Alliance Portfolio Diversity: Defining the Concept

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The meaning of diversity and its implications have fascinated researchers in different disciplines for a long time. Thus, natural scientists have studied biodiversity as variety of species. Sociologists and organizational behaviour scholars have investigated work-place and demography diversity as differences in attributes of individuals and groups. In strategy, the concept of diversity has been studied at the population level as organizational forms' heterogeneity, and at the firm level as diversification. Recently, researchers in strategy and entrepreneurship have started exploring diversity in the context of inter-organizational relationships. Alliance portfolio diversity (APD), in particular, has been of interest for scholars, and it is in the focus of the present paper.

There are several reasons explaining academic interest in studying APD. *First*, nowadays companies have to manage a portfolio of alliances (e.g., R&D, marketing, licensing, etc.) including increasingly diverse array of partners (e.g., upstream, downstream, and horizontal). Therefore, there is a need to broaden the analysis by looking not only at a particular type of partners or alliances, but also at all partners and alliances in alliance portfolio. *Second*, alliance portfolio diversity concept is notable because of the oppositions in theoretical arguments and empirical evidence they are accompanied with. Existing academic studies (e.g., Goerzen & Beamish, 2005; Lee, 2007) based on contradictory predictions from different theoretical perspectives report mixed results about the consequences of proliferation and increasing diversity of business relationships at firm level. Partly, it is due to differences in meanings that scholars attribute to the concept of alliance portfolio diversity and due to different operational measures they use.

The objective of the present paper is to formulate a set of guidelines susceptible to direct future research on alliance portfolio diversity. *First*, we suggest that the concept of alliance portfolio diversity should be studied along two dimensions: partners' and alliance ties' diversity. *Second*, though diversity increases with size, these are different alliance portfolio characteristics, which should be conceptually and empirically distinguished. The number of alliance ties and/or partners reflects portfolio size. Accounting for both alliance ties' and partners' types, on the one hand, and alliance portfolio size, on the other hand, permits to fully capture the meaning of alliance portfolio diversity. *Third*, we propose a conceptual framework that includes four archetypes of alliance portfolio (Economical Diversifiers, Active Diversifiers, Ties and Partners Multiplying Diversifiers) according to dimensions of diversity (partners' and ties' diversity) and to portfolio size.

Key words: diversity, alliance portfolio, conceptual definition and operational measures.

INTRODUCTION

> *There never were in the world two opinions alike, no more than two hairs or two grains; the most universal quality is diversity. – Montaigne: Of the Resemblance of Children to their Fathers, chap. Xxxvii.*

Diversity research in strategy and entrepreneurship has become an increasingly vital and pervasive topic. Alliance portfolio diversity (APD), in particular, has been of interest for scholars, and it is in the focus of the present paper. There are several reasons explaining academic interest in APD. *On the one hand*, there is a practical relevance in studying alliance portfolio diversity, since nowadays companies have to manage a portfolio of alliances (e.g., R&D, marketing, licensing, etc.) including increasingly diverse array of partners (e.g., upstream, downstream, and horizontal). Therefore, there is a need to broaden the analysis by looking not only at a particular type of partners or alliances, but also at all partners and alliances in alliance portfolio. *On the other hand*, alliance portfolio diversity concept is notable because of the oppositions in theoretical arguments and empirical evidence they are accompanied with. Existing academic studies (Goerzen & Beamish, 2005; Lee, 2007) based on contradictory predictions from different theoretical perspectives report mixed results about the consequences of proliferation and increasing diversity of business relationships at firm level. Partly, it is due to differences in meanings that scholars attribute to the concept of alliance portfolio diversity and due to different operational measures they use.

Despite the fact that alliance portfolio diversity is commanding a great deal of research attention, a close look at the literature in strategy and entrepreneurship suggests several gaps in the way it is studied. *First*, no effort has been made to think of a conceptual definition of alliance portfolio diversity. Though, clear constitutive definitions or stipulated meanings are crucial for cumulating and making sense of the pattern of findings and for ensuring comparability of findings across studies (Harrison & Sin, 2006). *Second*, operational measures of diversity, used in previous studies, have not been analyzed in terms of their appropriateness with respect to the conceptual definition of diversity. *Third*, the academic literature remains fragmented at different levels of analysis, with no overarching theme cohesively pulling together the various dimensions of interfirm diversity in systematic theory-building (Parkhe, 1991).

The objective of the present paper is to formulate a set of guidelines susceptible to direct future research on alliance portfolio diversity. *First*, we suggest that the concept of alliance portfolio diversity should be studied along two dimensions: partners' and alliance

ties' diversity. *Second*, though diversity increases with size, these are different alliance portfolio characteristics, which should be conceptually and empirically distinguished. The number of alliance ties and/or partners reflects portfolio size. Accounting for both alliance ties' and partners' types, on the one hand, and alliance portfolio size, on the other hand, permits to fully capture the meaning of alliance portfolio diversity. *Third*, we propose a conceptual framework that includes four archetypes of alliance portfolio (Economical Diversifiers, Active Diversifiers, Ties and Partners Multiplying Diversifiers) according to dimensions of diversity (partners' and ties' diversity) and to portfolio size.

The present paper is organized as follows. We start by reviewing the concept of diversity in different disciplines - biology, social studies, and strategy. Scholars studying alliance portfolio diversity can enrich their research by benefitting from these disciplines in terms of conceptualization and measurement of diversity. Then we present the concept of alliance portfolio diversity and discuss its existing operationalizations. Finally, we conclude by presenting a typology of alliance portfolios (a conceptual framework) and formulate avenues for the future research.

1. DIVERSITY CONCEPT ACROSS DISCIPLINES: CONNECTING STRATEGY, SOCIOLOGY, AND NATURAL SCIENCE

The meaning of diversity and its implications have fascinated researchers in different disciplines for a long time. Thus, natural scientists have studied biodiversity as variety of species. Sociologists and organizational behaviour scholars have investigated work-place and demography diversity as differences in attributes of individuals and groups. In strategy, the concept of diversity has been studied at the population level as organizational forms' heterogeneity, and at the firm level as diversification. Recently, researchers in strategy and entrepreneurship have started exploring diversity in the context of inter-organizational relationships.

Looking retrospectively, diversity in natural sciences has the longest history. In this relation, it is inevitable to cite Darwin's work on the *Origin of species* in 1859 and his article *On the tendency of species to form varieties* that preceded the publication of the above book. 'Biodiversity' has been defined as the variability among living organisms from all sources […] and the ecological complexes of which they are part, which encompasses a wide spectrum of biotic scales, from genetic variation within species to biome distribution on the planet (Gaston, 2000). Overall, researchers on biodiversity attempt to improve the understanding of the global distribution of biodiversity. The words "richness", "differences",

and "dissimilarity" are used to characterize diversity of species. They correspond to different measures of diversity taking their roots in ecological and economic research. The overall tendency in biodiversity research from methodological point is to construct the most complete diversity index integrating several structural patterns: number of species, their features and their relative abundance.

Organizational scholars (Nelson & Winter, 1982; Hannan & Freeman, 1989; Carroll & Hannan, 2000) extended Darwin's evolution theory originally explaining species selection, to the world of organizations. Organizational ecology has mainly looked at variation between organizations, via differences across organizations produced during their founding (Aldrich & Ruef, 2006). Ecologists assume that essential differences between types of organizations can be captured with the concept of organizational form. The scholars of this stream appreciate, even celebrate, the high level of volatility generated by the processes of population demographics, or what Carroll & Hannan (2000) called vital events: patterns of founding, transformations, and disbanding. However, sources of intra-organizational variation have been relatively neglected, in part because the preferred research design is the single population census, covering long spans of time and observing all vital events, but yielding fewer details about particular organizations (Carroll & Hannan, 2000: Chapter 5).

In strategy field, scholars interested in strategic outcomes have blended ecological model with institutional, learning, and resource-based models in a sign of fruitful theoretical eclectism. One of ecology's major contributions to the business policy and strategy literature is that it has focused attention on organizations as a unit of analysis, and it has made organizational survival and failure a salient outcome in studies of organizational performance. Therefore, in strategy the largely studied issue of diversity is firm diversity that signifies "difference" among aspects of a firm's activities, including business (or functional) diversity (diversification) (e.g., Pitt & Hopkins, 1982), product and resource diversity (e.g., Lavie, 2007; Goerzen & Beamish, 2005), market discreteness and geographic diversity (Mc Evily & Zaheer, 1999). Scholars have also investigated variation at inter-organizational level, studying firms' alliance portfolios and networks (Gulati, 1998; Powell, Koput, & Smith-Doerr, 1996; Gulati & Higgins, 2003). Doing so, they contributed to the strategic management field by extending the social network theory (Granovetter, 1973, 1985) from individual level to that one of organizations. Therefore, alliance portfolio diversity research finds its theoretical roots at two levels. On the one hand, it lies in the continuation of organizational ecology studies dealing with diversity at population level and strategic research studying intra-organizational

variations. On the other hand, it is rooted in sociological research that has studied networks and diversity at individual level.

In sociological literature on diversity of groups and teams in organizations, the term "diversity" is used to describe the distribution of differences among the members of a unit with respect to a common attribute, X, such as tenure, ethnicity, conscientiousness, task attitude, or pay (Harrison & Klein, 2007). Williams & O'Reilly (1998) acknowledged forty years of research on diversity that has elaborated on three primary theories: social categorization, similarity/attraction, informational diversity and decision-making. For instance, most formulations of diversity as variety are consistent with the idea that an organizational unit is an information-processing instrument for the organization. Based on well-known axioms in information processing or cybernetic theory (law of requisite variety), (Ashby, 1956), population ecology, and even human cognition theory (variation and selective retention, (Campbell, 1960), the fundamental idea is that units whose members have nonredundant (i.e., nonoverlapping) external network ties have access to information that other units, lacking in such variety, cannot easily obtain (Harrison & Klein, 2007: 1205). Units whose members bridge structural holes in an interunit network are thus likely to be more creative and productive (Burt, 1992; Reagans & McEvily, 2003). The concepts of ties embededdness (Granovetter, 1985) and structural holes (Burt, 1992) have been largely mobilized in strategy and entrepreneurship research to explain the formation and consequences of alliances and networks at organizational level, particularly in the case of alliance portfolio diversity (Uzzi, 1996; Beckman & Haunschild, 2002; Goerzen & Beamish, 2005).

In sum, diversity research rests on different theoretical perspectives depending on the discipline, and studies a particular type of diversity: (1) diversity of organizational forms in the ecological-evolutionary approach (Hannan and Freeman, 1989); (2) "difference" among aspects of a firm's activities in studies of firms' diversification (Pitts & Hopkins, 1982); (3) work-place diversity in sociology and organizational behaviour studies, and (4) heterogeneity of inter-individuals and inter-firms ties in the social network theory. However, theoretical boarders of diversity research are not rigid. Biodiversity in Darwin's evolution theory has led organizational scholars to ask the question about the diversity of organizational forms (organizational ecology theory). Strategic scholars adopting different perspectives (institutional, learning, resource-based theories) completed organizational ecology by investigating intra-firm sources of variation. Further, development of inter-firms ties and their increasing diversity approached firm and within-firm (groups and teams) research in that

firms' networks have been studied on the basis of theoretical perspectives originally developed in sociology at individual level. Finally, diversity research in sociology actively uses organization ecology Variation- Selection –Retention model to explain diversity as variety at within-units level.

Since diversity research has a long history across different disciplines, scholars studying alliance portfolio diversity should enrich their analysis by benefiting from existing knowledge on bio-, work-place, organizational forms diversity and diversification.

Guideline 1. *Alliance portfolio diversity research should integrate advances in theoretical conceptualization and operational measures of diversity concept across disciplines (natural science, sociology and strategy).*

2. DEFINING ALLIANCE PORTFOLIO DIVERSITY

2.1. CONCEPTUAL DEFINITION

Diversity as a viable construct in research needs to be specified by some adjective or modifier. In the case of diversity in a portfolio of interfirm relationships, we identified through the literature several of such adjectives: alliance network diversity (Beckman & Haunschild, 2002; Goerzen & Beamish, 2005), network range (Powell *et al*., 1996; Reagans & McEvily, 2003), alliance portfolio diversity (Hoffmann, 2007), inter-partner diversity (Borys & Jemison, 1989; Parkhe, 1991) and diversity of ties (Powell *et al.*, 1996). Goerzen and Beamish (2005) define *alliance network diversity* as a variance in partners' resources, capabilities, and industrial backgrounds. They measure interfirm heterogeneity by counting the number of different industries from which network partners originate, i.e. number of unique industries of partners. Reagans & McEvily (2003) uses the term *network range*. "Range" refers to the distribution of connections across different areas of expertise at individual level. We can also find the term "network heterogeneity" in published articles. In the study of Beckman and Haunschild (2002,) *network diversity* means that firms have access to unique information about premium experiences of their partners and their partners' partners.

In sum, authors dealing with the issue of diversity in inter-organizational relations use two different sets of terms. On the one hand, they use the terms "alliances", "ties", and "networks", and on the other hand, the terms "diversity", "heterogeneity", and "range". The terms in each set are often used interchangeably, though they are not strict synonymous and refer to different levels and units of analysis. This constitutes a problem of comparability

among findings, and partly explains mixed evidence on diversity consequences at firm level as reported in previous studies (see Table 1, Appendix A).

Guideline 2. *Precise specification of diversity object and level of analysis is essential; it allows theorists to differentiate and compare conceptual models and empirical evidence.*

Following the above guideline, we clarify the terms in order to properly define "alliance portfolio diversity".

First, the terms 'strategic network' and 'strategic alliance' are often used interchangeably. However, there is a clear distinction between the idea of a network with its implication of close but non-exclusive relationships, and that of an alliance which, however loosely, implies the creation of a joint enterprise at least over a limited domain (Child & Faulkner, 1998). Das & Teng (2002) define an alliance as an open-ended agreement between two or more organizations which enables cooperation and sharing of resources for mutual benefit, as well as enhancement of the competitive positioning of all organizations in the alliance. In the case when a firm enters an alliance with multiple partners, scholars use the term "multilateral alliance" (Doz & Hamel, 1998). Alliances can involve different functional areas within an organization and can run the gamut from complex R&D collaborations, involving hundreds of employees, to marketing and cross-selling arrangements that span geographical boundaries (Parise & Casher, 2003). Similarly, terms 'alliance network' and 'alliance portfolio' are not synonymous. Doz and Hamel (1998) give the following differentiating definitions. Alliance network is defined as a set of linkages between many relatively comparable firms or as an international network of independent local firms. Alliance portfolio is defined as a set of discrete bilateral alliances entered into by a firm. There is another approach to distinguish alliance portfolio and alliance network, which consists in adopting one of three perspectives on firms' alliances. The first, additive perspectives, defines alliance portfolio as a firm's group of alliances (Powell *et al.*, 1996)[1]. The second perspective takes into account interdependencies between alliances in the portfolio, it is called extra-additive perspective. Finally, the third perspective retains the term "alliance network" to define collections of several alliances linked by individual 'actors' (e.g., Das & Teng, 2002). It should be acknowledged that the majority of studies on diversity in inter-organizational relationships take the additive perspective and therefore refer to alliance

[1] In this case, an alliance portfolio is often referred to as an ego-network (Hoffman, 2007).

portfolio of a focal firm. In the present work, we stick with the term "alliance portfolio" as well.

Second, the terms "diversity" and "heterogeneity" also constitute a point of confusion in the alliance literature. These terms have been originally and clearly defined by (Blau, 1977). For him, diversity reflected vertical or hierarchical differences, and 'inequality' was a particular operationalization of those status differences: 'diversity refers to the great number of different statuses among which a population is distributed. It is the graduated-parameter equivalent of heterogeneity. Its minimum is when all persons occupy the same status; its maximum is when every person occupies a different status' (p. 276). Therefore, 'inequality' and 'diversity' are related terms for Blau. Diversity research in organizational studies has largely adopted this meaning of diversity, and it has taken a step further by distinguishing between *disparity* (vertical differences or inequality in Blau's terms) and *separation* (composition of differences in (lateral) position or opinion among unit members, primarily of value, belief, or attitude) (Harrison & Klein, 2007). Similarly, in natural science the words 'dissimilarity' and 'difference' are used to characterize diversity of species. By contrast, in alliance literature, diversity as disparity and separation has received lesser attention since it focused on diversity as *variety* which Blau (1977) has originally termed 'heterogeneity'[2]. Heterogeneity (variety) is a composition of differences in kind, source, or category of relevant knowledge or experience among unit members (or alliance partners); unique or distinctive information) (Harrison & Klein, 2007).

In the present paper we keep the general term 'diversity' since separation, disparity and heterogeneity (variety) appear as its particular types. Analysing the definitions of diversity in natural science, sociology and strategy cited in section 1 of this paper, the following common properties of these definitions become evident: (1) diversity means difference or distribution of differences; (2) diversity is not studied in general, but refers to a particular adjective (e.g., alliance, species, groups). At this stage of our analysis, we can define alliance portfolio diversity as the distribution of differences among attributes of a focal firm's group of alliances. However, we suggest that it is possible to further refine this definition by taking a deeper look at the definition of alliances we formulated above.

Alliances are agreements with particular partners (e.g., suppliers, customers, etc.) of a particular nature (e.g., R&D, marketing, licensing, etc.). Therefore a portfolio of alliances includes on the one hand, a certain number of partners, and, on the other hand, a certain

[2] In natural sciences, the term 'richness' is used which is comparable to the definition of heterogeneity we discuss.

number of alliances. Managing alliance portfolio means managing alliances of different nature with different partners. In the case of partners' diversity, researchers examined the degree of organizational fit in terms of *strategic priorities* (Borys & Jemison, 1989), *organizational and national culture* (Parkhe, 1991), *diversity of partners' experiences* (Beckman & Haunschild, 2002; Haunschild & Ni, 2000), *industry diversity*, *product* (Goerzen & Beamish, 2005), *geographic diversity* (Goerzen & Beamish, 2005; Hitt, Hoskisson, & Kim, 1997), *partners' technological diversity* (Koka & Prescott, 2002; Sampson, 2007) and *resources heterogeneity* and *partners' functional diversity* (Lee, 2007). Ties' diversity has been considered in studies on *alliance functional diversity* (R&D, marketing, licensing alliances) (e.g., Powell *et al.*, 1996), *alliance operational context* (upstream vs. downstream alliances) (Baum, Calabrese, & Silverman, 2000; Rothaermel & Deeds, 2006; Silverman & Baum, 2002), and *tie strength* (embedded vs. arm's-length alliances; direct vs. indirect ties) (Uzzi, 1996; Beckman & Haunschild, 2002; Watson, 2007). Table 2 (Appendix B) summarizes previous studies having investigated different types of diversity along two mentioned dimensions.

Overall, scholars dealing with issues of diversity in inter-firms relations have studied alliance portfolio diversity separately along its two dimensions – partners' and ties' diversity. We have not found any publication that includes both dimensions in one study. Some scholars (Koka & Prescott, 2002; Beckman & Haunschild, 2002; Goerzen & Beamish, 2005) looked at different diversity attributes including them in the same model. However, these diversity attributes have been studied within the same dimension, essentially within partners' diversity dimension. We suggest that diversity research in strategy and entrepreneurship will be enriched when considering two dimensions of alliance portfolio diversity simultaneously.

Guideline 3. *The concept of alliance portfolio diversity should be studied along two dimensions: partners' and alliance ties' diversity. Specifically, the following definition is appropriate:*

Alliance portfolio diversity *is the distribution of differences among attributes of both partners and alliance ties within a focal firm's group of alliances*

2.2. OPERATIONAL DEFINITION

In this section we will discuss alliance portfolio diversity operationalizations along its two dimensions – partners' and alliance ties' diversity. Table 2 (Appendix B) introduced above, summarizes the main measures of alliance portfolio diversity used in published research on strategy and entrepreneurship. Below we present several observations resulting

from the analysis of previous publications on different types of diversity (e.g., workplace diversity, diversification, etc.) and alliance portfolio diversity in particular.

First, comparing conceptual and methodological approaches to study diversity across disciplines – natural science, sociology, and strategy, we found that in natural sciences ecologists (biodiversity) tended to compute the most comprehensive diversity index, while scholars studying within-unit and alliance portfolio diversity have a dimensionalised approach. As Harrison & Sin (2006) affirmed that there is no sense to compute an integrative index of diversity. Nothing is gained empirically by having a composite (Diversity = diversity [A] + diversity [B] + diversity [C]) index in which the parts have no relationship to one another, as any empirical connection of an antecedent or outcome to the composite simply masks holding an identical strength of weights on diversity [A], [B], and diversity [C]. Thus, no such universal instrument could be meaningfully constructed because diversity should be studied in a dimentionalised approach and not in global terms. In studying alliance portfolio diversity we agree with Harrison & Sin (2006) that there is no sense and possibility to compute a composite index. However, scholars should not ignore possible interdependencies between diversity types and their common effects.

Guideline 4. *While no universal instrument to measure diversity could be constructed, researchers on alliance portfolio diversity should broaden their analysis by focusing not only on a particular diversity type (i.e., particular partner or alliance attribute), but investigating possible interactions and causal relationships between different diversity types and dimensions.*

For instance, research on alliance portfolio diversity could be enriched by considering firm's alliance strategy together with diversification strategy. One of the examples of such cross-fertilization, is considering a joint effect of alliance portfolio diversity and related market diversification of firm survival. This research project is currently in our research agenda. The preliminary results show that alliance portfolio diversity has a curvilinear relationship (inverted U-shaped form) with biotech firms' exit. Greater market scope increases the probability of biotech firms' exit (linear relationship). Finally, the most interesting result concerns the interaction effect between alliance portfolio diversity and related diversification. Combining greater market scope with increasing alliance portfolio diversity enhances biotech firms' chances to survive up to a certain point, where joint effect of two facets of organizational diversity return against firms and lead to their failure. Overall, this research avenue has a potential to contribute to research in entrepreneurship and strategy

by advancing new theoretical arguments about balancing different facets of organizational diversity under the risk of business exit.

Second, there are quite a few studies using count measures of partners' and alliance diversity. In Table 2 (Appendix B) we characterized these studies as measuring "richness" similarly to what is called "species richness" in natural sciences. In diversification research in strategy and entrepreneurship, this measure relates to business count approach and refers to numerical counts (Pitts & Hopkins, 1982). In terms of portfolio approach, the studies measuring alliance portfolio diversity as a total number of partners or ties do not make difference between two portfolio characteristics – size and diversity.

Diversity defined as heterogeneity and variety is tightly linked to size. We cannot dissociate portfolio diversity and size because a firm's network becomes more diverse as its connections to other firms increase (Burt, 1992). Empirical research uncovered the strong and increasingly systematic relationship between size and diversity and it showed that this conclusion applies equally well to firms in the United Kingdom, France, Germany and Italy (Pitts & Hopkins, 1982). However, in terms of alliance portfolio characteristics, the difference between portfolio size and portfolio diversity exists and it lies in the difference between qualitative and quantitative aspects. If size measures a simple number of ties, portfolio diversity takes into account the nature (types) of ties that compose the portfolio. We should also assume that the diversity of the firm's alliance portfolio is not increased equally by each alliance so much as it is increased by the extent to which these relationships are repeated or unique. Thus, while size remains a proxy of diversity, there is another more complex aspect of diversity, which relates to the content of the network, i.e., the characteristics of the nodes and/or the qualitative nature of the relationships (Goerzen & Beamish, 2005). Therefore, the distinction between alliance portfolio size and diversity should be reflected in diversity operationalizations, in a way to differentiate measures of species richness (a simple number of species), entropy-based indices taking into account species' features, and indices based on pairwise dissimilarity between species. In the overview of within-groups diversity we found that scholars in this domain concentrated their efforts on studying differences in attributes such as tenure, education, experience, etc. This direction should be adopted by authors dealing with alliance portfolio diversity since studying differences in attributes is more likely to give richer information than using size as a diversity roar proxy.

Guideline 5. *Though diversity increases with size, these are different alliance portfolio characteristics, which should be conceptually and empirically distinguished. The number of alliance ties and/or partners reflects portfolio size. Accounting for both alliance ties' and*

partners' types on the one hand, and portfolio size, on the other hand, permits to fully capture alliance portfolio diversity.

3. A FRAMEWORK FOR STUDYING ALLIANCE PORTFOLIO DIVERSITY

As Parkhe (1991) noted concerning alliance portfolio diversity research, "the academic literature remains fragmented at different levels of analysis, with no overarching theme cohesively pulling together the various dimensions of interfirm diversity in systematic theory-building." Basing on guidelines 3 and 5, we propose a framework that permits to study alliance portfolio diversity across two dimensions (partners' and ties' diversity) taking into account both count and categorical measures of diversity. Figure 1 (Appendix C) accounts for diversity along the two dimensions. The important question here is how diversity changes along these dimensions. For instance, increasing the number of alliances without considering partner diversity can create inefficient configurations that return less diverse information and capabilities for greater cost than a smaller nonredundant set (Baum et al., 2000). Taking into account partner's diversity and differences in alliance types, we conclude that the diversity increases when a firm enters in increasing variety of alliances different in their nature with diverse partners. We propose four archetype categories of alliance portfolio depending on number and types of alliance partners and ties.

A – Economical Diversifiers: limited number of homogeneous alliances with small number of homogeneous partners. The underlying theoretical rational of such strategy is 'economizing' perspective (e.g., transaction cost economics). From transaction cost economy view, alliance portfolio is seen as a specific governance form for organizing transactions (alliances). The proliferation and increasing diversity of business relationships imply increasing complexity in managing alliance portfolio[3]. The consequences are increased costs related to expenses on alliance portfolio formation or partnering pro-activeness, monitoring the portfolio, portfolio coordination and relational governance (Gulati, 1998). These costs are especially heavy for small inexperienced in alliances firms who choose to rely on multiple partners in developing and commercializing their technology. In addition to possible costs in terms of time and money, alliance partner diversity may increase hazards of opportunism. Transaction cost economics recalls that all complex contracts are unavoidably incomplete and

[3] In a diverse alliance portfolio, different partners and different alliance agreements demand tailor-made decisions. However, as all alliances are parts of the particular firm's alliance portfolio, their management should take into account how the decisions on a particular agreement with a particular partner will influence overall alliance portfolio value. By consequence, the increasing number and diversity of such decisions can be characterized as complex (the adjective "complex" is defined by Oxford language dictionary as consisting of many different and connected parts).

relying on contract-as-promise is fraught with hazard (Williamson, 1991). Therefore, economizing will be the best strategy.

An example of Economical Diversifiers is biotech start-ups. These firms subjected to liabilities of smallness and/or newness make their debut in biotechnology business with minimum of financial resources, possessing mainly intellectual property – patents. Some time is needed for them to develop their patents into commercially valuable applications and to start generating rents. Meanwhile, the common alliance strategy would be a focused alliance portfolio with, for instance, mainly R&D ties to few universities and/or public research organizations.

B – Ties Multiplying Diversifiers: important number of heterogeneous alliances with limited number of homogeneous partners. This alliance portfolio profile reflects the situation when a firm deals with few trustworthy partners and establishes with them multiple ties of different types (e.g., R&D, marketing, etc.).

The relational view, developed from transaction-cost economics and resource-based view of the firm (Dyer & Singh, 1998; Lorenzoni & Lipparini, 1999; Lavie, 2006), provides a theoretical rational for Ties Multiplying Diversifiers. According to this perspective, alliance portfolio is seen as a governance structure of a set of repeated transactions. Multiple, repeated, trust-based relationships with key partners favour lead firm's access to complementary capabilities and specialized knowledge with positive effects on the networks as a whole (Lorenzoni & Lipparini, 1999). The beneficial role of mutual trust and frequent interactions in creation of relational rents has been underlined by different authors. For instance, Jarillo (1988) argued that networks are more efficient when a network arrangement minimizes the transaction costs for participating firms. Mutual trust emerges in a network when the parties involved have successfully completed transactions in the past and perceive one another as acting in good faith and complying with norms of equity (Ring & Van De Ven, 1994). It elaborates on issues of joint value creation, since by definition relational rents accrue at the alliance level and cannot provide private benefits. Relational rents determine the interorganizational competitive advantage through relation-specific assets; knowledge-sharing routines, complementary resources and capabilities (Dyer & Singh, 1998).

In sum, relational perspective as well as transaction cost economics and game theory are prone to see benefits from repeated transactions with limited number of trustful partners, thus cautioning the excessive diversity. At the same time, firms gain diversity benefits by establishing multiple alliance ties (Powell *et al.*, 1996; Beckman & Haunschild, 2002).

C – Active Diversifiers: important number of heterogeneous alliances with multiple heterogeneous partners. Theoretical rational for Active Diversifiers is 'strategizing', which, by contrast to 'economizing' favours firms' strategic initiatives (e.g., alliance pro-activeness). 'Strategizing' perspectives underlines the role of alliances and alliance portfolios as social capital and network resources (resource and network theories). Following this view, alliance partner diversity is a strategic instrument that permits the focal firm to get multiple accesses to its partners' valuable resources and capabilities, which will buffer the firm from exit. Diverse partner affiliations giving access to diverse information lead to higher revenue growth, better learning and innovation rates (Powell *et al.*, 1996; Baum *et al*., 2000) and expected higher survival rates (Gimeno, Folta, Cooper, & Woo, 1997; Silverman & Baum, 2002). Specifically, Powell *et al.* (1996) argued that a diversity of alliance experience enhances firm learning; firms with different types of alliances in their portfolios, such as alliances for R&D, manufacturing, and/or marketing, are more likely to be central in an industry network and experience higher growth rates. Similarly, Baum *et al*. (2000) found that biotech firms that allied with many different types of partners, such as pharmaceutical firms, universities, and government labs, were more successful after their initial public offerings (IPOs) than biotechs engaging in alliances with only single types of partners.

Another theoretical explanation of Active Diversifiers alliance portfolio strategy is provided by real options theory. According to this perspective, the principle of betting on heterogeneous options (risk diversification) is supposed to yield better returns as opposed to the principle of putting all eggs in the same basket. Taking the real options theory lenses, alliance portfolio is seen as a set of strategic options, since entering new alliance constitutes a strategic choice. Opportunities for strategic choice come into being only when decision makers recognize them. The option bundle contains several options awaiting recognition, or *shadow options* (Bowman & Hurry, 1993). An organization entering an alliance passes through the process of shadow options recognition by searching for, selecting alliance partners, negotiating contract terms of alliances. When the agreement is signed an alliance becomes a real option. Using the option theory terminology, terminating or abandoning alliances can be seen as a put option strike, when further options are extinguished. Further investing in multi-facets relationships with an alliance partner, as well as making an equity investment or acquisition can be seen as a call option strike which creates further options and strategy is continued incrementally. In sum, risk diversification, on the one hand, and possibilities to realize promising options, on the other hand, constitutes the rational of Active Diversifiers strategy according to real options theory.

D – Partner Multiplying Diversifiers: limited number of homogeneous alliances with important number of diverse partners. This alliance portfolio strategy can be explained from network theory, real option and transaction cost perspectives discussed above. Several academic studies based on network theory have showed that allying with diverse partners permits a firm to yield information benefits and get access to partners' complementary resources and capabilities (Baum et al., 2000; Sampson, 2007; Watson, 2007). In terms of real options theory, entering homogeneous alliances with diverse numerous partners can reduce the uncertainty related to the project (especially in the case of R&D alliances). The strategy of "wait and see" suggested by real option theory permits to reduce the risk of failure, especially in the case of R&D projects. For instance, in pharmaceutical industry it is known that among multiple research projects exploring different active substances, only few will end up with a commercially viable drug (Hamdouch & Depret, 2001). Finally, from transaction cost economics, it is important to take into account possible partners' opportunistic behaviour. Having similar alliances with diverse partners permits to strengthen firms' bargaining power and gives a possibility to switch between partners if necessary.

Summarizing theoretical rationales of different alliance portfolio diversity strategies, the following conclusion can be made. *On the one hand*, transaction cost economics and relational theories build on efficiency analysis and advance arguments cautioning firms against extreme alliance portfolio diversity. By consequences, the best strategy from 'economizing' perspective would be that of Economical Diversifiers. *On the other hand*, network theory and real options view make an accent on diversity benefits and encourage firms to actively diversify their alliance portfolios, in other words encouraging firms to take strategic initiatives ('strategize'). Active Diversifiers are the extreme case of increasing alliance portfolio diversity strategy. In sum, 'economizing' and 'strategizing' approaches give contrasting predictions about alliance partner diversity consequences for a firm, reflecting its either "light" or "dark side".

However, while previous studies have usually argued for either positive or negative effect of alliance partner diversity (see Table 1, Appendix A), scholars should take into account the fact that economizing and strategizing are not mutually exclusive (Williamson, 1991). For instance, Burt (1992) stated that optimal network redundancy is determined by a 'budget equation… [that] has an upper limit set by the [focal firm's] time and energy' where the firms must make a trade-off between the network benefits provided by a new contact 'versus the time and energy required to maintain a productive relationship with that contact.' Therefore, the arguments of the network theory suggest that increasing alliance portfolio

diversity is associated with positive outcomes (higher survival) until some threshold is reached. In their empirical study, Goerzen & Beamish (2005) confirmed a curvilinear effect of alliance network diversity on Japanese multinationals' economic performance. In the same vein, Watson (2007) argued that while it is reasonable to expect that some level of networking will be beneficial, it is also plausible to suggest, consistent with the law of diminishing returns, that excessive networking is likely to be counter-productive.

Based on the above discussion, we suggest that the choice between Economical Diversifiers (A), Active Diversifiers (C) and intermediate diversity strategies (B and D) should be made on the basis of the trade-off between 'economizing' and 'strategizing'. The remaining question is what this trade-off depends on ?[4] Does it simply mean that these strategies can follow each other in time (e.g., looking for diversity in the first time, and privileging economy in the second time) or Is there an optimum in terms of alliance portfolio diversity ? These are extremely important research questions which should be incorporated in future studies. We suggest that the equilibrium between looking for diversity and economizing depends not only on the temporal aspect of portfolio change, but also on the objectives that concrete firms may pursue. For instance, if it is about intensifying innovative productivity, diversity may be preferable (Sampson, 2007). At the same time, the profitability imperatives require the restriction of alliance diversity (Goerzen & Beamish, 2005). Future research should investigate diversity change not only along partner's and alliance ties' dimensions defined by our framework, but also depending on the desired output of a concrete firm (e.g., innovation, performance, survival).

Guideline 6: *When studying alliance portfolio diversity or formulating alliance strategies, scholars, on the one hand, and managers, on the other hand, should take into account the trade off between 'economizing' and 'strategizing'.*

CONCLUSION

In the present paper we deal with the concept of alliance portfolio diversity. The objective was to formulate a set of guidelines susceptible to direct future research on this subject. Since this is the first attempt to structure research on alliance portfolio diversity, we consider it as a valuable contribution to the strategy and entrepreneurship field. We formulated the following guidelines for the future research:

[4] We thank an anonymous reviewer for suggesting this relevant question.

- Capitalizing on existing knowledge on diversity across different disciplines (biology, sociology, and strategy) enriches theory-building on and empirical measuring of alliance portfolio diversity.
- Precise specification of diversity object and level of analysis is essential; it allows theorists to differentiate and compare conceptual models and empirical evidence.
- The concept of alliance portfolio diversity should be studied along two dimensions: partners' and alliance ties' diversity. Specifically, the following definition is appropriate: ***Alliance portfolio diversity*** is the distribution of differences among attributes of both partners and alliance ties within a focal firm's group of alliances.
- While no universal instrument to measure diversity could be constructed, researchers on alliance portfolio diversity should broaden their analysis by focusing not only on a particular diversity type (i.e., particular partner or alliance attribute), but investigating possible interactions and causal relationships between different diversity types and dimensions.
- Though diversity increases with size, these are different alliance portfolio characteristics, which should be conceptually and empirically distinguished. The number of alliance ties and/or partners reflects portfolio size. Accounting for both alliance ties' and partners' types on the one hand, and portfolio size, on the other hand, permits to fully capture alliance portfolio diversity.
- When studying alliance portfolio diversity or formulating alliance strategies, scholars, on the one hand, and managers, on the other hand, should take into account the trade off between 'economizing' and 'strategizing' reasoning. Basing on different theoretical perspectives, we proposed four archetypes of alliance portfolio strategies depending on number and types of alliance partners and ties: Economical Diversifiers, Active Diversifiers, Ties and Partner Multiplying Diversifiers.

Although the formulated definition of alliance portfolio diversity (APD), as well as the presented framework for studying APD along its two dimensions are expected to be useful guides for researchers and portfolio managers, they are not free from oversimplification and incompleteness. However, since this is the first effort to conceptually define alliance portfolio diversity and theoretically explain its underlying logic and possible consequences at the firm level, we believe that our framework constitutes a valuable contribution to alliance literature. Particularly, our typology of alliance strategies refines the existing model proposed by Hoffmann (2007) at a level of a particular alliance portfolio characteristic – diversity. Moreover, by contrast to Hoffmann's (2007) model in which four configuration parameters,

namely alliance number, dispersion[5], redundancy and intensity of links, remain unlinked, we establish a link between portfolio diversity and size.

Explicitly defining diversity in alliance portfolio along its two dimensions and apprehending alliance strategy by combining count and categorical meaning of diversity opens a lot of research avenues. We reserve the development of these research avenues for future studies. Meanwhile, here are a few of possible research questions that might be of interest for scholars to explore: What is the relative importance of alliance portfolio diversity dimensions for different firms' outcomes (growth, performance, survival, innovation, etc.)? How can a firm effectively manage diversity along its dimensions, e.g., entering diverse alliances with homogeneous partners, establishing alliances of a particular nature with diverse partners, or multiplying diversity along both dimensions? What is the relation between alliance portfolio diversity and intensity of ties?

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[5] Dispersion in Hoffmann's (2007) model corresponds to the term 'diversity' that we use.

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APPENDIX A

TABLE 1.

Selected empirical studies on alliance portfolio diversity implications for organizations' outcomes

Author	Type of Diversity	Dependent variable	Sample	Effect
Sampson (2007)	Technological diversity of partners	Postalliance patents	463 R&D alliances in the US telecommunications equipment industry	***Inverted U-shaped***
Lee (2007)	Diversity of alliance partners' operational context Number of alliance partners	Rate of entry into an emerging product market	517 firms' strategic alliances on the US market of networking switches	***Positive effect*** ***Inverted U-shaped***
Watson (2007)	Network range	Survival	5014 Australian SMEs	***No effect***
Goerzen and Beamish (2005)	Alliance network diversity	Economic performance	580 large Japanese multinational entreprises	***Negative linear effect nuanced by identified U-shaped relationship***
Beckman and Haunschild (2002)	Network diversity Network partner industry diversity Network partner experience diversity	Acquisition premiums and acquirer's stock performance	182 U.S. acquisitions	***Positive effect*** ***No effect*** ***Positive effect***
Koka and Prescott (2002)	Information diversity: technological, country, holes	Performance	162 steel firm alliances (Europe, US, Japan)	***Positive effect*** ***No effect for Europe***
Silverman and Baum (2002)	Network efficiency	Survival	613 Canadian biotechnology firms	***Positive effect***
Oliver (2001)	Technological diversity	Formation of alliances	69 biotech firms (1976-1990)	***Positive effect***
Baum, Calabrese, and Silverman (2000)	Network efficiency (partners diversity)	Revenues, R&D expenses, and patents	142 biotech firms in Canada (1991-1996)	***Positive effect***
McEvily and Zaheer (1999)	Geographical dispersion	Acquisition of competitive capabilities (competitive scanning)	309 US metalworking small and mid-sized firms	***Positive effect***
Hargadon and Sutton (1997)	Diverse network (access to dissimilar industries)	New product development	1 product design firm in the US	***Positive effect***
Powell et al. (1996)	Diversity of ties (R&D, marketing, etc.)	Centrality in the network	225 US biotech firms	***Positive effect***

APPENDIX B

TABLE 2.
Partners' and Ties' Diversity Attributes

(a) Partners attributes

Attributes	Definition	Type	Operationalization	Study
Premium experience	Distribution of premiums paid by partners in alliance portfolio	**Disparity**	***Coefficient of variation, V(d):*** $SD_{\text{partner premiums}}$ / mean partner premium (n) ***Standardized V(d):*** V(d)/[2(1-1/n)]	**Beckman & Haunschild, 2002**
Organizational size	Distribution of network partners' size	**Disparity**	***Coefficient of variation, V(d)*** ***Standardized V(d)***	**Beckman & Haunschild, 2002**
Industry	Industry heterogeneity of the focal firm's partners	**Variety**	***Entropy-based index:*** $-\sum Pi(\ln Pi)$, for I = 1 to x, where x is the number of SIC codes and Pi is the proportion of partners having the same SIC code	**Beckman & Haunschild, 2002**
	Number of unique industries of partners.	**Richness**	***Count***	**Goerzen & Beamish, 2005**
Geographical location	Partners operating in different countries Geographic dispersion	**Richness**	***Count*** ***Dispersion*****:** √ mean (distance)	**Goerzen & Beamish, 2005 McEvily&Zaheer, 1999**
Culture	Differences in ideologies and values guiding partner companies		***No empirical study has yet been conducted***	**Parkhe, 1991**
Technology	Differences in technological backgrounds of partner firms	**Variety**	***Technological diversity (Jaffe, 1986) =*** $1 - F_iF_j' / \sqrt{(F_iF_i')(F_jF_j')}$, $i \neq j$, $F_i = (F_i^1 \ldots F_i^s)$, where F_i^s is the number of patents assigned to partner firm *i* in patent class *s*.	**Sampson, 2007**
	Technological relatedness: the number of patents that are common across partners' knowledge bases	**Richness**	***Count***	**Mowery, Oxley and Silverman 1996 Ahuja & Katila, 2001**
Organizational structure	Similarity of partners' organizational structure: in terms of formalization of management practices and the extent to which decisions are centralized		***Procedure used by Judge and Ferris (1993):*** (1) Centralization scale (seven-item articles) (2) Formalization scale (10 item scale) (3) The absolute difference between each partner's compensation practices score was divided into I to create a compensation similarity measure. When the alliance partners have identical scores (no difference), this calculation produces divide-by-zero error. In this case total similarity was manually recorded as 1.00	**Lane & Lubatkin, 1998**
Operational context	Distinction between partners of dissimilar operational context (upstream, vertical, horizontal alliances)	**Variety**	***Blau's (1977) index of heterogeneity*** $1 - \sum p_{it}^2{}_{,j}$, where p_{it} is the proportion of firm i's ties of type j. ***Hirshman-Herfindal index:*** $1-\sum(N_{ij}/N_i)^2$	**Lee, 2007 Baum, Calabrese, & Silverman (2000)**

APPENDIX B (continued)

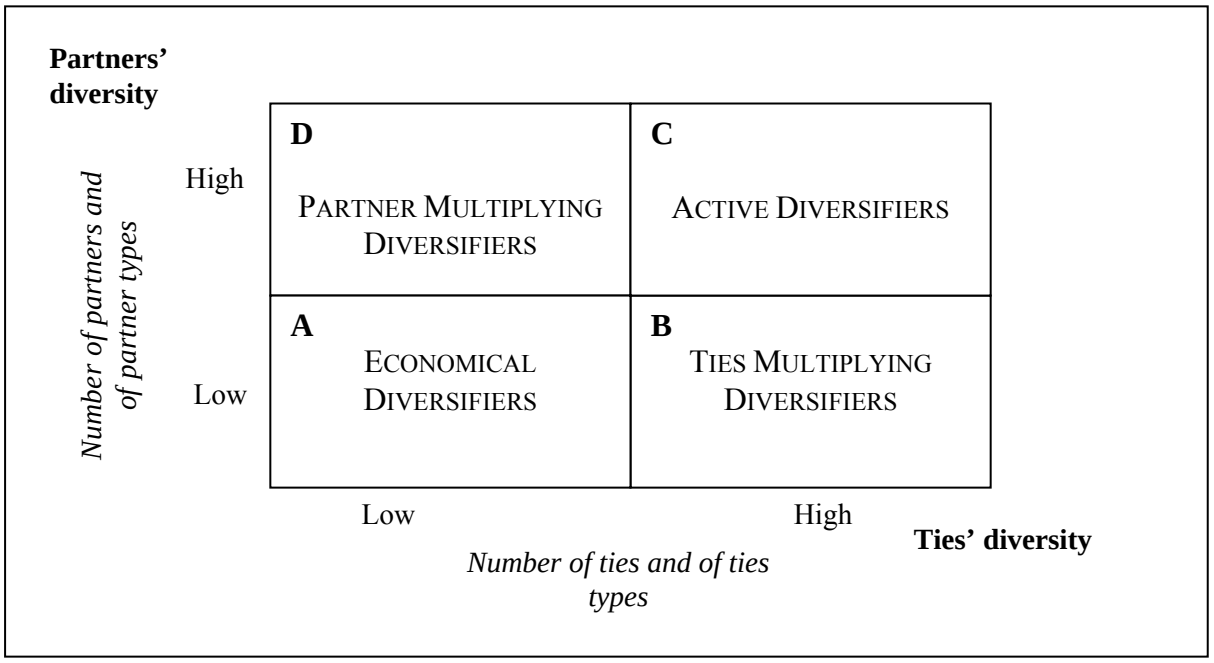
(b) Alliance attributes

Attributes	Definition	Type	Operationalization	Study
Formal vs. Informal	The total potential number of networks, formal and informal, that any individual SME owner could have indicated they had accessed.	**Richness**	***Count*** **(values from '0' to '10')**	**Watson, 2007**
Tie strength: Direct vs. Indirect	An organization receives direct ties from network partners that sit on its board (= network size). An organization has indirect ties with the partners of its network partners.	**Disparity**	***Ratio:*** Indirect/Direct ties	**Backman & Haunschild, 2002**
Embedded vs. Arm's length	Embedded ties differ from arm's-length ties in that commercial exchanges among actors are embedded in social attachments and affiliations, a process that injects into the business exchange expectations of trust and shared norms of compliance.		***Dummy:*** The tie was coded as embedded (1=Yes) if it lasted at least two years ***Ratio:*** Average firm-level measure of embedded tie= The number of embedded ties of the focal firm/ all of the ties of the firm per year ***Network coupling variables:*** ΣP_{ij}^2 (from j=1 to n_m) n_m – the number of manufacturers that contractor i works for; P_{ij}^2 – is the percentage of contractor i's output that is sent to manufacturer j. When the index approaches 1.0, the focal firm's ties become embedded.	**Uzzi & Lancaster, 2004** **Uzzi, 1996**
Functionality	Distinguishing between R&D, technology transfer / licensing and manufacturing as technological alliances, and those involving distribution, marketing / promotion and customer service as marking alliances	**Richness** **Variety**	***Count*** ***Blau's (1977) index of heterogeneity:*** $1 - \sum p_{it}^2{}_{,j}$ Where p_{it} is the proportion of firm i's ties of type j.	**Das et al., 1998** **Powell, Koput, & Smith-Doerr (1996)**
Operational context	Total amount of upstream, downstream horizontal and vertical alliances	**Richness**	***Count***	**Baum, Calabrese, & Silverman, 2000; Silverman & Baum, 2002; Rrothaermel & Deeds, 2006**

APPENDIX C

FIGURE 1.

A framework for classifying alliance strategy in terms of portfolio diversity and size



Details: A – Limited number of homogeneous alliances with small number of homogeneous partners;
B – Important number of heterogeneous alliances with limited number of homogeneous partners;
C – Important number of heterogeneous alliances with multiple heterogeneous partners;
D – Limited number of homogeneous alliances with important number of multiple partners.