Exploration and Exploitation Within Supply Networks: Examining Purchasing Ambidexterity and its Multiple Performance Implications

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Abstract

Purpose – This research introduces and defines the concept of purchasing ambidexterity in terms of two dimensions: balance dimension and combined dimension. The study proceeds to empirically examine the multiple performance effects generated for the buying firm and its key suppliers.

Methodology – Ambidexterity theory informs our conceptual model. To test our hypotheses, we collected survey data from 95 purchasing functions of medium and large European firms and applied various estimation techniques.

Findings – This research indicates that ambidexterity substantially varies across purchasing functions. Further, it discovers that a purchasing function's ability to advance the combined magnitude of exploratory and exploitative activities represents an essential determinant of supplier efficiency, supplier product innovation, and buyer financial performance. Notably, this research also discovers that balancing the magnitudes of exploratory and exploitative activities on a relative basis produces negative effects on the innovativeness of the supply network.

Originality – Although ambidexterity theory has been applied to supply chain management, limited attention has been dedicated to purchasing ambidexterity. This gap led us to study how purchasing impacts the competitiveness of the buying firm and of its supply network by balancing and combining exploratory and exploitative activities. This research is the first to advance the notion of purchasing ambidexterity, unpack its underlying dimensions, and examine its multiple performance implications. Such a conceptual and empirical development presents new perspectives on how purchasing can help the buying firm and its supply network to strengthen their competitiveness.

1. Introduction

This paper introduces the concept of *purchasing ambidexterity*, and namely, the extent to which a purchasing function simultaneously pursues exploratory and exploitative activities within supply networks. Purchasing ambidexterity is defined in terms of a balance dimension and a combined dimension. The balance dimension considers the extent to which purchasing balances the magnitudes of exploration and exploitation on a relative basis. The combined dimension considers the extent to which purchasing advances the combined magnitudes of exploration and exploitation. This research empirically examines how these dimensions improve the financial performance of the buying firm and foster efficient operations and innovative offerings within its supply network.

Ambidexterity theory discusses how to balance and combine exploratory and exploitative activities to generate sustained financial success (March, 1991; Adler et al., 1999; Gibson and Birkinshaw, 2004; Wang et al., 2008; Cao et al., 2009; Marino et al., 2015). This theory has been applied to supply chain management in the past, but with an important limitation. Scholars have studied "ambidextrous supply chain strategies" (Kristal et al., 2010), "ambidextrous technology sourcing" (Rothaermel and Alexandre, 2009), "ambidextrous governance" (Blome et al., 2013), and how these forms of ambidexterity benefit the buying firm. However, despite these developments, to date, limited attention has been dedicated to two points: first, the ambidexterity of functional units, and more specifically, purchasing ambidexterity; and second, the impact of ambidexterity on the respective performances of both the buying firm and its suppliers.

Purchasing functions can adopt a plethora of exploratory and exploitative activities, ranging from supplier qualification to supply market intelligence and beyond (Newman, 1988; Cavinato, 1999; Krause et al., 2007; Handfield, 2010; Schiele, 2010; Wagner, 2012; Revilla and Knoppen, 2015). To what extent should purchasing functions balance and

combine these diverse activities to strengthen the competitiveness of the buying firm and of its supply network? We argue that this relevant theoretical question deserves consideration for two main reasons. First, although scholars have suggested that ambidexterity may occur at different levels within the organization (Raisch and Birkinshaw, 2008; O'Reilly and Tushman, 2013), very little research has conceptualized and empirically assessed ambidexterity at the functional level of analysis (McCarthy and Gordon, 2010). Second, now that new forces such as globalization, digitalization, the Internet of Things, and environmental and social sustainability challenge business practices (Dobbs et al., 2015), purchasing functions are under unprecedented pressure to experiment and discover as well as implement and refine external ideas, knowledge, and solutions that can bring value to the buying firms (Handfield et al., 2015; Choi et al., 2015).

Hence, this paper offers two important contributions to ambidexterity theory and its application within supply chain management. First, we study the traits of an ambidextrous purchasing function; in particular, we follow Cao et al. (2009) to conceptualize and operationalize the balance dimension and the combined dimension of purchasing ambidexterity; moreover, building upon Adler et al., (1999), Gibson and Birkinshaw (2004), and McCarthy and Gordon (2010), we discuss the "contextual" nature of purchasing ambidexterity. Second, we examine the complex relationship between purchasing ambidexterity, the financial performance of the buying firm, and the competitiveness of its supply network; in so doing, we clarify that a purchasing function should be concerned with achieving a balance between exploration and exploitation, as well as attempting to maximize both simultaneously. We apply multiple estimation techniques to primary survey data from 95 purchasing functions operating in medium and large European firms to provide empirical support for our conceptual model. Our results illustrate how advancing the combined magnitude of supply exploration and supply exploitation can generate positive performance

outcomes, but the results also show that balancing their relative magnitudes negatively affects the competitiveness of the supply network.

2. Theoretical Development

The following sections review and integrate ambidexterity and supply chain management literatures; the first section illustrates the concept of purchasing ambidexterity, whereas the second derives testable hypotheses that unpack its performance implications.

2.1 Examining Ambidexterity at the Purchasing Function Level

March (1991) presents exploitation and exploration as two fundamentally different bundles of knowledge-search activities. Exploitation involves the implementation and refinement of certainties, whereas exploration refers to experimentation and discovery of new possibilities. Though one may argue that purchasing is mainly "exploitation" due to its historical focus on price negotiation, the dilemma of combining and balancing exploitation and exploration clearly exists in purchasing functions.

Cavinato (1999), for example, has already suggested that purchasing activities might vary across the exploitation-exploration continuum. On the one hand, purchasing functions must leverage supply categories, supply relationships, and supply markets to reach the best possible cost position. Supplier qualification (Newman, 1988), supplier development (Krause et al., 2007), and purchasing involvement in new product development (Schiele, 2010; Wagner, 2012) allow the buying firm to implement and refine existing but somehow disconnected ideas, knowledge, and solutions (exploitation). On the other hand, purchasing may allow the buying firm to experiment and discover unexpected opportunities, thus transforming purchasing into an innovative function (Cavinato, 1999). Supplier innovation workshops and supply market intelligence represent fundamental means of exploration (Handfield, 2010). At a more advanced level, the purchasing function may represent the

buying firm in consortia and regional clusters (Möller and Rajala, 2007); it can also try to discover and access "nexus" suppliers operating across industries and possessing critical information and capabilities that help in anticipating major economic changes (Choi et al., 2015).

Exploitation and exploration accomplish diverse goals and require different competencies and risk-taking behaviors (Levinthal and March, 1993). Still, they may be undertaken together to achieve economies of knowledge (Gibson and Birkinshaw, 2004). Thus, purchasing functions will face the challenge of balancing the magnitude of exploration and exploitation on a relative basis while also advancing their combined magnitudes (Cao et al., 2009). In fact, we may regard a purchasing function to be "ambidextrous" in two different ways: first, the purchasing function can be regarded as ambidextrous if it achieves and maintains a balanced focus on exploration and exploitation; second, it can be regarded as ambidextrous if it achieves and maintains high—but not necessarily balanced—pursuits of supply exploration and supply exploitation. For example, L'Oréal's purchasing function has been able to advance the firm's exploration activities and discover innovative packaging and recycling solutions that made its products more sustainable; yet, the purchasing function also endeavoured to maintain a balance between exploration and exploitation activities to continue delivering consistent economic results (L'Oréal, 2017).

As has been argued in the case of other functions, such as research and development (R&D) (McCarthy and Gordon, 2010), we argue that purchasing ambidexterity should be conceptualized as a contextual capability: for higher levels of ambidexterity, purchasing personnel will be allowed to make their own (contextual) judgments on how to best advance and balance efficiency-oriented and innovation-oriented activities. To maintain and nurture its ability to balance diverse activities, a purchasing function is expected to strategically engage with several learning arenas within the buying firm; this includes participation in

cross-functional teams, ad-hoc innovation teams, and strategy planning meetings. Such strategic integration enriches purchasing perspectives, counters inertia towards exploitation, and helps to adjust the direction of exploration activities over time (Mom et al., 2007; Sheth et al., 2009; McCarthy and Gordon, 2010). To achieve high combinative pursuits of exploration and exploitation, purchasing functions will also need to establish "parallel structures" (Adler et al., 1999) or the combination and enforcement of multiple control systems that foster creativity, diversity, and intellectual freedom while correcting unwanted behaviors (Simons, 1995; Gibson and Birkinshaw, 2004; Porter and Siggelkow, 2008; McCarthy and Gordon, 2010). A supportive culture and a focus on innovation will provide the positive energy and clear direction needed to experiment in an autonomous but focused manner (exploration), whereas efficiency measures and control standards embedded in larger reporting systems will define and enforce the limits beyond which individuals within the function must not stray, thus helping with implementation (exploitation).

2.3 Unpacking Purchasing Ambidexterity's Implications for Performance

Our conceptual model in Figure 1 presents seven key constructs, whose definitions are summarized in Table 1. Supply exploration (SER) refers to activities that serve to experiment and discover novel ideas, capabilities, and solutions within the supply network. Supply exploitation (SET) refers to the activities required to implement and refine ideas, capabilities, and solutions within the supply network. The balance dimension of purchasing ambidexterity (BD) refers to the extent to which the purchasing function balances these diverse bundles of activities on a relative basis, whereas the combined dimension (CD) considers their joint magnitude. On the performance side, our model considers the financial performance of the buying firm (BFP), the extent to which its key suppliers have been able to contain costs (i.e., supplier efficiency—SE), and the extent to which they have been able to improve and expand their offerings (i.e., supplier product innovation—SI).

---------- Insert Figure 1 approx. here ----------

---------- Insert Table 1 approx. here ----------

Building upon the literature on organizational ambidexterity (March, 1991; Levinthal and March, 1993; He and Wong, 2004; Wang et al., 2008; Marino et al., 2015), we suggest that a balanced focus on SER and SET contributes to performance through the avoidance of core rigidities and failure traps. For example, with the advent of the Internet of Things, Schneider Electric's purchasing function realized that, in order to stay ahead of the learning curve, it needed to discover start-ups that could bring value to its clients (exploration). At the same time, the function also realized that it needed to implement new purchasing processes and new forms of organizing their integration in the existing supply network (exploitation) (Prime, 2016). Conversely, an imbalance between SER and SET may allow rigidities and failure traps hamper the performance of both the buyer and its suppliers.

SET focuses purchasing attention towards leveraging current suppliers' capabilities and creating alignment within the supply network (Handfield et al., 2015); however, an unbalanced focus on exploitation will likely introduce rigidity into the buying firm's operations and the supply network's functioning. For example, it has been documented that an over-reliance on SET can result in over-embedded ties that are fraught with tensions, subject to appropriability hazards, and closed to external ideas and innovation (e.g., Villena et al., 2011). If a purchasing function does not balance exploitative activities with exploratory activities, the resulting buying firm may be less adaptable to changing competitive landscapes and the supply network may offer obsolescent products and services that gradually deteriorate the buying firm's performance.

With respect to the negative effects of over-exploration, we posit that purchasing decreases the buying firm's chances to maximize existing and newly identified suppliers and

appropriate returns from its costly experimentation (Levinthal and March, 1993; Cao et al., 2009). An investment in exploration is pointless without a plan to develop activities that exploit the fruits of such investment. Hence, our first set of hypotheses predicts that

> **H1a,b,c.** The balance dimension of purchasing ambidexterity positively impacts buyer financial performance (H1a), supplier efficiency (H1b), and supplier product innovation (H1c).

Having discussed the performance implications of the balance dimension, the next logical step is to discuss the role of the combined dimension of purchasing ambidexterity. As anticipated, SER and SET may reinforce each other and create economies of knowledge (Adler et al., 1999; Gibson and Birkinshaw, 2004; Cao et al., 2009). For example, having its purchasing and other functions survey early ideas and prototypes from tier-one suppliers (exploration) has helped Toyota acquire the technical knowledge required to reduce new product development times and enhance manufacturability (exploitation) (Sobek et al., 1999).

Regarding the positive effects of exploitation on exploration, we suggest that high adoption rates of SET can improve a purchasing function's effectiveness in exploring valuable new knowledge, even when suppliers themselves fail to signal opportunities for innovation (Edler and Georghiou, 2007). Through repeated use of existing knowledge (exploitation), purchasing can improve awareness of where problems and opportunities exist, and where solutions could reside within the supply network. In short, as the purchasing function gets better at exploiting, it will also get better at exploring. For example, scholars have documented that purchasing functions become more effective at supporting supplier innovation-related activities when these units can efficiently orchestrate the exchange of ideas and information with and between suppliers (Henke Jr and Zhang, 2010; Revilla and Knoppen, 2015).

In an analogous manner, as a purchasing function accesses new knowledge (exploration), it will have a larger pool of competencies and become more effective at

exploitation. Through SER, the purchasing function acquires new knowledge that enhances the problem-framing and problem-solving processes required to build efficient network operations—creating savings for both the buying firm and its suppliers (Brusoni et al., 2001). Therefore, our second set of hypotheses predicts that

> **H2a,b,c.** The combined dimension of purchasing ambidexterity positively impacts buyer financial performance (H2a), supplier efficiency (H2b), and supplier product innovation (H2c).

It must be noted that the links between purchasing ambidexterity and buyer financial performance (H1a and H2a) can partly be the result of an increase in supplier efficiency and supplier product innovation (H1b,c and H2b,c). The literature acknowledges that purchasing functions mainly contribute to the success of their buying firms by managing suppliers; efficiency and innovation at the supplier level tend to translate to lower costs of goods sold, and more complete and differentiated offerings at the firm level (Azadegan and Dooley, 2010). Empirical research also reports that purchasing activities are unlikely to impact performance unless new, more efficient suppliers are engaged, or existing suppliers augment their performance in the first place (Krause et al., 2007; Gualandris and Kalchschmidt, 2016). Thus, our last set of hypotheses predicts the following:

> **H3a,b.** Supplier efficiency partially mediates the direct effects that the combined dimension of ambidexterity (H3a) and the balance dimension of ambidexterity (H3b) have on buyer financial performance.

> **H4a,b.** Supplier product innovation partially mediates the direct effects that the combined dimension of ambidexterity (H4a) and the balance dimension of ambidexterity (H4b) have on buyer financial performance.

3. Methods

3.1 Data collection and sample

This paper is part of a larger research project to investigate how purchasing functions can help buying firms to create and capture value (Legenvre and Gualandris, 2017). We tested our hypotheses by relying on a survey approach. We chose purchasing functions of

medium and large European firms as a suitable population for testing our conceptual model. During the last two decades, purchasing functions within such buying firms have faced overwhelming competitive pressure and increased fragmentation of their vertical value networks (Dobbs et al., 2015). Therefore, our chosen target population offers significant potential for new insights about purchasing ambidexterity.

Our sampling frame consisted of 2,000 purchasing functions listed on the database of the European Institute of Purchasing Management (EIPM). EIPM was created in December 1990 by top leading firms such as Alcatel, Philips, and Renault, and was sponsored by the European Commission to create a European executive education center in purchasing. Since its foundation, EIPM has operated across a number of industries, engaging with the purchasing functions of numerous medium and large European firms. Potential respondents were directly approached with an e-mail invitation to participate in our survey. From those contacted, 664 individuals agreed to participate and were provided with a structured online questionnaire.

By May 2015, we received 108 completed questionnaires. Data cleaning was then performed: the cases with more than 15% of items left unanswered were discarded (i.e., 13 questionnaires). Alternatively, when less than 15% of items were left unanswered (i.e., 4 questionnaires), we applied the mean value replacement method because the number of missing values per item was less than 5% (Hair Jr et al., 2013, p. 147). As a result, the final sample for our empirical analysis consisted of 95 purchasing functions. According to a power analysis for the F-test that assumed (i) a small effect size ($f_2 = 0.15$), (ii) a significant level of 0.05, and (iii) four key predictors over a total number of 11 regressors, our sample size offered an adequate statistical power of 85%. Table 2 provides descriptive statistics for our sample, which adequately reflects the expected industry breakdown of medium and large European firms as provided by Eurostat.

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3.2 Non-Response Bias and Key Informant Check

The main problem with non-response bias relates to external validity: the final sample differs from the frame sample and we do not know how biased the non-response is. Thus, we first kept track of non-respondents and surveyed 15 of them using telephone calls (Forza, 2002). Based on such calls, we realized that purchasing experts that declined had no time to participate in our study. Since these calls also provided an opportunity to collect data about some of our theoretical variables, we could then evaluate the potential influence of non-response bias by testing for differences between two randomly selected groups of respondents and non-respondents, as well as between later respondents (n_{lr}= 28) and earlier respondents (n_{er} = 28) (Armstrong and Overton, 1977). T-tests revealed that these groups (respondents vs. non-respondents, and earlier respondents vs. later respondents) did not differ from each other at the 0.01 level of statistical significance.

To assess whether all of our respondents were equally knowledgeable about our theoretical variables, we considered different quality criteria, such as job title, organizational tenure, and the type of purchases each respondent was accountable for. The t-tests on the average scores of our survey items revealed no significant differences across groups of respondents formed on the basis of the above criteria. To corroborate this result, we obtained Chief Procurement Officer-buyer pairs for six purchasing functions in our sample. Agreement scores were always greater than 0.65 and inter-class correlation always above 0.75, indicating that chief procurement officers and buyers in our sample were equally knowledgeable and perceived our questions similarly.

3.3 Common Method Bias (CMB)

It is virtually impossible to fully address CMB in survey research like ours that uses one informant per observational unit (Ketokivi and Schroeder, 2004). While recognizing that

our research is subject to this limitation, we have adopted several safeguards to mitigate context effects, item effects, and rater effects (Podsakoff et al., 2003).

First, we minimized the potential for context effects by developing new scales and adapting existing survey items from previous research (see next section). Second, we minimized the potential for item effects by conducting an iterative process of reviewing, pre-testing, and revising the survey with the support of independent experts and senior academics. Yet, the high agreement scores and inter-class correlations for the six pairs of respondents in our sample provided evidence of our item formulation's adequacy.

Third, we controlled for rater effects by including one marker variable at the end of our survey questionnaire (for more details on our "marker technique"', please refer to Williams et al., 2010). We designed our marker variable to capture social desirability, which refers to the tendency of some raters to respond according to the social acceptability of their responses, rather than their true perception or understanding. Specifically, we asked our respondents to indicate their level of agreement (1: strongly disagree; 5: strongly agree) with the following statement: "The way I behave is strongly influenced by people's judgment". This personal trait (i.e., a willingness to be influenced by others' judgment) represents one of the most relevant sources of CMB; thus, we applied a partial correlation procedure, for which our marker variable was used as surrogate of CMB and included in regressions (Podsakoff et al., 2003, p. 893).

3.4 Measures

This section presents our measures, whereas their development process and their psychometric properties are discussed in the next section. Table A in the appendix reports the final formulation of our items. We have followed the recommendations of Petter et al. (2007) and calculated all our first-order constructs by predicting factor-based scores through principal component analysis.

SER is captured by a six-item, five-point Likert scale that measures the extent to which a purchasing function helps the buying firm experiment and discover novel ideas, knowledge, and solutions within its supply network. To experiment and discover, a purchasing function must (i) share roadmaps with external partners (Cavinato, 1999), (ii) engage with suppliers during innovation workshops (Moller and Rajala, 2007), (iii) represent the firm in regional clusters (Pisano and Verganti, 2008), (iv) identify new partners through universities and consultants (Moller and Rajala, 2007), (v) apply supply market intelligence (Handfield, 2010), and (vi) establish ties with indirect suppliers (Choi at al., 2015).

SET refers to the extent to which the purchasing function helps the buying firm implement and refine ideas, knowledge, and solutions within its supply network. SET is measured by a four-item, five-point Likert scale that considers exploitative activities like (i) qualifying suppliers (Newman, 1988), (ii) working hand-in-hand with them (Krause et al., 2007), (iii) facilitating their involvement in existing business processes (Carr and Pearson, 2002; Schiele, 2010), and (iv) coordinating their participation in a buying firm's innovation teams (Wagner, 2012).

Building upon organizational ambidexterity literature (He and Wong, 2004; Cao et al., 2009), BD relates to the relative magnitudes of SER and SET, so we operationalized it as the absolute difference between them. The absolute difference varies from 0.015 to 2.047, with a mean of 0.672 and a standard deviation of 0.490. To facilitate interpretation, we reversed this measure by subtracting the score from 5 so that a higher value indicates greater BD.

CD concerns a purchasing function's combined magnitude of SER and SET. Following Lubatkin et al. (2006), we operationalize CD by summing the scores of SER and SET. We used confirmatory factor analysis (CFA) to compare two alternative additive models: Model 1 treats SER and SET as independent constructs; Model 2 treats all 10 items from the two constructs as separate indicators of a single latent factor. Our data show that the best fit is

Model 1 (chi^2 = 71.02; p-value = 0.000; CFI = 0.92; TLI = 0.90; RMSEA = 0.10), compared to Model 2 (chi^2 = 113.69; p-value = 0.000; CFI = 0.83; TLI = 0.78; RMSEA = 0.15). Given these results, we measure CD as the sum of the two first-order constructs, rather than the sum of ten items.

Four items capture BFP—that is, the amount of economic value a buying firm has been able to create and retain over time. We employ the scale utilized by González-Benito (2007). One may argue against the convergent validity of this measure, as our respondents may not know the industry average and relative performance of their own buying firm. Accordingly, we decided to further test the reliability of our subjective measure. To do so, we used the Amadeus database to obtain an objective measure of return on assets (ROA) for 69 of our sample firms. To enhance comparability with the subjective scale, which is calibrated relative to competitors' performance, we adjusted the objective measure by the average ROA per industry, which was obtained from the CSI Market database. Finally, we correlated this objective industry-adjusted measure with our subjective performance measure and found a positive and significant association (coeff. = 0.20, p-value < 0.1). Although this statistic is likely to be understated due to the differences in how the two measures are computed, this finding provides evidence of the convergent validity of our self-reported measure.

SI and SE capture suppliers' willingness and ability to innovate products and services as well as improve efficiency in a way that benefits the buying firm's bottom line. We marginally adapted the scales from Azadegan and Dooley (2010) and Terpend et al. (2011) to fit our research. Satisfactory psychometric properties are maintained (Table 2).

Finally, we collected data about diverse control variables. First, previous studies have found that the size of the buying firm can explain variations in both financial performance and in the extent of exploration and exploitation activities (Raisch and Birkinshaw, 2008). Hence, in our estimation procedure, we included firm size as measured by the number of

employees. Second, purchasing functions in certain industries may be more prone to engage in exploration and exploitation activities relative to those in other industries, so we employed six dummies to control for industry effects: oil & gas, healthcare, materials, industrials, consumer goods, and consumer services. Third, Raisch and Birkinshaw (2008) suggest that a firm's ambidexterity orientation might permeate the entire firm, influencing behaviors and performance outcomes at different organizational levels. Thus, we controlled for ambidexterity at the buying firm level; the scales developed by Lubatkin et al. (2006) were employed in this study. Fourth, Purchasing Organizational Model represents the degree to which purchasing decisions are centralized at higher hierarchical levels and, consequently, might affect the development of purchasing ambidexterity. We employed the scale developed by Johnson and Leenders (2006).

3.5 New Constructs Development

We followed a rigorous procedure to develop new measures for SER and SET (Gerbing and Anderson, 1988; Menor and Roth, 2017). First, we generated preliminary definitions of constructs and survey items by considering the theoretical foundations laid down by the ambidexterity theory (March, 1991; Adler et al., 1999; Gibson and Birkinshaw, 2004; Lubatkin et al., 2006; Wang et al., 2008; Cao et al., 2009), as well as several papers in the supply chain management domain (Newman, 1988; Cavinato, 1999; Carr and Pearson, 2002; Gonzalez-Benito, 2007; Krause et al., 2007; Handfield, 2010; Schiele, 2010; Wagner, 2012; Revilla and Knoppen, 2015).

As a second step, definitions and survey items were refined via consultation with three purchasing experts and three senior academics; we approached each participant individually and asked that individual to put into words any ambiguity they could sense. These experts were not involved in the following steps of scale development.

Next, we used Q-sorting exercises to purify our items and ensure adequate face validity. We involved eight purchasing experts from buying firms such as Siemens, Vodafone, Novartis, L'Oréal, and Volvo. Each expert had knowledge and experience in the research topic, and importantly, could be seen as a general representative of our target population. We engaged each expert individually and presented our definitions of SER and SET. Next, we shared our list of (randomly sorted) items and asked for each item to be allocated to either one or the other construct, based on its perceived meaning. We then calculated hit ratios: at the first round, the average hit ratio was 85%, indicating satisfactory face validity.

The last step of our procedure consisted of applying exploratory factor analysis (EFA) and CFA based on our final sample of 95 cases (Gerbing and Anderson, 1988). EFA clearly replicated the five-factor measurement model and did not reveal any evidence of a single underlying construct. EFA was applied iteratively in order to drop items presenting high cross-loadings, and to obtain a valid and reliable solution; at the final round, all items loaded on the appropriate constructs presented adequate item loadings and high reliabilities. EFA results were further validated via CFA (Table 2), which yielded a measurement model that fitted the data adequately ($chi^2_{(160)}$ = 248.69; p-value = 0.000; CFI = 0.92; TLI = 0.90; RMSEA = 0.07). Items' loadings were all significant and greater than 0.62, suggesting adequate convergent validity and unidimensionality. Discriminant validity was also supported because the average variance extracted (AVE) for each construct was greater than the squared inter-construct correlations (see Table 3).

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3.6 Endogeneity Check

To assess the possibility of reverse causation between purchasing ambidexterity and performance, we performed a series of Durbin-Wu-Hausman tests (Davidson and

MacKinnon, 1993). Each test involved two steps: (i) generating the residuals of the potentially endogenous right-hand side constructs by regressing them over its exogenous constructs; and (ii) running an augmented regression model for the dependent variables that included the residuals calculated in the first step. These tests indicated that endogeneity could affect our estimates for relationships involving CD, SE, and SI (p-value of residuals < 0.1). A two-stage least squares (2SLS) estimation procedure was therefore performed to confirm (or confute) the results presented in the next section. As Table 4 shows, our 2SLS analysis largely corroborates the estimates from our core analysis.

Before executing the 2SLS procedure, we had to identify instrumental variables that met validity requirements. First, in a regression with only assumed exogenous variables from the original model, we identified candidates that were not significantly correlated with our dependent variables at the 10% significance level. From this step, industry dummies showed to be potential instruments for the combined dimension of purchasing ambidexterity. We then identified another variable related to CD that was not significantly correlated with SE nor SI: purchasing tactical differentiation. This construct captures the extent to which a purchasing function maintains a supportive culture for innovation and also adopts efficiency measures embedded in larger reporting systems to set the limits beyond which purchasing personnel must not stray. As discussed in the theoretical section of the paper, such "parallel structures" (Adler et al., 1999) help purchasing to tactically differentiate between SER and SET while achieving high pursuits of both. A three-item, five-point Likert scale adapted from Chandrasekaran et al. (2012) operationalizes this theoretical construct.

4. Analysis and Results

4.1 Hypotheses Testing

We tested our hypotheses using the seemingly unrelated regressions (SUR) approach

(Zellner, 1962). We followed the procedure illustrated by UCLA (2015) with the STATA r13 package; SUR (1) in Table 4 tests a baseline model considering the effects of SER and SET on our dependent variables, whereas SUR (2) tests our conceptual model.

Two considerations guided our choice of SUR over ordinary-least-squares, partial-least-squares, and structural-equation modeling (Preacher and Hayes 2008; Ronkko et al., 2016). Much like ordinary least squares, SUR helps to estimate the effects of single-item second-order constructs like CD and BD, which would not be possible with a structural-equation modeling approach. Moreover, SUR represents a preferable option over ordinary least squares as it enables controlling for correlated error terms across regressions that are run simultaneously in a system of equations, thus providing consistent and efficient estimates.

Before testing the conceptual model, our tests indicated that some variables were negatively skewed and could not be transformed adequately (Box and Cox, 1964); however, technically speaking, the normal distribution assumption is not necessary when the model equation is well specified and the goal is to estimate its coefficients and generate predictions in such a way as to minimize mean squared error (Doornik and Hansen, 2008). Three versions of the Breusch and Pagan (1979) test indicated no problems with the key assumption of heteroscedasticity. Variance inflation factors indicated no problem with multicollinearity.

---------- Table 4 approx. here ----------

Table 5 summarizes our key findings. First, hypotheses H1a,b,c do not find empirical support. Contrary to our predictions, the balance dimension of purchasing ambidexterity does not significantly impact SE and BFP (Table 4, Models 4b and 4c). Notably, BD produces a negative and significant effect on SI (Table 4, Model 4a). In the next section, we deepen our understanding of this counterintuitive result by applying polynomial surface analysis (Edwards and Parry, 1993).

Second, hypotheses H2a,b,c find strong empirical support: the combined dimension of purchasing ambidexterity positively and significantly impacts all performance outcomes. Moreover, a comparison of SUR (1) and SUR (2) suggest that singular, isolated adoptions of exploitative or explorative activities do not bring much value; rather, the ability to simultaneously pursue them becomes an essential determinant of competitiveness. Thus, we conclude that as purchasing functions develop the combined dimension of ambidexterity, they become progressively more effective and efficient at exploratory and exploitative activities (Gibson and Birkinshaw, 2004).

Third, while H3b does not find empirical support because BD does not significantly impact SE, the procedure proposed by Rungtusanatham et al. (2014) provides mixed empirical support to hypothesis H3a. A bootstrapping test with 500 replications shows that the indirect effect of CD on BFP through SE is marginally not significant (p-value > 0.1). Moreover, the coefficient of the relationship between the combined dimension of ambidexterity and BFP drops from 0.191 (Std. Dev. 0.064) to 0.161 (Std. Dev. 0.067) when supplier efficiency is included in the regression model; yet, a Wald's test suggests that such a drop is marginally not significant (p-value > 0.1). Hence, we can conclude that purchasing may foster the financial performance of the buying firm without necessarily affecting suppliers' efficiency. For example, purchasing may witness that some competitors (suppliers' other clients) are developing competitive solutions that are still ignored by R&D, production, or marketing functions, thus informing internal improvements without impacting the supply network.

Fourth, hypotheses H4a and H4b do not find empirical support. Although it was reasonable to expect that SI would translate to higher financial performance for the buying firm, our analysis suggests that purchasing ambidexterity does not represent a sufficient condition to capture a share of the value generated by SI. This unexpected finding aligns well

with an emerging stream of studies suggesting that, in order to capture value from suppliers' innovation, purchasing functions need to increase their "attractiveness" in the eyes of suppliers (Pulles et al., 2016) or secure control over complementary assets that appreciate as a consequence of supplier-driven innovation (Jacobides et al., 2006).

---------- Table 5 approx. here ----------

4.2 Post-Hoc Analysis

Polynomial surface analysis allows us to examine the extent to which different combinations of two predictors (SET and SER) relate to an outcome variable (SI)—particularly when the balance between the two predictors is a central consideration (for more details on this technique, please refer to Edwards and Parry, 1993).

Polynomial surface analysis is articulated into three main steps, as illustrated by Shanock et al., (2010) and by Paulraj and Blome (2017). First, we centered the predictors (SER and SET) around the midpoint of their scales to aid interpretation and reduce potential for multicollinearity. Second, we regressed our dependent variable (SI) on the centered predictors (SET and SER) as well as the product of these predictors, the centered SET squared and the centered SER squared. Third, rather than examining the coefficients from this polynomial regression, we used them to build the response surface graph in Figure 2 and the four surface values reported in Table 6. Before discussing our findings, it is important that we clarify the following:

- Pursuant to the detailed instructions by Shanock et al. (2010), we built the response surface graph from the results of our polynomial regression using Microsoft Excel; the surface of this graph is built upon the predicted values of SI for each specific combination of SET and SER. Evaluating the surface along the alignment line indicates the effects of augmenting (diminishing) the combined dimension of purchasing ambidexterity. Evaluating the surface along the misalignment line indicates the effects of

augmenting (diminishing) the balance dimension of purchasing ambidexterity.

- Polynomial surface analysis provides the means to perform four inference tests, one for each of the four surface values reported in Table 6. Inference tests for a1 and a2 look at the statistical significance of slope and curvature of the response surface along the alignment line. Inference tests for a3 and a4 enable testing the statistical significance of slope and curvature of the response surface along the misalignment line. The inference tests have been built according to the instructions provided by Shanock et al. (2010, p. 548).

---------- Insert Table 6 approx. here ----------

---------- Insert Figure 2 approx. here ----------

This post-hoc analysis focuses on the inference tests for a3 and a4, which will indicate if and how SI varies along the misalignment line for different values of BD. Our results show that a4—the curvature of the misalignment line—is positive and significant, meaning that supplier product innovation increases significantly as a purchasing function moves away from balanced pursuits. Interestingly a3—the slope of the misalignment line—is negative and marginally not significant (Table 6), which suggests that purchasing functions in our sample benefit slightly more from over-exploration than from over-exploitation. Similar results were found when considering SE and BFP as dependent variables.

Upon reviewing our sample, we are left with a new question: why are balance pursuits so detrimental for SI? Wang et al. (2008) and Marino et al. (2015) suggested that the advantages of the balance dimension of ambidexterity vary under different levels of environmental dynamism. According to these scholars, a buying firm that faces rapidly changing policies, technologies, and market expectations can achieve successful knowledge accumulation and positive performance outcomes when it engages more in exploration, relative to exploitation (over-exploration). Our survey included questions regarding the

volatility and turbulence of technologies and markets; an examination of these questions reveals that environmental dynamism varies significantly across cases, with 65% of our purchasing functions facing very high degrees of turbulence. Under such conditions, over-exploration represents the most efficient and effective use of a purchasing function's time and resources.

5. Discussion and Conclusions

5.1 Theoretical Implications

This paper influences academic thinking in several ways. First, this study demonstrates the need to expand and refine our conceptualization and operationalization of SER, SET, and purchasing ambidexterity. Building upon ambidexterity theory (March, 1991; Adler et al., 1999; Gibson and Birkinshaw, 2004) and supply chain management (Newman, 1988; Cavinato, 1999; Krause et al., 2007; Handfield, 2010; Schiele, 2010; Wagner, 2012; Revilla and Knoppen, 2015), this research has conceptually divided well-known purchasing activities into SER and SET, based on their diverse goals and underlying search behaviors. Our paper also proposes that purchasing functions can develop contextual ambidexterity along two distinct dimensions, BD and CD. Overall, this conceptual development represents a valid initial representation of reality, but future studies could build upon our work to further examine the nature of purchasing ambidexterity.

Second, our analysis suggests that ambidexterity substantially varies across purchasing functions in terms of both balance and combined dimensions. In this way, the paper establishes a crucial foundation for examining exogenous and endogenous antecedents that could explain such variations. On the one hand, in line with ambidexterity theory (Wang et al., 2008; McCarthy and Gordon, 2010; Marino et al., 2015), our analysis suggests that purchasing functions may need to adjust their exploration-exploitation balance over time in

order to match the dynamisms of their external environment. Hence, future studies could investigate how ambidextrous purchasing functions become organized to facilitate adjustments in their mix of exploration and exploitation activities. On the other hand, we have elaborated on the concept of "parallel structures" (Simons, 1995; Adler et al., 1999; Gibson and Birkinshaw, 2004), an organizational solution that has been largely overlooked even by recent studies of purchasing effectiveness and organizational design (Cousins et al., 2006; Ates et al., 2017; Bals and Turkulainen, 2017). Ultimately, future research could assess what configurations of goals, control systems, and forms of work organization will help purchasing achieve and maintain high combinative pursuits of exploration and exploitation. Case study research would perfectly suit these research questions.

Third, although we controlled for the effects of ambidexterity at the buying firm level, we found that unbalanced, combinative pursuits of SER and SET produce multiple performance outcomes. The outcomes of purchasing ambidexterity go well beyond business alignment and resilience (Handfield et al., 2015; Gualandris and Kalchschmidt, 2015) to include supplier innovation and improvements to a buying firm's current offerings. Our study complements prior research that has applied the ambidexterity theory within the context of supply chain management (Rothaermel and Alexandre, 2009; Kristal et al., 2010; Chandrasekaran et al., 2012; Blome et al., 2013) to demonstrate that different dimensions of ambidexterity operate through the purchasing function to influence the performance of the entire organization, as well as that of its suppliers. Thus, a third venue for future research concerns the investigation of multiple performance outcomes that may spur from purchasing ambidexterity. For example, our conceptual model could be expanded to include more granular typologies of innovation (Sawhney et al., 2011), consider short-term outcomes and long-term prospects, and examine key moderators such as the varying magnitude of industry regulatory changes (Marino et al., 2015). Most importantly, case study research could reveal

whether/how ambidextrous purchasing (via the work it does with other functions) contributes to expanding a buying firm's "architectural knowledge" or knowledge about the ways different resources can be integrated into a coherent whole (Brusoni et al., 2001; Marino et al., 2015). Transforming and leveraging supply networks requires framing problems clearly and reconnecting distant capabilities effectively—and wide architectural knowledge improves all of these activities (Moller and Rajala, 2007; Revilla and Knoppen, 2015). The importance of this third implication has been highlighted by scholars who emphasize the need to build theories that describe how ambidexterity operates, both within a given technological regime and when product designs, business models, and industry architectures are disrupted by new policies or discoveries (Jacobidies et al., 2006; O'Reilly and Tushman, 2013; Choi et al., 2015).

5.2 Managerial Implications

New global forces, from digitalization to climate change, are challenging business practice (Dobbs et al., 2015). Moreover, buying firms are still struggling to discover and implement critical ideas, knowledge, and solutions hidden within the vast expanse of supply networks (Handfield et al., 2015; Choi et al., 2015). We believe that our study can help managers find ways to overcome these challenges.

First, top management expects purchasing to impact the bottom line, mainly through effective negotiations, managing supply risks, and aligning behaviors within the supply network. For most top-level managers, purchasing is not yet synonymous with innovation (e.g., ADP, 2016). Yet, we find that as ambidexterity develops, a purchasing function's contribution to business performance will go well beyond these (albeit low) expectations. Top management should demand much more from their purchasing functions, especially in terms of contribution to the overall transformation of the buying firm and its supply network. CEOs and other top-level managers should help develop earlier and more intense synergies

between purchasing and other functions; doing so will help the buying firm as a whole to better anticipate and experiment with rapidly emerging solutions, to look at risks and opportunities with a different mindset, and to deliver both efficiency and innovation.

Second, we would encourage purchasing functions to establish differentiation mechanisms in their own way of working. On the one hand, chief procurement officers could establish clear innovation goals and allow some autonomy, so purchasing personnel can search for novel ideas, knowledge, and solutions (exploration). On the other hand, the officers could maintain reporting systems that stimulate activities with more short-term, predictable outcomes (exploitation). These parallel structures, with appropriate associated communication, will help personnel to embrace and concurrently reduce uncertainty, and to make better-informed decisions without oversimplification.

Finally, we found that very few purchasing functions are fighting the right battle: the majority of cases in our sample (40%) match the magnitude of exploration and exploitation on a relative basis, achieving poor performance in return. Since knowledge-search strategies are developed in a path-dependent manner (Wang et al., 2008), purchasing may tend to emphasize the wrong mix of knowledge-search behaviors due to its historical focus on the existing supply network (exploitation). As a result, we suggest that emphasis on SER and SET should instead be driven by a careful appraisal of the degree of dynamism characterizing the external business environment; in particular, purchasing functions should favor exploration when they face significant variability in technologies and stakeholder expectations, and emphasize exploitation when turbulence decreases. Any improvement on exploration and exploitation, even if decoupled, will leverage economies of knowledge with relevant financial returns.

5.3 Limitations

Our work does encounter a few limitations worth mentioning. First, although we show evidence of statistical power from the regression results, the sample size is relatively small and our empirical results should be considered with some caution. Second, although the analysis involving paired data and secondary data suggests that a systematic bias is unlikely, future studies should rely on multiple respondents in order to confirm and extend our results. This research helps to unpack the concept of purchasing ambidexterity and explore its many performance implications; it is hoped that future research will continue to build on these results.

APPENDIX

---------- Insert Table A approx. here ----------

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FIGURE 1 - Conceptual model

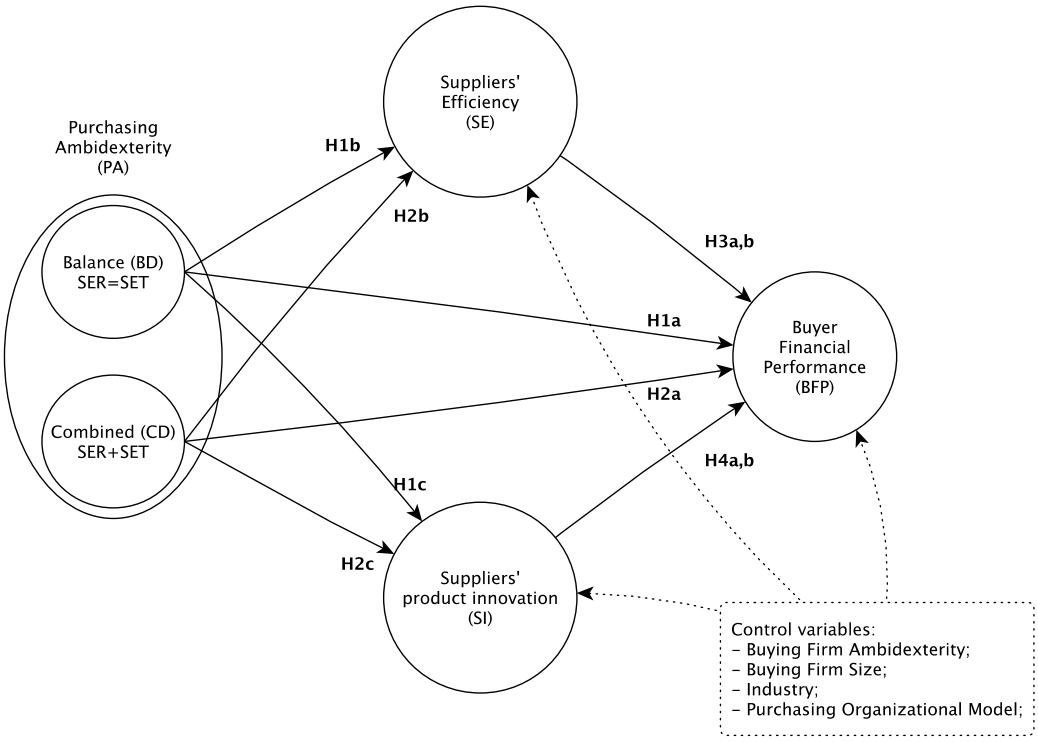

FIGURE 2 – Polynomial surface analysis

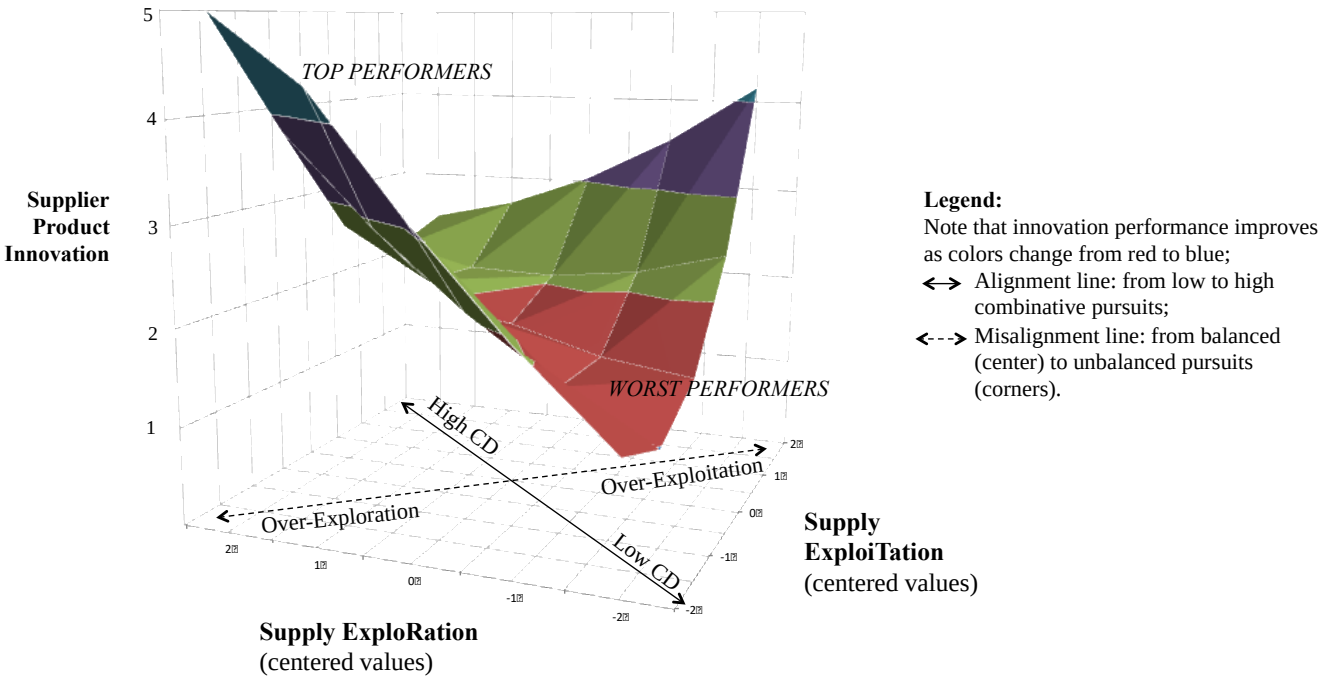

TABLE 1 - Theoretical variables

Short name	Definition	Derived from
Supply ExploRation (SER)	The extent to which the purchasing function helps the buying firm to experiment and discover novel ideas, knowledge, and solutions within its supply network. Activities range from supply market intelligence to engaging with indirect suppliers and non-traditional chain members.	(Cavinato, 1999; Moller and Rajala 2007; Handfield, 2010; Choi et al., 2015)
Supply ExploiTation (SET)	The extent to which the purchasing function helps the buying firm implement and refine old and newly identified ideas, knowledge, and solutions within its supply network. Activities range from qualifying suppliers to coordinating their involvement in innovation projects.	(Newman, 1988; Krause et al., 2007, Schiele, 2010; Wagner, 2012; Handfield et al., 2015)
Purchasing ambidexterity (PA) denotes the extent to which a purchasing function simultaneously pursues exploratory and exploitative activities:		(March, 1991; He and Wong, 2004; Gibson and Birkinshaw, 2004; Lubatkin et al. 2006; Cao et al., 2009)
Combined dimension (CD)	The extent to which the purchasing function advances the combined magnitude of both supply exploration and supply exploitation.	
Balance dimension (BD)	The extent to which the purchasing function balances the magnitude of supply exploration and supply exploitation on a relative basis.	
Buyer Financial Performance (BFP)	The amount of economic value a buying firm has been able to generate and retain.	(González-Benito, 2007)
Supplier product Innovation (SI)	The extent to which suppliers are able to continuously innovate their products and services.	(Azadegan and Dooley, 2010; Terpend et al., 2011)
Supplier Efficiency (SE)	The extent to which suppliers are able to contain costs to benefit the buying firm.	

TABLE 2 – Firm sample

Number of Employees	**n**	**%**
250-500	24	25.3
501-1000	10	10.5
1001-10000	26	27.4
Over 10000	35	36.8
Total	**95**	**100%**

Industry[1]	**n**	**%**
Oil & Gas	6	6.3%
Healthcare	12	12.6%
Materials	4	4.2%
Consumer Goods	21	22.1%
Consumer Services	11	11.6%
Industrials	41	43.2%
Total	**95**	**100%**

Purchasing Organizational Model	**n**	**%**
Centralized[2]	34	35.8
Hybrid[3]	43	45.3
Decentralized[4]	18	18.9
Total	**95**	**100%**

[1] Industries as for Industry Classification Benchmark

[2] All the purchases (measured in Euros) are committed to one central location for the entire firm;

[3] Approximately 50% of the purchases (measured in Euros) are commited at one central location for the entire firm;

[4] Almost all the purchases (measured in Euros) are committed on a divisional/plant basis for the entire firm

TABLE 3 - Constructs validation with CFA

	Std Loadings	Std.Dev	z	AVE	Inter-construct correlations				
					SER	**SET**	**BFP**	**SE**	**SI**
Supply ExploRation				0.50					
SER1	0.68***	0.064	10.54						
SER2	0.62***	0.071	8.72						
SER4	0.64***	0.067	9.44		1.00				
SER5	0.81***	0.044	18.19						
SER6	0.83***	0.041	19.88						
SER9	0.64***	0.068	9.39						
Supply ExploiTation				0.61					
SET1	0.76***	0.052	14.76						
SET2	0.83***	0.045	18.47		0.65***	1.00			
SET3	0.72***	0.059	12.16						
SET6	0.80***	0.049	16.41						
Buyer Finanacial Performance				0.69					
FFP1	0.67***	0.060	11.17						
FFP2	0.95***	0.023	41.20		0.45**	0.43**	1.00		
FFP3	0.85***	0.034	25.09						
FFP4	0.83***	0.039	20.84						
Supplier Efficiency				0.48					
SE1	0.61**	0.090	6.81						
SE2	0.82***	0.071	11.61		0.32**	0.42**	0.41**	1.00	
SE3	0.62***	0.082	7.44						
Supplier Product Innovation				0.74					
SI1	0.79***	0.045	17.49						
SI2	0.93***	0.031	29.69		0.39**	0.43**	0.32**	0.41**	1.00
SI3	0.86***	0.038	22.57						

chi2(160) = 248.69 ; p = 0.000 ; CFI = 0.92 ; TFI = 0.90 ; RSMEA = 0.07

*** p-value < 0.05 *** p-value < 0.01*

TABLE 4 - SUR and 2SLS

	SUR (1)[a]:			**SUR (2)[a]:**			**2SLS[b]:**		
	Model 1a	Model 1b	Model 1c	Model 4a	Model 4b	Model 4c	Model 5a	Model 5b	Model 5c
Indepedent variables	**DV: SI**	**DV: SE**	**DV: BFP**	**DV: SI**	**DV: SE**	**DV: BFP**	**DV: PA_CD**	**DV: SI**	**DV: SE**
Firm Size	-0.131*	-0.108	-0.007	-0.093	-0.103	0.014	0.190	-0.126	-0.156*
Oil&Gas	-0.566	-0.004	0.037	-0.577	-0.109	0.067	0.024	-0.588	-0.127
Healthcare	0.034	0.021	-0.028	0.041	0.020	-0.022	0.021	0.040	0.018
Materials	-0.010	0.210	-0.588	-0.198	0.027	-0.633	0.816	-0.353	-0.223
ConsGoods	-0.010	0.283	-0.254	-0.077	0.248	-0.281	-0.113	-0.088	0.231
ConsServ	0.283	-0.210	-0.092	0.267	-0.244	-0.085	0.139	0.265	-0.248
Firm Ambidexterity - CD	0.103	0.134**	0.181***	0.087	0.126*	0.176***	0.489***	0.005	-0.006
Firm Ambidexterity - BD	0.023	-0.070	-0.240**	0.088	-0.027	-0.215*	0.256	0.042	-0.101
Purchasing Organizational Model	-0.189	0.102	-0.127	-0.224*	0.100	-0.151	-0.099	-0.209*	0.124
Supply exploration	**0.218***	0.085	**0.217***						
Supply exploitation	0.147	**0.241***	0.099						
Purchasing Ambidexteirty - CD				**0.182*****	**0.165*****	**0.161*****		**0.326***	**0.397****
Purchasing Ambidexteirty - BD				**-0.394****	-0.224	-0.167		**-0.395****	-0.226
Supplier Efficiency			**0.208****			**0.208****			
Supplier Product Innovation			0.002			0.003			
Purchasing Tactical Differentiation [c]							**0.512*****		
Social desirability	0.157*	0.030	0.005	0.153*	0.038	0.002	0.314**	0.099	-0.050
_cons	0.180	0.260	1.324**	1.619	1.051	1.952	-2.251**	2.03*	1.714
R-squared	0.3079	0.2544	0.4096	0.3387	0.2616	0.4132	0.5002	0.3	0.1608
Chi2 / Robust F	42.26***	32.41***	65.92***	48.65***	32.28***	66.89***	7.61***	40.69***	27.72***

*** p-value < 0.01 ; ** p-value < 0.05 ; * p-value < 0.10

[a] Regressions are run simultaneously

[b] Two-stage models with identical first stage estimation. Model (5a) depicts the result for the first-stage regression considering the combinative dimension of purchasing ambidexterity as a potentially endogenous variable. Models (5b) and (5c) are the resulting 2SLS models incorporating the predicted values from the first stage as independent variable to replace the values of the assumed endogenous variables.

[c] Values used as instruments for the assumed endogenous variable

TABLE 5 - Research hypotheses

	Research hypothesis	**Result**
H1a	Balance dimension of purchasing ambidexterity -> buyer financial performance	Not supported
H1b	Balance dimension of purchasing ambidexterity -> supplier efficiency	Not supported
H1c	Balance dimension of purchasing ambidexterity -> supplier product innovation	**Negative association**
H2a	Combined dimension of purchasing ambidexterity -> buyer financial performance	**Supported**
H2b	Combined dimension of purchasing ambidexterity -> supplier efficiency	**Supported**
H3c	Combined dimension of purchasing ambidexterity -> supplier product innovation	**Supported**
H3a	Combined dimension of purchasing ambidexterity -> supplier efficiency -> Buyer financial performance	**Partially Supported**
H3b	Balance dimension of purchasing ambidexterity -> supplier efficiency -> Buyer financial performance	Not supported (BD does not associate with SE)
H4a	Combined dimension of purchasing ambidexterity -> supplier product innovation -> Buyer financial performance	Not supported (SI does not associate with BFP)
H4b	Balance dimension of purchasing ambidexterity -> supplier product innovation -> Buyer financial performance	Not supported (SI does not associate with BFP)

TABLE 6 – Testing slopes and curvatures with polynomial surface analysis.

Effects (as related to SI)	**Coefficient**	**Standard Deviation**	**Test statistics (t-value)**	**p-value**
a1: Slope along alignment line	0.30	0.12	2.481	0.015
a2: Curvature along the alignment line	0.03	0.07	0.472	0.638
a3: Slope along the misalignment line	-0.37	0.26	-1.425	0.157
a4: Curvature along the misalignment line	0.78	0.39	2.007	0.048

TABLE A - Survey items.

Supply ExploRation - Indicate the level of agreement (1=strongly disagree / 5=strongly agree)

SER1. The purchasing function proactively attends innovation days or workshops with suppliers

SER2. Our purchasing function collaborates with third parties (e.g., consultants, universities) to identify innovative suppliers

SER3. Idea management platforms are continuously leveraged by our purchasing function in order to search for supply opportunities (D)

SER4. Our purchasing function represents the firm in networks, consortia or regional clusters

SER5. The purchasing function attends presentations about roadmaps and trends by suppliers to scout supply opportunities

SER6. In order to scout supply opportunities our purchasing function leverages supply market intelligence

SER7. Our purchasing function proactively shares roadmaps with suppliers to identify potential synergies (D)

SER8. Through the purchasing function, our firm leverages open innovation platforms (e.g., InnoCentive) to explore new solutions (D)

SER9. Through our purchasing function, our firm organizes meetings with tier-2 or -3 suppliers to scout supply opportunities

SER10. In order to improve the firm's competitiveness, the purchasing function proactively attends industry meetings (D)

SER11. The purchasing function contributes to create/develop relationships with start-up companies (D)

Supply ExploiTation - Indicate the level of agreement (1=strongly disagree / 5=strongly agree)

SEI1. In order to leverage suppliers skills and solutions, the purchasing function coordinates co-design activities with suppliers

SEI2. Our purchasing function supports the new product/service development processes by coordinating the involvement of suppliers

SEI3. In order to leverage supplier resources and capabilities, the purchasing function coordinates supplier membership/participation in the firm's project teams

SEI4. The purchasing function manages the process through which some R&D activities are outsourced (D)

SEI5. The purchasing function promotes/supports collaboration between suppliers (D)

SEI6. In order to leverage supply opportunities, our purchasing function manages the process through which innovative suppliers are qualified

SEI7. The purchasing function is involved in decisions related to intellectual property and suppliers (D)

Buyer Financial performance - Please, rate the achieved performance (1=lower than competitors / 7= higher than competitors)

BFP1. Success of new product/service launches

BFP2. Return on investment

BFP3. Profit as percentage of sales

BFP4. Labour productivity (sales/employees)

Supplier Product Innovation – Please, rate the achieved performance (1=worst among competitors / 5= leader among competitors)

SI1. Supplier ability to design new products/services or make changes in existing products/services

SI2. Supplier introduction rate of new products/services in the last 5 years

SI3. The ability and willingness of suppliers to innovate their offerings radically

Supplier Efficiency – Please, rate the achieved performance (1=worst among competitors / 5= leader among competitors)

SE1. The total cost associated with sourced items, including price, transportation, inspection and testing, cost of supplier non-conformance, customer returns and other associated costs

SE2. The ability and willingness of your suppliers to share cost data

SE3. The ability of suppliers to reduce the unit price of their items

Firm Ambidexterity - Exploratory orientation

IER1. Our company looks for novel technological ideas by thinking "outside the box"

IER2. Our company bases its success on its ability to explore new solutions or technologies

IER3. Our company aims at creating products or services that are innovative for the firm

IER4. Our company looks for creative ways to satisfy customers' needs

IER5. Our company aggressively ventures into new market segments

Firm Ambidexterity - Exploitative orientation

IET1. Our company constantly surveys existing customers' satisfaction

IET2. Our company fine-tunes what it offers to keep its current customers satisfied

IET3. Our company penetrates more deeply into its existing customer base

Purchasing Tactical Differentiation

PTD1. Our function maintains different reporting systems for innovation activities and standard procurement activities

PTD2. We have distinct organizational processes, structures and cultures for innovation activities and standard procurement activities

PTD3. We have a distinct set of people skills and competences for innovation activities and standard procurement activities

(D) Items dropped during the EFA purification stage