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# Diversification Experiences and Firm Performance in Knowledge-Intensive Industries: The Moderating Role of Absorptive Capacity

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**ABSTRACT** In this study, we examine the moderation effect of absorptive capacity on the performance consequences of diversification experiences. We suggest that absorptive capacity positively moderates the performance effects of product and international diversification experiences and those of unrelatedness in product and international diversification experiences. An empirical analysis conducted using a longitudinal dataset of Indian firms, from knowledge-intensive manufacturing sectors, for the period 2008–2018, broadly supports our arguments. Findings imply that firms with superior absorptive capacity can acquire and leverage knowledge from their diversification experiences effectively and mitigate the risks of negative transfer associated with unrelatedness in diversification experiences. Findings contribute to the organizational learning literature by examining the role of absorptive capacity in enabling performance outcomes of diversification experiences.

**KEYWORDS** absorptive capacity, diversification experiences, international diversification, organizational learning, product diversification

**ACCEPTED BY** Senior Editor Dalhia Mani

## INTRODUCTION

Performance consequences of diversification have remained a central topic in the strategic management research for decades (Ahuja & Novelli, 2017; Rumelt, 1982). Prior studies document benefits and risks of product and international diversification (Ahuja & Novelli, 2017; Hitt, Tihanyi, Miller, & Connelly, 2006). Drawing on the diversification literature, scholars have recently examined the role of 'diversification experiences' in enabling organizational learning and performance (Andreou, Louca, & Petrou, 2016; Nguyen & Cai, 2016). The concept of *diversification experience* is distinct from *diversification*. Whereas the benefits of *diversification* accrue through economies of scope and sharing of resources (Ahuja & Novelli, 2017; Zahavi & Lavie, 2013), the benefits of *diversification experience* accrue

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through experiential learning in diverse markets (Andreou et al., 2016; Zahavi & Lavie, 2013). Firms that face diverse circumstances over time learn and enhance their knowledge-base (Vermeulen & Barkema, 2001).

The knowledge accumulated through the activities in different product and international markets have consequences for future strategic choices and firm performance (e.g., Andreou et al., 2016; Barkema & Vermeulen, 1998; Nguyen & Cai, 2016; Shukla & Mital, 2016). Learning from prior diversification experience can enable a firm to create superior values in subsequent diversification moves (Andreou et al., 2016). Firms are able to reduce their coordination and control costs as they gain experience in different cultural and institutional contexts (Wang & Larimo, 2020). Thus, broadly, the extant literature suggests positive implications of diversification experiences.

While the performance-enhancing effects of diversification experiences have drawn some attention from scholars, there is little understanding about firm-level contingencies that can affect performance outcomes. For example, firms may vary in their abilities to accumulate and utilize knowledge from their diversification experiences (Cohen & Levinthal, 1990; Zahra & George, 2002). Without the right abilities, there is a higher chance that knowledge acquisition may be ineffective or acquired knowledge may be applied inappropriately, leading to negative transfer of experience (Cohen & Levinthal, 1990; Finkelstein & Haleblian, 2002; Levitt & March, 1988). The risks of negative transfer may be even more salient when prior diversification experiences are highly unrelated (Finkelstein & Haleblian, 2002). In this regard, absorptive capacity, which refers to firms' abilities to value, acquire, and utilize external knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002), can enable the acquisition and utilization of knowledge from firms' diversification experiences (Cohen & Levinthal, 1990; Dushnitsky & Lenox, 2005; Zahra & George, 2002). Thus, the contingent role of absorptive capacity presents an important gap in our understanding of the performance effects of diversification experiences.

This study aims to bridge the abovementioned gap by addressing the following two research questions: (1) how absorptive capacity moderates the relationship between diversification experience and firm performance; (2) how absorptive capacity mitigates the challenges associated with unrelatedness in diversification experiences and, consequently, moderates its performance consequences. Drawing primarily on the absorptive capacity literature (Cohen & Levinthal, 1990; Zahra & George, 2002), this study suggests that absorptive capacity moderates the performance effects of product and international diversification experiences positively. Furthermore, it mitigates the negative transfer effects of unrelatedness in product and international diversification experiences. Results of an empirical investigation conducted using a longitudinal dataset, for the period 2008–2018, of Indian firms from knowledge-intensive manufacturing sectors broadly support to our theoretical arguments.



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Our findings extend the literature on performance effects of diversification experiences (Andreou et al., 2016; Hitt et al., 2006; Nguyen & Cai, 2016) by suggesting that the performance outcomes of diversification experiences are moderated by absorptive capacity. Furthermore, our findings contribute to the learning perspective (mainly the 'experience transfer theory') by highlighting that absorptive capacity can help mitigate the risks of negative transfer associated with high level of unrelatedness in diversification experiences (Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999).

## THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

### Learning from Diversification Experiences

Prior studies suggest two distinct types of diversification experiences – product diversification experience and international diversification experience – that help firms accumulate knowledge (Barkema & Vermeulen, 1998; Mayer, Stadler, & Hautz, 2014; Shukla & Mital, 2016). Firms' diversification experiences enable their abilities to appreciate new value creation opportunities (Barkema & Vermeulen, 1998). Learning from product and international diversification experiences improves firm growth and performance (e.g., Ahuja & Novelli, 2017; Nguyen & Cai, 2016; Tallman & Li, 1996; Zahavi & Lavie, 2013).

Firms with product diversification experience accumulate functional and organizational knowledge from their prior exposure in diverse product markets (Barkema & Vermeulen, 1998). Firms can leverage their prior experience in related product markets to minimize costly mistakes in subsequent diversifications, reduce coordination costs, and generate ideas of new products (Andreou et al., 2016; Finkelstein & Haleblian, 2002). On the other hand, firms' prior experience in unrelated product markets can enhance their abilities to sense and seize emergent opportunities in the unrelated markets (Ng, 2007). Furthermore, firms with prior experience in diverse markets can develop coordination capabilities by establishing appropriate systems, structure, routines, and processes to manage their multiple businesses.

Similarly, international diversification experience helps firms accumulate knowledge from various knowledge systems and institutional contexts. It also helps enhance understanding of customer needs and preferences in various country-contexts (Barkema & Vermeulen, 1998; Fang, Wade, Delios, & Beamish, 2007; Granstrand, 1998). An internationally diversified firm gets opportunities to learn through interactions with competitors, partners, and other stakeholders present in diverse knowledge systems and institutional settings (Barkema & Vermeulen, 1998; Granstrand, 1998). Such experience is crucial not only for managing and coordinating operations efficiently across multiple countries but also for accumulating novel and diverse technological and market knowledge (Granstrand, 1998). The literature suggests that international diversification experience



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increases firms' access to new technologies and enhances their reach to new markets (Barkema & Vermeulen, 1998) and improves firm performance (Delios & Beamish, 2001; Fang et al., 2007).

In summary, prior studies broadly suggest that both product and international diversification experiences can improve firm performance. However, the extant literature also emphasizes that the extent of relatedness (or unrelatedness) in prior diversification experiences has implications for effective learning transfer (Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999). For example, Finkelstein and Haleblian (2002) found that when learning from prior acquisition experience is applied to subsequent acquisition where the industry of the target was different from the earlier one, it led to poorer performance, indicating negative transfer of experience. Similarly, Haleblian and Finkelstein (1999) found that acquisitions which were similar to the earlier ones led to superior performance, indicating positive transfer of experience. Thus, the findings of these studies underscore that relatedness (or unrelatedness) in prior diversification experiences may play an important role in determining the extent to which firms' prior diversification experiences can translate into superior performance. Drawing on the findings of the extant literature, we consider two baseline expectations: (1) in general, diversification experiences improve firm performance; (2) unrelatedness in diversification experiences can lead to negative transfer, such that firm performance decreases with unrelatedness in diversification experiences.

In the below sub-sections, we present a brief overview of the concept of 'absorptive capacity' and then examine the contingent role of absorptive capacity in affecting performance consequences of product/international diversification experiences and unrelatedness in such experiences.

## Absorptive Capacity

Absorptive capacity, which refers to firms' abilities to recognize value, acquire, and leverage knowledge (Cohen & Levinthal, 1990), can help firms accumulate and leverage knowledge from prior experiences in diverse product and international markets. It helps firms in opportunity recognition and value creation (Camisón & Forés, 2010). Absorptive capacity of a firm is reflected in its diverse and deep knowledge stock, which resides in its human, structural, and relational resources (Dushnitsky & Lenox, 2005; Zahra & George, 2002). Firms develop absorptive capacity by engaging in research and development (R&D) activities, maintaining research collaborations with universities and research institutes, and incorporating functions to gather intelligence from diverse markets (Cohen & Levinthal, 1990; Lewin, Massini, & Peeters, 2011). These activities help firms broaden and deepen their knowledge stock and enable them in processing, acquiring, and utilizing external knowledge (Vasudeva & Anand, 2011).

Prior studies highlight the benefits of absorptive capacity in enabling learning from product and international diversification experiences, suggesting that



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absorptive capacity enables managing diverse and complex product portfolios of young firms (Fernhaber & Patel, 2012) and enhances benefits of international acquisitions and alliances (Zahra & Hayton, 2008). Absorptive capacity may have an important role in determining the extent to which a firm could reap the benefits from their diversification experiences.

## Effects of Diversification Experiences: The Contingent Role of Absorptive Capacity

We suggest that firms that possess superior absorptive capacity may take better advantage from their diversification experiences (Camisón & Forés, 2010). Firms with superior absorptive capacity possess diverse and deep knowledge stock that helps them process and absorb the variety of information and knowledge accessible in diverse product and international markets (Fernhaber & Patel, 2012; Zahra & Hayton, 2008). The extant knowledge stock will enable firms to make appropriate inferences from their diversification experiences while coordinating operations across diverse markets (Fernhaber & Patel, 2012; Zahra & Hayton, 2008).

Absorptive capacity helps industrially diversified firms recognize the value of information accessible in diverse businesses and leverage them in future strategic moves (Nguyen & Cai, 2016). Furthermore, diversification experiences expose firms to new value creation opportunities in different product markets, which firms with superior absorptive capacity can leverage to create value (Cohen & Levinthal, 1990). Firms that possess a broad and deep understanding about functional activities across various business sectors can identify synergistic opportunities and create value by sharing knowledge across their business units (Ahuja & Novelli, 2017).

Similarly, absorptive capacity is crucial in gaining benefits from international diversification experience as well. Diverse technological and market knowledge tend to cluster in various geographic regions of the world (Granstrand, 1998). International diversification experience, thus, exposes firms to diverse knowledge (Fang et al., 2007). Firms that possess absorptive capacity can process, acquire, and utilize such knowledge effectively. Moreover, firms with higher absorptive capacity may be able to understand the nuanced differences between technological, cultural, and institutional knowledge gathered through experiences in different countries and apply them appropriately in future international market decisions (Fang et al., 2007). Thus, we suggest that absorptive capacity can enhance the benefits of both product and international diversification experiences.

*Hypothesis 1a: Absorptive capacity positively moderates the relationship between product diversification experiences and firm performance.*

*Hypothesis 1b: Absorptive capacity positively moderates the relationship between international diversification experiences and firm performance*



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### Effects of Unrelatedness in Diversification Experiences: The Role of Absorptive Capacity

The relatedness (unrelatedness) in prior diversification experiences may have implications for effective acquisition and utilization of knowledge from such experiences. The literature on 'experience transfer' suggests that related (or similar) diversification experiences are better transferrable than unrelated (or dissimilar) ones (Ellis, Reus, Lamont, & Ranft, 2011; Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999). Indeed, prior studies have found that unrelatedness in diversification experiences can lead to negative transfer and, consequently, impact firm performance negatively (Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999).

There are two mechanisms through which unrelatedness in diversification experiences can lead to negative performance consequences. First, firms face challenges in processing and integrating highly unrelated experiences (Haleblian & Finkelstein, 1999). Consequently, firms may not be able to translate their unrelated diversification experiences into performance effectively (Finkelstein & Haleblian, 2002). Second, a high level of unrelatedness in prior diversification experiences led to negative transfer that arise from inappropriate use of prior experience to a new situation (Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999). Negative transfer also reflects firms' inadequate appreciation of contextual differences in past experiences across industries and geographies (Ellis et al., 2011). Thus, both these mechanisms highlight that firms face challenges in accumulation and utilization of knowledge from their highly unrelated diversification experiences.

In this regard, we suggest that firms with superior absorptive capacity can mitigate the challenges associated with unrelatedness in their diversification experiences. As highlighted by prior studies, the major source of negative transfer is the reliance on prior experience to make inferences about current situations without appreciating the contextual differences (Ellis et al., 2011; Finkelstein & Haleblian, 2002). Firms with diverse and deep knowledge stock can discriminate and integrate diverse knowledge streams (Vasudeva & Anand, 2011) and can make better sense of the similarities and differences in the context of their prior experiences. A deeper appreciation of the context of past experiences helps firms refrain from overgeneralizing their experience (Ellis et al., 2011).

In a similar vein, firms that have diversified into multiple countries with dissimilar knowledge systems and institutional contexts may face high risks of negative transfer (Vachani, 1991). However, with superior absorptive capacity, such firms can make relevant inferences from their experience in dissimilar contexts and mitigate negative transfer (Finkelstein & Haleblian, 2002). Firms with superior knowledge stock and intellectual assets will have deeper appreciation of the similarities and differences of the technological and market knowledge embedded in diverse geographic regions (Granstrand, 1998; Ng, 2007), which reduce the risks of



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negative transfer. Thus, firms with superior absorptive capacity will be better able to address challenges arising from high level of unrelatedness in their diversification experiences.

Drawing on the above, we suggest that firms with superior absorptive capacity can mitigate the challenges of negative transfer associated with unrelatedness in their product and international diversification experiences. Hence, we hypothesize that:

*Hypothesis 2a: Absorptive capacity positively moderates the relationship between unrelatedness in product diversification experiences and firm performance*

*Hypothesis 2b: Absorptive capacity positively moderates the relationship between unrelatedness in international diversification experiences and firm performance*

## METHODS

### Data and Sample

We examined our hypotheses using a panel dataset of Indian firms from the knowledge-intensive manufacturing sector for the period 2008 and 2018.[1] The initial sample for this study included 232 publicly traded firms. The first stage of the analysis, using Heckman's approach, included all 232 firms. However, the final sample effectively included 167–168 firms[2] after excluding firms for which data for some of the variables were not available. Appendix I (online Supplementary Material) presents details of the research context, data collection, and coding of diversification events. Furthermore, to facilitate causal inference, we lagged all independent variables by a year with respect to the dependent variable (DV) in both first and second stages of analysis. There were 1,282 firm-year observations (pertaining to 232 firms) in the first stage of the Heckman (1979). However, in the second stage, the number of observations for product diversification experience-related models was between 983–985 (168 firms) and those for international diversification experience-related models were between 977–979 (167 firms)[3] for different models.

### Variables and Measures

*Dependent variables*

Firm performance. We considered both market- and accounting-based measures of firm performance. Following prior studies, we used Tobin's *Q* as a market-based measure of firm performance (Chang & Wang, 2007). We calculated Tobin's *Q* as the ratio of market to book value of a firm's assets, where a market value is calculated as the market value of common equity plus a book value of assets minus the book value of common equity (Chang & Wang, 2007). The



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market value of common equity is calculated as the product of a firm's daily share price and the number of common stock shares outstanding, averaged over all trading days in a year. Additionally, we also considered return on assets (ROA) as an accounting-based measure of firm performance. ROA was calculated as the ratio of net profit to total assets (Richard, Devinney, Yip, & Johnson, 2009; Yamakawa, Yang, & Lin, 2011).

*Independent variables*

Product diversification experience. Following prior studies (Haleblian & Finkelstein, 1999; Nguyen & Cai, 2016), we measured *product diversification experience* as the number of diversifications made by a firm in the different industries, categorized based on the four-digit Standard Industrial Classification (SIC) code, in the last ten years.[4]

International diversification experience. *International diversification experience* captures the learning that accrues to a firm through the scope of internationalization (Hitt et al., 2006; Tallman & Li, 1996). This variable was measured as the number of countries in which a firm diversified in the last ten years. To measure this variable, we considered all key modes of international diversification, such as exports, greenfield subsidiaries (through internal development), non-equity alliances, join ventures, and acquisitions.

Product diversification experience unrelatedness. We measured *product diversification experience unrelatedness* as the ratio of the number of diversification moves made by a firm in unrelated industries to the total number of diversification moves made the firm (i.e., including related and unrelated industries) in the last ten years (Nguyen & Cai, 2016). Following prior studies (Haleblian & Finkelstein, 1999; Palepu, 1985), industries that share two-digit SIC but not four-digit SIC codes were considered related, whereas industries that do not have common two-digit SIC codes were considered unrelated. We considered four-digit SIC codes of the primary industry of the focal firm as the reference industry.

International diversification experience unrelatedness. This variable was measured as the ratio of the number of unique countries in which a firm has diversified to the total number of international diversification moves taken by a firm in the last ten years. In other words, if a firm has taken 10 internationalization moves in the last ten years, out of which four moves were in distinct countries, then the value of unrelatedness is 0.4.

Absorptive capacity. Prior studies consider patent-based measures to capture a firm's learning potential (Dushnitsky & Lenox, 2005; Nieto & Quevedo, 2005). Following the literature, we considered *patent stock diversity* as the primary measure of absorptive capacity, which captures a firm's abilities to process and



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absorb diverse knowledge (Quintana-García & Benavides-Velasco, 2011). We measured patent stock diversity using the Herfindahl index of diversification (Berry, 1975; Quintana-García & Benavides-Velasco, 2011). Additionally, we measured absorptive capacity as *intellectual capital efficiency*, which captures a firm's ability to utilize and transform knowledge that resides in its intellectual assets into value (Pulic, 2000; Zahra & George, 2002). We calculated intellectual capital efficiency using the 'intellectual capital efficiency' component of the value added intellectual coefficient (VAIC™) model suggested by Pulic (2000). A detailed description of the measurement of absorptive capacity is presented in Supplementary Material, Appendix II.

*Control variables*. We included several control variables, which can potentially confound the effects of our key explanatory variables. Prior studies suggest that *firm age, firm size, leverage, current ratio, business group affiliation, R&D intensity*, and existing *knowledge stock* affect firm performance (Chakrabarti, Singh, & Mahmood, 2007; Delios & Beamish, 2001; Khanna & Palepu, 2000; Kim, Hoskisson, & Lee, 2015; Yamakawa et al., 2011; Zahavi & Lavie, 2013). Hence, we controlled for these variables. Additionally, we controlled for *product diversity* and *international diversity* while examining the effects of product and international diversification experiences, respectively (Delios & Beamish, 1999; Zahavi & Lavie, 2013). Finally, year and industry dummies (based on two-digit SIC codes) were included to control for year and industry fixed effects. Supplementary Material, Appendix III (Table A1) presents measures of all variables used in this study.

## Analysis

Firms' diversification decisions may be driven by certain unobserved factors such as managerial assessment of opportunities in different product or international markets, which may make diversification experience potentially endogenous (Dastidar, 2009; Zahavi & Lavie, 2013). To handle the potential endogeneity concern, we used Heckman's (1979) two-stage procedure. In the first stage, we used probit models for panel data to predict whether a firm has diversified in product or international markets in the last ten years. The inverse Mills ratio (IMR) generated from the first-stage probit models – IMR_PD and IMR_ID for product and international diversification models respectively – were used as control variables, for respective models, in the second stage to account for the potential selection bias. The description and results of the first stage of Heckman's procedure are presented in Supplementary Material, Appendix IV.

In the second stage, we used cross-sectional time-series feasible generalized least square (FGLS) regression models for our unbalanced panel data (Cuervo-Cazurra, 2008; Kang, Zhu, & Zhang, 2020). Because of heteroscedasticity and autocorrelation in the error terms (White, 1980; Wooldridge, 2010), FGLS regression, with correction for heteroscedastic and auto-correlated error terms, provides



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more reliable estimates than the ordinary least squares regression (Cuervo-Cazurra, 2008; Wooldridge, 2010; Yamakawa et al., 2011). Furthermore, unlike fixed- and random-effect models, FGLS allows to control for both heteroscedasticity and autocorrelation in the same model (Cuervo-Cazurra, 2008). Additionally, fixed- or random-effect panels with AR(1) corrections have assumption of common autocorrelation across all panels, which may not hold in some cases of cross-sectional panels (Cuervo-Cazurra, 2008). FGLS, on the other hand, also allows specifying panel-specific AR(1) (Greene, 2003; Kang et al., 2020). Thus, in the second stage, we decided to use FGLS regression with corrections for heteroscedasticity and first-order autocorrelation.

## RESULTS

### Findings

The descriptive statistics and correlation matrix of the variables are presented in Table 1. Tables 2–5 present results of the second stage of the Heckman procedure. H1a is examined in Models 1–10 (Table 2) and H1b is examined in Models 11–20 (Table 3). Furthermore, H2a is examined in Models 21–28 (Table 4) and H2b is examined in Models 29–36 (Table 5). The interaction terms used to examine the moderation effect of absorptive capacity were created using standardized variables to reduce non-essential multicollinearity (Dalal & Zickar, 2012). Variance inflation factors (VIFs) for all the variables in all the models were less than the critical value of 10. Thus, multicollinearity was not a concern.

*Hypothesis 1a.* Models 3 and 8 examine H1a using patent stock diversity as a measure of absorptive capacity. The results show that the coefficients of *Product diversification experience* × *Patent stock diversity* are positive and significant in both models (Model 3: DV = Tobin's $Q$, $\beta = 0.041$, $p < 0.000$; Model 8: DV = ROA, $\beta = 0.003$, $p < 0.08$), supporting H1a. To understand the effect size, in Model 3, we found that when patent stock diversity is low[5] (i.e., one standard deviation (SD) below mean) and other independent variables are at mean, a one unit increase in the product diversification experience leads to 0.14 unit decrease in Tobin's $Q$ (i.e., marginal effect[6] is −0.14), whereas when patent stock diversity is high (i.e., one SD above mean) one unit increase in product diversification experience leads to only 0.06 unit decrease in Tobin's $Q$ (i.e., marginal effect is −0.06). This finding suggests positive moderation effect, which can also be observed from Supplementary Material, Figure A1 in Appendix VI. Similarly, in Model 8, we found that at low level of patent stock diversity, the marginal effect of product diversification experience is −0.008, whereas at high level the marginal effect is −0.003, suggesting positive moderation.

Next, we examined H1a, using *intellectual capital efficiency* as a measure of absorptive capacity, in Models 4 and 9. In both the models, the coefficient of the interaction term *Product diversification experience* × *Intellectual capital efficiency* is



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Table 1. Descriptive statistics and correlation matrices

| *Variable* | *Mean* | *SD* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | *17* | *18* | *19* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Tobin's $Q$ $(t+1)$ | 1.51 | 1.42 | 1 | | | | | | | | | | | | | | | | | | |
| 2. ROA $(t+1)$ | 0.02 | 0.11 | 0.17 | 1 | | | | | | | | | | | | | | | | | |
| 3. Firm size | 9.83 | 2.07 | −0.06 | −0.03 | 1 | | | | | | | | | | | | | | | | |
| 4. Firm age | 3.50 | 0.56 | 0.05 | 0.02 | 0.10 | 1 | | | | | | | | | | | | | | | |
| 5. Leverage | 2.39 | 10.97 | −0.05 | −0.10 | 0.07 | −0.05 | 1 | | | | | | | | | | | | | | |
| 6. Knowledge stock | 9.82 | 49.50 | −0.02 | 0.03 | 0.35 | 0.18 | −0.03 | 1 | | | | | | | | | | | | | |
| 7. Current ratio | 0.18 | 0.57 | 0.11 | 0.38 | −0.23 | 0.08 | −0.17 | 0.02 | 1 | | | | | | | | | | | | |
| 8. R&D intensity | 0.00 | 0.01 | 0.13 | 0.09 | 0.01 | 0.10 | −0.05 | 0.20 | 0.12 | 1 | | | | | | | | | | | |
| 9. Business group affiliation | 0.54 | 0.50 | −0.08 | −0.03 | 0.20 | 0.11 | 0.04 | −0.04 | −0.11 | −0.01 | 1 | | | | | | | | | | |
| 10. Product diversity | 0.35 | 0.37 | 0.00 | −0.03 | 0.14 | 0.27 | −0.04 | 0.09 | −0.02 | 0.06 | 0.11 | 1 | | | | | | | | | |
| 11. International diversity | 0.25 | 0.50 | 0.09 | 0.01 | 0.30 | 0.08 | 0.02 | 0.16 | −0.08 | 0.14 | 0.20 | −0.01 | 1 | | | | | | | | |
| 12. IMR_PD | 2.18 | 2.24 | 0.03 | 0.07 | −0.78 | −0.45 | −0.09 | −0.20 | 0.23 | −0.06 | −0.31 | −0.25 | −0.20 | 1 | | | | | | | |
| 13. IMR_ID | 1.71 | 2.42 | 0.04 | 0.08 | −0.79 | −0.07 | −0.10 | −0.15 | 0.25 | −0.03 | −0.30 | −0.17 | −0.19 | 0.85 | 1 | | | | | | |
| 14. Product diversification experience | 1.95 | 4.55 | −0.03 | 0.03 | 0.46 | 0.18 | −0.03 | 0.69 | −0.01 | 0.18 | 0.03 | 0.23 | 0.19 | −0.31 | −0.26 | 1 | | | | | |
| 15. International diversification experience | 2.68 | 5.00 | −0.01 | 0.04 | 0.57 | 0.09 | −0.01 | 0.43 | −0.08 | 0.20 | 0.01 | 0.08 | 0.31 | −0.37 | −0.32 | 0.54 | 1 | | | | |
| 16. Patent stock diversity | 0.15 | 0.31 | 0.02 | 0.12 | 0.47 | 0.27 | −0.05 | 0.49 | −0.00 | 0.17 | 0.00 | 0.11 | 0.27 | −0.35 | −0.31 | 0.44 | 0.44 | 1 | | | |
| 17. Intellectual capital efficiency | 4.49 | 9.67 | 0.02 | 0.03 | 0.14 | −0.12 | −0.01 | −0.02 | 0.05 | −0.06 | 0.01 | −0.05 | 0.03 | −0.05 | −0.11 | 0.02 | 0.05 | −0.02 | 1 | | |
| 18. Product diversification experience unrelatedness | 0.23 | 0.39 | −0.03 | −0.01 | 0.33 | 0.15 | 0.02 | 0.11 | −0.09 | 0.05 | 0.21 | 0.23 | 0.21 | −0.35 | −0.30 | 0.31 | 0.27 | 0.25 | 0.02 | 1 | |
| 19. International diversification experience unrelatedness | 0.49 | 0.46 | 0.12 | 0.01 | 0.36 | 0.13 | 0.08 | 0.08 | −0.04 | 0.14 | 0.07 | 0.19 | 0.17 | −0.38 | −0.41 | 0.18 | 0.31 | 0.26 | 0.00 | 0.18 | 1 |

*Notes*: $p$-value<0.05 for $r \geq |0.05|$. ROA = return on assets; R&D = Research and Development; SD = standard deviation; IMR_PD = inverse Mills ratio (product diversification); IMR_ID = inverse Mills ratio (international diversification).



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Table 2. Second-stage FGLS models for firm performance (product diversification experience)

| | *DV = Tobin's* $Q_{t+1}$ | | | | | *DV* = $ROA_{t+1}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| Firm size | −0.026** | −0.014 | −0.042*** | −0.013 | −0.038*** | 0.005** | 0.005** | 0.001 | 0.005* | 0.001 |
| | (0.009) | (0.010) | (0.010) | (0.009) | (0.009) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Firm age | 0.017 | 0.047** | −0.066* | 0.030 | −0.068* | 0.012* | 0.013** | 0.001 | 0.010* | 0.000 |
| | (0.017) | (0.018) | (0.029) | (0.018) | (0.029) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| Leverage | −0.001$^{+}$ | −0.001$^{+}$ | −0.001 | −0.001$^{+}$ | −0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Knowledge stock | 0.005 | 0.006 | −0.049$^{+}$ | 0.009 | −0.045 | −0.001 | −0.001 | −0.004 | 0.005* | 0.001 |
| | (0.023) | (0.024) | (0.028) | (0.023) | (0.028) | (0.002) | (0.002) | (0.002) | (0.003) | (0.003) |
| Current ratio | 0.188*** | 0.187*** | 0.241*** | 0.203*** | 0.241*** | 0.032*** | 0.033*** | 0.035*** | 0.032*** | 0.034*** |
| | (0.024) | (0.023) | (0.022) | (0.023) | (0.022) | (0.004) | (0.004) | (0.004) | (0.005) | (0.004) |
| R&D intensity | 4.440$^{+}$ | 4.554$^{+}$ | 4.834$^{+}$ | 4.814$^{+}$ | 5.368* | 0.363$^{+}$ | 0.396$^{+}$ | 0.277 | 0.343$^{+}$ | 0.318 |
| | (2.696) | (2.693) | (2.611) | (2.675) | (2.615) | (0.205) | (0.207) | (0.202) | (0.205) | (0.199) |
| Business group affiliation | −0.100*** | −0.100*** | −0.040* | −0.092*** | −0.046** | 0.003 | 0.004 | 0.006 | 0.004 | 0.006 |
| | (0.021) | (0.021) | (0.018) | (0.018) | (0.017) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Product diversity | 0.036* | 0.036$^{+}$ | 0.018 | 0.024 | 0.016 | −0.001 | −0.000 | 0.001 | −0.001 | −0.000 |
| | (0.017) | (0.018) | (0.018) | (0.019) | (0.017) | (0.004) | (0.004) | (0.004) | (0.005) | (0.005) |
| IMR_PD | −0.011 | −0.000 | −0.017 | −0.000 | −0.015 | 0.007*** | 0.007*** | 0.005* | 0.006** | 0.004$^{+}$ |
| | (0.010) | (0.010) | (0.011) | (0.010) | (0.010) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Year dummies included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummy included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Product diversification experience | | −0.038** | −0.102*** | −0.036** | −0.105*** | | −0.002 | −0.006$^{+}$ | −0.007* | −0.007* |
| | | (0.014) | (0.011) | (0.013) | (0.011) | | (0.002) | (0.003) | (0.003) | (0.003) |
| Patent stock diversity | | | 0.091*** | | 0.091*** | | | 0.011*** | | 0.010*** |
| | | | (0.018) | | (0.017) | | | (0.002) | | (0.002) |
| Product diversification experience × patent stock diversity (H1a) | | | 0.041*** | | 0.036*** | | | 0.003$^{+}$ | | 0.001 |
| | | | (0.009) | | (0.009) | | | (0.002) | | (0.002) |



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Table 2. Continued

| | *DV = Tobin's* $Q_{t+1}$ | | | | | *DV = ROA*$_{t+1}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 1* | *Model 2* | *Model 3* | *Model 4* | *Model 5* | *Model 6* | *Model 7* | *Model 8* | *Model 9* | *Model 10* |
| Intellectual capital efficiency | | | | 0.012$^{+}$ | 0.005 | | | | −0.003 | −0.002 |
| | | | | (0.007) | (0.008) | | | | (0.004) | (0.004) |
| Product diversification experience × intellectual capital efficiency (H1a) | | | | 0.060*** | 0.036* | | | | 0.015** | 0.014* |
| | | | | (0.015) | (0.017) | | | | (0.006) | (0.006) |
| Mean VIF | 2.78 | 2.84 | 3.18 | 2.79 | 3.15 | 2.78 | 2.84 | 3.18 | 2.80 | 3.15 |
| *n*/*N* | 983/168 | 983/168 | 983/168 | 983/168 | 983/168 | 985/168 | 985/168 | 985/168 | 985/168 | 985/168 |
| Wald $\chi^2$ (*p*) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

*Notes*: Unstandardized regression coefficients are reported with standard error in parenthesis. Intercept terms are included but not shown. *n* = firm-year observations; *N* = firms; ROA = return on assets; R&D = Research and Development; IMR_PD = inverse Mills ratio (product diversification); H = hypothesis; VIF = variance inflation factor.
$+p < 0.1$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.



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Table 3. Second-stage FGLS models for firm performance (international diversification experience)

| | *DV = Tobin's* $Q_{t+1}$ | | | | | *DV* = $ROA_{t+1}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 11* | *Model 12* | *Model 13* | *Model 14* | *Model 15* | *Model 16* | *Model 17* | *Model 18* | *Model 19* | *Model 20* |
| Firm size | −0.033*** | −0.046*** | −0.076*** | −0.063*** | −0.090*** | −0.016*** | −0.044*** | −0.001 | 0.002 | −0.001 |
| | (0.008) | (0.008) | (0.009) | (0.009) | (0.010) | (0.003) | (0.005) | (0.002) | (0.001) | (0.002) |
| Firm age | 0.032* | 0.036** | 0.055*** | 0.042** | 0.026$^{+}$ | −0.007 | 0.002 | −0.007$^{+}$ | −0.001 | −0.008* |
| | (0.013) | (0.011) | (0.014) | (0.016) | (0.016) | (0.007) | (0.014) | (0.004) | (0.003) | (0.004) |
| Leverage | −0.001 | −0.001$^{+}$ | −0.001 | −0.001 | −0.000 | 0.001*** | 0.000*** | 0.000 | −0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Knowledge stock | −0.025 | −0.025 | 0.004 | −0.017 | −0.032 | 0.013** | 0.031** | −0.003 | −0.000 | −0.001 |
| | (0.019) | (0.018) | (0.032) | (0.016) | (0.026) | (0.004) | (0.010) | (0.002) | (0.002) | (0.002) |
| Current ratio | 0.235*** | 0.242*** | 0.241*** | 0.252*** | 0.276*** | 0.042*** | 0.064*** | 0.033*** | 0.040*** | 0.035*** |
| | (0.021) | (0.020) | (0.022) | (0.021) | (0.022) | (0.006) | (0.006) | (0.004) | (0.004) | (0.004) |
| R&D intensity | 3.287 | 3.126 | 0.538 | 3.192 | 0.775 | −0.082 | −0.057 | 0.162 | 0.606** | 0.239 |
| | (2.729) | (2.722) | (1.952) | (2.733) | (1.844) | (0.198) | (0.215) | (0.204) | (0.222) | (0.209) |
| Business group affiliation | −0.104*** | −0.104*** | −0.144*** | −0.105*** | −0.126*** | −0.007 | −0.009 | 0.007$^{+}$ | 0.003 | 0.007$^{+}$ |
| | (0.017) | (0.017) | (0.017) | (0.018) | (0.016) | (0.010) | (0.023) | (0.004) | (0.003) | (0.004) |
| International diversity | 0.066** | 0.065** | 0.063** | 0.074** | 0.068** | 0.000 | 0.002 | −0.001 | 0.003 | −0.000 |
| | (0.023) | (0.023) | (0.022) | (0.023) | (0.023) | (0.004) | (0.005) | (0.003) | (0.003) | (0.003) |
| IMR_ID | −0.046*** | −0.050*** | −0.066*** | −0.063*** | −0.077*** | −0.008** | −0.008* | 0.003* | 0.003* | 0.002 |
| | (0.004) | (0.005) | (0.005) | (0.005) | (0.005) | (0.003) | (0.003) | (0.001) | (0.001) | (0.001) |
| Year dummies included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummy included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| International diversification experience | | 0.026$^{+}$ | 0.011 | 0.018 | −0.014 | | 0.008 | 0.004 | −0.000 | −0.003 |
| | | (0.016) | (0.019) | (0.017) | (0.021) | | (0.006) | (0.003) | (0.002) | (0.003) |
| Patent stock diversity | | | 0.077*** | | 0.121*** | | | 0.012*** | | 0.012*** |
| | | | (0.019) | | (0.019) | | | (0.002) | | (0.002) |
| International diversification experience × patent stock diversity (H1b) | | | −0.009 | | 0.003 | | | −0.000 | | 0.002 |
| | | | (0.015) | | (0.015) | | | (0.002) | | (0.002) |



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Table 3. Continued

| | *DV = Tobin's* $Q_{t+1}$ | | | | | *DV = ROA*$_{t+1}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 11* | *Model 12* | *Model 13* | *Model 14* | *Model 15* | *Model 16* | *Model 17* | *Model 18* | *Model 19* | *Model 20* |
| Intellectual capital efficiency | | | | 0.042** | 0.050*** | | | | −0.002 | 0.002 |
| | | | | (0.013) | (0.014) | | | | (0.003) | (0.004) |
| International diversification experience × intellectual capital efficiency (H1b) | | | | 0.082*** | 0.093*** | | | | 0.012*** | 0.014*** |
| | | | | (0.023) | (0.026) | | | | (0.003) | (0.004) |
| Mean VIF | 2.53 | 2.58 | 2.68 | 2.57 | 2.68 | 2.53 | 2.58 | 2.68 | 2.57 | 2.68 |
| *n*/*N* | 977/167 | 977/167 | 977/167 | 977/167 | 977/167 | 979/167 | 979/167 | 979/167 | 979/167 | 979/167 |
| Wald $\chi^2$ (*p*) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

*Notes*: Unstandardized regression coefficients are reported with standard error in parenthesis. Intercept terms are included but not shown. *n* = firm-year observations; *N* = firms; ROA = return on assets; R&D = Research and Development; IMR_ID = inverse Mills ratio (international diversification); H = hypothesis; VIF = variance inflation factor.
+$p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.



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Table 4. Second-stage FGLS models for firm performance (product diversification experience unrelatedness)

| | *DV = Tobin's* $Q_{t+1}$ | | | | *DV =* $ROA_{t+1}$ | | | |
|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 21* | *Model 22* | *Model 23* | *Model 24* | *Model 25* | *Model 26* | *Model 27* | *Model 28* |
| Firm size | −0.025* | −0.048*** | −0.019$^{+}$ | −0.040*** | 0.011*** | 0.008*** | 0.003 | −0.007 |
| | (0.010) | (0.011) | (0.010) | (0.011) | (0.001) | (0.001) | (0.008) | (0.009) |
| Firm age | 0.014 | −0.055$^{+}$ | 0.023 | −0.048 | 0.026*** | 0.017*** | −0.015 | −0.032 |
| | (0.017) | (0.029) | (0.017) | (0.030) | (0.003) | (0.003) | (0.022) | (0.028) |
| Leverage | −0.001$^{+}$ | −0.001 | −0.001$^{+}$ | −0.001 | −0.000*** | −0.000*** | 0.000 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Knowledge stock | 0.007 | −0.025 | 0.005 | −0.029 | −0.005** | −0.008*** | 0.000 | −0.001 |
| | (0.024) | (0.025) | (0.025) | (0.025) | (0.002) | (0.002) | (0.012) | (0.016) |
| Current ratio | 0.193*** | 0.239*** | 0.187*** | 0.242*** | 0.047*** | 0.049*** | 0.078*** | 0.081*** |
| | (0.024) | (0.023) | (0.023) | (0.022) | (0.003) | (0.003) | (0.011) | (0.012) |
| R&D intensity | 4.212 | 3.984 | 4.193 | 4.282 | 0.533** | 0.349$^{+}$ | −0.231 | −0.292 |
| | (2.729) | (2.787) | (2.716) | (2.797) | (0.198) | (0.197) | (0.533) | (0.535) |
| Business group affiliation | −0.056** | −0.073*** | −0.059** | −0.063** | 0.011*** | 0.008*** | −0.007 | −0.008 |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.002) | (0.002) | (0.020) | (0.025) |
| Product diversity | −0.024 | −0.041** | −0.030* | −0047*** | −0.001 | −0.001 | −0.001 | −0.000 |
| | (0.015) | (0.013) | (0.014) | (0.012) | (0.001) | (0.002) | (0.012) | (0.014) |
| IMR_PD | −0.015 | −0.025* | −0.009 | −0.021* | 0.013*** | 0.011*** | −0.001 | −0.008 |
| | (0.010) | (0.011) | (0.010) | (0.011) | (0.001) | (0.001) | (0.008) | (0.009) |
| Year dummies included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummy included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Product diversification experience unrelatedness | −0.016$^{+}$ | −0.034*** | −0.014$^{+}$ | −0.038*** | 0.002 | 0.001 | 0.002 | 0.001 |
| | (0.009) | (0.010) | (0.009) | (0.009) | (0.001) | (0.001) | (0.008) | (0.009) |
| Patent stock diversity | | 0.103*** | | 0.104*** | | 0.011*** | | 0.014 |
| | | (0.020) | | (0.020) | | (0.002) | | (0.014) |
| Product diversification experience unrelatedness × patent stock diversity (H2a) | | 0.016* | | 0.017* | | 0.001 | | 0.000 |
| | | (0.008) | | (0.008) | | (0.001) | | (0.007) |



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Table 4. Continued

| | *DV = Tobin's* $Q_{t+1}$ | | | | *DV =* $ROA_{t+1}$ | | | |
|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 21* | *Model 22* | *Model 23* | *Model 24* | *Model 25* | *Model 26* | *Model 27* | *Model 28* |
| Intellectual capital efficiency | | | −0.007 | −0.003 | | | −0.056*** | −0.058*** |
| | | | (0.010) | (0.011) | | | (0.004) | (0.004) |
| Product diversification experience unrelatedness × intellectual capital efficiency (H2a) | | | 0.002 | 0.000 | | | 0.022*** | 0.022*** |
| | | | (0.005) | (0.006) | | | (0.002) | (0.002) |
| Mean VIF | 2.84 | 2.80 | 2.73 | 2.71 | 2.84 | 2.80 | 2.73 | 2.71 |
| *n*/*N* | 983/168 | 983/168 | 983/168 | 983/168 | 985/168 | 985/168 | 985/168 | 985/168 |
| Wald $\chi^2$ (*p*) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

*Notes*: Unstandardized regression coefficients are reported with standard error in parenthesis. Intercept terms are included but not shown. *n* = firm-year observations; *N* = firms; ROA = return on assets; R&D = Research and Development; IMR_PD = inverse Mills ratio (product diversification); H = hypothesis; VIF = variance inflation factor.
+$p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.



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Table 5. Second-stage FGLS models for firm performance (international diversification experience unrelatedness)

| | *DV = Tobin's* $Q_{t+1}$ | | | | *DV* = $ROA_{t+1}$ | | | |
|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 29* | *Model 30* | *Model 31* | *Model 32* | *Model 33* | *Model 34* | *Model 35* | *Model 36* |
| Firm size | −0.143*** | −0.074** | −0.366*** | −0.191** | 0.003** | 0.000 | 0.007 | 0.004 |
| | (0.039) | (0.023) | (0.102) | (0.062) | (0.001) | (0.001) | (0.005) | (0.005) |
| Firm age | 0.030 | −0.028 | −0.119 | 0.037 | 0.000 | −0.007* | 0.001 | −0.004 |
| | (0.159) | (0.082) | (0.551) | (0.209) | (0.003) | (0.003) | (0.011) | (0.011) |
| Leverage | −0.000 | 0.000 | −0.000 | −0.000 | −0.000 | −0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.002) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| Knowledge stock | −0.082 | −0.045 | −0.187 | −0.046 | −0.001 | −0.003$^{+}$ | −0.002 | −0.006 |
| | (0.164) | (0.049) | (0.463) | (0.120) | (0.002) | (0.002) | (0.006) | (0.006) |
| Current ratio | −0.020 | 0.007 | −0.023 | 0.035 | 0.037*** | 0.038*** | 0.075*** | 0.075*** |
| | (0.023) | (0.026) | (0.067) | (0.063) | (0.004) | (0.004) | (0.010) | (0.010) |
| R&D intensity | −1.422 | −0.298 | −2.343 | −2.276 | 0.557** | 0.320 | 0.119 | 0.097 |
| | (1.647) | (1.472) | (2.791) | (2.684) | (0.211) | (0.206) | (0.539) | (0.537) |
| Business group affiliation | 0.252 | 0.055 | 0.643 | −0.012 | 0.002 | 0.006$^{+}$ | −0.001 | 0.001 |
| | (0.388) | (0.088) | (1.517) | (0.236) | (0.003) | (0.003) | (0.013) | (0.012) |
| International diversity | −0.018 | −0.012 | 0.006 | 0.036 | 0.003 | −0.001 | 0.007 | 0.004 |
| | (0.025) | (0.023) | (0.074) | (0.068) | (0.003) | (0.003) | (0.010) | (0.009) |
| IMR_ID | 0.018 | −0.016 | 0.014 | −0.043 | 0.004** | 0.004** | 0.005 | 0.004 |
| | (0.017) | (0.015) | (0.049) | (0.039) | (0.001) | (0.001) | (0.004) | (0.004) |
| Year dummies included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| International diversification experience unrelatedness | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | 0.011 | 0.021 | −0.003 | 0.019 | 0.002 | 0.001 | 0.001 | 0.006 |
| | (0.020) | (0.018) | (0.054) | (0.045) | (0.002) | (0.002) | (0.006) | (0.006) |
| Patent stock diversity | | 0.169*** | | 0.190$^{+}$ | | 0.013*** | | 0.013$^{+}$ |
| | | (0.047) | | (0.108) | | (0.002) | | (0.008) |
| International diversification experience unrelatedness × patent stock diversity (H2b) | | 0.024 | | 0.017 | | −0.002 | | −0.010 |
| | | (0.023) | | (0.051) | | (0.002) | | (0.007) |



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Table 5. Continued

| | *DV = Tobin's* $Q_{t+1}$ | | | | *DV = ROA*$_{t+1}$ | | | |
|---|---|---|---|---|---|---|---|---|
| *Variable* | *Model 29* | *Model 30* | *Model 31* | *Model 32* | *Model 33* | *Model 34* | *Model 35* | *Model 36* |
| Intellectual capital efficiency | | | 0.017 | 0.040 | | | −0.010 | −0.008 |
| | | | (0.052) | (0.049) | | | (0.008) | (0.008) |
| International diversification experience unrelatedness × intellectual capital efficiency (H2b) | | | 0.010 | 0.030 | | | 0.019* | 0.020* |
| | | | (0.049) | (0.046) | | | (0.008) | (0.008) |
| Mean VIF | 2.48 | 2.52 | 2.59 | 2.62 | 2.48 | 2.52 | 2.59 | 2.62 |
| *n*/*N* | 977/167 | 977/167 | 977/167 | 977/167 | 979/167 | 979/167 | 979/167 | 979/167 |
| Wald $\chi^2$ (*p*) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

*Notes*: Unstandardized regression coefficients are reported with standard error in parenthesis. Intercept terms are included but not shown. *n* = firm-year observations; *N* = firms; ROA = return on assets; R&D = Research and Development; IMR_ID = inverse Mills ratio (international diversification); H = hypothesis; VIF = variance inflation factor.
+$p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.



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positive and significant (Model 4: DV = Tobin's $Q$, $\beta = 0.060$, $p < 0.000$; Model 9: DV = ROA, $\beta = 0.015$, $p < 0.009$), suggesting a positive moderation effect. In terms of effect size, for Model 4, the marginal effect of product diversification experience at low level of intellectual capital efficiency is −0.096, whereas that at high level is +0.024, suggesting a very strong positive moderation. The same can be observed in Supplementary Material, Figure A2 in Appendix VI. Similarly, for Model 9, the marginal effect of product diversification experience is −0.022 at low level, whereas that is +0.009 at high level of intellectual capital efficiency, supporting H1a. Thus, findings support H1a with this measure of absorptive capacity as well. Furthermore, Models 5 and 10 present results of the full model where both measures of absorptive capacity are considered together. Results of full models also support H1a.

*Hypothesis 1b*. In Models 13 and 18, we examine H1b using patent stock diversity as a measure of absorptive capacity. The coefficient of the interaction term *International diversification experience* × *Patent stock diversity* is not significant in both Model 13 and Model 18. Next, in Models 14 and 19, intellectual capital efficiency is considered as a measure of absorptive capacity. The coefficient of the interaction term *International diversification experience* × *Intellectual capital efficiency* is positive and significant in both the models (Model 14: DV = Tobin's $Q$, $\beta = 0.042$, $p < 0.000$; Model 19: DV = ROA, $\beta = 0.012$, $p < 0.001$), suggesting a strong positive moderation effect of intellectual capital efficiency for both Tobin's $Q$ and ROA. In terms of effect size, for Model 14, the marginal effect of international diversification experience on Tobin's $Q$ is −0.06 at low level, whereas it is +0.10 at high level of intellectual capital efficiency. This suggests a strong positive moderation effect, which can also be observed in Supplementary Material, Figure A3 in Appendix VI. Similarly, for Model 19, the marginal effect of international diversification experience is −0.01 at low level, whereas it is +0.01 at high level of intellectual capital efficiency. Thus, findings support H1b with this measure of absorptive capacity. Furthermore, H1b is supported in full models (i.e., Models 15 and 20) as well.

*Hypothesis 2a*. We examined H2a, using patent stock diversity as a measure of absorptive capacity, in Models 22 and 26. Patent stock diversity positively moderates the effects of product diversification experience unrelatedness on Tobin's $Q$ (Model 22: $\beta = 0.016$, $p < 0.05$), supporting H2a. In terms of effect size, for Model 22, the marginal effect of product diversification experience unrelatedness is −0.05 at low level of patent stock diversity, whereas it is −0.02 at high level. This suggests a positive moderation effect, which can also be observed in Supplementary Material, Figure A4 in Appendix VI. However, this moderation effect is not significant when firm performance is measured using ROA (Model 26).



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Furthermore, Models 23 and 27 examine H2a using intellectual capital efficiency as a measure of absorptive capacity. The moderation effect is insignificant in Model 23. However, H2a is supported in Model 27 (DV = ROA, $\beta = 0.022$, $p < 0.000$).[7] In terms of effect size, for Model 27, the marginal effect of product diversification experience unrelatedness is −0.02 at low level, whereas it is +0.02 at high level of intellectual capital efficiency, supporting a positive moderation effect. Similar results are also observed in full Models 24 and 28. Thus, findings broadly support H2a.

*Hypothesis 2b*. We examined H2b, using patent stock diversity as a measure of absorptive capacity, in Models 30 and 34 (Table 5). The moderation effect is not significant in both the models. Models 31 and 35 examine H2b using intellectual capital efficiency as a measure of absorptive capacity. H2b is not supported in Model 31 (DV = Tobin's *Q*). However, H2b is supported in Model 35 (DV = ROA, $\beta = 0.019$, $p < 0.05$).[8] In terms of effect size, the marginal effect of international diversification experience unrelatedness is −0.017 at low level, whereas it is +0.019 for the high level of intellectual capital efficiency. Similar results were observed in full Models 32 and 36 as well. Thus, the findings weakly support H2b.

## Robustness Checks

We conducted several robustness checks and additional analysis using alternative estimation techniques and variable measures. Our findings remained broadly consistent. These results are included in Supplementary Material, Appendix V.

## DISCUSSION

We hypothesized that absorptive capacity positively moderates the outcome of product and international diversification experiences and those of unrelatedness in such experiences. A longitudinal investigation using a panel dataset of Indian firms from knowledge-intensive manufacturing industries, for 2008–2018, broadly supports our theoretical arguments. Although we observed significant relationships in our data, the effect size of our models is relatively small (Cohen, 1988). In robustness checks, we observed that $R^2$ statistics of all the random-effect models were relatively low, explaining only around 12–24% of total variance across all models. Furthermore, there are small changes in $R^2$ when moderating variables were included in the base models (see Tables C1–C4 in Supplementary Material, Appendix V). Such small effect size for firm performance models is not surprising, as the variance in firm performance can be attributed to multiple individual-, firm-, and industry-level factors (Wales, Parida, & Patel, 2013; Yang, Narayanan, & De Carolis, 2014), whereas we considered only observable firm-level variables, such as diversification experiences and absorptive capacity,



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to understand their performance outcomes. Furthermore, although we relied on the organizational learning perspective to explain the outcomes of learning from experiences, our measures of explanatory variables – diversification experience and absorptive capacity – are indirect, which may not adequately capture the organizational routines and processes that enable learning and help firms develop absorptive capacity (Lewin et al., 2011). Although patent-based measures are established proxies for absorptive capacity (Dushnitsky & Lenox, 2005), such indirect measures may not capture the internal and external routines and socially enabling mechanisms that facilitate learning and knowledge sharing (Lewin et al., 2011). Nonetheless, although our data and measures did not allow us to look at the microfoundations of absorptive capacity and organizational learning, our findings enhance the extant understanding about the crucial role of absorptive capacity in enabling performance from prior diversification experiences. Given our focus to understand the enabler of performance from prior diversification experiences, our findings make meaningful contribution with reasonable models (Cohen, 1988; Wales et al., 2013; Yang et al., 2014). However, we suggest that future studies use direct measures of learning and absorptive capacity to improve explanatory power of our models (Camisón & Forés, 2010). We discuss the theoretical implications of our findings below.

## Theoretical Implications

We advance the research on performance effects of diversification experiences by examining the contingent role of absorptive capacity (Andreou et al., 2016; Nguyen & Cai, 2016; Zahavi & Lavie, 2013). Extant literature suggests that diversification experiences can enhance performance, provided they are not highly unrelated (Andreou et al., 2016; Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999). However, there has been limited understanding about the contingent role of firms' learning capabilities (i.e., absorptive capacity) in affecting the outcome of diversification experiences. This study highlights that absorptive capacity is crucial for creating and capturing the value from prior diversification experiences (Cohen & Levinthal, 1990; Dushnitsky & Lenox, 2005; Levitt & March, 1988).

Furthermore, the findings also suggest that absorptive capacity may help mitigate some of the negative transfer effects associated with unrelatedness in diversification experiences. Drawing on the learning perspective (mainly the 'experience transfer theory'), prior studies have highlighted how unrelatedness in prior diversification experiences can lead to negative transfer, affecting the performance outcomes negatively (Finkelstein & Haleblian, 2002; Haleblian & Finkelstein, 1999). Our findings contribute to this stream of literature by suggesting that firms with superior absorptive capacity can mitigate some of the challenges associated with unrelatedness in diversification experiences. That is, firms that possess superior knowledge stock and intellectual assets can better manage the diverse knowledge



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flow and reduce negative transfer effects associated with unrelatedness. Our study, thus, has implications for the learning perspective as it highlights absorptive capacity as an important firm-specific learning capability that can explain why some firms are able to accumulate and make better use of their unrelated diversification experiences than others (Cohen & Levinthal, 1990; Levitt & March, 1988).

Furthermore, in a more general sense, our findings also add to our understanding of the role of absorptive capacity in enhancing firm performance by enabling acquisition and utilization of knowledge from diverse contexts (Tsai, 2001; Zhang, Li, Li, & Zhou, 2010). Our findings are consistent with prior studies which suggest that a firm's absorptive capacity can positively affect the performance outcome of learning from diverse sources (Tsai, 2001; Zhang et al., 2010). We extend this stream of research in two important ways. First, our findings add nuance to the extant understanding by highlighting that absorptive capacity helps translate experiences gathered in both diverse product and international markets. The diversification experiences gathered in product and international domains are distinct (Mayer et al., 2014). Thus, our findings emphasize that firms' abilities to value, acquire, and utilize knowledge are important for both types of diversification experiences. Second, although the extant literature suggests that absorptive capacity can enable learning from diverse contexts (Tsai, 2001; Zhang et al., 2010), there has been little empirical evidence about whether its benefits will accrue if sources of learning are highly diverse or unrelated (i.e., unrelatedness in the diversification experiences in this study). In this regard, our findings highlight that absorptive capacity can mitigate the challenges associated with high level of diversity or unrelatedness in sources of learning. However, it is important to emphasize that we have not captured the minute differences (unrelatedness) in the sources of learning within product or international markets, such as differences in buyers, suppliers, partners, and technological and institutional contexts in these markets. Future studies can measure the level of diversity (unrelatedness) in a more nuanced manner and contribute to the ongoing debates on the role of absorptive capacity in enabling learning from diverse sources (Tsai, 2001; Vasudeva & Anand, 2011).

## Limitations and Future Research Directions

There are a few limitations of this study which provide avenues for future research. First, for empirical analyses, we used a relatively small sample of firms from the knowledge-intensive manufacturing sector only. Accordingly, our findings are generalizable to the manufacturing industries which are characterized by high use of knowledge assets (Cavaliere, Lombardi, & Giustiniano, 2015). Future studies may consider knowledge-intensive service sectors as well to enhance generalizability of the findings. Second, data are taken from a single-country context. We suggest that a multi-country sample will be helpful in establishing generalizability of the findings across multiple broad empirical contexts. Third, we measured diversification



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experience as a count of a firm's diversification moves in the past ten years in product or international markets. However, despite wide use in the literature (Haleblian & Finkelstein, 1999; Nguyen & Cai, 2016), a count-based measure has a limitation as it loses out the richness of the experience gained through different levels of exposure in different business sectors or international markets. We could not measure experience based on the number of years of exposure because of the unavailability of reliable data. Future studies can survey firms to get rich information about their experience in diverse product and international markets. Finally, we measured absorptive capacity using proxies based on financial and patenting data. Although these proxies are well established (Dushnitsky & Lenox, 2005; Nieto & Quevedo, 2005), managerial assessment of learning and performance may provide further insights. Future studies may use surveys to operationalize absorptive capacity (Camisón & Forés, 2010).

## CONCLUSION

In conclusion, this study suggests that absorptive capacity is a crucial firm-specific capability that impacts the extent to which firms could translate their product and international diversification experiences toward superior performance. Absorptive capacity helps mitigate challenges associated with unrelatedness in diversification experiences and reduces the negative transfer effects. Thus, our findings apprise managers that the development of absorptive capacity is important to enhance benefits of diversification experiences.

## SUPPLEMENTARY MATERIAL

The supplementary material for this article can be found at https://doi.org/10.1017/mor.2022.44

## NOTES

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[1] Product and international diversification experience variables were measured based on the diversification information since 1998. Additionally, to measure patent stock diversity and knowledge stock, all the historical data on granted patents were gathered untill 2018.
[2] For the models related to product diversification experience, there were 168 firms in the final sample, whereas for models related to international diversification experience, the final sample included 167 firms.
[3] The number of observations reduced because of two reasons: first, all the independent variables were lagged by a year; second, when AR(1) was specified for the FGLS models, all the panels that had a single observation were excluded. For the random-effect models (with robust standard errors), the number of observations for the product diversification experience were 1,005 (190 firms) and 1,007 (190 firms) for Tobin's $Q$ and ROA models, respectively, and, those for the

international diversification experience were 999 (189 firms) and 1001 (189 firms) for Tobin's *Q* and ROA models, respectively.

[4] A few diversification events (44 out of 1,772) involved simultaneous move into new product and international markets. These were counted for calculating both product and international diversification experiences. In additional analysis, we removed these 44 events but found similar results. Since there is no strong reason for the removal of these diversification moves, we retained them in the final analysis which is presented in this article.

[5] For the illustration of effect size, low level of variable means the value is 1 SD below the mean, whereas high level means the value is 1 SD above the mean.

[6] Marginal effect signifies the positive or negative change in DV when the explanatory variable is increased by one unit while keeping all other variables at constant. A positive sign of marginal effect means an increase in value, whereas a negative sign means a decrease in value of the DV.

[7] The figure presenting the moderation effect of intellectual capital efficiency on the relationship between product diversification experience unrelatedness and ROA is not included in the Supplementary Material, Appendix VI, because of the space constraints. However, the same could be obtained from the authors.

[8] The figure presenting the moderation effect of intellectual capital efficiency on the relationship between international diversification experience unrelatedness and ROA can be obtained from the authors.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Open Science Framework at https://osf.io/4sxkh/?view_only=8c49fa2a2f6949399685bf64dfe7baa4. The folder name is 'Data File and Instruction for Replication'.

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