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What Are the Useful Past Inter-Organizational Relationships (IORs) for Forming Complex IORs?

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Abstract
Purpose: The purpose is to explore the relationship between prior and later inter-organizational relationships (IORs) by studying whether past experience can be leveraged on when forming new, more complex, IORs.
Methodology: Participation in prior IORs is characterized in terms of both resource-transferring and resource-pooling IORs in home-country networks, while complex IORs are considered those with foreign partners. An empirical test on 366 Italian firms is performed using OLS with robust standard errors.
Findings: Both resource-transferring and resource-pooling IORs have non-convergent effects. The former has controversial effects on the base of the position a firm occupies, that in turn affects the structure of interests between the partners. The latter has different effects in line with the information complexity of the objective of the relationship.
Research Implications: Results provide support to the idea that structure of interests and information complexity represent "discriminating characteristics" that identify salient structural alternatives in the analysis of inter-firm organization.
Practical Implications: The paper advances that firms can partially leverage on the exploitation of prior experience in settings that are explorative in nature, by carefully selecting within past experiences.
Originality: A distinction between coordination "giving" and coordination "taking" IORs is proposed to discern among different types of inter-firm coordination forms.

Keywords: Inter-Organizational Relationships (IORs), Resource-Transferring, Resource-Pooling

1. Introduction

Outstanding research shows that prior experience inter-organizational relationships[i] (IORs) is positively related to future IORs formation because firms learn how to create and manage the processes that the formation of IORs encompass (Anand and Khanna, 2000; Parkhe, 1993; Russo and Vurro, 2018; Sampson, 2005), including the choice of partners, the design of appropriate governance mechanisms and contractual arrangements, the solution to unforeseen and uncontracted-for issues and the development of inter-firm knowledge-sharing routines (Heimeriks and Duysters, 2007; Hottenrott and Lopes-Bento, 2015; Ring and Van De Ven, 1992; Schilke and Goerzen, 2010). However, a phenomenon that we may consider homogenous, namely past experience in IORs, can manifest a high degree of variety,

heterogeneity and causal ambiguity (Russo and Vurro, 2018). The set of IORs can be diverse depending on their contents, goals, resource and information flows, contractual and governance arrangements, power asymmetry, degree of formalization and coordination mechanisms (Reuer and Zollo, 2005). Thus, assuming all past IORs equally beneficial to future IORs is unrealistic. However, while prior IORs experience has been widely studied in general, the effect of specific IORs types is a quite unexplored topic (Barkema et al., 1997; Hoang and Rothaermel, 2005; Rothaermel and Deeds, 2006; Sampson, 2005). In this paper, we take on the challenge of theorizing and testing what relationship might exist between a firm's prior IORs and the formation of later IORs when later IORs are characterized by higher complexity due to geographical and cultural distance, that in turns demand for higher coordination efforts between the partners (Andersson *et al.*, 2013; Evers and O'Gorman, 2011; Guler and Guillén, 2010). It is not reasonable to assume that past experience is entirely positively associated to the formation of later IORs even if more experienced firms are likely to be better off in situations of complexity rather than poorly experienced firms (Sampson, 2005).

We specifically investigate the role of the experience a firm has accumulated in two types of IORs such as resource-transferring and resource-pooling IORs. We also characterize such types of IORs according to the structure of interests between the partners and the information complexity associated with the outcome of the IORs.

We conduct our analysis using data on the portfolio of domestic IORs of 366 Italian industrial firms across a period of nine years. Our results demonstrate that experiences in resource-transferring and in resource-pooling networks are variously associated with the formation of complex IORs.

We contribute to the theory on IORs by advancing the understandings on whether different IORs experiences affect the formation of relationships demanding higher coordination efforts and by highlighting the different properties on the basis of which it is possible to discern among different types of inter-firm coordination forms (Grandori, 1997). Specifically, such characteristics as direction of resource flows and the corresponding coordination mechanisms permit to divide between coordination "giving" and coordination "taking" inter-firm organization. From the managerial point of view, discerning among the variety of past experience would permit to draw deeper managerial insights on how successfully framing firm's investments in knowledge management strategies and practices as well as further insights for managers on the path-dependent processes that may lock firms into certain courses of action as a result of constraints from their current (or past) ties.

The paper proceeds as follow. In the next section, we describe the theoretical foundations of our research question, develop the corresponding hypotheses and describe the model. In the section 'Data and Method', we describe the research domain and sample, and illustrate how we operationalize the constructs. The results and a discussion follow including theoretical and managerial contributions of our work. Limitations and future directions are subsequently provided. In the last section, we summarize the most relevant findings.

2. Theory and Hypotheses

2.1. Past Experience and Complexity in IORs

A long research tradition highlights the prominent role of a firm's IORs in shaping its future actions and behaviour (Lechner and Dowling, 2003). Extensive and articulated literature demonstrates the effects that IORs, and the positions firms occupy in, produce on a firm behaviour and performance (for an effective synthesis of this literature see for example Gulati *et al.*, 2000). From these studies, the impact on competitiveness that firms can exploit through networks of IORs clearly emerges, transforming the set of relations generally defined as social or relational capital into economic value (Boehe, 2013; Burt, 2005; Dyer and Singh,

1998). IORs work as conduits of information and knowledge and are likely to affect both a firm's ability to single out and fend off threats and its ability to select and exploit further opportunities, including, among others, the formation of new IORs (Anand and Khanna, 2000; Evers and O'Gorman, 2011; Grandori and Soda, 1995; Granovetter, 1985; Gulati, 1998; Gulati and Gargiulo, 1999; Gulati and Sytch, 2008; Kale, Dyer and Singh, 2002; Kogut, 2000; Lorenzoni and Lipparini, 1999). Again, Soda et al. (2004: 893) point out that past experience in IORs exerts a kind of 'network memory' effect that 'cannot be ignored as it may project a structural overhang over the present'. All in all, the network of prior IORs *influences* the formation of later ones (Gulati, 1999). Indeed, such network produces positive returns through experience accumulation and learning as proved by prominent studies (Heimeriks and Duysters, 2007; Nadolska and Barkema, 2014; Simonin, 1997) even if such effect does not increase indefinitely (Rothaermel and Deeds, 2006).

Albeit managerial literature has discussed several facets of 'prior ties' and achieved a consensus on stating their role, some theoretical gaps still remain. There are studies that provide conflicting results on the role of the diversity of prior IORs experience (for example, diverse governance structures) in terms of firm's learning (Anand and Khanna, 2000; Barkema et al., 1997; Gulati, 1999; Zollo and Winter, 2002). However, no one has clearly demonstrated whether the effect is specific to the context in which past experience originated. In other words, even if experience in past IORs matter, we cannot argue that 'all' past experiences provide the same (positive) effect in future IORs (Gulati, 1999; Kale and Singh, 2009; Lai *et al.*, 2010). Put differently, while prior works have mostly investigated the "quantity" of past experience, in this paper we take the perspective of the "variety" of past experience to investigate whether it affects a firm future choices. In particular, if past and future IORs are *different*, then past experience could be of limited or no value in future IORs. Future IORs of higher complexity call for adequate forms of cooperation and integration that might be different from those a firm experienced in the past. One dimension of complexity in IORs stems from the nationality of the partners. Different nationalities imply different languages, managerial styles, institutions and practices (Hofstede, 1991; Kogut and Singh, 1988, North, 1990). Therefore, while IORs involving partners of the same nationality can leverage on a common ground in terms of national cultural and institutions, this is not possible when partners are of different nationalities (Barkema and Vermeulen, 1997; Inkpen and Dinur, 1998; Jiang *et al.*, 2010; Lai *et al.*, 2010; Parkhe, 1993, Shenkar, 2001). In the latter case, such asymmetry increases IORs complexity and worsens the risk of opportunistic behaviours, which in turn exacerbate the need for effective coordination and governance mechanisms.

2.2. Home-Country Network Types

In this paper, we assume that there is experience that is 'universally' beneficial, and experience that is specific, with less or no value 'outside' the setting in which it originated. We maintain that such contingency depends on some characteristics of the inter-firm interdependences that characterize such IORs, namely the direction of resource flows, the complexity of information and the structure of interests.

We begin by presenting the types of IORs we considered (Borgatti and Foster, 2003). On the basis of the interdependences that characterize IORs we take into consideration both resource-transferring IORs and resource-pooling IORs (Grandori, 1997; Grandori and Soda, 1995). Following classic organization theory, resource-transferring IORs (also called transactional-exchange IORs) are those in which a sequential interdependence links two units for which the output of a unit is the input of another. Conversely, resource-pooling IORs are those in which units are linked by a pooled interdependence, i.e. each unit renders a discrete contribution to a joint outcome and each unit is supported by the whole. Different types of interdependences

call for different sets of effective and efficient coordination mechanisms (Grandori, 1997). Therefore, firms participating in different types of IORs accumulate different types of experience concerning the coordination mechanisms that integrate individual partners' efforts. Such experience is likely to be of contrasting value when firms enter IORs requiring higher coordination efforts.

2.2.1. Resource-transferring IORs

Resource-transferring entails sequential interdependences, i.e. the transfer of goods or services through a technically separable interface as Williamson (1981) and Thompson (1967) maintain. In inter-firm relationships such transfer occurs among distinct organizations and traditionally includes inter-organizational relationships with suppliers and customers. In our analysis we consider business-to-business IORs between subcontractors and industrial customers. We name *upstream supply IORs* those IORs a firm (operating as customer) maintains upstream with subcontractors and *downstream industrial customer IORs* those IORs a firm (operating as subcontractor) maintains downstream with industrial customers.

Resource-transferring IORs are characterized by peculiar structure of interests that are different between subcontractors and customers. We believe that such differences can affect the value a firm, being the subcontractor or the customer in such relationships, can extract in terms of accumulated experience. Though some cooperation is implied by the fact that both parties agree to one firm outsource part of its production process to the other, somehow diverging interests between the subcontractor and the customer virtually occur. In a B2B supply relationship, being the subcontractor or being the customer is not necessarily equivalent as far as the structure of interest and, in turn, the coordination mechanisms, are concerned. An industrial customer looks upstream for reliable subcontractors with the 'right' competences that are able to supply on time and in full and willing to undertake some kind of relationship-specific investments. On the contrary, a subcontractor might prefer serving a reasonable number of industrial customers to prevent any possible situation of customer-dependency. Consequently, an industrial customer is more interested in promoting mechanisms that enhance both coordination and control over their subcontractors than what a subcontractor is able to affect the coordination and control of its industrial customers. Indeed, the (industrial) customer is usually the actor of higher weight in a relationship with a subcontractor that is willing to accept its subaltern position on the basis of trade-offs between profit reduction and risk-bearing reduction (Grandori, 1997). Therefore, the governance of such relationships require the use of a 'complex mix of coordination mechanisms including not only communication and negotiation, but also the definition of a constitutional framework of rules, and of third parties of the surveillance and enforcement of them' (Grandori, 1997, p. 908). As a consequence, the industrial customer has a specific interest in defining such architecture of coordination and governance mechanisms and in learning from past experience, while the subcontractor more likely is doomed to accept it with limited possibilities for intervening and eventually learning. Therefore, industrial customers are more likely to benefit from the experience they accumulated in the home-country relationships with subcontractors and to form alliances with foreign partners that, as we discussed above, are complex due to institutional, cultural and geographic distance (see section 2.1). Conversely, subcontractors are less likely to enter complex relationships with foreign firms as they benefit less from the experience they accumulated in the home-country relationships with industrial customers.

All in all, since in upstream supply relationships a firm participates as an industrial customer, while in downstream supply relationship a firm participates as a subcontractor, we speculate that participating in upstream supply IORs allows a firm to accumulate valuable experience

for managing complex IORs entailing high coordination efforts more than participating in downstream supply IORs does. Accordingly, we derive hypothesis 1:

H 1. For an industrial customer, participating in upstream supply IORs is more positive to the formation of complex IORs than it is participating in downstream industrial customer IORs for a subcontractor

2.2.2. Resource-Pooling IORs

Resource-pooling entails situations in which distinct activities sustain a common outcome. Such interdependence span from pure *pooled interdependences* to *intensive interdependences* (Thompson, 1967). In the former case activities are generically linked by the fact that they make use of the same resources, while in the second case, there is a joint application of complementary resources to a common problem or transformation process in an integrated way (Grandori, 1997). In inter-firm relationships, resource pooling occurs among distinct organizations and includes inter-organizational relationships among firms, virtually competitors, or among firms and other organizations such as research centres or universities. In our analysis we consider resource-pooling IORs between firms in consortia and for R&D purposes. We name them *consortia IORs* and *R&D IORs* respectively.

Consortia are organizations created by several firms with the objective of participating in a common activity or pooling their resources to achieve a common goal; examples include fund raising, distribution or export consortia (Grandori and Soda, 1995; Xia *et al.*, 2012). A consortium is an example of pooled interdependences where the contribution of each firm is discrete. For instance, all the producers of Parmigiano Reggiano (or of any other product under the same appellation, for example protected designation of origin, PDO) are grouped in a consortium. The consortium promotes and protects through a specific regulation the production process and the quality of the product itself. However, firms joining the consortium agree on complying with the rules established by the product specifications but are not involved in any specific joint project requiring an integrated effort among members. Consequently, a situation of pooled interdependences requires simple coordination mechanisms, such as for instance *communications, rules, procedures* and some *common staff* (Grandori, 1997).

Differently, in R&D IORs firms pool part of their complementary resources in joint activities that imply continuous interactions and whose outcome and timing are characterized by a certain degree of uncertainty and informational complexity (Reuer and Zollo, 2005). Indeed, R&D IORs are 'complex organizational forms involving the transfer of knowledge between firms under an incomplete contract' (Rothaermel and Deeds, 2006: 436). In R&D IORs, participating firms pursue such research goals as basic research, new materials or technologies, new product development, design and prototyping, and new production processes (Powell *et al.*, 1996, Hoang and Rothaermel, 2005; Rothaermel and Deeds, 2006; Sampson, 2005). Because of the uncertainty that characterizes such intensive interdependences, real time mutual adjustment among firms is unavoidable. Thus, a more complex mix of coordination mechanisms, with respect to pooled interdependences, is required. Such need can be met by means of *direct mutual adjustment* and *group decision-making* that are powerful mechanisms. In addition, intensive interdependences imply collective actions and a corresponding need for control to ensure effective contributions from individual firms.

In other words, different levels of information complexity characterize intensive interdependences (such as in R&D IORs) and pooled interdependences (such as in consortia). Information complexity is much higher in intensive interdependences than in pooled interdependences thus requiring appropriate coordination and control mechanisms. All in all, we speculate that participating in relationships characterized by intensive interdependences

(such as R&D IORs) allows a firm to accumulate valuable experience for managing complex IORs entailing high coordination efforts more than participating in relationships characterized by pooled interdependences (such as consortia IORs) does. Accordingly, we derive hypothesis 2:

H 2. Participating in IORs characterized by intensive interdependences is more positive to the formation of complex IORs than it is participating in IORs characterized by pooled interdependences.

3. Data and Method

3.1. Research Setting: Italian Manufacturing System

We decided to test our model using observations from the Italian manufacturing firms. The Italian industrial setting is an ideal context where developing our research question. It is known worldwide for its organization around geographically coupled supply systems (industrial districts) and the prevalence of specialized small and medium enterprises (SMEs) (Piore and Sabel, 1984). Industrial districts are characterized by a mixture of competition and cooperation, in that social embeddedness and geographical proximity facilitate knowledge diffusion and mutual learning among buyers, suppliers and even competitors (Dei Ottati, 1994; Pyke *et al.*, 1990). Specifically, geographical and cultural proximity fosters opportunities for regular meetings, trust among partners, the use of common practices and, eventually, the opportunity to enlarge or broaden existing collaborations. Consequently, industrial districts could be privileged terrain for the accumulation of relational experience, even if it risks being context-specific. For example, when partners know each other (even top managers know each other personally), they can rely exclusively on reciprocal trust and not even sign a formal contract. This facilitates the conclusion of that specific agreement, but not necessarily the use of formal coordination and control mechanisms.

In the past, Italian firms prospered and developed close ties with parties located upstream and downstream of their value chain in the same geographic area or in Italy. However, during the last decades, the characteristics of the Italian way of organizing production have turned into structural weaknesses due to globalization and digital technologies (Bianchi, 1998). This has spurred firms to increase their degree of internationalization. The limited size of the firms while promoting responsiveness and flexibility at the local level, it prevented the possibility to initiate internationalization processes based on direct investments. On the contrary, firms realized that developing international relationships with foreign partners could have been an adequate compromise to catch up with international opportunities while limiting their own risks and deployment of proprietary resources. Developing inter-organizational relationships with foreign firms turned out being a severe obstacle for several firms whose relationships where limited mainly to Italian partners and have poor experience in dealing with the complexity that institutional, cultural and geographic distances raise in international IORs. This starting point notwithstanding, statistics prove that the share of Italian firms relying on strategic alliances with foreign partners is constantly increasing and involves SMEs more than large firms (Osservatorio sulle Piccole e Medie Imprese, 2005).

3.2. Sample

This study uses firm-level data periodically gathered by the 'Indagine sulle Imprese Manifatturiere' (Survey of Manufacturing Companies) in the Italian manufacturing sectors (Unicredit Corporate Banking, www.unicreditcorporate.it). This survey of over 4,000 firms (with more than 9 employees) collects data on firm size, ownership, organizational structure, employees, R&D, degree of internationalization (export, foreign direct investments, alliances with foreign partners, delocalization), markets (both for inputs and products) and finance. The survey is performed every three years and the three databases at our disposal cover the period

1995-2003. Retaining only those firms that were in all three databases, we ended up with 366 observations. Even if common method variance may be a potential shortcoming (Podsakoff and Organ, 1986), we believe that our study does not suffer from it because: (a) some of our findings are based on quantitative/objective data, which are unlikely to be distorted; (b) data have been collected in advance by an independent institution, therefore respondents were not informed about the object of our research (i.e. we could not influence them ex-ante); (c) the questions on the dependent and independent variables are placed at different positions of the questionnaire[ii], thus considerably reducing the chances of respondents intentionally distorting their answers.

The 366 firms of the sample occupy different positions in the supply chain and have a variety of resource-transferring IORs with subcontractors and industrial customers and resource-pooling relationships with R&D partners and in consortia.

3.3. Dependent Variable

3.3.1. Complex IORs

In this paper we aim at studying whether past IORs turns into valuable experience when forming complex IORs. Therefore, our dependent variable is the formation of complex IORs, i.e. international IORs. As we elaborated above, IORs with foreign partners entail higher coordination efforts, whereas IORs with home-country partners can be considered less demanding from the coordination requirements point of view. Moreover, complexity in international IORs is likely to grow exponentially as the firm engages in several international relationships with specific scopes and with partners from different geographical areas (Gulati and Singh, 1998; Lavie and Miller, 2008; Sampson, 2005). Following this line of reasoning, a firm with a highly diversified portfolio of international IORs is managing a more complex portfolio of IORs. Coherently, our dependent variable measures the complexity of the portfolio of a focal firm's international IORs along two dimensions: the variety of scopes of the agreements and the variety of geographical areas where the foreign partners are located. As concern the variety of scopes, we considered three scopes: manufacturing, marketing and commercial scopes. As concern the geographical areas, we considered three areas where the foreign partner may be located: European Union, Other industrialized countries and Developing countries. We scored each firm on the basis of the number of different scopes and the number of different geographical areas that are in its portfolio of international IORs in the two periods 1998-2000 and 2001-2003. We weighted the score of the first period (1998-2000) by one-half to account for a possible "time deterioration" of experience (Sampson, 2005). Thus, the dependent variable, which measures the formation of complex IORs, lies in the range 0-13,5. A firm scores 0 if it has not established any inter-organizational relationship with foreign partners both in the period 1998-2000 and in the period 2001-2003. A firm scores 13,5 if it has established IORs for manufacturing, marketing and commercial scopes in the European Union, in Other industrialized countries and in Developing countries both in the period 1998-2000 and in the period 2001-2003. Therefore it has a total score of 13,5 resulting from a score of 4,5 (9/2) for the period 1998-2000 and a score of 9 for the period 2001-2003. All firms scoring between 0 and 13,5 have established "some" international IORs for one or more purposes in one or more geographical areas either in the period 1998-2000 or in the period 2001-2003. We calculated the logarithm[iii] base 10 of the variable in the regression analysis and named it (LOG COMPLEX IORs).

3.4. Independent Variables

3.4.1. Resource-Transferring IORs

In line with our theoretical arguments, we considered both upstream supply IORs and downstream industrial customers IORs with domestic partners.

We estimated a firm's participation in upstream supply IORs (relationships with domestic subcontractors) measuring the percentage of subcontracting costs with domestic subcontractors, over the total cost of subcontractors (using the 1997 data) and calculating the logarithm base 10 (LOG UPSTREAM SUPPLY IORs).
We estimated a firm's participation in downstream supply IORs (relationships with domestic industrial customers) measuring the percentage of revenues from domestic industrial customers, over the total revenues from subcontracting activities (using the 1997 data) and calculating the logarithm base 10 (LOG DOWNSTREAM SUPPLY IORs).

3.4.2. Resource-Pooling IORs
We estimated a firm's participation in IORs characterized by pooled interdependences using the network of consortia as a proxy. Specifically, we counted the number of consortia a firm is part of with other domestic firms in 1997 and calculated the logarithm base 10 (LOG CONSORTIA IORs).
We estimated a firm's participation in IORs characterized by intensive interdependences using the network of R&D partners as a proxy. Specifically, we took into consideration the amount each firm invested in R&D and measured how much each firm relied on external (domestic) partners for R&D purposes versus how much it relied on internal investments. We calculated the logarithm base 10 of the share of R&D external contributions (LOG R&D IORs).

3.5. Control Variables
We controlled for variables that could affect a firm's ability to manage complex IORs, including previous experience in international IORs, size and industry.
First, we controlled for the prior experience that a firm might have accumulated in the management of a complex portfolio of international IORs in the past, by using the same construct of the dependent variable, but in the period 1995-1997 (LOG PRIOR COMPLEX IORs).
Second, we used the number of employees as a proxy for firm size and then calculated the logarithm base 10 of the variable (LOG SIZE) before including it in the regression analysis.
Third, we included two dummy variables to account for manufacturing (MANUFACTURING) and high-tech industries (HIGH-TECH). This variable allows accounting for possible industry effects.

4. Results
Table 1 shows the descriptive statistics of our sample including the number of observations, the mean, standard deviation and correlation coefficients between the variables used to test the model. Significant correlation coefficients are indicated with a star. As illustrated in Table 1, all correlations are below the recommended 0.70 threshold, reducing concerns about potential multicollinearity.
Table 2 shows the empirical results of the OLS regressions with robust standard errors: Models 1 and 2 show the regression results on the full sample. For each model, we performed the usual controls to make sure OLS assumptions are verified. To better assess the threat of multicollinearity, we also calculated the variance inflation factors (VIFs) for each coefficient. The maximum VIF obtained in the two models is 1.28, which is well below the rule-of-thumb cut-off of 10 for multiple regression models (Neter *et al.*, 1985).
Results in Model 1 and 2 confirm that the model fits the data quite well, and explains more than 17% of the total variance of the dependent variable.
Results in Model 2 confirm our overall assumption underlying the paper, i.e. that different types of IORs are variably associated with the formation of international IORs. More

specifically, they confirm the existence of IORs that are beneficial to the formation of complex IORs. In addition, our results prove that participating in some IORs shows no statistically significant effect (neutral), as well as participating in some other is detrimental to the formation of complex IORs.

Table 1: Descriptive statistics and correlations

		Observations	Mean	Std Dev	1	2	3	4	5	6	7	8	9
1	LOG COMPLEX IORs	341	0.155	0.242	1								
2	LOG UPSTREAM SUPPLY IORs	350	0.603	0.910	0.147*	1							
3	LOG DOWNSTREAM SUPPLY IORs	361	0.597	0.883	-0.063	0.397*	1						
4	LOG R&D IORs	361	0.249	0.570	0.236*	0.167*	-0.018	1					
5	LOG CONSORTIA IORs	366	0.042	0.113	0.018	0.124*	0.067	0.091	1				
6	LOG SIZE	366	1.726	0.524	0.307*	0.136*	-0.028	0.180*	0.050	1			
7	LOG PRIOR COMPLEX IORs	366	0.047	0.126	0.266*	0.132*	0.021	0.165*	0.142*	0.121*	1		
8	MANUFACTURING	364	0.962	0.193	-0.104	-0.036	0.052	-0.155*	0.036	-0.081	-0.082	1	
9	HIGH-TECH	366	0.038	0.193	0.104	0.036	-0.052	0.155*	-0.036	0.081	0.082	-1	1

* $p < 0.05$

Table 2: Results of the regression analysis. Dependent variable Log complex IORs – OLS results (robust std error in parentheses)

	VARIABLES	Model 1	Model 2
1	LOG UPSTREAM SUPPLY IORs		**0.031****
			(0.016)
2	LOG DOWNSTREAM SUPPLY IORs		**-0.027***
			(0.014)
3	LOG R&D IORs		**0.046***
			(0.026)
4	LOG CONSORTIA IORs		-0.106
			(0.106)
5	LOG SIZE	**0.145*****	**0.125*****
		(0.035)	(0.037)
6	LOG PRIOR COMPLEX IORs	**0.445*****	**0.404****
		(0.140)	(0.146)
7	MANUFACTURING	-0.087	Omitted
		(0.068)	
8	HIGH-TECH	Omitted	0.062
			(0.061)
9	CONSTANT	-0.025	-0.083
		(0.093)	(0.059)
10	OBSERVATIONS	339	321
11	F	13.35***	7.34***
12	ADJ R2	0.1521	0.176

$^{+}$ $p < 0.10$; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

In Hypotheses 1, we predicted that the role of resource-transferring IORs varies depending on the structure of interests and that participating in upstream supply IORs is more positively associated to the formation of complex IORs than participating in downstream industrial customer IORs. Findings support Hypothesis 1. Indeed, in Model 2 the coefficient of the variable LOG UPSTREAM SUPPLY IORs is positive and statistically significant (Model 2: $\beta = 0.031$, $p < 0.05$), while the coefficient of the variable LOG DOWNSTREAM SUPPLY IORs is even negative and (weakly) significant. (Model 2: $\beta = -0.027$, $p < 0.10$).

In Hypotheses 2, we predicted that the role of resource-pooling IORs varies depending on the informational complexity. Specifically, we proposed that participating in IORs characterized by intensive interdependences is more positively associated to the formation of complex IORs than participating in IORs characterized by pooled interdependences. Findings provide some support to Hypothesis 2. Indeed, in Model 2 the coefficient of the variable LOG R&D IORs is positive and (weakly) statistically significant (Model 2: $\beta = 0.046$, $p < 0.10$), while the coefficient of the variable LOG CONSORTIA IORs is negative but not significant.

Control variables behave differently. The formation of complex IORs is associated with firm size and prior experience in international relationships as expected, but there is no statistically significant variation between manufacturing and high-tech industries.

5. Discussion

The network of IORs in which a firm is embedded plays a relevant role in shaping firm actions and behaviours. Current or previous inter-organizational networks are sources of experience and capabilities that a firm may actively depend on when developing new IORs. These evidences notwithstanding, we contend that past experience is not homogeneously beneficial in new IORs when the latter are more complex and coordination demanding

compared to those in which a firm participated in the past and accumulated experience because firms get used to coordination mechanisms that could not be appropriate in the new setting. This happen, for example, in the case of IORs with foreign partners where cultural, social, economic and institutional differences add to the complexity of the inter-firm relationship compared to the case of relationships between companies that share the same nationality (Guler and Guillén, 2010).

We provided some empirical evidence consistent with our arguments and found that complex IORs are associated with the variety of IORs types in which firms participate. Our results show that not all types of IORs matter when forming coordination demanding IORs and that some types of IORs matter more than others. Consequently, a firm can leverage on the variety of prior experience it matured in different backgrounds when establishing more complex relationships, but it should carefully 'select' within past experiences because they are not entirely homogenously beneficial.

Indeed, experiences originated in resource-transferring IORs have controversial effects on the base of the position a firm occupies, which in turn affects the structure of interests. In a resource-transferring relationship a firm can be either the "supplier" of an input or the "receiver" of an output. The relationship is mostly governed by the receiver (the customer in a supply relationship) which takes the decision to supply from outside, from whom and how, i.e. the coordination and governance mechanisms adopted. That position offers greater opportunities to get familiar with the implementation of coordination and control mechanisms to integrate with partners and avoid opportunistic behaviours. Coordination-related activities and mechanisms are usually within the area of higher influence of the receiver and not within the area of influence of suppliers as Lazerson (1995) pointed out in subcontracting IORs. The receiver is likely to be in a "superior" position compared to that of the "supplier", which is somehow subordinate. Such asymmetry is likely to turn into an asymmetric distribution of the learning effects. Established literature has demonstrated the asymmetric distribution of learning in customer-supplier relationships on operational capabilities, for example on the 'content' of the relationship (Fink et al. 2006; Helper et al. 2000). Our analysis sheds some light on the possibility to extend similar results to the learning of how to form and manage complex IORs. Indeed, not only our results confirm that participating in upstream supply IORs is more valuable than participating in downstream supply IORs but go even beyond demonstrating that the latter can be even of detrimental value, reducing the possibility to create complex IORs.

Participation in resource-pooling IORs shows also different effects. In line with our theoretical argument, we maintain that pooled interdependences behave differently from intensive interdependences due to the different information complexity that characterize the two types of IORs. In the case of intensive interdependences, firms agree on the joint application of complementary resources to a common objective, while in pooled interdependences they limit to make use of the same resources. Hence, intensive interdependences, differently from pooled interdependences, are characterized by a high degree of uncertainty which forces firms to implement formalized knowledge sharing procedures, coordination and governance mechanisms and the associated experience can be utilized in complex settings in which formal mechanisms are recommended.

We believe our study offers some theoretical contributions to organization theory and the study of inter-firm organization specifically. Within this frame, we tried to deepen the consequences of participating in different forms of inter-firm organizations. We provided some confirmation to the idea that coordination mechanisms, structure of interests and information complexity might represent "discriminating characteristics" that identify salient structural alternatives in the analysis of inter-firm organization in addition to the currently

used characterizations such as legal forms or industrial features (Albers *et al.*, 2016; Grandori, 1997).

Our study confirms that past experience is useful in complex IORs but suggests a *new* driver in the analysis of IORs that permits to discern between value 'giving' and value 'taking' IORs (Anand *et al.*, 2016), being the former the IORs that equip firms with experience that is beneficial to the management of highly complex IORs (i.e. upstream supply relationships in resource-transferring IORs and relationships characterized by intensive interdependences in resource-pooling IORs), while the latter the IORs that equip firms with experience that is somehow detrimental (i.e. downstream industrial customer relationships in resource-transferring IORs) or neutral (i.e. relationships characterized by pooled interdependences in resource-pooling IORs).

We believe we can also contribute to the knowledge-based perspective on IOR's types proposed by Parmigiani and Riviera-Santos (2011). They show how any given type of IOR can be classified into (and in practice combines traits of) co-exploration and co-exploitation. Accordingly, IORs can be more explorative or exploitative in nature. Our paper opens new venues in the trade off between exploration and exploitation in IORs. By proving that there is a positive association between participating in (some) IORs that are low coordination demanding and the formation of high coordination demanding IORs, we advance that firms can partially leverage on the exploitation of prior experience in settings that are explorative in nature.

From a managerial perspective, our results show that firms should assess past experience when developing new courses of action. It turns out that inexperienced firms are not prevented from pursuing infrequent or ambiguous activities on which they have not yet accumulated experience because firms can potentially leverage on selected past experience accumulated in different settings (Anand *et al.*, 2016). Therefore, being able to properly identify the *beneficial* and *detrimental* past experience might turn into a distinctive capability for future IORs formation.

5.1. Limitations and Directions for Future Research

This paper has a number of limitations that might represent avenues for future research. First, even if network participation is a source of experience accumulation, subsequent studies could elaborate a more fine-grained model on the micro-organizational mechanisms that explain why some experiences are beneficial to the formation of coordination-demanding IORs and some experiences are not. Moreover, a possible extension concerning our independent variables could also consider such learning mechanisms as articulation and codification (Zollo and Winter, 2002) in addition to experience accumulation via IORs participation.

Second, future studies could provide more precise results by directly linking the actual coordination mechanisms that firms used in prior IORs with the characteristics of later IORs (Srikanth and Puranam, 2011). Along the same vein, future research could analyse single IORs to studying *how* such arrangements feed the development of valuable capabilities for managing complex IORs, namely relational capabilities (Schilke and Goerzen, 2010). Such study would permit to elaborate on the idea of how 'transferability' of such capabilities between different inter-organizational settings takes place.

Last, even if our results show some positive links between past experience and future IORs, we did not consider whether such future IORs have a positive or negative outcome. A possible extension could link past experience, the formation of future IORs and the outcome of such relationships.

6. Concluding Remarks

In this paper, we have demonstrated that the possibility to utilize prior experience in a different setting is somehow associated with the overall variety of IORs types a firm has experienced. Participation in some types of IORs provides valuable experience to the formation of IORs characterized by higher degree of uncertainty and task complexity. Such value is contingent to the interdependences that characterize inter-firm relationships, which in turn affects the coordination mechanisms that a firm experiences. Moreover, the structure of interests between the partners (in resource-transferring IORs) and the information complexity that characterize the joint task (in resource-pooling IORs) divide between beneficial and detrimental experience.

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[i] In line with Parmigiani and Rivera-Santos (2001: 1108) we define Inter-Organizational Relationships (IORs) as broad array of collaborative arrangements, including strategic alliances, joint ventures, buyer-supplier agreements, licensing, co-branding, franchising, cross-sector partnerships, networks, trade associations, and consortia.

[ii] The questionnaire is available upon request.

[iii] We applied the logarithmic transformation in order to stabilize the variance of the variable and achieve better normal distribution conformation. It reduces the skewness of the variable and eliminates potential outlier problems (Maddala 2001).