

XII CLADEA'S DOCTORAL CONSORTIUM

**DRIVING GOVERNANCE MODES IN START-UPS FROM AN OPEN
INNOVATION APPROACH**

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Abstract

This study examines how start-ups contribute to open innovation through a relational perspective. Start-ups depend on critical external knowledge assets for the successful realization of their innovative endeavors. As a result, start-ups engage in a series of relations. These relations can adopt several modes, and the governance mode decisions affect the innovation performance. Based on relational factors –trust, level of commitment, flexibility or stability-, some governance modes are preferred over others. We differentiate two open innovation process, inbound and outbound, and we identify them with the R&D stage and the commercialization stage, respectively. We propose that during the R&D stage, start-ups will embrace venture capital over non-equity alliances, non-equity alliances over equity alliances, and equity alliances over mergers and acquisitions because even though start-ups lack resources –financial and strategic-, the start-up's purpose during this stage is to look for business opportunities. On the contrary, during the commercialization stage, the locus is in the technology exploitation, so start-ups try to sell (part of) the business to other firms. In this stage, mergers and acquisitions by large firms are preferred to equity alliances, equity-alliances to non-equity alliances, and non-equity alliances to venture capital.

Key words: start-up; inbound open innovation; outbound open innovation; governance modes.

Resumen

Este estudio examina cómo las empresas de nueva creación (*start-ups*) contribuyen a la innovación abierta desde una perspectiva de relaciones. Las *start-ups* dependen del conocimiento externo para una exitosa realización de sus esfuerzos de innovación. Como resultado, las *start-ups* entablan una serie de relaciones. Estas relaciones pueden adoptar diversas formas, y las decisiones sobre el modo de gobierno afectan al resultado de la innovación. Basándonos en factores relaciones –confianza, nivel de compromiso, flexibilidad o estabilidad-, unos modos de gobierno son preferidos sobre otros. Para establecer qué modo de gobierno es preferido, diferenciamos entre los dos procesos de innovación abierta, interiorización y exteriorización, e identificamos éstos con las etapas de I+D y la de comercialización, respectivamente.

Proponemos que durante la etapa de I+D, las *start-ups* aceptarán empresas de capital riesgo sobre alianzas sin participación en capital, alianzas sin participación en capital sobre aquellas con participación en capital, y alianzas con participación en capital sobre fusiones y adquisiciones debido a que a las *start-ups* les faltan los recursos –financieros y estratégicos- y su objetivo durante esta fase es buscar oportunidades de negocio. Por el contrario, durante la etapa de comercialización, el eje central está en la explotación de la tecnología, por lo que las *start-ups* tratarán de vender (parte de) su negocio. Es esta etapa, los modos de gobierno preferidos son las fusiones y adquisiciones por grandes empresas sobre alianzas con participación en capital, alianzas con participación en capital sobre alianzas sin participación, y alianzas sin participación en capital sobre inversiones de empresas de capital riesgo.

Palabras clave: *start-up*; interiorización de la innovación abierta; exteriorización de la innovación abierta; modos de gobierno.

I. Introduction

The goal of this project is to advance understanding of the considerable significance of how Spanish start-ups contribute to innovation from a relational view. In other words, we are going to analyze the governance modes of start-ups, differentiation between inbound open innovation and outbound open innovation and identifying these processes with the R&D stage and commercialization stage, respectively, for start-ups.

Previous literature has emphasized the role of strategic alliances for innovation, paying attention to inter-firm relations. However, they are generally discussed in terms of specific activities performed, but not in a comparative way (Provan and Kenis 2008). The central arguments of this literature are based on the potential benefits of alliances as they provide firms with access to information, resources, markets, and technologies; and allow firms to achieve strategic objectives, such as sharing risks and outsourcing value-chain stages and organizational functions (Gulati, Nohria and Zaheer 2000). These collaborations have been revitalized recently because of the called open innovation (Chesbrough 2003) approach. This framework offers ample opportunities for extension and many areas have not been studied yet (Huizingh 2010; Gassmann, Enkel and Chesbrough 2010). Especially, more research is needed in order to understand the outbound open innovation process. Moreover, few studies have focused in start-ups as key promoters of open innovations activities. Stinchombe (1965) justified that start-ups fail because of a lack of either resources or relations. Our study is going to analyze the governance modes from the start-up point of view, considering the inflows and outflows that they provide to the environment.

We propose that during the R&D stage, start-ups will embrace corporate venture capital over non-equity alliances, non-equity alliances over equity alliances, and equity alliances over mergers and acquisitions. And we propose that during the commercialization stage, these governance modes will be preferred inversely. The proposed research is expected to be tested in a sample of Spanish start-up firms in Silicon Valley.

Hence, this paper intends to contribute to literature by connecting a phasing model on innovation to concepts of inter-organizational governance for start-ups, by examining what governance mechanisms are in use during the R&D stage and the commercialization stage. It also offers insights into how start-up firms benefit from different open innovation processes to improve their innovation performance.

The remainder of this paper is structured as follows. In the next section, we will introduce the theoretical background, reviewing the relational theory, the open innovation approach and start-up literature. The third section develops our hypotheses about the relation between governance modes and open innovation practices for the R&D stage and the commercialization stage. Then, we describe the proposed methodology that will be used when hypothesis are validated. Finally, we conclude with a discussion of our hypothesis, managerial implications and some directions for future research.

II. Literature review

1. Open innovation paradigm

Since Henry Chesbrough introduced the open innovation concept in 2003, the idea has been revitalized, being the new paradigm in the innovation management field. Open innovation can be defined as ‘the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively’ (Chesbrough, Vanhaverbeke and West 2006, p.1). Hence, it consists of two processes, the former it is referred to an outside-in process where firms control the environment to internalize technology and external knowledge to the business (Spithoven, Clarysse and Knockaert 2011). The latter, it is an inside-out process and it is referred to the benefits that firms get when they bring ideas to the market, sell intellectual propriety rights or multiply the technology through the idea transfer for the external environment (Enkel, Gassmann and Chesbrough 2009). These processes are also called ‘technology acquisition’ and ‘technology exploitation’ (Lichtenthaler 2011).

However, the open innovation concept has also received several criticisms by scholars who have argued that some of the open innovation principles are not new (Mowery 2009) and it is ‘old wine in new bottles’ (Trott y Hartmann 2009). Even Groen and Linton (2010) wondered if open innovation is a real field of study or, rather, a communication barrier to theory development. Despite such objections, the phenomenon has been studied and it is understood as the outcome of a longer evolution of many firms’ innovation activities, a sustainable development rather than a managerial fashion (Lichtenthaler 2011). On this basis, Chesbrough and Bogers (2014) have clarified the OI concept as ‘a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model’.

Nevertheless, open innovation does not constitute a theory by itself, but open innovation research lacks a link to theory (Enkel 2010). As networks have been proved to be of special interest to the open innovation approach (Powell and Grodal 2005; Lee, Park, Yoon and Park 2010), we link open innovation to network theory. Firms can no longer rely on their own resources and knowledge to compete in today’s markets; rather, they need to look for strategic interactions outside firms’ boundaries (Sobrero and Roberts 2002). As a result, firms have moved towards an open innovation model where they use both internal and external channels to explore and exploit technologies (Van de Vrande, de Jong, Vanhaverbeke and Rochemont 2009). It is just in this intersection of internalizing and externalizing where the open innovation process depends on the strategic alliances (Hagedoorn and Duysters 2002).

2. The relational view

In order to investigate the governance modes’ choice that better fits the open innovation process of start-ups, it is necessary to review the theoretical perspectives that yield insights into effective and efficient governance. Scholars have differentiated two perspectives: the contractual perspective and the relational one. The former focuses on the structural design of single transactions and emphasizes the importance of contracts as effective and efficient governance mechanism; the latter assumes trustworthy behaviors between firms, drawn from social exchange theory (Faem, Janssens, Madhok and van Looy 2008). Hence, the relational view incorporates relational norms, such as trust, commitment, cooperation or flexibility, within governance mechanisms (Lew and Sinkovics 2013).

We consider that the relational view is suitable for explaining the governance modes that are used for start-ups during the R&D stage and the commercialization stage because it focuses on

networking as a unit of analysis to understand the competitive advantage, so managers who are effective at aligning transactions with governance structures will have an advantage over those who do not comply efficient governance mechanisms (Dyer and Singh 1998).

3. The start-ups phenomenon

Entrepreneur firms are defined as ‘ones that engage in product-market innovation, undertake somewhat risky ventures, and is first to come up with proactive innovations, beating competitors to the punch’ (Miller 1983, p.771). Though they are usually small and medium enterprises – SME- and some of SME’s literature can be generalized to these firms, however, they show their own specificities and an in-depth analyses is needed. Shane y Venkataraman (2000) built a conceptual framework related to entrepreneurship and they identified three steps in the entrepreneur process, namely, existence, discovery and exploitation of business opportunities. On this basis, innovations play a key role for start-ups because they often explore the environment seeking new opportunities. Dividing the product development and commercialization process in this way increases the start-up’s focus on R&D activities (Shan, Walker and Kogut 1994). In this regard, Christensen and Overdorf (2000) concluded start-ups are the most efficient structure to take advantage of industrial opportunities offered by disruptive technologies.

Given the importance of start-ups for innovation, literature has studied the role of innovative networks for start-ups (Shan et al. 1994; Larson 1992; Baum, Calabrese and Silverman 2000; Stuart 2000; Rothaermel and Deeds 2006). For example, Shan et al. (1994) analyzed a sample of biotechnology start-ups to study if cooperative relations with other firms had a positive effect on patents. The empirical analysis evidenced that collaborative relationships increase innovation performance. Similar conclusion was given by Baum et al.’s (2000) study. In the same vein, Stuart (2000), using a sample of 150 firms in the semiconductor industry, showed that firms who own partners of sophisticated technological alliances patent at a faster pace than firms who does not own these links, and patent performance is bigger for young and small businesses. And Rothaermel and Deeds (2006) investigated a high-technology venture’s alliance management capability and they found that alliance type and alliance experience moderate the relationship between a high-technology venture’s R&D alliances and its new product development. However, few studies about start-ups have been framed in the open innovation approach and research differentiating the inbound and outbound processes is needed.

III. Discussion of the proposal

Open innovation and network relationships are considered by many firms as a way to enhance innovation performance. The adoption of open innovation practices could be a response to innovation impediments, such as lack of capability or information access and risk management (Mortara and Minshall 2011). This is especially important for start-up businesses which usually suffer from a lack of resources and relations (Stinchombe 1965; Shan et al. 1994; Baum et al. 2000). Larson (1992), though she did not refer explicitly to innovation, but business success, supported the importance of relationships to get the resources needed to boost the start-up's success.

Given that many governance modes exist for an organization to be open, it makes sense to identify which one best fits with a specific open innovation process. The organisational modes vary substantially along of the R&D process because they are characterised by dissimilar requirements in terms of level of risk, uncertainty, investment and need for exploring new technologies rather than exploiting the existing ones (Bianchi, Cavaliere, Chiaroni, Frattini and Chiesa 2011). Firms must be aware of their strategies to build and capture value, and given that strategies evolve, the right collaboration mode could also change (Dyer and Singh 1998; Pisano and Verganti 2008). The choice of a government mode or another depends on several factors, but especially, it depends if the start-up is carrying out an inbound or an outbound process. These processes essentially follow the key work by March (1991), which illustrates the different strategies that a firm can select for both technological exploration and exploitation (Mortara and Minshall 2011; Bianchi et al. 2011).

Inbound open innovation can be defined as the internal use of external knowledge (Huizingh 2010). This process enriches the company's own knowledge base through the integration of suppliers, customers, and external knowledge sourcing (Enkel et al. 2009), so R&D external to the firm is absorbed to increase the innovativeness of the firm. As a result, many firms identify technology exploration with the inbound open innovation process. Bianchi et al. (2011), though referred to biotechnological firms' sample, found that during the first stages of the drug discovery and development process inbound open innovation activities are predominant. During the exploration phase, firms scan the external environment looking for new business opportunities. Ferrary (2011) outlined the emphasis for start-ups is on exploration. As start-ups are focused on seeking new business opportunities during the R&D stage, this phase can be linked to the inbound open innovation.

Outbound open innovation refers to external exploitation of internal knowledge (Huizingh 2010). Here, companies look for external organizations that are better suited to commercialize (part of) the firms' given technology (Spithoven et al. 2011). Enkel et al. (2009) explained that the inside-out process refers to earning profits by transferring knowledge to the market, selling IP, and multiplying technology by bringing knowledge to the external environment. Thus, outbound open innovation is identified with technology exploitation. These activities are common for start-ups who usually decide to shift the locus of exploitation outside the company's boundaries during the commercialization phase. In this sense, Ferrary (2011) explained the acquisition and development strategy of large businesses, which decide to acquire start-ups when they have previously carried out the exploration activities, so the exploitation or commercialization of technology is carried out by large firms as start-ups decide to sell it.

In sum, start-ups tend to differentiate the inbound process from the outbound according to the innovation stage –R&D or commercialization-. Therein, during the R&D phase, start-ups make an intensive use of inbound open innovation as they explore the environment to look for new business opportunities; while during the commercialization stage, start-ups tend to use outbound open innovation because they lack the resources needed in the commercializing stage, so they look for other companies who deal with trade issues.

***Hypothesis 1:** During the R&D stage, start-ups embrace inbound open innovation practices.*

***Hypothesis 2:** During the commercialization stage, start-ups embrace outbound open innovation practices.*

1. Governance modes during the inbound open innovation process and the R&D stage

We have justified that the inbound open innovation process is identified with technology exploration during the R&D stage for start-ups. Traditionally, literature has identified some inbound innovation practices, such as in-licensing, minority equity investments, acquisitions, joint ventures, R&D contracts and research funding, purchase of technical and scientific services and non-equity alliances (Bianchi et al. 2011).

In order to simplify our research and following van de Vrande, Lemmens y Vanhaverbek (2006) study, we are going to consider three groups of organization modes, namely, corporate venture capital investments, strategic alliances –non-equity and equity-, and mergers and acquisitions. Corporate venture capital investments refer to equity investments in entrepreneurial ventures. These investments typically occur in start-up firms, so the focal firm establishes a separate

organizational unit in the start-up with allocated funds (van de Vrande, Vanhaverbeke and Duysters 2009). Strategic alliances can be divided into non-equity alliances, which involve non-equity R&D agreements, usually with universities, research centers, suppliers, customers and other partners; and equity alliances which imply a financial investment but corporations maintain their own identities, making cooperative efforts, such as joint ventures or minority holdings. Finally, mergers and acquisitions are the more irreversible modes of collaboration, being acquisition defined as the purchase of one firm by another to acquire firm's technology.

These organization modes are not used in the same way when start-ups enter into different relationships to acquire technology and knowledge (we focus on networks that enter inside start-ups) because there are some key relational factors –level of commitment, flexibility, trust, etc.- that determine the effective governance mode (Dyer and Singh 1998; Lew and Sinkovics 2013). Alternative governance modes might exhibit differences in their effectiveness and when they can be used (Keil, Maula, Schildt and Zahra 2008). For example, Bianchi et al. (2011) argued alliances with universities and research centers, purchase of scientific services and in-licensing as the main organizational modes during the inbound process.

According to the relational view, from the different organization modes that start-ups can choose, we consider that during the R&D stage start-ups embrace corporate venture capital over non-equity strategic alliances, non-equity strategic alliances over strategic alliances, and strategic alliances over mergers and acquisitions for the following reasons. First, the level of commitment has been outlined as one of the key relational factor in inter-firm relationships (Lew and Sinkovics 2013). Van de Vrande et al. (2006) determined that during the first stages of development of a new business model, where the technological and market uncertainty are high, it is most beneficial for companies to use reversible organization modes and with a low level of commitment, for instance, corporate venture capital or non-equity short-term strategic alliances.

Second, the relational view highlights that self-enforcing agreements call for greater value creation initiatives on the part of the exchange partners because it is difficult to explicitly contract for value-creation initiatives, such as offering innovations (Dyer and Singh 1998). Recall, we have defined start-ups as entrepreneur firms that look for new business opportunities in the external environment, so this goal cannot be explicitly contracted, resulting in a preference of informal modes over formal and delimited ones. Besides, start-ups are usually more flexible and more innovative in new areas, but they lack resources and partnerships (Stinchcombe 1965). As a consequence, start-ups' network is used to complete the lack of resources of them, so they seek partners who invest in the business, but not interfere in their affairs, maintaining internal

competence, such as corporate venture capital. Venture capital provides funding for start-ups, both financial and strategic (Mortara and Minshall 2011; Ferrary 2011).

Third, external R&D cooperation is an important channel to search for knowledge and information and most of the companies that adopt open innovation practices embed into network relations with universities and research institutions (Penghu et al. 2013). Start-ups could show a preference for networking with public research institutes and universities because of the fear of giving away their technology to competitors as it happens for SMEs (Lee et al. 2010). In this sense, trust on partners is another key relational factor (Lew and Sinkovics 2008).

Fourth, at the exploration stage, Lee et al. (2010) also found that SMEs are likely to use external partnerships too. Even though start-ups have a high fail rate (Ferrary 2011), some firms could be interested in investing in start-ups to keep an eye on potential opportunities in case their technologies prove to be valuable (van de Vrande et al. 2009a).

Fifth, another relation factor is flexibility (Provan and Kenis 2008), as start-ups are essentially flexible businesses that look for new business opportunities during the R&D stage, strong ties with larger firms could limit opportunities and alternatives for start-ups. Hence, mergers and acquisitions, which involve a high level of commitment and are irreversible, are the last option for start-ups during the R&D stage.

Based on the above arguments, we state the following hypothesis:

***Hypothesis 3:** During the R&D stage, start-ups are more likely to choose corporate venture capital over non-equity strategic alliances, non-equity alliances over equity strategic alliances, and equity alliances over mergers and acquisitions.*

2. Governance modes during the outbound open innovation process and the commercialization stage

We have stated that for start-ups, the outbound open innovation process is identified with technology exploitation during the commercialization stage. Typically outbound open innovation practices are licensing out, spinning out of new ventures, sale of innovation projects, joint venture for technological commercialization, supply of technical and scientific services, corporate venturing investments and non-equity alliances (Bianchi et al. 2011).

Again, in order to simplify our research and following van de Vrande et al. (2006) study, we consider three groups of governance modes, namely, corporate venture capital investments, strategic alliances –non-equity and equity-, and mergers and acquisitions/sales. Because this stage

is referred to technology exploitation, the innovation process is focused on an inside-out process, so start-ups are selling or entering into the market technology. Here, the strategy for acquisitions is usually referred to the sale of the start-up, so larger firms buy them.

As same as it happens during the inbound process, some governance modes are preferred to others because of critical relational factors –stability, commitment, etc.-. Bianchi et al. (2011) evidenced that out-licensing and alliances for exploitation are most commonly used for biotechnology industries during the outbound process. We consider that during the commercialization stage start-ups will embrace acquisitions/sales over equity alliances, equity-alliances over non-equity alliances, and non-equity alliances over corporate capital venture investments for the following reasons.

First, partners are not simply focused on temporary projects, but also on sustainment, especially once the technologies have been developed. As a result, stability in networks is important to sustain competitive advantage and it is got when the lead organization strives to maintain the control (Provan and Kenis 2008), for example, through an acquisition. In this sense, van de Vrande et al. (2006) determined that when the technological and market uncertainty decrease, companies shift to less reversible governance modes and more hierarchical. Thus, in this situation companies prefer acquisitions and equity alliances.

Second, some large businesses follow an acquisition and development (A&D) strategy, which is based on outsourcing exploration through an A&D strategy of start-ups and exploitation specialization for the large firm (Ferrary 2011; Mortara and Minshall 2011). This means that large firms buy start-ups once they have gone beyond the R&D phase and are ready for the commercialization stage. Therein, start-ups sell the business to larger firms.

Third, the exploitation stage might lead partners to opportunistic behavior. The relational view proposes that when it happens, a higher level of commitment or an explicit contract is needed (Dyer and Singh 1998; Lew and Sinkovics 2013). In this sense, for start-ups, business based on equity alliances, where firms jointly invest to share risks and profits, can help them to develop new business opportunities during the commercialization stage (Lee et al. 2010). Some start-ups do not sell the complete business, but they let other firms participate in capital, creating, for example, joint ventures. In this sense, start-ups are likely to establish alliances with their potential rivals because such linkages to similar organizations enable a new organization to take advantage of relevant experience (Baum et al. 2000).

Fourth, collaboration with research centres and universities, as well as, corporate venture capital are reduced during the commercialization stage because the ‘transition’ phase has finished and

the start-up will have been connected with a large firm that acquire it to handle the exploitation phase or it will have been introduced to an investment bank that will underwrite the exploitation stage (Ferrary 2011).

For the reasons outlined above, we propose the following:

Hypothesis 4: During the commercialization stage, start-ups are more likely to choose mergers and acquisitions/sales over equity strategic alliances, equity strategic alliances over non-equity strategic alliances, and non-equity alliances over corporate venture capital.

IV. Methodology

1. Sample

The hypotheses are expected to be tested through a sample of Spanish start-up firms that deal in a competitive environment, such as Silicon Valley. Using empirical evidence from Silicon Valley's firms is suitable for the following reasons. First, several studies have previously used this area (e.g. Ferrary 2011) because it is one of the most competitive regions, so firms that are set up there rely on innovation as a motor to success, and develop more R&D activities. Second, there are numerous technological centers that locate start-ups in this area, for instance, the Spanish Tech Center of San Francisco. These centers are composed of start-ups that try to find networks to create market. As a result, there is a 'cluster' of star-up firms in this region and the Spanish Tech Center of San Francisco holds a representative sample of Spanish star-ups to test our hypothesis, while CIS may lack an enough number of young firms to carry out statistical analysis. Hence, our research design is based on interviews to several start-ups' managers to control tautology problems. Questionnaires allow building scales to create constructs that measure the variables under analysis and it is an advantageous over CIS, which do not ask specifically about the category of governance modes that we have proposed.

2. Measures

Our empirical study is divided in two parts: stage and open innovation process, and governance mode. The former tests whether start-ups firms carry out open innovation practices during the R&D stage and the commercialization stage. Hence, our dependent variable is product innovation, which is explained by different open innovation practices and a variable to indicate the stage in which firms perform them. We use product innovation as a proxy to indicate the innovative performance by firms. This proxy has been previously used in other studies, such as

Un, Cuervo-Cazurra and Asakawa (2010). It is a binary variable that indicates the ability of the firm to carry out innovation in products (products that are completely new or with modifications significant enough to make them different from the ones that the firm was producing previously), being 0 if the firm did not make any innovation in products and, 1 if it did.

Following Van de Vrande et al. (2009a), we measure the nature of firm's innovation process by distinguishing eight innovation practices: customer involvement, external networking, external participation, outsourcing R&D, inward IP licensing, venturing, outward IP licensing, employee involvement. The stage variable is tabulated, so R&D stage will be 1 if firms declare that they perform the determined activity during the R&D stage and 0 otherwise. As the same way, commercialization stage will be 1 if the firm declares that the innovation practice was performed in this stage and 0 otherwise.

For the second part of our model -the preferred governance mode-, our dependent variable is the governance mode. The different governance modes that we have considered are corporate venture capital, non-equity alliances, equity alliances, and mergers and acquisitions. Following Van de Vrande et al. (2009b)'s methodology, we label governance modes according to their supposed level of commitment. Venture capital investments, being the more reversible governance mode, are coded 1, followed respectively by non-equity alliances, being 2; equity alliances, 3; and mergers and acquisitions, 4, being the less reversible mode. Again, the stage variable is tabulated, so R&D stage will be 1 if firms declare that they perform the determined activity during the R&D stage and 0 otherwise. As the same way, commercialization stage will be 1 if the firm declares that the innovation practice was performed in this stage and 0 otherwise.

In order to rule out possible alternative explanations to those formally hypothesized, the model includes the following control variables. Firm size (expressed in logarithms) is measured as total sales (LOGSIZE). R&D expenditures (R&DEXPEND) are measured as a percentage of sales. Finally, we have included a sector variable control (INDEX) to test if there are differences across sectors.

3. Statistical analysis and expected results

To test empirically whether Spanish start-ups contribute to innovation by performing open innovation practices, we will first start a factorial analysis to group the different practices in inbound open innovation and outbound open innovation. Then, we will apply a Probit regression analysis as our dependant variable is discrete. However, a potential problem with this analysis and data is sample selection. Since we can only analyze those firms that answered the

questionnaire, it could be argued that selective reporting biases our results (Heckman 1979). To control for a possible sample selection bias in our discrete dependent variable we use Heckprobit model, the STATA command for estimating a Probit model with sample selection. This model corrects the selection bias when the dependant variable is discrete.

To test the second part of our model and following Van de Vrande et al. (2009b), we use an ordered Logit model. Ordered logistic regressions control for the ordered nature of the dependent variable, and we have argued that our dependent variable –governance mode- is ranked along a continuum from less to more level of commitment: venture capital, non-equity alliances, equity alliances, and mergers and acquisitions.

Although the empirical analysis has not been conducted yet, we expect to find that during the R&D stage start-ups are innovative because they embrace inbound open innovation practices and, during the commercialization stage, the focus is on outbound open innovation. Furthermore, during the R&D stage, as start-ups lack resources –financial and strategic-, they will link to corporations that provide funds, so they will embrace venture capital over non-equity alliances, non-equity alliances over equity alliances, and equity alliances over mergers and acquisitions. On the contrary, during the commercialization stage, the locus is in the technology exploitation, so start-ups try to sell (part of) the business to other firms. In this stage, mergers and acquisitions by large firms are preferred to equity alliances, equity-alliances to non-equity alliances, and non-equity alliances to venture capital.

V. Discussion and conclusions

The aim of this study was to analyze how start-ups contribute to innovation through a relational perspective. The open innovation system implies that firms depend on critical external knowledge assets for the successful realization of their innovative endeavors (Christensen, Olesen and Kjaer 2005), and we consider that it is especially true for start-ups, which are characterized by a search of new business opportunities, but they lack resources and relations. As a result, start-ups engage in a series of relationships. These relations can adopt several modes, and the choice of the governance will depend on relational factors, that determine its effectiveness and the innovation performance.

To establish what governance mode is preferred, we have differentiated two open innovation processes, inbound and outbound, and we have identified them with the R&D stage and the commercialization stage, respectively. According to relational factors, such as flexibility or stability, level of commitment and trust, we have proposed that during the R&D stage, start-ups

will embrace venture capital over non-equity alliances, non-equity alliances over equity alliances, and equity alliances over mergers and acquisitions because the start-up's purpose during this stage is to look for business opportunities, making entrepreneurial activities. As they lack resources –financial and strategic- they will link to corporations that provide funds, but do not meddle in business affair, so start-ups maintain business management. On the contrary, during the commercialization stage, the locus is in the technology exploitation, so start-ups try to sell (part of) the business to other firms. In this stage, mergers and acquisitions by large firms are preferred to equity alliances, equity-alliances to non-equity alliances, and non-equity alliances to venture capital.

The paper contributes to the literature in several ways. First, previous research on open innovation has often focused on large firms (Chesbrough 2003; Bianchi et al. 2011; van de Vrande et al. 2009b), and even though there are some studies that analyze SMEs (Louart y Martin 2012; Zeng, Xie y Tam 2010; Lee et al. 2010), they do not analyze explicitly the start-up phenomenon. In this study we have framed the start-ups' features to the open innovation approach. Second, few studies have previously examined the commercialization stage and literature have outlined that more research is needed about outbound open innovation (e.g. Poot, Faems and Vanhaverbeke 2009). To contribute to this research gap, we have analyzed governance modes in two stages -R&D and commercialization-, and we identify them with the open innovation processes, inbound and outbound, respectively. Besides, we contribute to open innovation literature by linking this approach to theory, so we examined if from relational theory. In this sense, we have addressed the choice between different governance modes according to relational factors, explaining why some governance modes are better suited for start-up firms in each stage. We have analyzed it from the start-up point of view, so we have considered how external partners arrive to the entrepreneurial firm and how start-ups try to transfer their technologies.

This study has also some implications for practitioners. Given the importance of relationships for innovation performance of start-ups, there is a need that they include these networks in their strategies from the founding (Baum et al. 2000). A firm's alliance partners are the most important source of new ideas and information that result in performance-enhancing technology and innovations (Dyer and Singh 1998). Next, although we have consider that some governance modes are better suit than other for start-ups, senior managers need to be wary of the notion that one type of collaboration is superior to others. Rather, differences in strategy and capabilities can lead to different kinds of collaboration networks competing against one another in the same

industry (Pisano and Verganti 2008). Managers should be aware that networking is a strategic issue, and it depends on the firm environment –internal and external-.

This study has also its limitations, which not only represent the boundaries of its insights but also provide opportunities for future research. First, although it is expected to be tested soon, this paper has not done yet, so this study is still a theoretical construction. A logical step for further research would be to empirically validate the use of governance modes in new business development. Future research could also consider a longitudinal analysis, instead of the cross-sectional study proposed, though the fact that sample refers to firms of new creation makes difficult to analysis a period time of more than three years. Second, we have limited our analysis to three governance modes. Future research could extend this research and broaden the perspective on how companies use external sources of innovation, including more organizational modes. Finally, we have addressed the choice between governance modes according to some relational factors and start-ups' features. Future research should also go into other moderating factors that influence the relation between the governance mode and the innovation performance, both internal and external, such as, absorptive capacity or propriety rights.

VI. Bibliographic references

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