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ROLE OF COLLABORATION IN INNOVATION SUCCESS: DIFFERENCES FOR LARGE AND SMALL BUSINESSES

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Abstract. This article analyses the role of collaboration in the contribution of innovation to business performance. Moreover, the analysis considers business size as a key control variable to understand the moderating role of collaboration in innovation success. A survey administered to Spanish firms from industrial, building, agriculture, and trade-service sectors measured two levels of innovation, incremental and radical, and two dimensions of collaboration, channel and consulting advice. The findings show that the probability of success increases when firms use collaboration to support innovation efforts. In addition, small businesses take more advantage of channel collaboration, whereas large businesses rely more on consulting advice-based collaboration. These findings suggest that the convenience of different collaboration approaches depend on business size. Also small and large firms differ on the way they might get additional advantages from alternative ways of collaboration. Therefore, the main contribution is the understanding of how innovation success depends on the interaction between the collaboration approach and business size.

Keywords: innovation, business performance, organizational collaboration, channel collaboration, consulting advice, business size.

JEL Classification: M3.

Introduction

Business management literature has studied the impact of collaborative networks and concluded that they can improve business performance (Combs, Ketchen 1999; Sarkar *et al.* 2001, Zaheer, Geoffrey 2005). Some authors further assert that the success or failure of firms depends on their direct and indirect interactions with other entities (Håkansson, Waluszewski 2002; Wilkinson, Young 2002).

Innovation can be a vehicle for improvement, such that collaboration supports innovation success and new business creations (Powell *et al.* 1996; Teece *et al.* 1997). Because "higher levels of cooperation generate stronger new product performance than lower

levels of cooperation" (Olson *et al.* 2001: 269), it appears that companies working together have more facility to adapt their products, services, and operational processes to satisfy market demands (Wilkinson, Young 2002).

The underlying logic regarding the performance contribution of collaboration involves access to resources and capabilities. Companies cannot depend exclusively on internal developments of resources and knowledge (Swaminathan, Moorman 2009) and their limited ability to predict outcomes of strategic actions, coupled with resource scarcity and the high costs of acquiring knowledge, makes it increasingly difficult to achieve business success alone (Wilkinson, Young 2002). Inter-organizational interaction can reinforce skills, reduce resource limitations, promote knowledge combinations, foster creativity, and promote the exploration and exploitation of new business channels. These benefits in turn lead to economic growth and increased competitiveness (Hewitt-Dundas 2006; Daugherty *et al.* 2006).

To attain these benefits though, the firm must be able to absorb, promote, and apply newly acquired knowledge to the innovation (Cohen, Levinthal 1990; Lane, Lubatkin 1998; Lane *et al.* 2001). Perhaps then the role of collaboration varies with the size of companies. Small businesses face notable limitations in their ability to access resources and their internal capacity, so they tend to be less assertive in innovation projects (Yasuda 2005). In collaborative networks, they likely seek to benefit from complementarities that the external environment can facilitate and that might ensure their innovative success (Sen, Haq 2011).

Therefore, this article proposes a theoretical framework and empirical evidence regarding the roles of collaboration and size in the relationship between innovation and performance. We study three initial links: the contribution of innovation to performance; the moderating role of collaboration with regard to this contribution, that is, for innovation success; and size as a conditioner of the moderating role of collaboration on innovation success.

Unlike most prior research, this study (1) uses two levels of innovation, (2) considers two dimensions of collaboration, and (3) includes size as a moderator.

First, we include radical and incremental innovation in a single study. Social network literature tends to focus specifically on radical innovation and reveals that cooperation promotes the development of new products (Bond *et al.* 2004). In contrast, authors dedicated to the incremental element of innovation have pointed out that collaboration in technological resources enhances business innovation (Baum *et al.* 2000; Stuart 2000).

Second, collaboration scope can be interpreted according to two classifications: channel collaboration or consulting advice collaboration. Channel collaboration refers to support received from customers, suppliers, competitors, and companies in the same network; it provides benefits focused mainly on trade issues in the market. In contrast consulting advice collaboration involves the support of associations, consultants, licensors, and universities, which provides benefits more oriented toward R&D, the implementation of new technologies, advice for opening new markets, and so on (Nooteboom *et al.* 2005). Third, we distinguish small and large businesses to determine differences between com-

panies that benefit from collaborations in terms of their innovation and business performance (Freeman *et al.* 2006). With these unique approaches, our results can clarify rules and practices for external support, as well as assess current tactics used by small businesses in disadvantaged local environments, which are characterized by poor low management capacity and difficulty in obtaining resources.

1. Theoretical framework and hypotheses

Several theories aim to justify the relationship of collaboration, innovation, and business performance, though we turn specifically to two partnership theories focused on innovation and business success: the resource- and skills-based view and social network theory. Resources alone cannot lead to competitive advantage. Rather, they require some management or combination that leads to value, so the focus is not ownership of the resource itself but the value created from combining it with other resources in the business network (Harrison, Håkansson 2006). Collaborative networks reinforces this point, because the exchange and transfer of resources and capabilities among related companies is what leads to business success (Osborn, Hagedoorn 1997). These structures of exchange and collaboration aim to enhance the value of the company resources, which in turn can generate a competitive advantage if combined and managed correctly, according to the resource-based theory (Grant 1991; Mahoney, Pandian 1992; Peteraf 1993).

1.1. Innovation success: input to business performance

Companies struggling to maintain an innovative advantage work to perceive and attract new opportunities that will provide them with efficient and effective business performance. This positive, significant causal relationship has been tested extensively and is supported by a strong literary framework, beginning with Schumpeter (1934) and his theory of dynamic economies, through Zaltman *et al.* (1973), and up to more recent studies by Han *et al.* (1998), Bhaskaran (2006) and Damanpour *et al.* (2009).
Therefore, we propose:

H1: *Innovation relates positively to business performance.*

1.2. The role of collaboration for innovation success

For this study, the concept of collaboration refers to an external cooperation link (in the channel or through consulting) that establishes a voluntary agreement to share and combine knowledge and resources, with the goal of creating competitive advantage and greater value for final customers (Kanter 1994; Wilkinson, Young 2002).

According to social network theory, cooperative relations function according to a structure for exchanging knowledge and information flows. They promote joint solutions that favor reduced development costs and maximize marketing opportunities (Chesbrough 2003; Dhanaraj, Parkhe 2006). They provide complementary resources ("network resources", Gulati 1998: 295), which represents "one of the reasons for the success of the collaboration" (Mowery *et al.* 1998: 508). Complementarity ensures mutual benefits and generates greater, more rapid performance growth (Kogut, Zander 1992; Eisenhardt, Shoonhoven 1996).

If collaboration (channel or consulting) occurs simultaneously with innovation, it creates a synergy that improves profits. Organizational collaboration combined with innovation promotes knowledge intensity and contributes greatly to growth and economic performance (Drejer, Vinding 2005). With collaboration, business innovation is more likely to achieve success, because it creates junctures that companies could not attain alone (Kogut 2000). Collaboration thus becomes a key to innovation process success.
Therefore, we posit:

H2: (a) Channel collaboration and (b) consulting advice collaboration positively moderate the relationship between innovation and business performance, such that the greater the collaboration, the stronger is the relationship between innovation and business performance.

1.3. Successful innovation: differences between large and small businesses

Several business management studies highlight size as an organizational factor and an antecedent of both organizational performance (Smith *et al.* 1986) and innovation (Rogers 2004). However, we propose that size acts as a moderator of the relationship. We anticipate that innovation is more successful among larger companies, because these larger firms have greater capacity and more resources (research, technology, marketing skills, financial autonomy, experience, teams) to develop and implement successful innovations (Rothwell, Dodgson 1994; Shaffer 2002). Although smaller businesses might enjoy behavioral advantages (i.e., they are more flexible and faster), it is harder for them to commit to an expensive innovation and assume the risks until they can earn a return on their investment (Ying-Chieh, Cipolla 2007).

Accordingly, we propose:

H3: Size positively moderates the relationship between innovation and business performance, such that larger firms experience a stronger relationship between innovation and business performance.

1.4. Role of collaboration in innovation success: differences between large and small businesses

Collaborative environments promote the exchange and transfer of resources and knowledge, which can provide companies with a competitive advantage (Mowery *et al.* 1996). However, companies of different sizes may benefit more from one collaboration or another.

The financial autonomy, technological capacity, and human capital limitations of small businesses likely are detrimental to innovative success; the launch of innovative projects is costly and complex. Collaborative networks address these limitations through resource sharing and knowledge transfer, so small businesses should make more use of channel collaborations to enhance their innovative success, through improved business skills, understanding of the environment, and market reactiveness. This transfer of business skills also should be assimilated well by small firms, because the "external knowledge" relates closely to their "previous knowledge" (Cohen, Levinthal 1990; Lane

et al. 2001) and represents timely input to the innovation process. Large firms depend less on channel collaboration, because their size gives them sufficient resources, even without external relationships.

However, large businesses likely use consulting advice collaboration, which represents a more complex form of collaboration, offering diverse resources and capabilities (i.e., diverse perspectives and technology diversity) that encourage co-creativity, specialized learning, and new solutions (Powell *et al.* 1996). For example, according to Baum *et al.* (2000), large biotech firms make better use of collaboration with different external partners, such as pharmaceutical industry associations, universities, consultants, and government labs, and also have more success when innovating. These large firms might search for direct benefits (e.g., access to resources and capabilities) in collaboration networks, but they also are interested in indirect benefits (specialized learning, development of new skills), which then provide a basis for future projects (Ahuja, Katila 2001).
Therefore, we propose:

H4a: Small businesses benefit from the synergy between channel collaboration and (radical and incremental) innovation to achieve business success.

H4b: Large businesses benefit from the synergy between consulting advice collaborative and (radical and incremental) innovation to achieve business success.

We present these hypotheses graphically in Figure 1.

2. Methodology

2.1. Data

The sampling frame came from DUNS 50,000 (2004). Initially we limited the study to small businesses in the Spanish regions of Extremadura and Castilla & León. However, to support a comparison with large businesses, we extended the sample population beyond these relatively marginal regions to ensure that there were sufficient large companies in the sample. The sample of large businesses thus encompasses the entire national population.

Small businesses employed between 20 and 99 employees and earned less than 50 million Euros in turnover, which was appropriate for firms located in these two less developed regions of Spain. The large enterprises employed more than 100 people and earned more than 50 million Euros in annual turnover. These criteria reflect regional characteristics as well.

The total population of companies that fulfilled these selection parameters included 2,602 Spanish companies (1,569 large enterprises nationwide, 1,033 small businesses in Castile and León and Extremadura). An initial contact by mail explained the project and gauged possible interest in participation, followed by telephone calls. Of the 1,580 companies that agreed to participate, 793 were large enterprises across all Spanish regions, and 787 were regionally located small businesses. The questionnaire was sent online or by mail, depending on the respondent's preference.

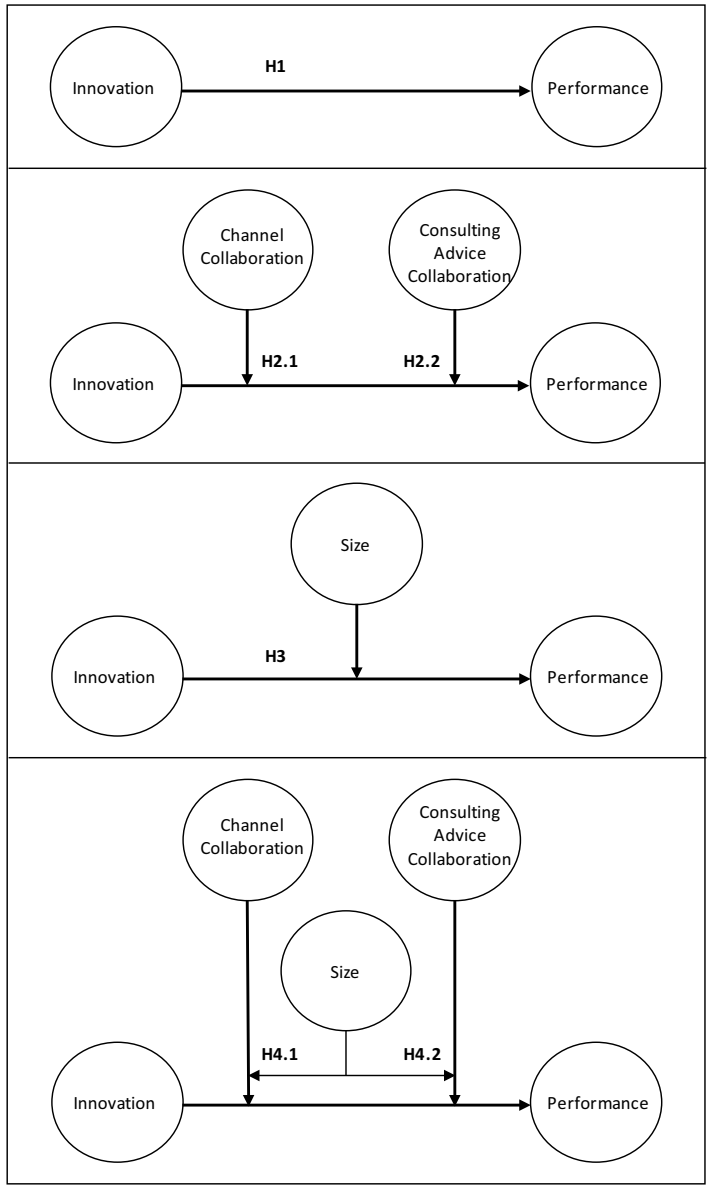

Fig. 1. Theoretical model

498 responded of the 1,580 companies that agreed to participate for an average response rate of 31.5%, including 222 large businesses and 276 small businesses. For purification, we excluded any companies with excessive missing data, which reduced the final sample to 440 companies (190 large, 250 small).

Table 1 shows the characteristics of the total population and the study sample:

Table 1. Population and sample charateristics

	Population (DUNS)				Sample			
	Large (1569)		Small (1033)		Large (190)		Small (250)	
Sectors		%		%				%
Industry	744	47	393	38	93	49	75	30
Building	107	7	204	20	26	14	49	20
Agriculture	23	1	37	4	5	3	22	9
Trade services	695	44	400	39	66	35	104	42
Employees								
<50			690	67			166	66
51–99			343	33			84	34
100–249	478	30			71	37		
>250	1091	70			119	63		

Sources: DUNS (2004) and survey.

2.2. Measures

Innovation: The measures of radical innovation rely on three items (seven-point Likert scale): registered patents, R&D team, and the development of new products/markets (Hess, Rothaermel 2011; Sen, Haq 2011). The measure of incremental innovation reflects assessments of five items (seven-point Likert scale): innovation in management, organization, marketing, product, and production processes (Lin, Chen 2007). In Tables 2 and 3 we provide the descriptive statistics, correlations, and factor analyses for each type of innovation. The results suggest that both types of innovation constitute one-dimensional constructs. We consider the respective factors extracted to measure these concepts in our subsequent analysis.

Table 2. Measurement of radical innovation

		Mean	SD	Correlations		Loadings	Variance explained	Cronbach's Alpha
				1	2			
Patents	Number of patents registered in the past five years	4.57	1.49			0.76	0.69	0.71
R&D	People clearly involved in R&D + i	4.65	1.59	0.51*		0.87		
New businesses	Rate the degree to which your company has been involved in the last five years in the creation of new products/markets	4.25	1.44	0.42*	0.70*	0.85		

Note: *p < 0.01.

Table 3. Measurement of incremental innovation

		Mean	SD	Correlations				Loadings	Variance explained	Cronbach's Alpha
				1	2	3	4			
Management	Implementation of advanced management techniques	4.73	1.39					0.80		
Organizational	Implementation of new or altered organizational structures	4.56	1.54	0.71*				0.82		
Marketing	Significant changes in the sales force, political communication, or distribution channels	4.45	1.63	0.62*	0.58*			0.81	0.86	0.91
Product	Changes in product-related aspects such as packaging, size, and presentation	4.36	1.91	0.34*	0.40*	0.48*		0.71		
Process	Changes in the production process or distribution plants in the means of production	4.42	1.69	0.40*	0.46*	0.45*	0.63*	0.75		

Note: * $p < 0.01$.

Business performance: We focus on four indicators of business performance, following González-Benito *et al.* (2009):

1) Profitability, measured as benefits, profit margin, return on investment (ROI), and so on, using a single item that refers to economic performance achieved.
2) Market response, or the demand reaction to products and services offered by the company, measured with two items related to sales and market share growth.
3) Market value, defined as achieving a favorable position in the minds of consumers. This indicator consists of two items, customer satisfaction and image/reputation of the company.
4) Success with the new product, measured by one item.

The four indicators were measured in comparison with main competitors. The responses used a seven-point Likert scale (1 = "much worse than the competition" and, 7 = "much

better than the competition"). The data in Table 4, which include descriptive details and a reliability analysis, suggest unidimensionality in the multi-item scales (market response and market value). Although the four dependent measures are highly correlated, the uncommon variance would be elided if the measure were global.

Table 4. Measurement scale: performance variables

		Mean	SD	Correlations			Loadings	Variance explained	Cronbach's Alpha
				1	2	3			
Profitability	Profitability	4.46	1.22						
Market response	Sales growth	4.67	1.22						
	Growing market share	4.65	1.24	0.68*			0.85	0.81	0.9
Market value	Customer satisfaction	5.37	1.21						
	Image / reputation of the company	5.44	1.22	0.53*	0.56*		0.81	0.79	0.9
New product success	Percentage of sales from new products/services launched in the last five years	4.77	1.46	0.43*	0.46*	0.57*			

Note: * $p < 0.01$.

Organizational collaboration: we measured organizational collaboration separately for radical innovation and incremental innovation. First, respondents assessed the degree of importance of collaboration by a group of entities in the registration of patents, R&D, and development of new products/markets. Second, for incremental innovation they rated the degree of importance of collaboration for the same set of entities regarding innovative improvements in their firms in the past five years. The responses used a seven-point Likert scale (1 = "not important" and 7 = "very important"). The entities rated in terms of collaboration included those relevant for both channel collaboration (other companies, suppliers, customers, competitors) and consulting advice collaboration (licensors, consultants, business associations, universities).

Tables 5 and 6 provide the descriptive statistics, correlations, and factor analysis for each type of collaboration and innovation. The data indicate the unidimensionality of two constructs created for each type of collaboration: channel collaboration and consulting advice collaboration.

Firm size: the firm size variable only differentiates small and large businesses. The analysis therefore includes a binary variable equal to 1 for large businesses and 0 for small businesses.

Table 5. Measurement scale: collaboration for radical innovation

		Mean	SD	Correlations 1	2	3	4	5	6	7	Loadings	Variance explained	Cronbach's Alpha
Radical innovation	*Channel*												
	Other group firms	3.82	2.25								0.78		
	Suppliers	3.50	1.95	0.30*							0.78	0.75	0.8
	Customers	4.00	1.87	0.33*	0.45*						0.83		
	Competition	3.65	1.81	0.30*	0.43*	0.67*					0.84		
	Consulting advice												
	Licensors	2.34	1.57	0.18*	0.51*	0.45*	0.34*				0.78		
	Consultants	2.60	1.61	0.22*	0.46*	0.43*	0.46*	0.52*			0.82		
	Business associations	2.56	1.63	0.17*	0.41*	0.43*	0.44*	0.48*	0.59*		0.83	0.78	0.9
	Universities	2.83	1.77	0.23*	0.41*	0.49*	0.50*	0.52*	0.58*	0.64*	0.82		

Note: * $p < 0.01$.

Table 6. Measurement scale: collaboration for incremental innovation

		Mean	SD	Correlations 1	2	3	4	5	6	7	Loadings	Variance explained	Cronbach's Apha
Incremental innovation	*Channel*												
	Other group firms	4.21	2.27								0.72		
	Suppliers	4.23	1.81	0.30*							0.72	0.76	0.8
	Customers	4.49	1.82	0.24*	0.36*						0.85		
	Competition	4.41	1.72	0.24*	0.39*	0.69*					0.83		
	Consulting advice												
	Licensors	20.73	10.75	0.22*	0.38*	0.36*	0.32*				0.81		
	Consultants	30.39	10.77	0.19*	0.33*	0.34*	0.42*	0.45*			0.85		
	Business associations	20.98	10.71	0.22*	0.39*	0.33*	0.37*	0.48*	0.54*		0.83	0.86	0.9
	Universities	20.53	10.69	0.22*	0.39*	0.36*	0.41*	0.43*	0.52*	0.51*	0.82		

Note: * $p < 0.01$.

3. Results

Table 7 presents the results related to radical innovation; Table 8 details the incremental innovation results. In both tables, for each proposed dimension of business performance, we estimated a sequence of six models. Model 1 (M1) examines the basic relationship between innovation and business performance. Models 2 and 3 (M2 and M3) integrate the potential moderators of the channel collaboration and consulting advice collaboration, respectively. Model 4 (M4) analyzes only the role of size and its interaction with innovation. Finally, Models 5 and 6 (M5 and M6) include the moderating role of size on the moderating effect of channel collaboration and consulting advice collaboration, respectively. That is, these models feature double moderating effects.

Regarding the relationship between innovation and business performance, M1 shows that the contribution of innovation (radical and incremental) is positive and highly significant for all performance measures. The changes implemented in management, marketing, product, process, patent introduction, R&D, and new products thus have a positive effect on financial and operating results. The investment of resources to support radical or incremental innovation strengthens the ability to achieve effectiveness and efficiency in enterprises. Therefore, we confirm H1.

The contribution of channel collaboration positively moderates the relationship between innovation and business performance (M2), and similarly, consulting advice collaboration exerts a moderating role when it comes to innovative success (M3). However, channel collaboration is generally more fruitful than consulting advice collaboration in synergy with radical and incremental innovation. Perhaps collaboration closer to the channel promotes more frequent improvements and new ideas than external consulting advice collaboration. Moreover, the moderating effects of collaboration generally are more advantageous in a relationship that pursues incremental innovation, perhaps because the contributions tend to offer more information and exploration-related resources to facilitate improvements to existing ideas without demanding excessive financial or operational resources. These results empirically confirm our second hypotheses (H2).

Regarding the role of size, the regression coefficients in M4 confirm that size acts as a moderator of the relationship for radical innovation, but it has no effect for incremental innovation. For incremental innovation, we find less difference between small and large businesses, which seems reasonable. This kind of innovation usually requires fewer resources, so the advantages of size may diminish in these cases. We thus find partial support for H3.

Finally, M5 and M6 indicate the role of collaboration in the innovation success of large versus small businesses. On the one hand, small firms benefit more than large businesses from the synergy between channel collaboration and innovation (radical and incremental). In contrast, large businesses benefit more from consulting advice collaboration, possibly because these companies look for more complex and explosive collaborations, and consulting advice collaboration provides a combination of resources and knowledge that channel collaboration does not. Thus, the fourth block of hypotheses (H4) receives confirmation.

Table 7. Estimation results for radical innovation

Incremental innovation	Profitability						Market response						Market value						New product success					
	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6
Constant	4.14	3.56	3.55	4.15	3.40	3.38	3.795	3.730	3.720	3.320	3.640	3.632	4.730	4.426	4.422	4.767	4.389	4.409	3.254	3.935	3.940	3.631	3.880	3.907
Incremental innovation	0.30*	0.28*	0.26*	0.19*	n.s	n.s	0.35*	0.20*	0.27*	0.28*	0.24*	0.23*	0.24*	0.19*	0.2'*	0.21*	n.s	n.s	0.39*	0.23*	0.32*	0.34*	0.27*	0.31*
Channel collaboration		0.26*			n.s			n.s			n.s			0.19*			0.20*			0.27*			0.24*	
Channel collaboration X innovation		0.18#			0.19*			0.16#			0.20*			0.15#			n.s			0.19#			n.s	
Consulting advice collaboration			0.22*			0.18#			0.21*			0.17*			n.s			n.s			n.s			n.s
Consulting advice collaboration X innovation			0.17#			n.s			0.17#			0.18*			0.18*			0.19*			n.s			0.19*
Size X consulting advice collaboration				0.44*	0.40*	0.43*				0.24*	0.24*	0.24*				n.s	n.s	n.s				n.s	0.174*	n.s
Size X innovation				0.24*	0.23*	0.25*				0.21*	0.20*	0.24*				0.16*	0.17*	0.18*				0.21	0.21	0.18
Size X channel collaboration					0.17#						0.15#						0.11+						0.11+	
Size X channel collaboration X innovation					0.18#						0.18*						0.17*						0.19*	
Size X consulting advice collaboration						0.19*						0.27*						0.15*						0.24*
Size X consulting advice collaboration X innovation						0.20*						0.18*						0.18*						0.19*
R^2 (ajusted)	0.24	0.26	0.24	0.25	0.22	0.24	0.24	0.24	0.24	0.23	0.26	0.26	0.26	0.26	0.24	0.24	0.27	0.27	0.23	0.24	0.21	0.13	0.24	0.22
ANOVA F	27.2	29.4	29.2	42.0	37.5	37.4	28.53	37.82	38.74	34.44	39.93	39.91	33.56	29.35	28.41	38.96	25.08	27.60	26.39	36.97	34.04	23.53	28.80	32.56

Notes: All constants and ANOVA F are $p < 0.01$; $+p < 0.10$; $\#p < 0.05$; $*p < 0.01$; n.s = not significant.

Table 8. Estimation results for incremental innovation

Incremental innovation	Profitability						Market response						Market value						New product success					
	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6
Constant	4.18	3.57	3.54	4.13	3.38	3.37	4.39	3.70	3.67	4.24	3.58	3.56	4.01	4.47	4.43	4.73	4.44	4.41	3.02	3.10	3.91	3.18	3.01	3.07
Incremental innovation	0.34*	0.31*	0.28*	0.31	0.24*	0.25*	0.35*	0.30*	0.31	0.33*	0.30*	0.29*	0.35*	0.25*	0.22*	0.34	0.29*	0.26*	0.59*	0.53*	0.57*	0.58*	0.58*	0.56*
Channel collaboration		n.s			0.23*			n.s			0.23*			0.24*			0.21*			n.s			n.s	
Channel collaboration X innovation		0.22*			n.s			0.20*			n.s			0.20*			0.18*			0.19*			n.s	
Consulting advice collaboration			0.18*			0.20*			n.s			0.19*			0.21*			0.20*			0.19*			n.s
Consulting advice collaboration X innovation			0.18*			n.s			0.17#			n.s			0.19#			n.s			0.16#			n.s
Size X consulting advice collaboration				0.48*	0.35*	0.20*				0.32*	0.28*	n.s				0.23#	n.s	n.s				0.17#	0.16#	n.s
Size X innovation				n.s	0.19*	0.18*				0.19#	0.19#	0.19*				0.18+	0.13+	0.10+				n.s	0.11+	n.s
Size X channel collaborion					0.17#						0.28*						n.s						0.21*	
Size X channel collaboration X innovation					0.26*						0.23*						0.12#						0.19#	
Size X consulting advice collaboration						0.18#						0.26*						0.11#						0.24*
Size X consulting advice collaboration X innovation						0.27*						0.18*						0.17#						0.17#
R^2 (ajusted)	0.39	0.29	0.22	0.27	0.26	0.27	0.23	0.22	0.23	0.24	0.26	0.26	0.26	0.28	0.24	0.3	0.29	0.25	0.35	0.36	0.35	0.36	0.37	0.36
ANOVA F	31.2	30.4	35.6	46.1	28.5	29.1	26.6	34.9	36.0	33.4	28.24	28.70	31.3	43.3	37.8	37.9	30.3	28.07	48.9	55.7	54.7	46.6	35.8	35.4

Notes: All constants and ANOVA F are $p < 0.01$; + $p < 0.10$; # $p < 0.05$; * $p < 0.01$; n.s = not significant.

Conclusions

This research has studied the role of collaboration when it comes to the success of radical and incremental innovation. Collaboration appears in two forms: channel and consulting advice collaboration. As key original contribution we analyze the role of collaboration on innovation success by controlling for business size. We differentiate size into two subsamples: large and small businesses. As our main conclusion, we find that the probabilities of business success increase when firms use collaboration to support their innovation. In addition, small businesses take more advantage of channel collaboration, whereas large businesses take more advantage of consulting advice collaboration. This study offers important implications for businesses and governments to enhance the relationship between innovation and performance through collaboration. First, the results show that as a consequence of implementing innovative initiatives, firms benefit in their commercial and financial activity, because they use resources and respond to changes and environmental opportunities. These findings again confirm that innovation efforts are key to promoting business success and thus economic welfare.

Second, because collaboration contributes to more successful innovation, the promotion of collaborative networks should be a priority for improving enterprise competitiveness. Innovation emerges as a vehicle by which contribution leads to business success. Therefore, to enhance the innovative success of firms, they should improve the use of social networks. Having collaborative relationships and an open exchange of knowledge and information flows promotes joint solutions to reduce the development costs of innovation (manufacturing capabilities and know-how regulation) and maximize marketing opportunities (market knowledge and access).

Third, the economic and social context of this study raises insights, especially for small businesses. The results are of particular interest with regard to setting guidelines for competitiveness and business viability in disadvantaged regions in global competitive environments. For example, government policies pertaining to less developed regions should provide small businesses with facilities to collaborate with external entities and thereby gain technological and learning tools that accelerate innovative development and business success. Reinforcing these links, small businesses should seek to benefit more from collaborative networks through consulting advice, not just channel collaboration. Thus they could increase their benefits, obtain access to more complex resources for innovation, and develop greater knowledge and R&D capabilities.

In contrast, large businesses already take advantage of consulting advice collaboration to develop radical innovations (patents, R&D, new products). The opportunity to collaborate with partners and external consultants (national and international) should continue to improve at institutional levels, because large firms tend to deplete local markets for collaboration, which limits these companies to a lower level of absorption of knowledge and resources.

Finally, this study has several limitations. For example, the sample is small, which reduces the power of the contrasts and makes it difficult to detect potential moderating effects. An analysis of larger samples would facilitate a more accurate description of the

phenomenon at hand. The measure of the focal constructs also might be improved. The length considerations were pertinent in our questionnaire development, so we could not attain more accurate measurements. In addition, the methodology we used to measure the constructs may generate fictitious relationships though a 'halo effect'. That is, the measures for any company reflect the valuation of a single manager, and the response style might produce an apparent relationship. Adding different sources of information to measure the different constructs could extend our findings.

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