new values, perspectives, and points of views in operating their firms, as well as absorb new knowledge around various areas, including environmental issues, for example. This learning mechanism of board interlocking will enable firms to infuse family-centered interests into environmental innovation.

5.1. Theoretical and Empirical Implications

This study provides several important theoretical and empirical implications. First, our study extends and elaborates the literature on family businesses and environmental performance. While prior studies have largely focused on the passive responses of firms to environmental needs from a dichotomous view [7,10], our study illuminates how the degree of a firm's family involvement affects its proactive decisions and behavior (captured

by environmental innovation). Building on existing SEW literature, we propose that a firm's family involvement is positively related to its environmental innovation.

Second, this study advances our understanding of the link between family involvement and environmental innovation by exploring the role of family interlocks. Specifically, given that environmental innovation triggered by a firm's family involvement depends on its absorptive capacity and that such internal capabilities are not spontaneously embodied within the firm [32,35,36], we suggest that the family interlocks of a firm serve as a conduit for embedding and assimilating external knowledge into its processes and routines.

5.2. Limitations and Scope for Future Research

Although this study theoretically and empirically contributes to the literature on family businesses and environmental performance, we acknowledge that our study had several limitations that necessitate further research. First, because the sample of this study was limited to US public firms, it is not particularly generalizable. Further analysis in a variety of empirical contexts wherein social expectations and needs regarding environmental issues differ is required to ensure generalizability. Moreover, since small and medium-sized enterprises (SMEs) that face serious resource constraints may behave differently in comparison to public firms, it is necessary to investigate whether our findings can be applied to SMEs.

Second, given that innovation is significantly influenced by a firm's absorptive capacity, this study examined how the environmental innovation caused by a firm's family involvement can be contingent on its family interlocks. This study focused on the board interlocks of family members who are attached to the family's business because, despite the fact that knowledge gleaned from outside the firm does not automatically enhance the firm's internal capabilities, family members have a stronger incentive to implement the benefits of external knowledge within the firm. Although we believe that family interlocks can explicate the internalization mechanism of a firm's absorptive capacity, the characteristics of family members need to be more fine-grained in an empirical model. In other words, future studies will need to delve deeper into the characteristics of family members because they may have different interests and goals.

Third, as the interests in environmental issues in the stock markets have rapidly increased in a decade, the recent behaviors of public firms on environmental innovation may be different from those operating in the time frame of our analysis. While we believe that our findings represent the general responses from family firms to the social demands regarding environmental issues, these findings might not fully capture the institutional change driven by the capital market that incorporates the ESG criteria into the traditional firm valuation scheme. We can conjecture that the demands from the capital market can strongly motivate firms to pursue environmental innovation. Thus, we expect that future research will further investigate the prosocial behaviors of family firms in response to ESG demands from the stock markets.

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