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Article

Racially Diverse Leadership and Sustainable Alliance Portfolios

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Abstract: In my research, the effects that the racial diversity of firms' leadership has in deciding the sustainable composition of firms' alliance portfolios is investigated, defined as the distribution of exploratory, exploitative, and mixed alliances. Grounded in social categorization, information elaboration, and social contact mechanisms, racially homogeneous leadership has a J-shaped relationship with sustainable alliance portfolio composition. Very racially homogeneous or heterogeneous leadership leads firms towards maintaining more exploratory alliances in their portfolio as opposed to moderately diverse leadership, which prefers the safety of exploitative alliances. Further, I explore how racially homogeneous leadership differs from racially heterogeneous leadership in that the former has a higher propensity to maintain more exploratory alliance portfolios compared to the latter. A two-stage analysis on a panel of 128 pharmaceutical and software firms, accompanied by response surface analysis, yields support for our theorizing. This study encourages scholars to further investigate the different weights that social categorization, information elaboration, and social contact exercise on leadership diversity and how they are elemental in firms' sustainable alliance decision-making.

Keywords: racial diversity; leadership; social categorization; exploration; exploitation; alliance portfolios; sustainability



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1. Introduction

The decisions regarding firms' sustainable alliance portfolio compositions have received abundant sustainable alliance interest (Hoehn-Weiss and Karim 2014; Metcalf and Benn 2013; Mouri et al. 2012; Sakai and Kimura 2024; Stettner and Lavie 2015). Alliances are critically important in science- and engineering-based industries (e.g., pharmaceuticals and software), where firms rely heavily on experimentation and cooperation and where attracting external resources is crucial (Koza and Lewin 1998; Laursen and Salter 2014; Li 2013; Rothaermel and Deeds 2004). Sustainable alliance research claims that the alliance decision is grounded in firms' resource and capability needs and ultimately rests with the decision maker (Ahuja et al. 2008; Das and Teng 1998; Lavie and Rosenkopf 2006; Tsang 1998). In the literature, the composition of firms' alliance portfolios—defined here as the distribution of exploratory, exploitative, and mixed alliances within a firm's alliance portfolio—is mainly guided by the firm's resource and capability needs (Ahuja 2000; Ahuja et al. 2008; Baum et al. 2000; Harryson et al. 2008; Lavie 2006). It remains unexplained why some pharmaceutical and software firms maintain alliance portfolios with a composition that does not seem to fulfill a resource or capability gap (Lavie 2006; Wassmer 2010). To explain the determinants of such alliance decisions, this study focuses on leadership as the guiding element in the alliance portfolio composition.

Previously, scholars have mostly considered only the top management team (TMT) as the decisive factor in alliance decisions (Chatterjee and Hambrick 2011; Hambrick and Mason 1984; Liu et al. 2022; Harryson et al. 2008; Jiang et al. 2016; Koza and Lewin 1998; Ozcan and Eisenhardt 2009; Schilke and Goerzen 2010), and few studies have shown that as a cooperative partnership, the alliance involves a high degree of cooperation and understanding beyond what the TMT can provide (Das and Teng 1998). While the alliance decision-making

process may differ among firms, the recent decrease in the early termination rate of sustainable alliances (Das and Rahman 2010; Das and Teng 1998) can be explained by the profound understanding and tacit knowledge that the upper management as a group, beyond the TMT, can have. Following this line of reasoning, this study considers upper management as the leadership group (e.g., chief information officer, director of research) involved in alliance decision-making. In particular, racial diversity at the upper management level dictates how, why, and what information is shared with an alliance partner (Gillespie et al. 2017; Jiang et al. 2016; Sakai and Kimura 2024). Their attitude toward information sharing, collaboration, and risk ultimately guides firms' alliance preferences, deeply impacting the alliance portfolio composition.

The burden of alliance decisions is carried by firms' leadership and the chief executive officer (CEO), with the leadership's diversity controlling firms' decision-making (Gillespie et al. 2017; Hambrick 1994; Hambrick and Mason 1984; Richard et al. 2004; Zhao et al. 2023). Diverse leadership teams are more likely to explore unconventional ideas and challenge groupthink, which improves a firm's performance, particularly in uncertain and complex environments (Richard et al. 2004). Racial diversity in leadership has also been found to introduce complexity into decision-making, as leaders must navigate differences in cultural backgrounds and perspectives. While this can lead to richer, more informed decisions, it can also complicate the process by requiring additional effort to achieve a consensus. This complexity is important to consider in research on leadership decision-making because it affects how leaders balance inclusivity with efficiency (Williams and O'Reilly 1998b). Demographic and motivational characteristics of both leadership and CEOs have been found to shape firms' motivation and attitudes behind strategic decisions (Richard et al. 2004). Considering the mixed findings of prior literature, this study focuses on the matching/mismatching levels of demographic characteristics and how this phenomenon affects sustainable alliance decisions. Thus, I ask: How does the racial diversity of the leadership influence firms' sustainable alliance portfolio composition?

Previous literature showed that when upper management makes decisions, it is influenced by the demographic and psychological characteristics of its members (Hambrick and Mason 1984; Liu et al. 2022). With the proportion of racial minorities in leadership growing, I consider that racial diversity holds significant potential to influence the sustainable composition of firms' alliance portfolios. Despite the abundant research on racial diversity (Andrevski et al. 2014; Richard et al. 2007), the research linking leadership racial diversity and firms' sustainable alliance portfolio composition is limited. To some degree, racial diversity has been linked to the firms' ability to compete and innovate (Andrevski et al. 2014; Cox 1993; Richard et al. 2004; Vlas et al. 2022a). Racially diverse groups have been shown to stimulate social contact, enlarge resource access, and diversify firms' perspectives (Blau 1977). Leadership is responsible for allocating resources for alliances and helping the CEO make alliance decisions. I expect that various configurations of social categorization, information elaboration, and social contact processes determine how different levels of leadership's racial diversity favor or inhibit the firms' perception of and propensity for risk-taking and opportunism in alliances.

This study endeavors to raise scholars' attention to the potential significance that the leadership's racial diversity may have in deciding the composition of firms' alliance portfolios. This study's hypotheses are tested on a panel of pharmaceutical and software firms over a time frame of six years (2006–2011 inclusive). This study claims important contributions to existing theory and research. By building on the categorization–elaboration model (CEM) (van Knippenberg et al. 2004) and social contact mechanisms (Blau 1977), this study investigates a possible J-shaped effect of the leadership's racial diversity on firms' sustainable alliance portfolio composition, where racially homogeneous leadership displaying the highest propensity for maintaining exploratory alliance portfolios is compared to extreme-to-moderate racially heterogeneous leadership.

2. Theoretical Perspectives on Sustainable Alliance Portfolios and Leadership Diversity

As a widely dispersed organizational form in the last decade (Lavie 2007), alliances imply either a short-term, rent-seeking relationship (exploitative) (Li 2013; Sakakibara 2002), a long-term, trust-based relationship (exploratory) (Jiang et al. 2016; Zanmarone et al. 2015; Sakai and Kimura 2024), or a combination of both (mixed) (Lavie 2007; Lavie and Rosenkopf 2006). On one side, exploratory alliances require partner firms to be open, to trust, and to fully cooperate for longer periods of time (Inkpen and Tsang 2007). On the other side, exploitative alliances imply a more superficial relationship, usually for a shorter period of time and for a specific rent-seeking purpose such as licensing or marketing (Jiang et al. 2016; Laursen and Salter 2014).

As the main driver of sustainability in alliance decision-making, leadership diversity has been mostly overlooked in strategic management research. While diversity research has been abundant, how racial diversity interacts with various firm-level outcomes is complicated (De Dreu et al. 2008; Roberson et al. 2013; Zhou and Rosini 2015). It is important to understand how racial diversity relates to organizational behavior and outcomes because these processes shape a firm's behavior and explain a firm's choices (Wooten 2008). Although no research to date has investigated the effects of leadership's racial diversity on firms' sustainable alliance portfolio composition, there has been some research showing that strategic choice is a function of leaders' characteristics (Golden and Zajac 2001). The categorization–elaboration model (van Knippenberg et al. 2004) identifies two mechanisms with the potential to affect the composition of firms' alliance portfolios. The first one is grounded in the social contact theory (Blau 1977), and the second one draws simultaneously from the social categorization perspectives (Tajfel 1981; Turner et al. 1987) and the information-processing models (Mannix and Neale 2005; Williams and O'Reilly 1998a).

Regarding the social contact mechanism, Blau's theory of heterogeneity argues that low and high degrees of racial differences help social interaction among people, while medium levels of diversity impede it (Blau 1977). Accordingly, homogeneous and heterogeneous leadership has fewer barriers to overcome in making decisions or reaching an agreement on a strategic direction compared to moderately diverse leadership. The theory claims that groups in which members have more opportunities to socialize face lower cultural barriers with regard to action and thus develop relations among them. Members of homogeneous leadership groups display similar norms and preconceptions (DiStefano and Maznevski 2000), have low cultural barriers, and develop more cohesive groups in terms of communication and positive social relations (Richard et al. 2004; Vlas et al. 2022b).

In leadership with low racial diversity, members are likely to share unified views that they develop together as a result of sharing perceptions and developing positive feelings of inclusion in the group (Dahlin et al. 2005; Vlas et al. 2022a). As heterogeneity increases, subgroups are likely to form, and the barriers to social communication with members of other subgroups increase (Earley and Mosakowski 2000). These communication barriers impede the flow of information between different subgroups (Alexander et al. 1995; Wiersema and Bird 1993). The segregation between subgroups increases each group's inertia and deprives each individual subgroup of information diversity. With further increases in heterogeneity, groups become diverse enough to encourage open communication. At very high levels of diversity, the effect of racial minorities is minimized. The flow of informational resources is improved, and even if diverse groups do not share common perceptions and attachments to any particular context, their social contact facilitates the sharing of information among them.

Beyond the social contact processes, social categorization and information elaboration processes arise in work groups. The categorization–elaboration model (CEM) (van Knippenberg et al. 2004) proposes that people categorize themselves and exchange information depending on how they categorize others into an in-group/out-group (Chen et al. 2002). The social categorization mechanism refers to people's tendencies to categorize similar others as part of the in-group and dissimilar others as part of the out-group (Chen et al. 2002; Tajfel and Turner 1986; Turner et al. 1987). The information-processing mechanism refers

to the exchange and integration of others' perspectives (Harrison and Klein 2007; Thomas and Ely 1996; van Knippenberg et al. 2004; Vlas et al. 2022a, 2022b). As defined by van Knippenberg et al. (2004, p. 1011), information elaboration is "the exchange of information and perspectives, individual-level processing of information and perspectives, the process of feeding back the results of this individual-level processing into the group, and discussion and integration of its implications." According to CEM, social categorization may harm decision-making, while information elaboration may benefit it. Low diversity is expected to enhance social integration through low categorization but undermines decision-making through a lack of access to information. At the same time, high diversity is expected to weaken social integration through high categorization but benefit decision-making through expanded access to diverse information.

3. Hypotheses Formulation

To the degree that leadership shapes strategic decision-making (Finkelstein 2009; Hambrick 1994; Hambrick and Mason 1984; Liu et al. 2022), racially diverse leadership may have a significant impact on the formation of sustainable alliance portfolios. In this hypothesis, I claim that racially homogeneous or heterogeneous leadership that does not suffer from social categorization tends to keep more exploratory alliances in the alliance portfolios compared to a moderately diverse leadership that suffers from social categorization inhibiting information elaboration (Tajfel 1981; van Knippenberg et al. 2004).

To decide in favor of an exploratory alliance (e.g., an R&D alliance) implies a willingness to engage in a long-term relationship based on trust (Sakai and Kimura 2024). Such endeavors require the ability and willingness to develop interpersonal communication with alliance partners (Lavie 2007; Lavie et al. 2010; Zahavi and Lavie 2013). Homogeneous and heterogeneous leadership are better equipped to enter such trust-based relationships compared to moderately diverse leadership due to a higher ability to foster social contact (Blau 1977). In moderately diverse leadership groups where categorization and social comparison processes occur, the formation of subgroups raises social barriers and hinders communication (Ely and Thomas 2001; Tajfel and Turner 1986). Additionally, social categorization processes that dominate at moderate levels of diversity do not allow for much information elaboration (Turner et al. 1987). The segregation resulting from social categorization cannot lead to exploratory-seeking behavior because categorization neither stimulates constructive debate nor fosters information elaboration (Barkema and Shvyrkov 2007; Harrison and Klein 2007; Jehn 1997; Richard et al. 2017; Thomas and Ely 1996; Vlas et al. 2022a). Constructive debate is essential in reaching a consensus, and moderately diverse leadership suffering from segregation cannot reach it.

According to Blau's theory of heterogeneity, opportunities for social contact are more numerous in homogeneous and heterogeneous groups compared to moderately diverse groups. They are better at transferring information, thus minimizing the chances that social categorization processes take place and helping the development of positive social associations among leadership members (Lau and Murnighan 2005). In homogeneous leadership, for example, managers do not face cultural barriers to social action and develop deep solidarity within their racial group (K. Williams and O'Reilly 1998b). They relate to other similar managers in the group more easily, transfer knowledge without inhibition, and develop stronger interdependencies (Richard et al. 2007). These, in turn, make upper management, as a group, more effective in making difficult and risky decisions, such as choosing in favor of a long-term R&D alliance (Dahlin et al. 2005).

Hypothesis 1. *Leadership's racial diversity displays a U-shaped relationship with firms' sustainable alliance portfolio composition, such that homogeneous and heterogeneous leadership have a higher proclivity for more exploratory alliance portfolios compared to moderately diverse leadership.*

In racially homogeneous leadership, managers identify with the social group and see each other as being part of the same social category (Hogg and Terry 2000; Tajfel and Turner

1986; Turner et al. 1987; van Knippenberg et al. 2004). Because members of racially homogeneous leadership groups identify as part of the same in-group, they do not develop feelings of discrimination against others in the way that moderately diverse or very heterogeneous leadership do (Earley and Mosakowski 2000; Lau and Murnighan 2005; Richard et al. 2004). Even if, in racially homogeneous leadership, the access to a wide array of viewpoints and diverse information is limited, members develop increased trust among members of the in-group, leading to unanimity in decisions. The lack of intergroup bias makes homogeneous leadership transfer information faster, have more positive-affective evaluative reactions to others' behavior, and have a higher propensity to collaborate (Harrison and Klein 2007; Thomas and Ely 1996). Compared to very heterogeneous or moderately diverse leadership, homogeneous leadership groups, as a result of low-categorization processes and very good social contact, are more open to engaging in long-term trust-based relationships, such as exploratory alliances, and less open to engaging in short-term exploitative alliances (Jiang et al. 2016).

On the other side of the spectrum, racially heterogeneous leadership suffers from higher categorization (Vlas et al. 2022a). At the same time, racially heterogeneous leadership benefits from the highest elaboration derived from very good access to a wide pool of perspectives, skills, and preferences (Jackson 1992; Tajfel and Turner 1986; Turner et al. 1987). Access to an extensive range of perspectives makes them more capable of identifying external opportunities and making novel strategic decisions (Barkema and Shvyrkov 2007; Boeker 1997; Sakai and Kimura 2024). However, due to high social categorization, information elaboration processes are inhibited to some degree. Even if racially heterogeneous leadership is likely to perceive less risk in entering alliances that involve intensive knowledge sharing—such as R&D alliances—access to a diversity of perspectives makes these leadership groups more aware of issues possibly out of their control. Social categorization processes are also likely to negatively affect heterogeneous leadership's collaboration capability, decision-making, and trust in the alliance partner.

Overall, based on the social categorization, information elaboration, and social contact mechanisms, I claim a J-shaped relationship between the racial diversity of the leadership and the firms' sustainable alliance portfolio compositions.

Hypothesis 2. *Racially homogeneous leadership has a higher proclivity for exploratory alliance portfolios compared to racially heterogeneous leadership.*

4. Methods

4.1. Sample and Data

This study commenced by identifying US-based science and engineering firms in the pharmaceutical (SIC 2833, 2834, 2835, and 2836) and software (SIC 7372, 7373, 7374, and 7375) industries. This study used Dun and Bradstreet, which is considered the most exhaustive database of US-based firms (Hmieleski and Baron 2008; Kalleberg et al. 1990). To avoid possible inconsistencies introduced by the Sarbanes–Oxley Act of 2002, I retrieved data for the period after the introduction of this act, leaving a one-year delay for the new regulation to settle. Therefore, the inclusive years of 2006–2011 are covered, with some data traced back to 2003.

I collected alliance data from the SDC Platinum database (Lavie et al. 2010; Stettner and Lavie 2015). Information on the leadership's racial and gender diversity and controls was extracted from the Institutional Shareholder Services (ISS) database. Firm-level financial controls were collected from the Compustat/CRSP database, patent-related controls from the US Patent and Trademark Office (USPTO), and alliance-specific controls from the SDC database.

4.2. Analytical Strategy

The final dataset is a panel of 128 firms analyzed between 2006 and 2011, including the alliance and patent data traced back to 2003. A one-year lag for all predictor and control

variables relative to the dependent variable helps mitigate the potential interdependence among the multiple firm observations over a number of years. A Hausman test yielded the fixed-effects model as (Hausman 1978). Graphical representation in the form of a response surface analysis allowed me to better interpret and understand the relationships between the different configurations of the predictor variable (leadership's racial diversity) and the outcome variable (sustainable alliance portfolio composition).

To test the hypotheses, I estimated a panel fixed-effects model with year controls. I addressed possible endogeneity with a Heckman two-stage model (Heckman 1979). Firms' tendencies to explore alliances may be influenced by the inherent benefits of this activity, irrespective of the leadership's racial diversity. To account for this endogeneity effect, I first ran a probit model for the firms' exploratory propensity. The predicted values were used to compute the exploration inverse Mills ratio (λ Exploration).

To account for the exploration of self-selection bias, I incorporated the inverse Mills ratio as a control in the second-stage model. Potential interdependence among observations was managed by the one-year lag between all predictor and control variables and the dependent variable. To avoid an increase in multicollinearity, I sequentially added variables. All models' individual VIFs are well below the recommended threshold of 10, suggesting that multicollinearity is not significant.

For the purpose of running the panel fixed-effects regression analysis, I first mean-centered the predictors and then used hierarchical regression by sequentially adding variables to avoid an increase in multicollinearity (Bashshur et al. 2011; Richard et al. 2017). The polynomial function takes the following form:

$$\text{SAPC} = b_0 + b_1 \times \text{RD} + b_2 \times \text{RD}^2 + b_3 \times K + e \quad (1)$$

where SAPC denotes the sustainable alliance portfolio composition, RD denotes the leadership racial diversity, K is a vector of the control variables, and e denotes the error term. I constructed two models: a base model with controls only and a model with both first-order and second-order terms. To test the first hypothesis, I used the model that included the first- and second-order terms of the predictor. A potential U-shape effect was denoted by the significant negative first-order term alongside a positive second-order term (Edwards and Parry 1993). To test the second hypothesis, I engaged in mathematical and graphical representations, as displayed in the following.

4.3. Variable Description

4.3.1. Sustainable Alliance Portfolio Composition

The dependent variable is the firms' sustainable alliance portfolio composition. This represents the degree of exploration undertaken by a firm through its entire alliance pool. I captured the firms' alliance portfolios by pooling all alliances formed in the last five years (Kogut 1988). Firms can form alliances either to explore and gain access to partners' knowledge or to exploit and leverage firms' existent knowledge (Koza and Lewin 1998; Lavie and Rosenkopf 2006; Rothaermel and Deeds 2004). I expected that the firms' alliance portfolios would be composed of a variety of alliance types, such as licensing, marketing, or R&D alliances.

Following Rothaermel and Deeds (2004), I defined the alliances that involve joint R&D activities as exploratory, alliances that involve joint marketing, licensing, resale, or production activities as exploitative, and alliances that combine both activities as mixed. Our conceptualization assumes that exploration and exploitation are two separate indicators of activities that inhibit each other because they use resources from firms' limited pools of resources (Uotila et al. 2009). Thus, when coding the alliance descriptions mentioned in the SDC database, the exploration alliances were coded as 1, exploitation alliances as 0, and mixed alliances as 0.5 (Hess and Rothaermel 2011; Rothaermel and Deeds 2004). After summing up all the alliances formed by each firm over the last five years (Kogut 1988), a ratio reflecting the percentage of exploration in the firms' alliance portfolio was computed. For example, a firm with one R&D alliance and four licensing alliances will have

an alliance portfolio composition index of 0.2, reflecting that the firm's alliance portfolio is 20% exploratory and the remaining 80% is exploitative. This index serves as our dependent variable and ranges from 0 to 1, with values closer to 1 reflecting the firm's exploratory endeavors and values closer to 0 reflecting the firm's exploitative endeavors.

4.3.2. Leadership's Racial Diversity

The independent variable is operationalized using Blau's heterogeneity index (Blau 1977). Blau's index is a commonly used measure for categorical variables such as race because it captures qualitative distinctions of diversity as variety (Harrison and Klein 2007). It has been widely used to measure the diversity of management teams (Andrevski et al. 2014; Bunderson and Sutcliffe 2002; Roberson et al. 2013; Richard et al. 2007) and is recommended by researchers as a measure that attributes equal weights to all racial categories without skewing the distribution in favor of any category (Harrison and Klein 2007; Richard et al. 2007). In the sample, leadership's racial diversity encompasses five racial categories (e.g., Caucasian, African-American, Hispanic, Asian, and American-Indian), and thus, the index theoretically ranges from 0 to 1, with an index of 0 reflecting racial homogeneity (only one racial category is represented) and an index of 1 reflecting racial heterogeneity (all racial categories equally represented). The index is calculated at the upper management level as follows:

$$RD = 1 - \sum_{i=1}^5 p_i^2 \quad (2)$$

where p_i represents the proportion of members of the leadership in each racial category, i . The minimum value for the leadership's racial diversity in our sample is 0, and the maximum is 0.67, with a mean of 0.34. The average group ranges from 3 to 32, with a mean of 9.73.

4.3.3. Controls

To minimize the possible alternative explanations, I included controls for the firms' characteristics, alliance-related variables, and diversity-related variables, as they may significantly correlate with a leadership's racial diversity. Specifically, I controlled for the *firm's previous performance* as reflected in the firm's sales growth, which is logged because the variable is highly skewed. I controlled for the *firm's size* as reflected in the firm's total assets (in billions of dollars) because successful or larger firms have a higher propensity to enter exploratory alliances, tilting the alliance portfolio composition to a more exploratory end (Shan et al. 1994). I controlled for the *firm alliance experience* measured with the total number of alliances formed in the last 5 years (Kogut 1988) because more experienced firms are more capable of developing and implementing knowledge from their alliance partners. I controlled for *firm solvency* because it captures the available financial slack resources that might make it easier to explore alliances. Given that *leadership's gender diversity* has been found to share variations with racial diversity (Richard et al. 2003), this was included as a control. I used the same Blau index that I used to compute leadership's racial diversity to measure leadership gender diversity, as well, and included the inverse Mills ratio computed in the first stage (λ *Exploration*) to control for potential endogeneity.

The first stage of the probit model that provided the inverse Mills ratio regressed the firms' probability of exploration in alliances on firm performance (sales productivity), firm age (logged), firm R&D intensity, patenting experience, joint venture experience, acquisition experience, leadership group's average age, leadership group's size, CEO duality, year 2008 effect, and year effects. The patenting experience, joint venture experience, and acquisition experience variables were computed as dummies, with them taking a value of 1 if the firm patented or engaged in a joint venture/acquisition in that respective year or 0 otherwise. The year 2008 effect variable takes a value of 1 if the alliance event year comes after 2008 and a value of 0 if the alliance event year precedes 2008.

Finally, in the second stage, the time effects with the *alliance event year* and any remaining heterogeneity with fixed-effects regression were controlled for.

5. Findings

Table 1 details the means, standard deviations, and minimum and maximum for all variables. Table 2 presents the Pearson correlations between variables.

Table 1. Descriptive statistics.

Variables	Mean	s.d.	Min	Max
1 Sustainable alliance portfolio composition	0.504	0.368	0	1
2 Leadership racial diversity	0.342	0.154	0	0.672
3 Previous performance (ln)	0.394	3.443	−8.70	9.254
4 Firm size (mil \$)	20.97	46.46	0.005	275.64
5 Alliance experience	9.117	14.07	1	152
6 Firm solvency (thousands)	0.295	3.903	0	69.66
7 Leadership gender diversity	0.358	0.124	0.142	0.5
8 λ Exploration	1.356	0.327	0.678	2.19
9 Exploration propensity	0.574	0.495	0	1
10 Firm productivity	426.1	320.9	1.176	1987.35
11 Firm age (ln)	3.148	0.756	1.098	4.905
12 R&D intensity ^a	0.691	0.462	0	1
13 Patenting experience ^a	0.879	0.326	0	1
14 Joint venture experience ^a	0.105	0.307	0	1
15 Acquisition experience ^a	0.347	0.476	0	1
16 Leadership group average age ^a	0.537	0.499	0	1
17 Leadership group size ^a	0.368	0.483	0	1
18 CEO duality	0.374	0.485	0	1
19 2008 effect ^a	0.673	0.469	0	1

Number of observations = 331. ^a dummy variable.

Table 2. Pearson correlations.

Variables	1	2	3	4	5	6	7	8
1 Sustainable alliance portfolio composition	-							
2 Leadership racial diversity	0.28	-						
3 Previous performance (ln)	−0.45	−0.20	-					
4 Firm size (mil \$)	−0.06	−0.00	0.18	-				
5 Alliance experience	0.11	−0.09	0.00	0.42	-			
6 Firm solvency (000)	−0.07	−0.02	−0.02	−0.03	−0.04	-		
7 Leadership gender diversity	0.39	0.58	−0.35	0.01	−0.05	−0.04	-	
8 λ Exploration	−0.45	−0.18	0.64	−0.12	−0.29	0.03	−0.28	-

$p < 0.05$ for correlations in bold; two-tailed test.

Table 3 presents the Heckman first-stage results, where the firms' exploratory propensity is regressed on firm performance (sales productivity), age (logged), R&D intensity, patenting experience, joint venture experience, acquisition experience, leadership average age, leadership size, CEO duality, 2008 effect, and year effects. The random effects probit regression reports a highly significant Wald chi-square of 32.12 ($p < 0.001$) and a log-likelihood of −801.20.

Table 4 shows the results of the panel fixed-effects regression. I start with the baseline model with the control variables only. Table 4 was used to test hypothesis 1, which discusses the effect of racially diverse leadership on sustainable alliance portfolio composition. Hypothesis 1 proposes that, as a result of high-elaboration and low-categorization processes allowing for social contact opportunities, racially homogeneous and heterogeneous leadership tend to keep more exploratory alliance portfolios compared to moderately racially diverse leadership. Model 2 confirms a curvilinear effect ($\beta_{RD} = -2.414$, $p = 0.015$ and $\beta_{RD \text{ squared}} = 3.287$, $p = 0.019$). The model shows an improvement in the baseline model R-square of 2.78%. I conclude that hypothesis 1 is supported.

Table 3. First stage regression results.

DV: Exploration Propensity			
Variables	Model 1		
Intercept	−1.651 (0.44)	***	
Year fixed effects	Included		
Firm productivity	0.0001 (0.00)	†	
Firm age (ln)	0.146 (0.15)		
R&D intensity ^a	0.466 (0.18)	**	
Patenting experience ^a	0.204 (0.14)		
Joint venture experience ^a	0.422 (0.26)		
Acquisition experience ^a	0.305 (0.15)	*	
leadership average age ^a	0.196 (0.17)		
leadership size ^a	−0.235 (0.20)		
CEO duality	−0.152 (0.18)		
2008 effect ^a	−0.452 (0.15)	**	
Observations	1673		
Wald chi2	32.12	***	
LL	−801.20		

Random effects probit regression. *Standard errors* in parentheses. ^a dummy variable. † $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4. Panel fixed-effects regression.

DV: Sustainable Alliance Portfolio Composition			
Variables	Model 1		Model 2
Intercept	0.365 (0.16)	*	0.730 (0.22) ***
Leadership racial diversity (RD)			−2.414 (0.98) *
Leadership racial diversity squared (RD ²)			3.287 (1.38) *
Previous performance (ln)	0.001 (0.01)		0.001 (0.01)
Firm size	−0.000 (0.00)		−0.000 (0.00)
Alliance experience	−0.001 (0.00)		−0.001 (0.00)
Firm solvency	−0.000 (0.00)		−0.000 (0.00)
Leadership gender diversity	0.614 (0.27)	*	0.643 (0.27) *
λ Exploration	−0.023 (0.10)		−0.038 (0.10)
Year fixed effects	Included		Included
R ²	3.62%		6.40%
ΔR ²			2.78%
VIF	3.68		3.99

Number of observations = 331; *Standard errors* in parentheses. λ represents the inverse Mills ratio. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

However, to test hypothesis 2, both the regression results, as detailed above, and the graphical representation must be investigated. In terms of the graphical representation,

I commenced by computing the sustainable alliance portfolio composition index (\widehat{SAPC}) for the minimum, mean, and maximum values of leadership racial diversity using the formula below.

$$\widehat{SAPC} = b_0 + b_1 \times RD + b_2 \times RD^2 + b_i \cdot K_i \quad (3)$$

where RD represents racial diversity, RD^2 represents the racial diversity squared, and K_i is a vector of the control variables. I found that racially homogeneous leadership has a sustainable alliance portfolio composition index of 0.86, which is higher than the sustainable alliance portfolio composition index of 0.72 for racially heterogeneous leadership and, further, higher than the sustainable alliance portfolio composition index of 0.41 for moderately diverse leadership groups. Since the mean of the dependent variable index is 0.504, moderately diverse leadership (index = 0.41) has the lowest proclivity for exploratory alliances compared to racially heterogeneous leadership (index = 0.86) and racially homogeneous leadership (index = 0.72). The graphical representation in Figure 1 endorses the regression results. Hypothesis 2 is supported.

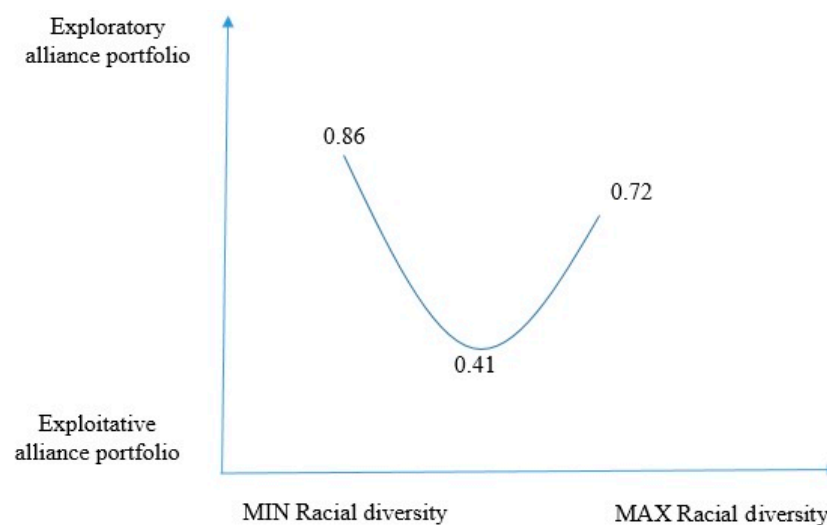


Figure 1. Graphical representation of the J-shaped effect.

6. Discussion

6.1. Contributions

This study claims important contributions to existing theory and research. Grounded in social categorization (Tajfel and Turner 1986; Turner et al. 1987), information elaboration research (Harrison and Klein 2007; Thomas and Ely 1996; van Knippenberg et al. 2004), and social contact (Blau 1977), this study contributes to the diversity research by theorizing an innovative J-shaped effect of leadership racial diversity on firms' sustainable alliance portfolio compositions. This level of detail enriches scholars' understanding of the effects of racial diversity and is important both for diversity research and alliance research since the exact effects of leadership racial diversity on macro-level decision-making are still unclear (Andrevski et al. 2014; Richard et al. 2017). By building on the CEM model (van Knippenberg et al. 2004) and on the social contact mechanisms (Blau 1977; De Dreu et al. 2008), this study offers guidance into how micro-level research may be useful and meaningfully integrated into firms' strategic decision-making efforts.

6.2. Limitations and Future Research

There are three noteworthy limitations to this study that open the way to interesting future research in the field of diversity in particular and strategic management in general. First, this current study focuses on the impact of leadership racial diversity on firms' strategic alliance decisions. However, it has been shown that racial and gender diversity share a high degree of variance (Richard et al. 2004). To provide a more complete testing

of the theory, future research may consider the interplay of racial diversity and other demographic characteristics such as gender or age. In this study, I retested the models using leadership gender diversity and found broadly robust results, confirming that the results hold across demographic characteristics.

Second, it would be theoretically arousing and methodologically challenging to have a mediating factor explaining the mechanism that leads leadership's racial diversity to affect the composition of firms' sustainable alliance portfolios. Scholars have shown relevant effects by investigating a number of such mediators, including competitive intensity (Andrevski et al. 2014). While measuring the alliance formation underlying processes is outside the scope of the current study, future research may consider quantifying the more proximal effects of social contact, social categorization, and information elaboration as vital links that account for the diversity effects.

Last, in the sample studied, the maximum value of the racial diversity index is 0.67, which means that no leadership team in the sample is fully racially heterogeneous. The absence of fully heterogeneous leadership (index = 1) in the sample restricts the ability to test hypothesis 2 fully. While I claim support for this hypothesis, it is important to note that the limitations of the sample lead me to conclude that further research is needed. Based on the current sample, I can only compare racially homogeneous leadership with moderately heterogeneous leadership rather than fully heterogeneous leadership. Extremely high diversity (approaching 1) may show similar or different trends, but this cannot be concluded without more data.

7. Conclusions

This study endeavors to explore the direction and the degree to which racially diverse leadership affects the composition of firms' sustainable alliance portfolios. To investigate firms' alliance decision-making, categorization–elaboration and social contact mechanisms were drawn upon. Relevant diversity research allows for theorizing a novel U-shaped relationship between racially diverse leadership and the composition of firms' sustainable alliance portfolios, for which there is strong support. By employing the relevant social contact theoretical mechanisms, it can be posited that a medium level of racial diversity in leadership is the least likely driver of sustainable alliance exploration. Even more, comparing racially homogeneous to racially heterogeneous leadership, it was found that homogeneity in race drives organizations towards more exploratory alliances to support firms' sustainable alliance portfolios compared to heterogeneity in race. This study encourages scholars to further investigate the different weights that social categorization, information elaboration, and social contact exercise on leadership diversity, further being elemental in firms' alliance decision-making efforts.

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