Capabilities, Innovation and Performance of Brazilian Exporting Firms

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Abstract
Premised on the resource-based view and dynamic capability perspective, we examine the differential and interactive effects of the exploration and exploitation capabilities in new product development for external markets and in overall performance. In addition, we test the moderate effect of market dynamism and the control effect of firm size on these relationships. Our model was tested with data from 498 Brazilian exporting firms, applying structural equation modeling (SEM). We found support to the hypotheses that exploitation capabilities influence both product innovation and performance, whereas exploration capabilities and its interaction with exploitation influence performance but not product innovation.
Introduction

Product innovations constitute one of the major instruments for firm's competitive advantage and survival. It is even more important in turbulent environments. In turn, new product development (NPD) is an entrepreneurial process applying existing and new capabilities (Zhou & Wu, 2010; Atuahene-Gima, 2005; Atuahene-Gima & Murray, 2007; Yalcinkaya, Calantine and Griffith, 2007; Verhees and Meulenberg, 2004). Hence, capabilities, innovation and firm performance are, according to Neely, Filipini, Forza, Vinelli and Hill (2001), in the CEOs and researchers agenda. However, to date, few studies (if any) have examined the relationship between capabilities, innovation for external markets and overall performance in the context of Brazilian exporting firms. The exporting firms, as noted by Salomon and Shaver (2005), based on an extensive literature, tend to be more productive compared to non-exporters. They confirmed this to the case of Spanish industrial firms showing that “exporters consistently have greater average product innovation and patent application counts than their non-exporting counterparts” (p.441).

To develop new products, firms invest in new innovation capabilities (explorative) and/or apply the already existent within them (exploitative). However, which is the type of capability linked to innovations and performance is not a clear cut question in the literature. Zhou and Wu (2010), for example, claim that while the absorptive capacity perspective indicates that a distinctive capability may foster a higher level of explorative innovation, the organizational inertia theory suggests that a higher level of organizational capabilities in a particular field is linked to more exploitative innovations. In general, it is proposed that exploitation capabilities aim cost reductions and exploration capabilities focus on new products or differentiation.

Hence, this study tries to advance in the understanding of these relationships with the analysis of firms’ antecedents of product innovation and overall performance in the context of Brazilian exporting firms. In terms of antecedents, the research assesses the impact of capabilities on product innovation for external markets and in terms of consequences the impact of this innovation on overall performance. The general objective is to analyze the impact of different and integrated capabilities on product innovation for external markets and, direct and indirectly, on overall performance of Brazilian exporting firms.

These types of innovation and performance were selected because it is suggested in the literature (eg. Cassiman & Golovko, 2011) that both product innovations and exporting strategy are complementary. Specially, we follow Golovko and Valentin (2011) who found robust empirical support for the hypothesis that the positive effect of innovation activity on firms’ growth rate is higher for firms that also engage in exports, and vice versa. As claimed by Kylaheiko, Jantunen, Puumalainen, Saarenketo and Tuppura (2011), internationalization and innovation combined is the most successful strategy when domestic markets are limited.

This paper, after this introduction, is structured as follows. The concepts, notions, and relationships of innovation, capabilities and overall performance, relevant to this research, are reviewed in section 1 (items 1.1 and 1.2). In item 1.3, a conceptual model and hypotheses on these relationships, derived from that review, are proposed. The study methodology is described in the section 2. After that, the model is tested on a specific sample of Brazilian exporting firms and the results are presented and discussed in section 3. The paper finishes with the managerial and theoretical implications of the results.

1. Capabilities, Innovation and Performance: A Review of the Literature

1.1 Capabilities and Innovation and Performance

The organizational capabilities are the principal sources of firms’ performance (Knight & Cavusgil, 2004). Specifically, according to a generalized premise, firms develop and apply knowledge and competences that make them more innovative and leverage their general performance (Li & Calantone, 1998; Atuahene-Gima, 1995a; 1995b; 2005; Lages, Silva and Styles, 2009; Vorhies & Morgan, 2005). Under a strategic point of view, Yalcinkaya et al.
(2007), based on several researchers, suggest that product innovation capabilities are central to the firms’ sustainability. Accordingly, Golovko and Valentini (2011), for the context of exporting firms, the innovation process depends on firms’ learning abilities, which may increase through exports.

Hence, Neely et al. (2001) claims that the relevant question of why some firms are more innovative than others, should be reformulated to: why some firms have more propensity to innovate than others? The answer, according to Zhou and Wu (2010), based on a review of the literature, is that the innovation process implies that a firm should search, identify, and evaluate alternative knowledge from different sources. This knowledge should be disseminated within the firm and used in its transformation into specific product designs that constitute product innovation. Hence, Yalcinkaya et al. (2007) claim that exploration and exploitation capabilities are a central theme into all the process of product innovation.

According March (1991), this knowledge can be associated with two groups: the first means the exploration of new possibilities and the second the exploitation of old certainties. He asserts that although ‘maintaining an appropriate balance between exploration and exploitation is a primary factor in system survival and prosperity’ (p.71), firms make a choice between the two, due to the limited access to scarce resources.

Zhou and Wu (2010) adapted March’s view of knowledge to the domain of product innovation and define “exploitation as the use and refinement of existing knowledge and skills in product development, whereas exploration refers to the search and pursuit of completely new knowledge and skills in product development” (Zhou & Wu, 2010, p.548).

Accordingly, Atuahene-Gima (1995b) claims that, since by definition, product innovativeness reflects the experience the firm has in developing and/or adopting the innovative product, we can accept that radical products are more likely to require greater learning and behavioral change on the part of the firm than incremental innovations.

Based on the firms’ dynamic capabilities perspective, Yalcinkaya et al. (2007) also studied the influence of exploration and exploitation capabilities on product innovation. From March (1991) and Levinthal and March (1993) definitions, the authors defined “exploration capabilities as the importer’s ability to adopt new processes, products, and services that are unique from those used in the past and exploitation capabilities as the importer’s ability to improve continuously its existing resources and processes” (Yalcinkaya et al., 2007, p.66).

According to Atuahene-Gima (2005) exploiting existing capabilities may provide short-term success, but to the firm’s long-term sustainability exploration capabilities should be integrated to the firm. In turn, Atuahene-Gima and Murray (2007) claim that exploitation is linked to the full use of a firm’s existing technology and product-market domains. The chances of innovation efficiency are greater, since the process uncertainty is smaller. According to March (1991), exploitation capabilities present “returns that are positive, proximate, and predictable” (p.85).

Regarding exploration capabilities, Atuahene-Gima and Murray (2007) suggest that it enhances product innovativeness due to the cumulative process of new knowledge being added to the knowledge repertoire of firms’ members. This new knowledge leads to differentiated products which distinguishes the firm from competitors and provide superior competitiveness. However, exploration capabilities present “returns which are uncertain, distant and often negative” (March, 1991, p.85).

In addition, Yalcinkaya et al. (2007) suggest that exploration and exploitation capabilities are closely linked, since exploring only existing knowledge (exploitation) without exploring new one (exploration) will eventually become ineffective given the probability of technological exhaustion in the market. For Atuahene-Gima and Murray (2007) firms’ concentration in exploration capabilities may produces deficit in the relation costs of experimentation and turnover with new products; while concentration in exploitation may produce a suboptimal
equilibrium. Hence, balancing exploratory and exploitation capabilities, as proposed by March (1991), means the combination of an adequate level of both capabilities.

1.2 Innovation and Overall Performance

For Verhees and Meulemberg (2004), the various meanings of the term innovation over the years can be summarized as ‘the process of developing a new item, the new item itself, and the process of adopting the new item’. Freeman (1982) focus on the object and define innovation by the “first commercial transaction of one idea involving a new or improved product or process” (p.7). Success means the economic return with the launching of innovations.

Innovation has been researched at the sectoral, regional, firm, and project levels (Verhees & Meulemberg, 2004). In this study, innovation is investigated at the firm level since it analyzes some antecedents and consequents internal to firms. At this level, innovation has been suggested as the main variable associated with superior performance. Day and Wensley (1988), for example, state that new products that meets customer’s need constitute direct evidence of competitive advantages. Yalcinkaya et al. (2007) claim that the continuous introduction of new product and service which satisfies customer needs and wants is central to firm’s survival.

In this sense, Sandvik and Sandvik (2003) stressed that successful product innovativeness produces effect in three kinds of market: the availability of a price premium, growth in sales, and capacity utilization. The authors claim that since improved and new successful products “generally provide value to customers and greater differentiation for the firm’s products from those of Competitors” (p.359), in many cases the pricing decision is close that of a monopoly. Hence, it is expected that this innovativeness leads to higher performance.

In turn, according Golovko and Valentini (2011), since exporting firms have access to knowledge sources not available in their domestic market; they can upgrade the internal learning process which is one of the main bases for innovations. This trajectory increases the likelihood of the firms enter new geographical markets, making exports more successful and increase the domestic sales. Hence, according to the authors, “exports and innovation can thus give rise to a virtuous, reinforcing circle” (p.363), that culminate with a better overall performance.

Also, Golovko and Valentini (2011), stress that investments in innovation for exports may produce positive spillovers in the firms’ domestic markets since they be able to obtain a price premium for their domestic sales of some exported product.

1.3 Capabilities, Innovation and Overall Performance: Hypotheses and Model

The paper’s model (Figure 1) aims at explaining capabilities as antecedents of innovation and capabilities and innovation impacts on overall performance for Brazilian exporting firms. Hence, the focus is on innovation as dependent, explanatory, mediate and moderated variable. In turn, capabilities are antecedents and overall performance is the consequent analyzed.

On the basis of this model, hypotheses are formulated. Beginning with capabilities, Yalcinkaya et al. (2007) evaluated the direct and indirect influence of exploitation and exploration capabilities over market performance in the case of US importers. Innovation was analyzed both as a mediated variable and the direct influence on performance. They formulated the hypotheses that ‘exploration capability is positively related to an importer’s degree of new product innovations’ (and exploitation is negatively related), while ‘exploration and exploitation capabilities are positively related to an importer’s market performance’ (Yalcinkaya et al., 2007).

The empirical results confirmed that the capabilities present diverse knowledge base, with exploitation capabilities primarily derived from a marketing resource base and exploration capabilities derived from a technological resource base. Also, they confirmed the hypotheses that while exploitation capabilities are negatively related to the degree of product innovation,
exploration capabilities are positively related both to the degree of product innovation and market performance. In addition, exploitation capabilities and product innovation are positive but not significantly related to market performance. The authors claim that this unveils “the intricate relationships between exploitation and exploration capabilities and specific firm outcomes” (Yalcinkaya et al., 2007, p.84), since the first tends to narrow and the second tends to broaden the importer’s product innovation. However, since exploitation capabilities provide a foundation to exploration capabilities, it presents an indirect effect on product innovation and market performance.

![Figure 1. Research Conceptual Model](image)

However, Atuahene-Gima and Murray (2007) claim that exploitation capabilities reduces errors in problem solving and avoids mistakes in product innovations, however, deeper exploitation within a familiar knowledge base makes the adoption of alternate, newer directions of development difficult. Hence, they tested the hypothesis that exploitation enhances new product innovation performance until a threshold, with a lower new product performance from this point, because of knowledge ossification. The result gone in different direction: the relationship between exploitative learning and new product performance is U-shaped (not inverted), suggesting that product innovativeness is linked to a low and high level of exploitation capabilities, with a lower level in the medium point.

Atuahene-Gima and Murray (2007) also claim that exploration capabilities activities present higher risks and costs due to likely inefficiencies in problem solving derived from many proposed solutions to customers’ needs with high level of unsuccessful innovations. Hence, they tested the hypothesis that exploration capabilities also present an inverted U-shaped relationship with product innovativeness, with a positive impact at low levels and negative one at high levels. Also in this case the hypothesis was refuted, however suggesting that the relationship is ‘positively curvilinear, denoting a faster-than-linearly increasing returns on new product performance’ (Atuahene-Gima & Murray, 2007, p.21).

Joining their results to others in the literature, Atuahene-Gima and Murray (2007) conclude that the assumption of diminishing returns of exploration and exploitation is overblown, which makes more probably that both exploitative and exploratory learning present increasing returns and product innovativeness performance.

Specifically to the cases of exporters firms, Salomon and Shaver (2005) argue that these firms generally access new knowledge (explorative) which lead to a process of learning by exporting and ultimately increase capabilities and foster increased innovation. They confirmed this process of learning by exporting and its association with innovation to a representative sample of Spanish manufacturing firms with data from 1990 to 1997.

In turn, based on the proposal that capability exploitation enhances incremental innovations and hinder radical innovation, since it is focused on the improvement of existing processes and products, Atuahene-Gima (2005) formulated and confirmed the hypothesis that capability
exploitation is positively related to incremental innovation performance and negatively related to radical innovation performance. The opposite was confirmed to capability exploration, that is, it is negatively related to incremental innovation performance and positively related to radical innovation performance.

Therefore, the results in the literature offer conflicting view about the role of capabilities on product innovations. Given these conflicts and the predominance of incremental innovations in the Brazilian industrial firms (Cabral, 1998; Instituto Brasileiro de Geografia e Estatística [IBGE], 2010) which apply knowledge ‘in use’ in the innovation process, we posit the following hypotheses: H1. The internal exploration capabilities of Brazilian exporting firms are negatively related to the intensity of product innovation to the overseas market.

H2. The internal exploitation capabilities of Brazilian exporting firms are positively related to the intensity of product innovation to the overseas market.

In agreement with Nerkar (2003) statement that their hypotheses mean that ‘there are diminishing returns associated with both exploration and exploitation’ and with March (1991) statement ‘that an appropriate balance between exploration and exploitative learning is a crucial factor in a firm’s effectiveness’, Atuahene-Gima and Murray (2007) tested alternative hypotheses that “the interaction between exploration and exploitation learning is positively (or negatively) related to new product performance”. The authors’ idea is that firms which exploit and explore more, become more efficient in learning processes and achieve better new product performance. The result shows a coefficient negative and significant confirming the hypothesis of a negative relation between the interaction and innovativeness. In addition, the analysis shows that the advantages of exploration learning on new product performance become smaller when exploitative learning increase. Hence, it is suggested that firms need to balance exploration and exploitative learning to enhance innovation performance, since high levels of both capabilities should lead to greater inefficiencies.

In turn, in line with this proposal of balance, Atuahene-Gima (2005) tested the hypotheses that the interaction between competence exploration and exploitation is related to incremental innovation performance and radical innovation performance. The results confirm that the relationship of the interaction with incremental innovations is not significant and the interaction with radical innovations is negative. Hence, capabilities exploitation and exploration are independent in their relationship with incremental and radical innovations.

This is compatible with Abernathy (1978) questioning about the possibilities for organizations to pursue both types of activities simultaneously. For Benner and Tushman (2003) this is possible via a context of an ambidextrous organization form which permits the senior executives to conciliate variation reduction and control (exploitation), as well as exploration and option creation.

Given these results and again the predominance of incremental innovations in the Brazilian industrial firms (Cabral, 1998; IBGE, 2010) which apply ‘knowledge in use’, we formulate the hypothesis: H3. The integrated exploration and exploitation capabilities of Brazilian exporting firms are negatively related to the intensity of product innovation to the overseas market.

As above, Yalcinkaya et al. (2007) study confirmed exploration capabilities and product innovation as positively related to market performance, while exploitation capabilities is not. According to Nath, Nachiappan and Ramanathan (2010), based on the RBV view, the extensive work in academy to understand the relation between capabilities and firm performance has been conclusive about the significance of this relationship. They tested and confirmed this hypothesis for a sample of 102 UK based firms, showing that capabilities (marketing and operational) have a significant impact of superior financial performance. Although, they conclude that firms should integrate these capabilities whether they wish
improve their business performance, the results show marketing capabilities as more important in the case of efficient firms. Vorhies and Morgan (2005), in a survey of 230 top marketing executives of U.S. firms in six industry types, tested and confirmed the hypothesis that marketing capabilities are associated with superior business performance. They also verify that the gap in marketing capabilities between top and bottom firms explain significant variance in business performance.

In turn, Atuahene-Gima (1995a) formulated hypotheses that new product propensity and performance are determined by two groups of factors, those related to the firm (firm size, R&D intensity, etc.) and those related to new product factors (proficiency of predevelopment activity, product advantage, international orientation in new product development, etc.). Also, they posit that the contribution of the second group would be greater than the first one. The results confirmed that new product factors play an outstanding role in export performance, however firm’ factors, actually, overwhelms new product factors in explaining export performance. Given the fact of little empirical evidence of capabilities impact on export performance, Lages et al. (2009) formulate and confirmed the hypothesis that relationship capabilities influence export performance measured by relationship performance.

Hence, the following hypotheses are posited: 

H4. The internal exploration capabilities of Brazilian exporting firms are positively related to their overall performance.

H5. The internal exploitation capabilities of Brazilian exporting firms are positively related to their overall performance.

According to He and Wong (2004), while there is a good understanding of the conceptual distinction between exploration and exploitation and their implications for strategy and structure, there has been surprisingly little empirical investigation of the interaction effect between the two and its effect on firm performance indicators. However, from the few works, we can see a different picture from the proposition and results about the effect of the interaction of capabilities on product innovation, that is, there is a more positive statement and results that this interaction is positively related to firms’ overall performance. He and Wong (2004), for example, based on a sample of 206 manufacturing Singapore and Malaysia firms, found evidences consistent with the ambidexterity hypothesis that the interaction between explorative and exploitative innovation strategies is positively related to performance, measured by sales growth rate. Hence, we posit the following hypothesis:

H6. The interaction of internal exploration and exploitation capabilities of Brazilian exporting firms is positively related to their overall performance.

Based on a literature review, Li and Calantone (1998) suggest that whether new successful products are joined with buyers’ favorable perceptions, the former are also correlated to superior market performance. From this proposal, they tested and confirmed the hypothesis that “the greater the new product advantage, the better the product market performance will be” (p.17).

Sandvik and Sandvik (2003) explore the influence of two dimensions of innovativeness - new-to-the-firm products and new-to-the-market products – on business performance, because they are suggested to produce different responses on the outcome variables. They formulated and confirmed the hypotheses that only new-to-the-market products leverages all analyzed dimensions of performance - sales growth, relative price premium, capacity utilization, and firm profitability. Keskin (2006), in a study of 157 small firms operating in Turkey, found that firm innovativeness positively affects firm performance.

In a specific analysis of the global market, Lages et al. (2009) stress that the crescent level and shortening time of new product imitation by competitors, amongst other factors, are enhancing the importance of product innovation to achieve better export performance. Based on this proposal, they formulated and confirmed the hypothesis that product innovation produces a positive effect in export performance, measured by the economic effect. In a
similar fashion, Aulakh, Kotape and Teegen (2000) carried out a research on a sample of firms from Brazil, Chile, and Mexico and concluded that cost-based strategies (generally an outcome of process innovations) enhance export performance in developed country markets and differentiation strategies (generally an outcome of product innovations) enhance performance in other developing countries.

Golovko and Valentini (2011) cite that through the data analyzes of 1400 Spanish SMEs over a period of 10 years the hypothesis of complementarity between innovation and export was confirmed. Therefore, innovation presents a positive effect on sales growth which is higher in exporting firms. Hence, we propose the following hypothesis:

H7. The intensity of product innovations to the overseas market of Brazilian exporting firms is positively related to their overall performance.

The hypothesis 7 has not been supported in some studies. This is consistent with the statement that the relationship is contingent on the dynamics of the market. In this direction, Jansen, Van Den Bosch and Volberda (2006) claim that the relationship between product innovation for actual and emerging customers and markets with overall financial performance is moderated by degree of market dynamism. They found that in dynamic markets the effect of radical innovations on financial performance is greater, while incremental innovations present a positive effect on this performance in competitive markets. From this result, the authors suggest that ambidextrous organizations coordinate the development of both types of innovations, looking at to respond efficiently to market conditions.

Hence, in this study, we examine the moderating effects of market dynamism on the relationship amongst product innovation and performance. According to Jaworski and Kohli (1993) market dynamism means the perceived speed of change in product preferences, customer demand and emergence of new customer segments in the industry. This definition suggests a positive linkage between market and innovations. Therefore: H8. The market dynamism moderate the relationship between innovation and overall performance, that is, a greater market dynamic strengthens the positive effect of innovation on performance.

Finally, we also test whether product innovation mediate the relationship between capabilities and overall performance. We will do this based on some results in the literature. Li and Calantone (1998), for example, claim that their findings suggest that “market knowledge competence leads to better product market performance by enhancing new product advantage” (p.25).

2. Research Methods
The conceptual model formulated in this research posits that the internal factors to firms, namely, exploitation and exploration capabilities, directly and mediated by product innovation to overseas market, influence the overall performance of exporting firms. It stresses also that the relationship between innovation and performance is moderated by market dynamism. With the empirical data, it will be assessed whether this model applies to the context of Brazilian exporting manufacturing firms.

2.1 Sampling and Data Collection
The unit of analysis of this research is the exporting manufacturing firm grounded in Brazil. The research population in 2010 was comprised by 20,133 firms (Ministério do desenvolvimento, Indústria e Comércio Exterior [MDIC], 2010). The sample size, defined by the method of finite population, is of 378 firms. However, to increase reliabilities and analyses possibilities we decide to have a sample of 501 firms. The questionnaires of three respondent firms were not included in the analysis since most of the questions were not answered. So, the final sample is of 498 distributed by all Brazilian regions, manufacturing sectors, and varied size.

The data was collected through a formal structured questionnaire, basically with closed questions, using the back-translation process. This questionnaire comprised 38 statements to
answers in 7-point Likert scale, with 1 meaning ‘not at all’ and 7 meaning ‘to an extreme extent’. Before the definitive design, the questionnaire was submitted to academics and experts in international trade to test clarity, layout, and relevance. Their suggestions contributed to a reformulated design. In addition, this ‘new’ design was pre-tested through in-depth interviews with managers of approximately 3% of the calculated sample (11 firms). This pre-test gave more indication to improve clarity and face validity of the definitive questionnaire.

The questionnaire was applied by a team of trained researchers from CEPA-Center for Studies and Research in Management of UFRGS-Federal University of Rio Grande do Sul (Brazil), from October 2010 to March 2011. They called, by phone, the main executive of the firm selected by chance. Each interviewer explains the objectives and relevance of the study and each interview lasted an average two hours.

2.2 Measures

The component unidimensionality of the measurement items was assessed through exploratory factor analysis, while internal consistency was assessed through Cronbach’s alpha obtained from reliability analysis. We do these tests complementarily for reliability assurance, since all items were selected from previous works in the literature, following Churchill (1979) recommendations. We run the analyses for each construct, namely, exploitation capability (EXPLOI), exploration capability (EXPLOR), product innovation (INP), overall firm performance (DG), and market dynamism (DM). All constructs are measured by at least four indicators, as suggested by Hair et al. (2009).

We adopt the exploitation (α=.87) and exploration capabilities (α=.88) from Atuahene-Gima (2005), who defined them by the extent to which a firm uses existing or explores new knowledge and technologies in the product development. They are measured by five items each. To measure product innovation (α=.96) for overseas market we follow the definition of Lages et al. (2009) comprised by five indicators. Overall performance (DG) is measured as a second-order construct comprised by three first-order latent dimensions – customer satisfaction - SC (α=.84), market effectiveness - EM (α=.88), and profitability - LA (α=.92) – each of them measured by four indicators (Vorhies & Morgan, 2005). The last construct, market dynamism (α=.87), is defined as ‘the rate of change, hostility, and heterogeneity inherent in the firm’s export markets’ and is measured by five indicators (Cadogan, Kuivalainen and Sundqvist, 2009). The option for measuring market dynamism in external marketplaces follows the definition of innovation also for these markets. Overall, the exploration tests show coefficients confirming satisfactory reliabilities, since all Cronbach’s α are greater than 0.7, confirming the theoretically expected factor solutions.

To account for the effects over the relationships with overall performance, we include firm size as control variable. To measure it, we use the logarithm of the number of full-time employees as an indicator.

Finally, before create two interaction terms, exploitation capability with exploration capability (EXPLOI*EXPLOR) and product innovation with market dynamism (INP*DM) we mean centered these independent and moderator variables (Aiken & West, 1991; Marôco, 2010). After that, we multiply the values of each indicator of EXPLOI by EXPLOR and each indicator of INP by DM (Slater & Narver, 1994; Marôco, 2010).

2.3 Analysis and Results

We test our model applying structural equation modeling, with AMOS™ 17.0 (SPSS). At first, we run a five-factor confirmatory measurement model (CFA) and estimated path coefficients using maximum likelihood (ML) estimation.

The first and second solutions were not considered admissible, since the residuals 2 and 3, respectively, presented a negative variance. Following Marôco (2010) recommendation, we fixed these residual variances in value next to zero (0.001). In the third model, the solution
was accepted with the ‘minimum achieved’. The test yielded a $\chi^2$ value of 1795.821 with 613 degrees of freedom and $p<0.001$, suggesting a poor fit. However, given the sensitivity of this test to the sample size, results like this are not unexpected (Byrne, 2010; Marôco, 2010). Hence, to the final decision we should look at other group of statistics. In general, all indexes present a good fit (goodness-of-fit index [GFI] = 0.86, parsimony goodness-of-fit index [PGFI] = 0.75, comparative fit index [CFI] = 0.91, parsimony comparative fit index [PCFI] = 0.84, incremental fit index [IFI] = 0.91, Tucker–Lewis index [TLI] = 0.90, root mean square error of approximation [RMSEA] = 0.06, with a PCLOSE of 0.001 and confidence interval of 0.059 to 0.066). In addition, all main path coefficients are significant at the level of 0.001 and the standard covariances (i.e. correlations) between the predictors terms present high statistical significance, except for four paths ($\text{EXPLOI} \leftrightarrow \text{INP} \times \text{DM}$; $\text{EXPLOR} \leftrightarrow \text{INP} \times \text{DM}$; $\text{INP} \leftrightarrow \text{INP} \times \text{DM}$; $\text{INP} \times \text{DM} \leftrightarrow \text{DG}$).

To test for multicolinearity we have calculate the VIF through a linear regression with a composite score of $\text{DG}$ as dependent variable and the mean-centred of the independent variables, using the SPSS. There is a very weak evidence of multicolinearity between exploration and exploitation, with VIF of 2.3 and 2.2, respectively (Marôco, 2010, p.62 claims that only VIFs superiors to 5 suggest multicolinearity).

To assess specification model we observed the ‘modification indices’ (MI) and noted nine pairs of errors terms above the threshold of 11 (Marôco, 2010), suggesting model misspecification (Byrne, 2010). Four of them, stand apart since they are substantially larger than the others. The pairs are related to the same factors, which shows an overlap in content and justifies theoretically adding a covariance between them in the model (Byrne, 2010; Marôco, 2010).

Hence, we follow the literature suggestion and add in model 4 only one parameter having the largest MI: the covariance between errors 29$\leftrightarrow$28. The results, compared the third model, did not change very much. However, the ‘modification indices’ shows that the other three pairs of errors yet present a substantially larger covariance than others pairs. Hence, we decide to run the fifth model for adding a covariance between errors 32$\leftrightarrow$31, 2$\leftrightarrow$1 and 15$\leftrightarrow$14, which are related to the same factors.

All results improved regarding the former model: $\chi^2$ value drop to 1635.668 (df=609), GFI=0.87, PGFI=0.76, CFI=0.92, PCFI=0.84, IFI=0.92, TLI=0.91, RMSEA=0.06. Hence, we need to assess whether the model 5 is significantly better than the model 4. We have done by testing the differences in $\chi^2$ (Byrne, 2010; Marôco, 2010). As the $\chi^2$ of the difference is 102,582 which is greater than the observed value for $\chi^2_{0.05; (1)}$, we reject $H_0$ and conclude for final best-fitting of the model 5 to represent the data.

Overall, the confirmatory tests show coefficients confirming convergent and discriminant validities (Hair et al., 2010; Malhotra & Birks, 2007; Marôco, 2010). Regarding convergent validity and reliability, the composite reliabilities (CR) of all constructs exceed by far the 0.70 benchmark, and all average variance extracted (AVE) exceed the benchmarking of 0.50 (Table 1). In terms of discriminant validity, we follow the suggestion of Marôco (2010) and figure out the squared root of average variance extracted of each construct and compare the results with the correlation coefficient between pairs of constructs. As all squared root of AVE are equal or greater than the shared variance, so we can claim that the measures present adequate reliability and validity.

The descriptive statistics and correlations in Table 1 also provide some initial evidences of the hypotheses of the study. As expected, given the suggestion (e.g. Zhou & Wu, 2010) that exploration capability is riskier and more uncertain in returns than exploitation capability, our results show a mean of the second capability slightly lower than the first one. Product innovation for external markets presents the smallest mean of independent variables, which is consistent with the view that Brazilian exporting firms are not very innovative, given the
predomination of export of commodities or mature products and the firms’ orientation to production (Cabral, 1998; Aulakh et al., 2000). In turn, the overall performance present the highest mean, as expected by the overall performance of Brazilian exports in the 2000’s years. In addition, all correlation coefficients between the main paths are significant, providing initial evidence in the theorized direction.

Table 1.

Measurement Items and Validity Assessment

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<td>3. INP</td>
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<td>4. DG</td>
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<tr>
<td>5. INP*DM</td>
<td>-0.04</td>
<td>-0.05</td>
<td>-0.07</td>
<td>-0.03</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. EXPLOI*EXPLOR</td>
<td>-0.45*</td>
<td>-0.43*</td>
<td>-0.19*</td>
<td>-0.16*</td>
<td>0.19*</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SIZE</td>
<td>-0.01</td>
<td>0.04</td>
<td>0.07</td>
<td>0.13*</td>
<td>0.01</td>
<td>-0.04</td>
<td>NA</td>
<td>NA</td>
<td>2,104</td>
<td>8,728</td>
</tr>
</tbody>
</table>

Notes: 1. * Correlation is significant at 0.01 level (p<0.01; 2-tailed). 2. The diagonal (in bold) shows the square roots of AVE. 3. N=498. 4. Items 5 and 6 with independent variables Mean Centered. NA: Not Available.

Confirmed the adequate fit of the measurement model, we pass to run the test of causality (structural equation) to test our hypotheses. The model presents very similar adjustment indices to the measurement model, suggesting that it is an acceptable model ($\chi^2=1690.230$ (df=646), p 0.001, $\chi^2/d.f.=2.62$, GFI=0.87, PGFI=0.76, CFI=0.92, PCFI=0.85, IFI=0.92, TLI=0.91, RMSEA=0.06). The results in Table 2 show that from nine hypotheses testing, six are supported with statistical significance.

Table 2.

Hypotheses-testing results

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Standard estimate (t-value)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1. Exploration capabilities → product innovation (-)</td>
<td>0.02 (0.08)</td>
<td>No support</td>
</tr>
<tr>
<td>H2. Exploitation capabilities → product innovation (+)</td>
<td>0.73 (3.33**)</td>
<td>Support</td>
</tr>
<tr>
<td>H3. Exploration X exploitation capabilities → product innovation (-)</td>
<td>-0.02 (-0.21)</td>
<td>No support</td>
</tr>
<tr>
<td>H4. Exploration capabilities → performance (+)</td>
<td>0.19 (2.06*)</td>
<td>Support</td>
</tr>
<tr>
<td>H5. Exploitation capabilities → performance (+)</td>
<td>0.20 (1.98*)</td>
<td>Support</td>
</tr>
<tr>
<td>H6. Exploration X exploitation capabilities → performance.</td>
<td>0.07 (2.00*)</td>
<td>Support</td>
</tr>
<tr>
<td>H7. Product innovations → performance (+)</td>
<td>0.06 (2.97**)</td>
<td>Support</td>
</tr>
<tr>
<td>H8. Market dynamism X innovation → performance (+)</td>
<td>-0.03 (-0.16)</td>
<td>No Support</td>
</tr>
<tr>
<td>Control path: Firm size → performance (+)</td>
<td>0.05 (3.14**)</td>
<td>-</td>
</tr>
</tbody>
</table>

The H1 is not supported. The result is not significant and the coefficient is not negative. Hence, we did not find evidence to the hypotheses that exploration capability is negatively related to product innovation in the Brazilian exporting firms. H2, however, is supported: exploitation capability is positively and significantly ($p<0.01$) related to product innovation. H3 was not confirmed, since the coefficient is negative, but no significant. Hence, there is no evidence for the effect of the interaction of exploration and exploitation capabilities over product innovation.

Both exploration and exploitative capabilities are significantly ($p<0.05$) and positively related to overall performance, confirming H4 and H5. In addition, the interaction of both capabilities is positive and significantly ($p<0.05$) related to performance. Hence, there is support for H6. To gain more insights about this result, we follow Aiken and West (1991) recommendation to plot the interaction and conduct simple slope tests. To achieve this, we use the unstandardized coefficients and split exploration capabilities (exploitative capabilities) into a high group (one standard deviation greater than the mean) and a low group (one standard deviation less than the mean) and reestimate the relationship between the interaction of capabilities and overall performance. The results strengthen the finding that this interaction influences performance in Brazilian exporting firms. The plot shows that when exploration capabilities is high, the
positive relationship between exploitation capabilities and performance is stronger (simple slope: \( b = .28, t = 4.11, p < 0.001 \)) than when it is low (simple slope: \( b = .21, t = 3.02, p < 0.01 \)). Similarly, the plot in Figure 2b shows that when exploitation capabilities is high, the positive relationship between exploration capabilities and performance is stronger (simple slope: \( b = .27, t = 3.98, p < 0.001 \)) than when it is low (simple slope: \( b = .20, t = 2.94, p < 0.01 \)).

In turn, the results confirm evidence to the relationship between product innovation and performance, supporting H7. However, the interaction effect of market dynamism and product innovation on performance is negative although not significant. This result does not support the hypothesis (H8) that market dynamism moderates positively the effect of product innovation on performance. Hence, performance varies with product innovation independent of the market dynamism.

In addition, the results show that firm size plays a control effect on the paths with performance \((p < 0.01)\). The measurement of size was based on number of employees and to ensure normal distribution we tested this control effect by taking its logarithm. In addition, to gain further insight, we tested this control effect applying a multigroup analysis (Joreskog & Sorbom, 1993; Marôco, 2010). Based on the median split we classified the groups in small/medium (0) and large (1) firms, with the two groups of firms distributed almost equally. The first has 251 and the second one has 247 firms. The largest firm in the first group has 450 employees and the smallest firm in the second group has 500 employees.

The multigroup analysis shows a good fit for small/medium and large firms, simultaneously, that is, to the total sample \( \chi^2=2724.015, 1292 \text{ d.f.}, p < 0.001, \chi^2/\text{d.f.}=2.11, \text{GFI}=0.80, \text{PGFI}=0.70, \text{CFI}=0.90, \text{PCFI}=0.82, \text{IFI}=0.90, \text{TLI}=0.88, \text{RMSEA}=0.05 \). The separate estimation of the groups (unconstrained and measurement weights) result in different estimation \[ \chi^2 (1292) = 2724.015 \text{ and } \chi^2 (1321) = 2797.487 \], both significant at the \( p < 0.001 \) level. The test of the difference shows that the two models are significantly different \( \chi^2 \text{ diff}=73.472 > \chi^2 .95(29)= 42.56 \). Since, the \( \chi^2 \) of the difference is greater than the observed value, the hypothesis of the difference between firms’ size is reinforced.

Finally, to test for the mediation effect of innovation into the relationship capabilities and performance, we observed the standardized total, direct and indirect effects of \( \text{EXPLOI} \) over \( \text{DG} \). We follow Marôco (2010) suggestion and test the significance of the mediation effect with Sobel’s test. We found \( Z \) statistics equal to 103.5, which suggest rejecting \( H_0 \) at \( \infty 0.05 \). Hence, we can accept the mediation effect. In addition, we run for coefficients significance through Bootstrap simulation and confirmed the direct effect of \( \text{EXPLOI} \) on \( \text{DG} \) \( (\beta=0.321; \rho<0.001) \) and an effect mediated \( (\beta=0.259; \rho<0.001) \) by \( \text{INP} \) on the relationship.

3. Main Findings and Discussion

Building on the resource-based view and dynamic capability perspective, we provide an original perspective on the relationship amongst capabilities, product innovation for external markets, and overall performance. Specifically, we analyze innovative and performance outcomes of exploitative and explorative capabilities, and whether product innovation for external markets has a mediation role on overall performance, in the context of Brazilian exporting firms.

As such, we find that exploration capability is not related to product innovation. The context of Brazilian exporting firms may explain this result, since most of these firms innovates incrementally and the majority of product innovations are new only to the firm (Cabral, 1998; IBGE, 2010), and the main group of products exported by these firms are commodities (MDIC, 2010). Hence, the knowledge base is ‘knowledge in use’, while exploration capabilities are connected to fundamental changes in the current technology and knowledge. As suggested by Benner and Tushman (2003), incremental technological innovations and innovations designed to meet the needs of existing customers build upon existing
organizational knowledge. Hence, the firms use exploitative capabilities. In this direction, Atuahene-Gima (2005) found that competence exploration is negatively related to incremental innovation performance and positively related to radical innovation performance. These propositions and results partially confirm our research finding.

In addition, it is important to stress that Brazilian firms tend to develop or adopt more process than product innovations (IBGE, 2010), which tend to use mainly internal knowledge. The outcome of process innovations is cost minimization, greatly associated with a process of learning-by-doing (Cohen & Levinthal, 1989). As posit by Sousa and Lengler (2009), the lower prices of Brazilian products compared to other countries is the main strategy to penetrate into the foreign markets, since the consumers in developed countries tend to perceive products and brands from developing countries negatively. Hence, they equate the products with low price and quality, which makes a cost leadership strategy more suitable for competition.

However, exploration capability enhances overall performance since it influences other firms’ factors, as the understanding of the needs of emerging customers and new markets. Process innovations to solve bottlenecks and minimize costs should have a base on new knowledge and present an effect on performance. Also, most of the firms in the sample sell and innovate to the domestic market.

Further, we find that exploitation capability is positively related to product innovation. Since, most of Brazilian firms use and refine existing knowledge and skills in product innovations, the needed capabilities are mainly connected to absorptive capability to adopt innovations developed out-house. This confirms Atuahene-Gima (2005) who found that competence exploitation is positively related to incremental innovation performance which is the predominate innovation type in Brazilian exporting firms. Also, He and Wong (2004) found that exploitative innovation strategy affect both product and process innovation.

Exploitation capability is also positively related to overall performance. Since exploitation capabilities lead to improvements in current products and exhibit no deviation from the current market, it is probable that this process achieves a better customers’ satisfaction culminating with crescent firms’ performance.

The interaction of exploration and exploitation capabilities has no influence over product innovation. Hence, the weight of capabilities exploitation is not enough to offset the importance of capabilities exploration to product innovation. This also is in accordance with Atuahene-Gima (2005) results which show that the interaction between competence exploitation and exploration is negatively related to radical innovation performance and is not related to incremental one. In turn, Atuahene-Gima and Murray (2007) also find a negative interactive effect of exploitative and exploratory learning on new product performance, suggesting diminishing returns from their integration. According to these authors, probable reasons for that are the degree of market competition, as suggested by Nerkar (2003), and different organizational structures and environments, as proposed by Benner and Tushman’s (2003).

However, we find that the interaction of exploration and exploitation capabilities is linked to overall performance, suggesting a crescent return to this kind of performance when both capabilities are integrated. As proposed by Lisboa, Skarmeas and Lages (2011), while exploitative capabilities provide the immediate capital flow that enables firms to perform in the present, explorative capabilities support the search for new sources of growth, including export markets. This result indicates that the trade-off between exploration and exploitation capabilities is pivotal in ensuring a high level of performance. This result confirms Tushman and O’Reilly’s (1996) proposition that an ambidextrous firm achieves superior performance through a simultaneous operation of exploration and exploitation capabilities.
We confirmed that the relationship between product innovation and performance is positive. This result is different from Yalcinkaya et al. (2007) one who did not find a confirmation for this relationship in their research. However, they admit this result as one of special interest, since the literature in general confirms it. They credited the result to the intricate relationship between exploitation and exploration capabilities. The majority of the empirical research confirms the relationship, that is the direct effect of innovation on performance was observed in other contexts, as exemplified by the works of Li and Calantone (1998), Sandvik and Sandvik (2003) and Lages et al. (2009), discussed in section 1.

Innovation was found not only to have a direct effect on overall performance, but also as a mediator of the effect of exploitation capabilities on this performance. This result about mediation support findings by Hult, Hurley and Knight (2004), extended them to the Brazilian exporting firms context. These authors found that innovation mediates partially or totally the effect of capabilities (market orientation, learning orientation, and entrepreneurial orientation) on business performance.

However, it is important to stress that, in our research, the contribution of exploitation capabilities to overall performance is not entirely mediated by product innovation for external markets, since those capabilities make a direct contribution to performance, in addition to the contribution to innovation.

In turn, market dynamism does not moderate the relationship of product innovation and performance. Again, the reason for that should be related to the fact that product innovations in Brazilian exporting firms are predominantly incremental and these firms trade products in markets (commodities) relatively less dynamic. Also the results in the literature are mixed: there are evidences of the moderator positive effect of market dynamism in many relationships as in ‘market-oriented culture and financial performance’ (Homburg and Pflesser, 2000), but also of little support for the effect of market dynamism in other relationships as in ‘market-orientation and performance’ (Slater & Narver, 1994). These authors emphasize that the effects of market orientation are long term, while environmental conditions are often transient. This result also was found by Hult et al. (2004), confirming for their sample that innovation is an important determinant of business performance, independent of the market dynamism.

Finally, we find that firm size plays a control effect on the paths with performance. This is in accordance with other studies (e.g. Slater & Narver, 1994; Damanpour, Walker & Avellaneda, 2009) which found a similar effect of firm size on performance.

4. Theoretical and Managerial Implications

Capabilities are applied to new ways to produce competitive advantages. Hence, this paper emphasizes the fact that capabilities leverage firm performance directly and mediated by product innovation. It contributes theoretically to capabilities and innovation literatures in the following ways:

First, our study adds to the understanding that capabilities exploitation affect firms’ overall performance both directly and indirectly (via product innovation) in the case of Brazilian industrial exporting firms. This insight shows the importance to consider, in theory and research models about determinants of overall performance, the role of mediating and moderator variables to avoid the overestimation of the constructs roles. Hence, we will have an approximation of the necessary and sufficient conditions for superior performance.

Second, it highlights the distinct effects, that is, direct and as mediator, that innovation has on overall performance. It sheds some new light on a stream of research that explains firms’ growth through innovation for internal markets or through entrance in new international markets. As innovation and exporting are complementary (Golovko & Valentini, 2011), we adopt a different perspective and provide evidence on the existence of the different effects of innovation for external markets on overall performance.
Third, it shows an original empirical support for the hypothesis of interdependency between product innovations for external markets and overall performance. This hypothesis was formulated based on Salomon and Shaver (2005) proposition that exporting firms tend to be more productive compared to non-exporters and also the result of Golovko and Valentini (2011) that the positive effect of innovation activity on firms’ growth rate is higher for firms that also engage in exports, and vice versa.

Fourth, it provides new empirical evidence of the effects of ambidexterity capabilities to product innovation and overall performance, in the context of exporting firms.

The findings of our study have important implications for practice. They suggest that executives need to invest in both types of capabilities in a differentiated way to improve product innovativeness. However, in any case these capabilities will enhance overall performance, directly and through their impacts on other antecedents. It seems that the level of exploitative capabilities should be maintained to continuing the product innovation performance and the explorative capabilities effort should be redirected to ensure the development of radical product innovation.

As indicated by Zhou and Wu (2010) managers must be aware about what their firm existing capabilities favor regarding innovations, since the less risk use of ‘knowledge stock’ is related to a good incremental innovations performance, but “it may trap them in existing technological trajectories, lock them in with existing customers, and prevent them from exploring new options” (p.558). In other words, firms that focus only on exploitation capabilities may be stuck in developing incremental innovations. Hence, given the effects of capabilities in innovation and performance and as resources are limited, managers must make choices in their resource allocation and define the trade-off between exploitation and exploration capabilities to ensure the best results in performance.

5. References

Degrees of Market Dynamism and Internationalization Journal of International Marketing Vol. 17, No. 4, pp. 71–89.


