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Investigating the Relationship between Innovation Strategy and Performance

Kenneth B. Kahn and Marina Candi

Abstract

Existing research indicates that the decision to pursue an exploitation innovation strategy or an exploration innovation strategy will have performance implications. The present research investigates how firm size and the type of offering (product or service) moderate the relationship between innovation strategy and performance. Results from two empirical studies involving distinct samples of US managers show that firm size and type of offering do indeed moderate the relationships between innovation strategy and performance and that dual moderation effects exist as well. The results challenge the prevailing notion that there is a linear progression of increasing benefits from smaller to larger firms when enacting an exploitation innovation strategy and an inverse linear progression from larger to smaller firms when enacting an exploration strategy. Rather, non-linear moderating effects by firm size are identified, which offers more nuanced insights than presented in existing research. And while it is generally presumed that service firms pursue and benefit primarily from an exploitation innovation strategy, the findings indicate that service firms actually benefit from an exploration innovation strategy regardless of size. The findings further suggest that the performance implications of innovation ambidexterity vary across contexts. Managerial and research implications are discussed.

Keywords: Innovation Strategy, Innovation Ambidexterity, Firm Size, Product vs Service Innovation

Introduction

Exploration and exploitation are essential strategies for innovation (March, 1991), but because resources are not unlimited and each requires a different set of capabilities, firms make explicit and implicit choices between the two. A firm choosing to pursue an exploitation innovation strategy will focus on refining and extending current resources, enhancing efficiency for short-term performance gains while a firm choosing to pursue an exploration innovation strategy will aim to identify and pursue new alternatives intended to foster longer-term growth and profitability (March, 1991; Zhang et al., 2017). Although the two strategies appear juxtaposed, which would imply a strategic choice between whether to pursue one or the other, innovation ambidexterity may be possible, where the two strategies are pursued jointly to bring about robust performance. Some research finds positive performance impacts from innovation ambidexterity (Katou et al., 2020; He and Wong, 2004; Day and Moorman, 2010), while other research reports mixed evidence (cf. Junni et al., 2013). Research also presents evidence of moderators of the relationship between innovation strategy and performance (cf. Junni et al., 2013; Solís-Molina, 2018).

Firm size and type of offering (product or service) are two moderators that deserve particular consideration. Firm size is one of the more debated firm-level factors influencing innovation performance (cf. Messeni Petruzzelli, et al., 2018) and studying service firms is a needed extension to mostly product-centric research in order to understand the effects by type of offering (cf. Solís-Molina et al., 2018). Regarding firm size, Schumpeter (1942) posed *the firm size and R&D hypothesis*, which asserts that larger firms are the major engine of economic growth. Later research has followed this line of thinking and there is popular consensus around the notion that larger firms will likely achieve success through an

exploration strategy, while smaller firms will more likely achieve success by pursuing an exploitation strategy. Larger firms are also believed to be more likely to reap positive performance outcomes from the joint pursuit of exploration and exploitation strategies due to resource availability (cf. O'Reilly and Tushman 2011), although there is evidence that smaller firms may benefit from innovation ambidexterity too (cf. Lubatkin et al., 2006). The changing nature of innovation, markets, and technological developments over the past decade warrants re-examining the moderating effect of firm size on the innovation strategy-performance relationship.

Research on innovation strategies has been conducted predominantly in product firms, leaving innovation in service firms less understood. Meanwhile, like products, services have been strongly influenced by the changing nature of innovation, markets, and technology in the past decade, thereby requiring investigation. Of the limited existing research on type of offering, some research finds that product firms are more likely to pursue an exploration strategy in order to stay competitive than service firms while other research argues that service firms need to be more ambidextrous (cf. Junni et al., 2013).

Two general research questions guide this research. One, *does firm size moderate the relationship between innovation strategy and innovation performance?* Answering this question addresses whether firm size might predispose a firm to pursue a particular innovation strategy or both strategies in order to drive successful performance. Two, *does the type of offering (product versus service) moderate the relationship between innovation strategy and innovation performance?* This latter question examines whether product and service firms reap the same, or different, performance outcomes from enacting exploitation

and/or exploration innovation strategies. In addition to examining each moderating effect, a dual moderation by firm size (small, medium, large) and type of offering (product, service) on the innovation strategy-performance relationship is investigated.

Answering these questions and presenting empirical findings, this research makes important contributions for theory and practice. The findings challenge some of the prevailing notions about what innovation strategies should be pursued based on firm size and the type of offering, and highlight the contexts in which an exploitation or exploration innovation strategy is more or less likely to lead to improved performance. In the case of firm size, the findings indicate that non-linear moderating effects may exist, which challenges prevailing assumptions about linear moderating effects of firm size on the innovation strategy-performance relationship. Testing the innovation ambidexterity hypothesis, we find mixed results. Pursuing exploitation and exploration jointly is particularly beneficial for large product firms, while pursuing the two strategies independently appears to be more beneficial for small service firms. Such results add to the discourse on whether innovation ambidexterity is universally beneficial across contexts.

The manuscript begins with a literature review discussing the innovation strategy to performance relationship by way of exploitation and exploration strategies and the possible moderating effects of firm size and offering type. Four hypotheses are developed. A two-study methodology to test the hypotheses is then discussed and the results of Study One, which comprised small, medium, and large product firms, and Study Two, which examined product and service firms of varied sizes, are presented. The manuscript concludes with discussion, managerial implications and future research directions.

Literature and Hypotheses

Exploitation and exploration innovation strategies are recognized as central to driving innovation and sustaining firm success (March 1991; Yalcinkaya et al., 2007). An exploitation strategy is generally associated with incremental improvements to offerings that satisfy existing customers in known markets (Siren, et al., 2012). Through exploitation, a firm is able to build on current competitive advantage and efficiently manage existing resources and capabilities to improve the designs of current products and services or to strengthen current customer relationships (Benner and Tushman, 2003; Hitt et al., 2011; Lubatkin et al., 2006). An exploration strategy is associated with more breakthrough or radical departures from existing offerings such as new to the world products or services, creating new markets, and the identification of needs for emerging markets (Siren, et al., 2012). Through exploration, a firm is able to recognize opportunities, develop new knowledge, and create capabilities around new products and markets, which are necessary for survival and long-term prosperity (Ireland et al., 2003; March, 1991; Uotila, et al., 2009). Researchers tend to characterize exploitation and exploration as two distinct innovation strategies that may occur simultaneously (Burgelman 2002; Hitt et al., 2011; Lubatkin et al., 2006). When pursued jointly, the term *innovation ambidexterity* is commonly used and refers to the ability to jointly pursue exploration and exploitation strategies (cf. Ardito et al., 2021; Ardito, et al, 2020; Messeni Petruzzelli 2014; Siggelkow, 2002). Empirical work, primarily conducted in the context of product firms, provides evidence of positive innovation performance impacts from jointly pursuing exploitation and exploration strategies (Birkinshaw and Gibson, 2004; He and Wong, 2004; Lubatkin et al., 2006; McDermott and Pravogo 2012; Messeni Petruzzelli 2014; Sarkees et. al, 2014), although other research

indicates that jointly pursuing these two strategies does not guarantee success (Venkatraman et al., 2007). This suggests that the connection between innovation strategy and performance may depend on, and be moderated by, contingency characteristics (Yang and Li, 2011). The moderating effects of firm size and type of offering are now discussed.

Innovation Strategy and Firm Size

The effect of firm size on innovation has been a long-standing topic for debate in the economics literature. Seminal work by Schumpeter (1942) posed *the firm size and R&D hypothesis*, which asserts that larger firms are the major engine of economic growth. Firm size affords the advantage of scale economies as larger firms can amortize their R&D investment over a large number of units (cf. Cohen and Klepper 1996). Consequently, larger firms are believed to be more likely to pursue riskier, more radical innovation than smaller firms. Studies of innovation behavior have found that R&D investment tends to increase with scale (e.g., Baldwin and Scott, 1987; Scherer and Ross, 1990), while other studies have found that small firms are more productive at R&D (e.g., Pavitt et al., 1987; Acs and Audretsch, 1990). Recent research by Knott and Vieregger (2016) verified that R&D spending and R&D productivity both do appear to increase with firm size.

Innovation management and entrepreneurship research also supports the premise that firm size influences the relationship between innovation strategy and performance. Ettlie and Rubenstein (1987) found that large firms commercialize radically new products more successfully than small firms because they have greater resources and easier access to resources in order to make commercialization happen. While these authors did find that the introduction of radically new products tapered off as firms became very large, the level of

radical innovation was still higher than that of smaller firms. Bhaskaran (2006) found that small and medium-sized enterprises (SMEs) tend to favor incremental innovation because these innovations can be adopted and operationalized more rapidly by these firms. This better positions SMEs to be competitive and especially compete successfully with larger businesses (Bhaskaran 2006).

Studying the moderating effect of firm size on knowledge maturity and innovation value, Messeni Petruzzelli, et al. (2018) noted that large firms have many advantages over smaller firms to capitalize on knowledge to drive innovation. These include a larger R&D staff comprising specialized talent that would be more likely to recognize opportunities, greater slack human resources that can be devoted to riskier projects, higher economies of scale to spread out costs, and wider portfolios of businesses that may compensate potential losses. Such factors reduce risk for larger firms versus smaller firms and provide more chances for innovation by large firms. Their empirical results, based on a sample of biotechnology firms, found that larger firms outperformed smaller firms when innovation was based on nascent or mature knowledge. Smaller firms appeared to perform better in the region between nascent and mature knowledge. This suggests that firm size enables firms to create valuable innovations by leveraging knowledge with a very low or very high maturity level (Messeni Petruzzelli et al. 2018).

The above discussion affirms that firm size is likely to moderate the relationship between innovation strategy and performance. With larger firms having more resources to invest in innovation and an exploration innovation strategy requiring sufficient resources to absorb the costs of, and garner resources to develop, higher risk innovations, it is likely that larger firms

are more apt to invest in and gain from an exploration strategy. Smaller firms tend to be more resource-constrained than larger firms (Cohen, et al., 2000; Messeni Petruzzelli et al. 2018), making smaller firms less likely than larger firms to be able to successfully pursue an exploration innovation strategy. Meanwhile, small firms' pursuit of an exploitation strategy will not deplete scarce resources as dramatically as an exploration strategy (Cegarra-Navarro and Dewhurst, 2007) leading them to be more likely to emphasize efficiency over novelty (Felicio et al., 2019). Work by McDermott and Prajogo (2012) corroborates the above, finding that as firms grow in size, the effect of exploration on performance increases while exploitation's link to performance decreases.

Because of their resource constraints, smaller firms' pursuit of an exploitation innovation strategy should relate with more substantial performance than the pursuit of an exploration strategy. Conversely, larger firms' pursuit of an exploration innovation strategy should relate to more substantial performance outcomes because these firms have the resources to support exploration. Therefore, we hypothesize the following:

H1: The relationship between innovation strategy and performance is moderated by firm size.

H1a: The relationship between an exploitation innovation strategy and performance is negatively moderated by firm size.

H1b: The relationship between an exploration innovation strategy and performance is positively moderated by firm size.

Regarding innovation ambidexterity, Knott and Vieregger (2016) found that as firm size increases, there is an increased likelihood of jointly pursuing exploitative and explorative strategies and thereby achieving greater productivity. Larger firms' greater resource availability enables these firms to jointly pursue exploitation and exploration innovation

strategies and be more likely than smaller firms to reap positive performance outcomes from a strategy of innovation ambidexterity. Other research indicates that entrepreneurial SMEs may be unable to develop an ambidextrous approach because they do not have the resources to fully manage internal and external relationships, forcing a choice between exploitation or exploration (Solís-Molina et al., 2018; Cenamor et al., 2019). Innovation ambidexterity incurs demanding requirements to balance exploitation and exploration, which SMEs cannot successfully accomplish with their limited resources (Junni et al., 2013). Entrepreneurial SMEs may be better off focusing on either exploitation or exploration (Solís-Molina et al., 2018) and reflect similar effects on organizational performance (Felicio et al., 2019).

Hypothesis H2 is given below:

H2: The relationship between a strategy of innovation ambidexterity and performance is positively moderated by firm size.

Innovation Strategy and Type of Offering

Documented differences between product and service firms (cf. Nijssen, et al., 2006; O’Cass and Wetzels, 2018) imply that the innovation strategy-performance relationship will differ between product and service firms. A limited number of empirical studies have specifically addressed type of offering as a moderating variable on the relationship.

Fischer et al., (2010) found that service firms tend to favor an exploitation strategy due to many services being based on the exploitation of technology, which rapidly changes and requires constant attention (Van den Ende and Wijnberg, 2001). Another reason for service firms favoring an exploitation strategy is that many service firms do not have dedicated

earmarked R&D resources, e.g., staffing, processes, and systems, for radical innovation typical in product firms (Nijssen et al., 2006). A lack of earmarked R&D resources inhibits service firms' ability to enact an exploration strategy and lowers the probability of success from exploration activities, which in turn, is likely to reinforce a tendency to focus on, develop competency in, and benefit from exploitation (Groysberg and Lee, 2009; Blindenbach-Driessen and van den Ende, 2014). The availability and dedication of resources for innovation is a primary rationale for the existence of dedicated innovation units in product firms, as noted in a study by Blindenbach-Driessen and van den Ende (2014). The authors further posited that costs and the higher complexities in the transfer process from developers to the front office are reasons for why service firms are less likely able to maintain separate innovation units. Similarly, in a meta-analysis of 114 studies, Fourné et al. (2019) presented evidence that product firms invest in and support separate structural units, which are more conducive to enact an exploration strategy; product firms are therefore more likely to adopt an exploration innovation strategy. Conversely, service firms appear to make lesser innovation investments due to resource constraints and favor an exploitation strategy.

We therefore hypothesize that product firms are more inclined to pursue an exploration strategy and reflect higher performance when doing so. Comparably, service firms are more inclined to pursue an exploitation strategy in order to sustain successful performance.

H3: The relationship between innovation strategy and performance is moderated by the type of offering.

H3a: The relationship between an exploitation innovation strategy and performance is stronger in service firms than in product firms.

H3b: The relationship between an exploration innovation strategy and performance is stronger in product firms than in service firms.

Results of a meta-analysis conducted by Junni et al. (2013) revealed that service industries studies report a strong positive relationship between innovation ambidexterity and performance, and that this relationship is stronger than reflected in studies of product firms. This infers that innovation ambidexterity may actually be less important in product firms than in service firms. As previously noted, the reliance on technology by many service markets and dynamism resulting from digital transformation may actually require service firms to continuously look for new opportunities (exploration) along with exploiting existing resources because the duration of an existing competitive advantage is uncertain (Junni et al., 2013). Fourné et al. (2019) also showed that some service firms favored joint use of exploration and exploitation strategies. Such correspondence of findings implies that service firms may benefit more from innovation ambidexterity, reaping performance benefits when jointly pursuing exploitation and exploration strategies. Hypothesis H4 is proposed as follows:

H4: The relationship between a strategy of innovation ambidexterity and performance is stronger in service firms than in product firms.

Methodology

Two empirical studies, referred to as Study One and Study Two, were undertaken to test the hypotheses. Study Two replicates elements of Study One, which offers the opportunity to explore the generalizability of study findings (Block and Kuckertz 2018). Both data sets were collected prior to the COVID-19 pandemic.

Study One is based on a sample of managers of product firms engaged in innovation located in the United States (US). Study Two is based on a sample of managers of US-based firms that develop either new products or new services. For both studies, panel service providers were employed to collect data using a web-based survey. Support for the use of this type of data collection procedure comes from various empirical studies that show no significant difference compared with random samples as long as the respondents have the necessary knowledge to complete the survey (Krotki and Dennis, 2001; Pollard, 2002; Skinner, 2009). To minimize the risk of respondent overlap between the two studies, two different panel research providers were employed, one headquartered in Europe and the other based in the US; each provider curates different panels of managers of firms located in the US. For Study One, the panel service provider was provided with a list of manufacturing sectors from which to collect data. For Study Two, data were collected from roughly an equal number of respondents from manufacturing sectors and service sectors.

In both studies, validity was ensured by imposing a number of criteria to qualify respondents. The first criterion was that firms for which respondents worked had to operate in one of the specified sectors. The second criterion was that firms for which respondents worked had to be for-profit firms engaged in innovation. The third criterion was that respondents must hold management positions in their firms. The fourth criterion was that responding managers must be knowledgeable about their firm's innovation activities. In cases where these four criteria were not all met, respondents were disqualified from participation. In Study Two, an additional criterion was imposed. Potential respondents were asked whether their firms were engaged primarily in product innovation or primarily in service innovation; if the response was neither or both, the respective respondent was disqualified from the survey sample.

Study One's sample comprised 321 responses out of a panel of 1035 managers, corresponding to a 31% response rate. After dropping cases containing missing values, 248 usable responses remained. The industry composition of the sample included 24% of the responses from managers of firms in aerospace and defense sectors, 23% in industrial manufacturing sectors, 17% in automotive sectors, 15% in consumer products manufacturing, 15% in electronics manufacturing and 6% in information/telecommunications equipment sectors.

A total of 613 usable responses were collected in Study Two, comprising 334 product firms and 279 service firms. With a panel of 1000 managers targeted for each type of firm, the response rates were 33% and 28% for product and service firms, respectively. The top four industry sectors represented were information technology (27%), professional services (15%), healthcare (9%), and retail (9%).

The same survey items were included in both studies. Exploration and exploitation innovation strategies were measured using the scales developed by He and Wong (2004). Items to measure innovation performance were drawn from the work of Griffin and Page (1993, 1996) and Moorman and Rust (1999) and included market success, market growth and financial performance. Firm size was based on respondents' answers to the question of how many people were employed by their firms. The samples were divided into groups using Gartner's (2020) definition for firm size: firms with fewer than 100 employees were classified as small, firms with 100-999 employees were classified as medium-sized, and firms with 1000 or more employees were classified as large. Respondents' answers to the type of

offering (product or service) served as the type of offering variable. Refer to Table 1 for a list of variables and corresponding survey items.

--- Insert Table 1 About Here ---

For Study One's dataset, measurement model analysis indicated good model fit with $\chi^2 = 358$ (156 degrees of freedom), root mean squared error of approximation (RMSEA) = 0.067, comparative fit index (CFI) = 0.94 and Standardized root mean squared residual (SRMR) = 0.054. All average variances extracted were above the generally accepted 0.5 cut-off and all composite reliabilities were over 0.7.

Pairwise correlations between variables and the average variances extracted are shown in Table 2. Based on these data, the Fornell and Larcker (1981) criterion for discriminant validity is met. Guidelines proposed by Grewal et al. (2004) were employed to detect potential multicollinearity for various ranges of correlations between independent variables in structural models. Grewal et al.'s guidelines stipulate that multicollinearity is not likely to be a problem if reliability is strong (in this case, 0.83-0.87), R^2 is acceptable (in this case, 46-65%), and sample size is sufficiently large (in this case, the sample size exceeded 200).

--- Insert Table 2 About Here ---

Study Two's dataset also reflected good measurement model fit statistics, with RMSEA=0.060, CFI=0.96, SRMR=0.047, all average variances extracted over 0.5 and composite reliabilities over 0.7. Pairwise correlations and average variances extracted are shown in Table 2. As with Study One, the pairwise correlations and average variances

extracted along with the R^2 s and composite reliabilities indicate that discriminant validity is adequate and multicollinearity was not likely a problem.

Because the data were collected from single respondents, the possibility of common method bias was addressed. Procedural remedies recommended by Podsakoff et al. (2003) were employed in executing the data collection. To reduce the risk of respondents selecting answers they might deem to be more socially acceptable, the survey clearly stated that respondents would remain anonymous, which was ensured by using a third-party panel research provider to collect the data. To test for common method bias, four items measuring a variable unrelated to the topic of this research — employee flexibility — were included in the surveys (Bagozzi, 2011; Lindell and Whitney, 2001). When included in a factor analysis of each sample, these items loaded on one variable and did not have any substantial cross-loadings with other variables, alleviating common method bias concerns.

Stata version 15.1 was used for all statistical analyses.

Results

Study One

Analyses were conducted using multi-group structural equation modelling to enable comparisons among small, medium-sized and large firms. Addressing hypotheses 1 and 2, Study One results are shown in Table 3. For small firms, an exploitation innovation strategy is related with all three performance variables at statistically significant levels, while an exploration innovation strategy is not. Medium-sized firms exhibit a different pattern, where an exploration innovation strategy is related to market growth and financial performance, and

an exploitation innovation strategy is related to market success. It would appear that when firms reach medium size (exceeding the threshold of 100 employees), success begins to hinge not only on exploiting known certainties but also on exploring new possibilities and taking risk. Market success, which is essentially a measure of customer acceptance, is related with an exploitation strategy in medium-sized firms, akin to small firms; small and medium-sized firms do not appear to gain market success benefits from an explorative innovation strategy. In the large firm group, an exploration innovation strategy is related with all three performance variables. An exploitation innovation strategy is related with all three performance variables in the large firm group as well.

Across the size groups, we see that the relationship between exploitation and both financial performance and market growth is weaker for medium-sized than for small firms, which supports hypothesis 1a. When comparing medium sized and large firms, we see that the relationships are stronger for large firms, which contradicts hypothesis 1a. Thus, firm size exert a moderating effect, albeit a non-linear moderating effect, on the relationships between exploitation and performance variables. The non-linearity of the effect fails to support hypothesis 1a for the entire range from small to large firms, while the positive moderating effect of firm size on the relationship between exploration and performance is supported when comparing small and medium-sized firms for all three performance variables and when comparing medium sized and large firms except in the case of market success.

With regards to innovation ambidexterity, the significant positive relationships of both exploitation and exploration strategies with performance in the case of large firms suggests

that large product firms benefit from innovation ambidexterity. This lends support to hypothesis 2.

--- Insert Table 3 About Here ---

Study Two

For Study Two, multi-group structural equation modelling compared six groups (3 firm size groups x 2 types of offerings). All hypotheses could therefore be tested. As shown in Table 4, Study Two findings regarding product firms are consistent with those of Study One, with the exception of the relationship between exploration and market growth in small product firms, which is statistically significant in Study Two, but was not in Study One. Like Study One, Study Two supports hypothesis 1 about a moderating effect of firm size on the relationships between innovation strategy and performance. As was found in Study One, the moderating effect for exploitation is negative when small and medium-sized firms are compared (supporting hypothesis 1a) and positive when medium-sized and large firms are compared (contradicting hypothesis 1a). Thus, the results for hypothesis 1a point to a non-linear moderating effect. Also consistent with the findings of Study Two, hypothesis 1b is supported when comparing medium-sized and large firms, but not when comparing small and medium-sized firms. Thus, the positive moderating effect of firm size on the relationships between exploration and performance appears to follow a second-order convex shape. The moderating effects of firm size will be examined in more detail below using moderated regression analysis.

--- Insert Table 4 About Here ---

Results concerning service firms present an almost completely different picture and greatly contrast product firms. In small service firms, both exploitation and exploration are related with financial performance and market success, and exploration (but not exploitation) is related with market growth. Hypothesis 1a only supported for market success in service firms and hypothesis 1b is not supported, since the relationships between exploration and the performance variables are essentially consistent across the three size groups. Hypothesis 2 is also not supported in service firms, since it is only in the small firm group that we see both exploitation and exploration contributing to performance.

Hypothesis 3a posits that the relationship between exploitation and performance will be stronger in service firms than in product firms. This hypothesis is not supported by the data because all standardized coefficients for exploitation are smaller for service firms than product firms. Hypothesis 3b anticipates that the relationship between exploration and performance will be stronger in product firms than service firms. This hypothesis is supported only for large firms. It would appear that when it comes to service firms, exploration might be more effective than exploitation in driving performance. These findings correspond to Junni et al. (2013), who reported that an exploration strategy appeared to outperform an exploitation strategy in service firms.

Further examination of interaction effects

To further examine the moderating effects of firm size (hypothesis 1), moderated regression analyses were conducted for each of the dependent variables. In the first step of hierarchical moderated regression, the variables for exploitation and exploration were included, next the moderator variable (firm size) was added. The logarithm of firm size was used to obtain a

more normal distribution (Tukey, 1977). Next, the interactions between firm size and exploitation and exploration were added to the model to test for linear moderation. Since the results shown in Table 3 and Table 4 suggest non-linear second-order moderations, firm size squared was then added to the model. Finally, the interactions between exploitation and exploration, respectively, and firm size squared were added. The results of the final steps of hierarchical moderated regression for each of the dependent variables are shown in Table 5 for product firms and in Table 6 for service firms.

--- Insert Table 5 About Here ---

--- Insert Table 6 About Here ---

The results shown in Tables 5 and 6 are consistent with the results shown in Table 4 and the 8 statistically significant interactions are plotted in Figures 1-6.

The findings of Study Two indicate that innovation ambidexterity, where both exploitation and exploration are pursued, contributes to performance in small service firms and in large product firms. This affirms hypothesis 2 for product firms and hypothesis 4 for small firms. It further poses a dual moderating effect by firm size and type of offering on innovation ambidexterity, where the pursuit of an exploitation strategy and an exploration strategy could be particularly relevant for large product firms and for small service firms. With evidence of positive contributions for innovation ambidexterity noted in large product firms and small service firms, moderated regression analysis was conducted for these two sub-groups. The analysis included the interaction between exploitation and exploration to assess the nature of this interaction in accordance with the procedure suggested by He and Wong (2004).

As show in Table 7, the interaction was statistically significant in the case of large product firms for all dependent variables. This result supports He and Wong's (2004) ambidexterity hypothesis. However, the interaction was not statistically significant in the case of small service firms. This latter finding corroborates with the results of Fourné et al. (2019), who suggested that exploration and exploitation may be able to coexist independently. The pursuit of each strategy in small service firms would appear to neither compromise nor reinforce the effects of the other. Interestingly, existing research has tended to study samples comprising large product firms, which this study indicates would reflect a significant interaction effect. Small service firms, which have been sparsely studied, do not show this effect, but instead, show exploration and exploitation innovation strategies to be coexisting and independent.

--- Insert Table 7 About Here ---

Discussion

Overall, the findings of this research demonstrate that firm size and type of offering moderate the relationships between innovation strategy and performance. There appear to be dual moderation effects as well.

With regards to firm size, a moderating effect is affirmed in product firms across Studies One and Two. Small product firms appear to benefit from pursuing an exploitation strategy, as this strategy reflects significant relationships with all three performance variables in small product firms across the two studies. Hence, refining and extending current resources to enhance firm efficiency and address short-term goals contributes to performance in small

product firms. While Study Two showed a statistically significant relationship between exploration and market growth in the case of small product firm, which was not expected and implies further study is needed, the commonality of findings across Studies One and Two present evidence that small product firms will derive benefits from pursuing an exploitation strategy.

As firm size increases, an exploration strategy begins to reflect significant relationships with performance variables in product firms. For medium-sized product firms, an exploration strategy is positively related to financial performance and market growth, while an exploitation strategy is related to market success. Identifying new alternatives by way of new products is a distinguishing performance factor for medium-sized product firms to foster longer-term growth, which is characteristic of financial performance and succeeding/growing relative to competitors. Exploitation via refining and extending current resources appears to help medium-sized product firms meet customer needs and satisfy and retain customers.

For large product firms, there are statistically significant relationships between both exploitation and exploration strategies and all three performance variables. This suggests that large product firms can benefit from pursuing both exploitation and exploration strategies, and are likely to have the resources to enact these strategies successfully. The findings further suggest that the two strategies reinforce the positive effects of each other and large product firms can be advised to pursue innovation ambidexterity.

Whereas most existing research assumes that the moderating effects of firm size on the innovation strategy-performance relationship are linear, the present study shows the effects to be more likely non-linear. This result was derived from conducting a combination of multi-

group SEM and moderated regression analysis – as suggested by one of our reviewers, and highlights the value of conducting two sets of statistical tests of hypotheses.

The second research question was about whether the type of offering (product versus service) moderates the relationship between innovation strategy and innovation performance. Here, we found unexpected results. Contrary to prevailing notions, service firms not only benefit from an exploitation strategy, but an exploration strategy as well. Exploration appears to play a particularly important role for service firms with higher performance across all service firm sizes, including small firms.

An interesting pattern was noted in that small service firms that pursue both exploitation and exploration strategies reflect higher financial performance and market success; the same was shown for large product firms. Medium-sized and large service firms reflect a significant relationship between an exploration strategy and all three performance variables. Thus, service firms not only benefit from an exploitation strategy, but an exploration strategy as well. Results also indicate that small service firms can benefit from pursuing both exploitation and exploration. But, unlike large product firms, where pursuing exploitation and exploration jointly is particularly beneficial, in small service firms the two strategies can be pursued independently with independent contributions to performance. Further examination is needed as research posits that the relationship may be orthogonal, complementary, or competing (e.g., Venkatraman, et al., 2007; He and Wong, 2012; Blindenbach-Driessen and van den Ende, 2014).

Managerial and Research Implications

For managers, the results highlight exploration as a winning strategy for both product and service firms, with the possible exception of small product firms, where performance gains are more likely to be derived from a strategy of exploitation. Small service firms also can achieve higher performance with an exploitation strategy along with an exploration strategy. Exploitation is an important strategy for small firms, but the results suggest that only small product firms are likely to achieve success by pursuing exploitation exclusively.

Large product firms pursuing both exploitation and exploration strategies will reflect stronger performance across all areas measured, i.e., financial performance, market growth, and market success. Those medium-sized product firms that emphasize an exploration innovation strategy will reflect higher financial performance and market growth; medium-sized product firms that emphasize an exploitation strategy will reflect higher market success. Small product firms that rely on an exploitation strategy will reflect higher performance across all areas measured.

The results further indicate that an exploration innovation strategy, not one of exploitation, is related with higher performance for medium sized and large service firms. In the case of small service firms, an exploration strategy also reflects higher market growth. These results show that not only does firm size moderate the innovation strategy-performance relationship, but so does the type of offering—product or service.

Several important contributions for theory and practice emerge from the present empirical investigations. One, the findings challenge long-standing notions about differences in innovation strategies between smaller and larger firms. This may be due, in part, to

technological change and digital transformation, which supports the development and launch of novel services even by small firms. Across product and service firms, it appears that medium-sized and large firms can capitalize on exploration for higher performance because exploration reflects a significant positive relationship with performance across both product firm samples and the service firm sample. A significant exploitation-to-performance relationship was found primarily in smaller firms, but large product firms also might capitalize on exploitation for performance success and by jointly pursuing exploitation and exploration innovation strategies. The discovery of non-linear moderating effects by firm size on the innovation strategy to performance relationship offers a more nuanced picture than offered by existing research.

Two, the findings challenge the prevailing notion about differences in innovation strategies between product and service firms. In particular, while it is generally presumed that service firms pursue, and benefit from, primarily an exploitation innovation strategy, our findings show that service firms actually benefit from exploration regardless of size. This suggests that refining and improving services along with offering new alternatives is a means for small firms to be competitive in service markets; refining and improving products along with offering new alternatives is a means for large firms to be competitive in product markets.

Three, interaction analysis failed to indicate significant relationships between the combination of exploration and exploitation and performance outcomes except in the case of large product firms. This might reflect the fact that most research on innovation strategies and innovation ambidexterity has been conducted in larger product firms, while neglecting

smaller firms and service firm. Such results resonate with Venkatraman, et al. (2007), who found that pursuing exploration and exploitation jointly is not related with performance.

Limitations and Future Research Directions

Among potential limitations, the collection of data for dependent and independent variables from the same respondents has the potential to produce single respondent bias. Procedural measures were undertaken to minimize such bias and marker variable tests indicated that there was not common method bias. Deliberate measures also were undertaken during the data collection phase to qualify managers and ensure they were competent in answering questions about their firms' innovation activities.

A second potential limitation stems from the use of cross-sectional data sets. The correspondence of results across the two distinct datasets supports study findings, though future research should examine the relationships between innovation strategies and performance using longitudinal panel data. In this way, any time-dependent effects may be uncovered and afford the possibility of analyzing for causality.

Another limitation is the sample comprising managers of US-based firms. This raises the issue of generalizability to other geographical locations. While the use of two different panel service providers for each sample diminishes some data collection biases, replication using samples from other parts of the world is warranted. In addition, with many studies predicated on samples comprising product firms, further research should consider service firms. The present study offers a comparative study, where product and service firms are analyzed in the same study. This latter approach is encouraged for future research.

The results of the present study contribute to the ongoing discussion surrounding innovation ambidexterity and performance (cf. Ardito, et al., 2021; Ardito, et al, 2020; Messeni Petruzzelli 2014, 2019), but continued study of innovation ambidexterity is needed. One research avenue is to include preferences by different types of firms for exploration and exploitation innovation strategies in response to environmental factors such as technological domains, geographic domains, market uncertainty, technological dynamism, and competitive intensity (cf. Messeni Petruzzelli 2014). Such study could offer insights into the viability, advantages, and benefits associated with pursuing exploration and exploitation strategies, and discern whether and when it is may be more viable, advantageous, and beneficial to pursue these strategies independently or jointly.

While other moderators may be considered, the present research study proffers compelling evidence that the innovation strategy-to-innovation performance relationship is influenced by *firm size* – small, medium, or large, and *type of offering* – product or service. This implies that firm size and type of offering deserve more consideration than the control variable status most commonly seen. A prescription for future study is to include antecedents and performance outcomes, versus just choice of strategy. Doing so will further understanding of why firm size and type of offering influence the innovation strategy-performance relationship.

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Table 1: Variables and Survey Items in Studies One and Two

Variables	Items
Exploration innovation strategy	To what extent were the following among your firm's objectives for undertaking innovation projects in the past year: Developing completely new products Introducing new generations of products Extending the range for our products Opening up new markets for our products Entering new technology fields
Exploitation innovation strategy	To what extent were the following among your firm's objectives for undertaking innovation projects in the past year: Improving the quality of existing products Improving production flexibility Reducing production costs Improving yield or reducing material consumption
Market success	Thinking about the past year, please indicate the degree to which you agree or disagree with the following statements: Our customers were more satisfied than our competitors' customers We created more value for customers than our competitors did We fulfilled customers' needs better than our competitors did We were better able to retain existing customers than our competitors
Market growth	Thinking about the past year, please indicate the degree to which you agree or disagree with the following statements: We increased our market share more than our competitors We gained more new customers than our competitors We increased sales to existing customers more than our competitors Our revenue growth was greater than our competitors' revenue growth
Financial performance	Thinking about the past year, please indicate the degree to which you agree or disagree with the following statements: Our company's profits increased more than our competitors' profits Our returns on investment were greater than our competitors' returns on investment Our returns on sales (margins) were greater than our competitors' returns on sales Our financial performance was better than our competitors' financial performance

Table 2: Pairwise Correlations between Variables in Study One and Study Two
(Average variances extracted for each variable are shown on the diagonal in bold font)

Study One	1	2	3	4	5
1 Financial performance	0.70				
2 Market growth	0.71	0.62			
3 Market success	0.62	0.57	0.62		
4 Exploitation innovation strategy	0.52	0.48	0.58	0.60	
5 Exploration innovation strategy	0.49	0.49	0.46	0.59	0.51

Study Two	1	2	3	4	5
1 Financial performance	0.69				
2 Market growth	0.71	0.60			
3 Market success	0.66	0.68	0.59		
4 Exploitation innovation strategy	0.30	0.30	0.36	0.63	
5 Exploration innovation strategy	0.46	0.49	0.39	0.43	0.71

Table 3: Results of multi-group structural equation modelling including all three dependent variables in Study One. The maximum likelihood method was used.

	Small firms, N=50				Medium firms, N=76				Large firms, N=122				
	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z	
Financial performance <													
Exploitation	0.50	0.21	2.41	0.02 *	0.10	0.16	0.66	0.51	0.53	0.14	3.86	0.00 *	
Exploration	-0.06	0.23	-0.27	0.79	0.46	0.15	2.96	0.00 *	0.33	0.14	2.33	0.02 *	
Market growth <													
Exploitation	0.41	0.19	2.20	0.03 *	0.23	0.15	1.50	0.13	0.40	0.14	2.74	0.01 *	
Exploration	0.11	0.20	0.53	0.60	0.38	0.16	2.42	0.02 *	0.34	0.15	2.26	0.02 *	
Market success <													
Exploitation	0.64	0.16	3.91	0.00 *	0.57	0.19	2.92	0.00 *	0.51	0.16	3.12	0.00 *	
Exploration	-0.26	0.18	-1.41	0.16	0.01	0.25	0.06	0.95	0.36	0.18	2.03	0.04 *	

*p<0.05, **p<0.01

Table 4: Results of multi-group structural equation modelling including all three dependent variables in Study Two. The maximum likelihood method was used.

	Small product firms, N=78				Medium product firms, N=151				Large product firms, N=105			
	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z
Financial performance <												
Exploitation	0.37	0.13	2.82	0.01 *	0.08	0.11	0.75	0.46	0.28	0.11	2.51	0.01 *
Exploration	0.25	0.13	1.86	0.06	0.23	0.11	2.10	0.04 *	0.50	0.10	4.86	0.00 *
Market growth <												
Exploitation	0.30	0.13	2.21	0.03 *	0.01	0.11	0.09	0.93	0.37	0.12	3.20	0.00 *
Exploration	0.33	0.13	2.49	0.01 *	0.27	0.11	2.54	0.01 *	0.50	0.11	4.65	0.00 *
Market success <												
Exploitation	0.38	0.13	2.81	0.01 *	0.25	0.11	2.37	0.02 *	0.46	0.11	4.30	0.00 *
Exploration	0.18	0.14	1.33	0.19	0.20	0.10	1.95	0.05	0.40	0.11	3.78	0.00 *
	Small service firms, N=93				Medium service firms, N=101				Large service firms, N=85			
	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z	Coef.	Std. Err.	z	P>z
Financial performance <												
Exploitation	0.22	0.11	2.09	0.04 *	-0.12	0.11	-1.07	0.29	0.07	0.13	0.54	0.59
Exploration	0.49	0.08	6.32	0.00 *	0.46	0.09	5.15	0.00 *	0.33	0.11	2.92	0.00 *
Market growth <												
Exploitation	0.14	0.10	1.33	0.19	-0.03	0.11	-0.24	0.81	0.09	0.13	0.67	0.50
Exploration	0.59	0.07	7.98	0.00 *	0.49	0.09	5.72	0.00 *	0.37	0.11	3.29	0.00 *
Market success <												
Exploitation	0.34	0.11	2.98	0.00 *	0.17	0.11	1.62	0.11	0.06	0.14	0.42	0.67
Exploration	0.23	0.09	2.69	0.01 *	0.32	0.09	3.47	0.00 *	0.36	0.12	3.13	0.00 *

*p<0.05, **p<0.01

Table 5: Results of moderated regression analyses to test linear and non-linear moderation effects of firm size on relationships between innovation strategies and three performance variables for product firms.

Financial performance	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.13	0.04	2.93	0.00	**	0.06	0.05	1.24	0.22	
Exploration	0.26	0.04	5.82	0.00	**	0.18	0.05	3.26	0.00	**
Firm size (FS)	0.08	0.04	1.93	0.05		0.00	0.04	-0.10	0.92	
FS x Exploitation	-0.05	0.05	-0.85	0.40		0.02	0.06	0.37	0.71	
FS x Exploration	0.05	0.05	0.98	0.33		0.10	0.06	1.84	0.07	
FS ²						-0.11	0.03	-3.33	0.00	**
FS ² x Exploitation						0.09	0.04	2.03	0.04	*
FS ² x Exploration						0.10	0.05	2.00	0.05	*
Market growth	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.11	0.04	2.55	0.01	*	0.04	0.05	0.93	0.35	
Exploration	0.27	0.04	6.36	0.00	**	0.20	0.05	3.99	0.00	**
Firm size (FS)	0.10	0.04	2.52	0.01	*	0.06	0.04	1.49	0.14	
FS x Exploitation	-0.01	0.05	-0.27	0.78		0.02	0.05	0.44	0.66	
FS x Exploration	0.03	0.05	0.58	0.56		0.06	0.05	1.15	0.25	
FS ²						-0.07	0.03	-2.84	0.01	**
FS ² x Exploitation						0.07	0.03	2.16	0.03	*
FS ² x Exploration						0.07	0.04	2.01	0.05	*
Market success	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.20	0.04	5.17	0.00	**	0.15	0.05	3.27	0.00	**
Exploration	0.18	0.04	4.39	0.00	**	0.16	0.05	3.35	0.00	**
Firm size (FS)	0.03	0.04	0.69	0.49		0.01	0.04	0.16	0.87	
FS x Exploitation	0.01	0.05	0.20	0.84		0.02	0.05	0.51	0.61	
FS x Exploration	0.10	0.05	2.13	0.03	*	0.10	0.05	2.21	0.03	*
FS ²						-0.04	0.03	-1.57	0.12	
FS ² x Exploitation						0.07	0.03	2.24	0.03	*
FS ² x Exploration						0.01	0.04	0.21	0.83	

*p<0.05, **p<0.01

Table 6: Results of moderated regression analyses to test linear and non-linear moderation effects of firm size on relationships between innovation strategies and three performance variables for service firms.

Financial performance	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.09	0.05	1.91	0.06		0.00	0.06	0.05	0.96	
Exploration	0.25	0.05	4.91	0.00	**	0.30	0.06	4.81	0.00	**
Firm size (FS)	0.10	0.05	2.26	0.03	*	0.07	0.05	1.46	0.15	
FS x Exploitation	-0.06	0.05	-1.21	0.23		0.02	0.06	0.38	0.70	
FS x Exploration	0.00	0.05	0.02	0.98		-0.02	0.05	-0.42	0.68	
FS ²						-0.08	0.03	-2.27	0.02	*
FS ² x Exploitation						0.11	0.04	2.56	0.01	*
FS ² x Exploration						-0.06	0.04	-1.55	0.12	
Market growth	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.09	0.05	1.93	0.06		0.02	0.06	0.34	0.73	
Exploration	0.30	0.05	6.12	0.00	**	0.29	0.06	4.91	0.00	**
Firm size (FS)	0.06	0.04	1.44	0.15		0.01	0.05	0.31	0.75	
FS x Exploitation	-0.04	0.05	-0.96	0.34		0.02	0.05	0.50	0.62	
FS x Exploration	-0.04	0.04	-0.87	0.38		-0.01	0.05	-0.23	0.82	
FS ²						-0.11	0.03	-3.48	0.00	**
FS ² x Exploitation						0.08	0.03	2.37	0.02	*
FS ² x Exploration						0.01	0.03	0.16	0.87	
Market success	Coef.	Std. Err.	t	P>t		Coef.	Std. Err.	t	P>t	
Exploitation	0.16	0.05	3.34	0.00	**	0.13	0.06	2.38	0.02	*
Exploration	0.19	0.05	3.97	0.00	**	0.16	0.06	2.68	0.01	**
Firm size (FS)	-0.09	0.04	-2.03	0.04	*	-0.11	0.05	-2.43	0.02	*
FS x Exploitation	-0.03	0.05	-0.74	0.46		-0.01	0.05	-0.11	0.91	
FS x Exploration	0.01	0.04	0.20	0.84		0.03	0.05	0.69	0.49	
FS ²						-0.05	0.03	-1.52	0.13	
FS ² x Exploitation						0.02	0.03	0.66	0.51	
FS ² x Exploration						0.03	0.03	0.89	0.37	

*p<0.05, **p<0.01

Table 7: Results of moderated regression analysis for large product firms and small service firms, respectively.

	Large product firms				Small service firms					
	Coef.	Std. Err.	t	P>t	Coef.	Std. Err.	t	P>t		
Financial performance										
Exploitation	-0.01	0.09	-0.17	0.87	0.28	0.11	2.53	0.01	*	
Exploration	0.38	0.09	4.32	0.00	**	0.22	0.09	2.38	0.02	*
Exploitation X Exploration	0.14	0.07	2.08	0.04	*	0.00	0.07	0.01	0.99	
Market growth										
Exploitation	0.09	0.08	1.11	0.27	0.19	0.11	1.71	0.09		
Exploration	0.31	0.08	3.94	0.00	**	0.30	0.09	3.31	0.00	**
Exploitation X Exploration	0.13	0.06	2.12	0.03	*	0.00	0.07	-0.04	0.97	
Market success										
Exploitation	0.04	0.07	0.48	0.63	0.24	0.09	2.61	0.01	**	
Exploration	0.38	0.08	4.99	0.00	**	0.04	0.08	0.56	0.57	
Exploitation X Exploration	0.12	0.06	2.14	0.03	*	-0.05	0.06	-0.90	0.37	

*p<0.05, **p<0.01

Figure 1: Interaction diagrams showing the non-linear moderating effect of firm size on the relationship between an exploitation innovation strategy and financial performance in product and service firms.

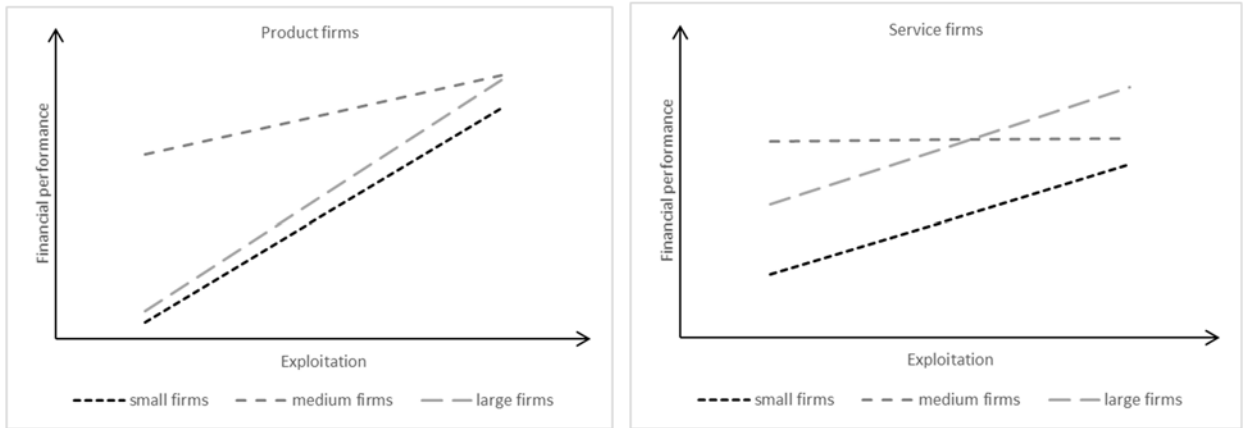


Figure 2: Interaction diagram showing the non-linear moderating effect of firm size on the relationship between an exploration innovation strategy and financial performance in product firms. There is not a statistically significant interaction in service firms.

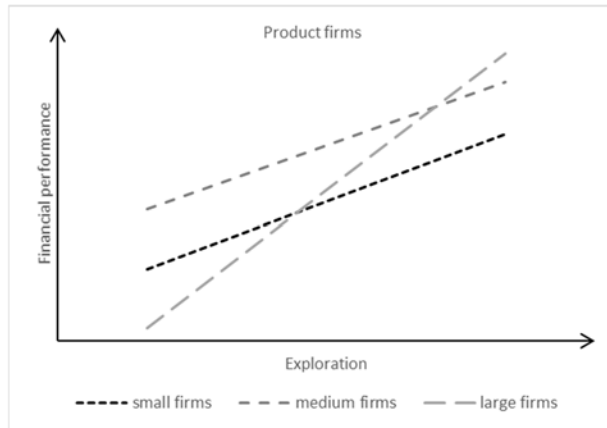


Figure 3: Interaction diagrams showing the non-linear moderating effect of firm size on the relationship between an exploitation innovation strategy and market growth in product and service firms.

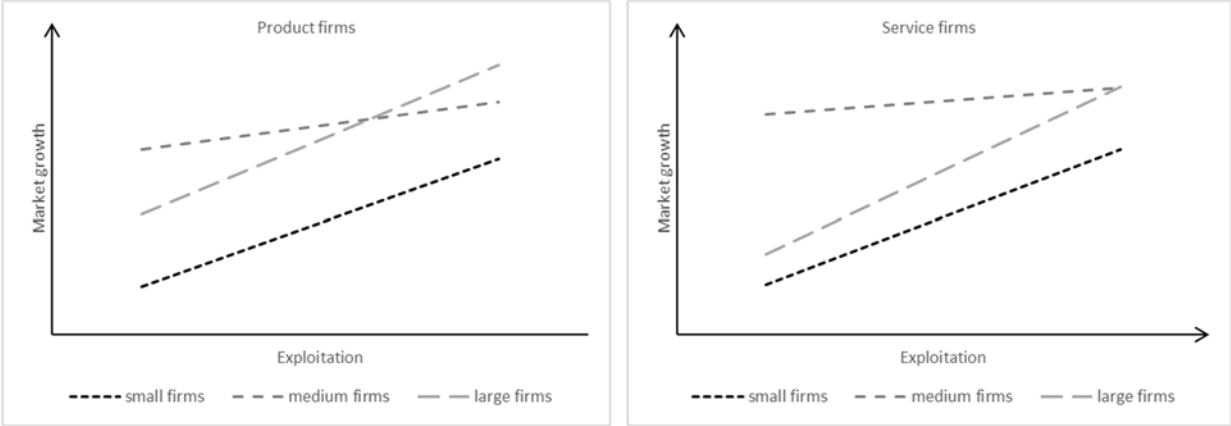


Figure 4: Interaction diagram showing the non-linear moderating effect of firm size on the relationship between an exploration innovation strategy and market growth in product firms. There is not a statistically significant interaction in service firms.

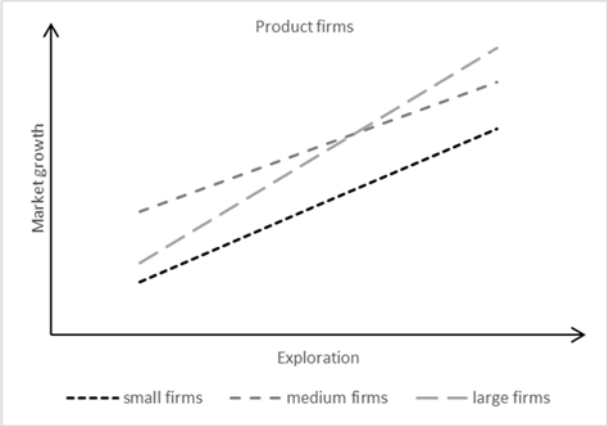


Figure 5: Interaction diagram showing the non-linear moderating effect of firm size on the relationship between an exploitation innovation strategy and market success in product firms. There is not a statistically significant interaction in service firms.

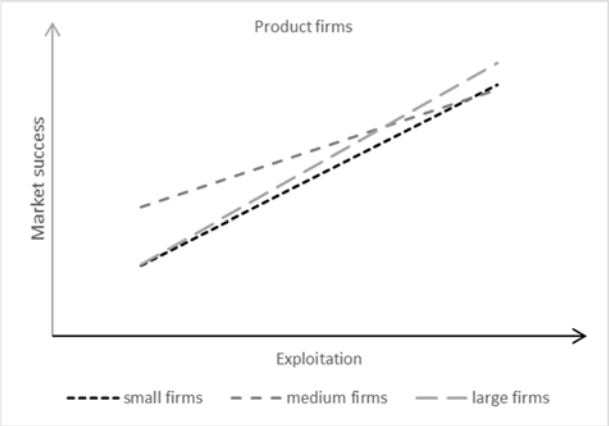


Figure 6: Interaction diagram showing the linear moderating effect of firm size on the relationship between an exploration innovation strategy and market success in product firms. There is not a statistically significant interaction in service firms.

