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TOWARD A PERIPHERAL VIEW OF MANUFACTURING NETWORKS

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CONTENTS

TOWARD A PERIPHERAL VIEW OF MANUFACTURING NETWORKS

I was a peripheral visionary. I could see the future, but only way off to the side.

(Steven Wright)

FOREWORD

This doctoral thesis unfolds into a collection of three distinct articles that share an interest in supply firms, or "peripheral firms". The three studies offer a novel theoretical perspective that I call the *peripheral view of manufacturing networks*. Building on the *relational view* literature (Dyer and Singh, 1998), this new perspective identifies the supplier-based theoretical standpoint to analyze and explain the antecedents of relational rents in manufacturing networks. My interest in suppliers has three roots. Firstly, as an Italian scholar, I have grown up surrounded by interesting examples of firms that compete in manufacturing networks or industrial districts as suppliers of other firms. For decades, these Italian firms have managed to be competitive in international markets despite their small size, undercapitalization, and lacking internationalization. I have always wondered how these firms could sustain their competitiveness, as many of their characteristics appeared counterproductive to success in large markets. However, international strategic management literature has only partially provided analysis on suppliers' competitive advantage and my wonderment as to their competitiveness has remained. With this study, I propose a touchstone for a deeper understanding and future research on exactly this kind of peripheral, but highly competitive firm. Secondly, the group of scholars who has decisively shaped my academic training developed relevant advances about theory concerning firm relations (Lipparini and Sobrero, 1994; Lorenzoni and Lipparini, 1999), firms networks (Cattani, Ferriani, Negro and Perretti, 2008; Lazerson and Lorenzoni, 1999a, 1999b; Lorenzoni, 1990), and core-periphery approaches (Cattani and Ferriani, 2008). In building on their contributions, I offer an incremental theoretical advancement concerning firm relations, observing dyads as unit of analysis. Finally, the recent international financial crisis has dramatically influenced the competitiveness of peripheral firms, sometimes leading suppliers to failure. The international crisis has led me to question the validity of established supply firms' business models, which scholars have so far considered successful. Theory states that in order to brave competence-destroying exogenous changes, firms must redefine their core capabilities and recombine internal resources (Zander and Kogut, 1995). Accordingly, I believe that research should play a primary role in providing orientation for managers' decision-making in rough times. Therefore, I propose a framework that not only contributes to theory, but also delivers useful tips and instruments to practitioners who are leveraging competitive strategy to sustain their firm's survival. The manuscript develops as follows.

The first article, the namesake of the dissertation, is a theoretical contribution that explains the foundations of the "peripheral view of manufacturing networks". In technology-based industries, alliances between assemblers/buyers, or core/focal firms, and suppliers, or peripheral firms, are common practice to foster innovation as well as relational rents. Assemblers mostly drive innovation in the early phases of an industry life cycle, but as products become more complex, the locus of innovation shifts to suppliers. Despite the increasing relevance of peripheral firms, strategic management literature principally focuses on focal firms. I affirm that it is misleading to underestimate the role of strategic suppliers in innovation development. This is why studies on the "peripheral view of the network" might foster a deeper understanding of relational rents generation and innovation drivers in technology-based industries by leveraging analysis of strategic suppliers through a specific lens.

The second article *"Framing The Strategic Peripheries: A Novel Typology of Suppliers"* is an empirical study with the aim to offer an interpretation of peripheries' characteristics and dynamics. Leveraging data collected in a longitudinal multiple-case study of eighteen firms in the Italian motorcycle part industry, I develop a four-type classification of suppliers based on two relation-based dimensions: *asset specificity*, which is a proxy for relational capabilities, and *strategic focus*, which is a proxy for operational ambidexterity. Four types of peripheries emerge: (1) *Niche Suppliers* (low asset specificity – narrow strategic focus); (2) *Flexible Suppliers* (low asset specificity – wide strategic focus); (3) *Committed Suppliers* (high asset specificity – narrow strategic focus); and (4) *Multi-Purpose* Suppliers (high asset specificity – wide strategic focus). Results suggest that different levels of relational capabilities correspond to diverse positioning in the industry, and therefore reveal different types of suppliers' competitive strategy. I advance nine theoretical propositions that explain how the interplay between relational capabilities and operational flexibility affects peripheries' competitive advantage.

The third article, *"What is Behind Absorptive Capacity? Dispelling the Opacity of R&D"* presents an example of general theory development by using data from peripheral firms. This empirical paper contributes to the concept of absorptive capacity (Cohen and Levinthal, 1990). Strategic management scholarship has identified research and development investments as the main proxy to observe absorptive capacity. However, literature shows that using exclusively R&D figures fails to unravel the dynamic set of processes and routines standing behind firms' commitment toward knowledge absorption and exploitation. I unpack the concept of R&D and present a four-type typology of R&D strategies based on knowledge scope and asset specificity. In a second step, I combine the four-type typology with prior scholarly contributions to advance an extension of the absorptive capacity model. Evidence displays significant intra-industry differences in R&D strategies, which affect the ways in which firms develop potential and realized absorptive capacity. My results disconfirm previous research, showing that regimes of appropriability affect not only the exploitation of knowledge for commercial outcomes, but also the decision-making process that firms face before engaging in R&D activities.

The main thrust of my argument points to the impossibility of fully understanding how dyads and firm networks compete if we keep relying on unbalanced and biased studies that focus solely on the core firm in a partnership. In the following three articles, I demonstrate that, due to their particular nature, supply firms deserve specific theoretical analysis, which might paradoxically reveal that peripheries do not play a peripheral role, but instead are fundamental players in the competition between firm networks.

Bologna, March 2011

Paolo Aversa

REFERENCES

Cattani G, Ferriani S. 2008. A Core/Periphery Perspective on Individual Creative Performance: Social Networks and Cinematic Achievements in the Hollywood Film Industry. *Organization Science* **19**(6): 824-844.

Cattani G, Ferriani S, Negro G, Perretti F. 2008. The structure of consensus: Network ties, legitimation, and exit rates of US feature film producer organizations. *Administrative Science Quarterly* **53**(1): 145-182.

Cohen WM, Levinthal DA. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* **35**(1): 128-152.

Dyer JH, Singh H. 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *The Academy of Management Review* **23**(4): 660-679.

Lazerson MH, Lorenzoni G. 1999a. The firms that feed industrial districts: A return to the Italian source. *Industrial and Corporate Change* **8**(2): 235-266.

Lazerson MH, Lorenzoni G. 1999b. Resisting Organizational Inertia: The Evolution of Industrial Districts. *Journal of Management and Governance* **3**(4): 361-377.

Lipparini A, Sobrero M. 1994. The glue and the pieces: entrepreneurship and innovation in small-firm networks. *Journal of Business Venturing* **9**(2): 125-140.

Lorenzoni G. 1990. *L'architettura di sviluppo delle imprese minori: costellazioni e piccoli gruppi*. Il Mulino.

Lorenzoni G, Lipparini A. 1999. The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal* **20**(4): 317-338.

Zander U, Kogut B. 1995. Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science* **6**(1): 76-92.

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All errors and omissions are my own responsibility.

This work is dedicated to the people who have inspired me all the way,

but unfortunately aren't around to see it completed:

my grandparents and my uncle Pino

TOWARD A PERIPHERAL VIEW

OF MANUFACTURING NETWORKS

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ABSTRACT

In technology-based industries, alliances between assemblers (core/focal firms) and suppliers (peripheral firms) are common practice to foster innovation and relational rents. Assemblers mostly drive innovation in the early phases of an industry life cycle, but as products become more complex, the locus of innovation shifts to suppliers. Despite the increasing relevance of peripheral firms, strategic management literature principally focuses on focal firms. This work affirms it is misleading to underestimate the role of strategic suppliers in innovation development. By analyzing strategic suppliers through a customized lens, research on the "peripheral view of manufacturing networks" might foster a deeper understanding of relational rents generation and innovation drivers in technology-based industries.

Keyworks: peripheral view, suppliers, relational view, focal firms, networks.

INTRODUCTION

The strategic use of knowledge is one of the most discussed topics in management and organizational literature (Badaracco, 1991; Brusoni, Prencipe and Pavitt, 2001; Cohen and Levinthal, 1990; Grant, 1996a, 1996b; Grant and Baden-Fuller, 1995, 2004; Kogut and Zander, 1992; Nonaka, 1994; Winter, 1987), especially when it is framed in a relational perspective (Gulati, 1998, 1999; Gulati, Nohria and Zaheer, 2000; Porter, Whittington and Powell, 2005). The *relational view* literature has attempted to understand the importance of alliances to develop knowledge and, therefore, create relational rents[1]. (Dyer and Singh, 1998). Dyer and Singh affirm that supernormal profits derive, among others, from “substantial knowledge exchange, including the exchange of knowledge that results in joint learning” (Dyer and Singh, 1998 : 882). Knowledge exchanges differ depending on the type of agents involved. Within manufacturing networks, scholars have identified two main roles: assembler/buyer and supplier. To some extent, almost every firm is engaged in assembly, purchase, and supply activities. According to relational view scholars, we define assemblers/buyers as those firms whose main activity is to design and develop finished products, which are often directly distributed to end-markets. We define suppliers as those organizations whose main activity is manufacturing components and parts, which are sold to other manufacturers. Therefore, suppliers mainly engage in business-to-business markets, while assemblers are traditionally oriented toward business-to-consumer markets. Due

[1] Although Dyer and Singh (1998) use the term “relational rents,” according to Peteraf it would be more correct to use the term “quasi-rents” due to the temporary nature of relational profits. In fact, Peteraf defines quasi-rent as "returns that exceed a factor's short run opportunity cost ... [and] are an excess over the returns to a factor in its next best use" (1994: 155).

to their centrality and their importance within the supply network, scholars traditionally define assemblers as “core firms” or “focal firms” and suppliers as “peripheral firms” (Dyer and Nobeoka, 2000; Gottfredson, Puryear and Phillips, 2005; Lerro and Schiuma, 2005; Mintzberg, Pascale, Goold and Rumelt, 1996; Pascale, 1996; Takeishi, 2001). However, as products become more complex and competition fiercer, assemblers struggle to innovate and develop their products as a whole. To brave the increasing pace of competition, assemblers become knowledge integrators that combine modular innovations developed by peripheral firms as sub-components (Brusoni and Prencipe, 2001; Brusoni *et al.*, 2001). Their focus changes from manufacturing to design, assembly and suppliers coordination. As a result, scholars affirmed that in those cases the *locus of innovation* shifts from assemblers to suppliers (Powell, Koput and Smith-Doerr, 1996). However, strategic management scholars have continued to focus their attention on core firms, instead dedicating some attention to the new innovation players. Analyzing innovation exclusively observing core firms’ activities would be consistent if theory demonstrated that the two types of organizations – assemblers and suppliers – are the same. But are they the same? Can we expect that the theories, methods, and implications scholarship has developed for assemblers, can be applied consistently to suppliers? To answer this question Table 3 compares the stereotypical differences of a core firm and peripheral firm.

Even at first glance, suppliers look different from assemblers. Indeed, literature demonstrated that they have distinctive characteristics and engage in specific strategies (Kaufman, Wood and Theyel, 2000). Firstly, suppliers have a narrower domain and compete in niche markets more often than assemblers (Hambrick, MacMillan and Day, 1982). Niche markets are usually smaller than mass markets, and thus limits firms' dimensional growth (Cooper, Willard and Woo, 1986). As a result, within the same industry suppliers are usually smaller than the assemblers they work for. In recent years, literature has clearly pointed out the specific characteristics of small firms (Acs and Audretsch, 1987; Chen and Hambrick, 1995; Covin and Slevin, 1989; MacMillan, Hambrick and Day, 1982). Accordingly to literature on small firms, being small implies less resources, narrower domains, and less vertical integration (Hambrick *et al.*, 1982).

TABLE 3
Characteristics of Stereotypical Focal Firms and Peripheral Firms

Characteristics	**Focal Firm**	**Peripheral Firm**
Synonyms	Core firm Assembler Buyer	Supplier Part/component manufacturer
Common Size	Bigger than peripheral firms	Smaller than focal firms
Network Centrality	High	Medium-Low
Production	Final products	Parts, components, services
Market	Mass market	Niche market
Innnovation process	Knowledge intergrator	Knowledge developer
Access to end market	Common	Uncommon
Access to focal firms	Yes, for partnerships	Yes, for commercial relation
Standard barganing power	High	Low
Organization	Structured	Unstructured
Reputation	Well known	Unknown
Reporting	Structured, often mandatory	Unstructured, often non-mandatory
Ownership	Public	Private
Family business	Possible	Common
Example	Car manufacturer	Brake manufacturer

However, Chen and Hambrick have demonstrated two important findings: (1) Small firms can be as effective as large ones and (2) Small firms require different competitive strategies to reach success (1995 : 454). Secondly, most suppliers do not have direct access to commercial distribution since their own value chain ends with sales to the original equipment manufacturer (OEM) customer. Instead, by integrating the suppliers' work into the whole supply chain, assemblers mostly obtain stronger bargaining power, while suppliers suffer higher pressures from customers (Kang, Mahoney and Tan, 2009). The clear distinction between suppliers and assemblers implies different problems and requires a tailored analytical lens. Yet, scholars within the relational view have mainly focused their attention on a "core perspective" by centering on assemblers' relational strategies. Due to this lack of attention to suppliers' activities, scholars have not fully understood the pivotal set of processes affecting innovation within supply firms. Furthermore, even the few authors specifically focusing on suppliers used a core-firm standpoint, such as relying on assembler opinion to gather information about supplier roles and activities. For example, Sako (2004) describes the factors that affect the sustained development and replication of organizational capabilities at the supplier level from a core perspective. This method can potentially develop biased interpretations when data is not properly triangulated.

After almost three decades of focusing on core firms, scholars should adopt a perspective tailored to suppliers' characteristics as well in order to fully interpret the processes influencing innovation within technology-driven industries. Also, when possible, future studies should integrate both perspectives to get a complete view of the relational landscape. This paper promotes a novel perspective that we call the "peripheral view" of manufacturing networks, defined as the supplier-based theoretical standpoint that explains the antecedents of relational rents.

PAST RESEARCH ON RELATIONAL VIEW

In 1998, Dyer and Singh published a theoretical work defining a body of recent literature that focused on understanding the effects of dyad/network routines and processes on firms' relational rents and competitive advantage (Dyer and Singh, 1998 : 661). The authors compared this emerging theoretical perspective, called the "relational view", to the well-established *industry structure view* and *the resource-based view* (table 1).

TABLE 1
Comparing the Industry Structure, Resource-Based, and Relational Views of Competitive Advantage

Dimensions	**Industry Structure View**	**Resource-Based View**	**Relational View**
Unit of analysis	Industry	Firm	Dyad of network of firms
Primary sources of supernormal profits	Relative bargaining power Collusion	Scarce physical resources: (e.g., land, raw material inputs) Human resources/know-how (e.g., managerial talent) Technological resources (e.g., process technology) Financial Resources Intangible Resources (e.g. reputational)	Relation-specific investments Interfirm knowledge-sharing routines Complementary resources endowments Effective Governance Dyadic/Network Barriers to imitation Causal ambiguity
Mechanism that preserve profits	Industry barriers to entry: Government regulations Production economies/sunk costs	Firm-level barriers to imitation Resource scarcity/property rights Causal ambiguity Time compression diseconomies Asset stock interconnectedness	Time compression diseconomies Interorganizational asset stock interconnectedness Partner scarcity Resource indivisibility Institutional environment
Ownership control of rent-generating process/resources	Collective (with competitors)	Individual firm	Collective (with trading partners)

Source: Dyer and Singh, 1998 : 674

The former perspective considers the industry as main unit of analysis and determinant of competitive advantage (Porter, 1980). Scholars from the industry perspective believe that relative bargaining power and collusion are the primary sources of supernormal profit returns. Preservation of competitive advantage is achieved through industry barriers to entry, such as government regulations and production economies. For the industry view the control of rent-generation is collective. The latter perspective instead concentrates on how individual firms obtain supernormal returns leveraging on internal resources (Barney, 1991; Rumelt, 1984, 1991; Wernerfelt, 1984) and capabilities (Teece, Pisano and Shuen, 1997). Firms sustain their competitive advantage through barriers to imitation, derived from (1) Resource scarcity; (2) Property rights; (3) Causal ambiguity; (4) Time compression diseconomies; (5) Asset stock interconnectedness. The relational view argues instead "that a firm's critical resources may span firm boundaries and may be embedded in interfirm routines and processes" (Dyer and Singh, 1998 : 661). The two scholars affirm that supernormal profits, defined as relational rents, depend on (1) Relation-specific investments (2) Interfirm knowledge-sharing routines; (3) Complementary resource and capability endowments; (4) Effective governance mechanisms. Competitiveness is defended via Dyadic/network barriers to imitation. Indivisibility of joint investments and partner scarcity, among others, are the main guarantors for preserving supernormal rents. According to Williamson (1985), the authors affirm that asset specificity avoids opportunism and promotes trust. Since both partners invest in transaction specific assets, both partners control rents generation and sharing. Dyer and Singh's work framed the boundaries of an emerging fashion in management literature. Indeed, prior works had already started to adopt a relational perspective (Dyer, 1996a; Dyer, 1996b; Hamel, 1991; Kogut and Zander, 1992; Peteraf, 1994; Powell *et al.*, 1996; Teece, 1986; Zaheer and Venkatraman, 1995; Zander and Kogut, 1995). However, as Dyer and Singh pointed out, "they have tended to focus on one particular benefit associated with collaboration, such as learning, lower transaction costs or pooling of resources" (1998 : 661). After Dyer and Singh's article, relational view scholars started to adopt a wider standpoint that considered the different relevant aspects concerning firm alliances. Table 1 reports some of the most cited works contributing to the relational view. Our literature analysis showed that, in management literature, scholars have addressed the relational perspective in several ways. The first mainly relates to the interpretation of alliances, defined as "any voluntarily initiated cooperative agreement between firms that involved exchange, sharing, or co-development, and it can include contributions by partners of capital, technology, or firm-specific assets, including information and knowledge" (Gulati and Singh, 1998 : 781). Scholars mostly focus their observation on partnering effects on focal firms that are embedded in one or more alliances. Scholars have developed analysis in several industries and their samples included firms in every position of the value chain. In fact, alliances may be established for example between suppliers and buyers, different buyers or even between competitors. Among these studies, Gulati (1999) showed that relational capabilities speed up the lead firm's knowledge access and transfer, fostering company growth and innovation. Kale, Dyer and Singh (2002) demonstrated that investing in a specific alliance function within firms boundaries positively affects stock market gains in the short run and increases the likelihood of alliance success in the long run. Also, Kale *et al.* affirmed that the initial stock market response to a key event positively correlates to the long-term performance and value of the event. Gulati, Lavie and Singh (2009) specified two kinds of partnering experiences: (1) *partner-specific* and (2) *general partnering.* Their results showed that firm-specific and relation-specific factors influence the impact of accumulated partnering experience on the possible gains of the alliance. Another branch of contributions focused on relations among firms that have commercial relations along the supply chain, i.e. in principal buyers and suppliers. In this branch of research scholars have looked at dyads or ego-networks where a focal firm (e.g. Toyota, Honda, IBM) deals with a variable number of suppliers. These studies have utilized a more fine-grained analysis, based on processes and routines underpinning relational capabilities. Working for the same supply chain, these firms are most of the time part of the same industry. The contributions are concentrated on medium-technology or high-technology industries, such as automobiles (Dyer, 1996a; Dyer, 1996b; Dyer and Chu, 2000; Dyer and Nobeoka, 2000) or motorcycles (Mintzberg *et al.*, 1996; Pascale, 1996), packaging (Lorenzoni and Lipparini, 1999), semiconductors (Stuart, 2000), and others. Scholars have furthered our understanding of relational rents generation and the connection between relational capabilities and performance. Yet aside from the relevant advances for research, this part of literature still contains biases and limitations. The first problem is a selective focus on one of the firms involved in the relation. In many cases, scholars have favored a focal-firm perspective that is based on the analysis of the buyer or assembler. For example, Dyer and Nobeoka examine Toyota's skills in managing a knowledge-sharing network of suppliers and their (successful) attempt to be more effective in knowledge variety generation than firms that do not rely on network structures. Along these lines, Lorenzoni and Lipparini develop a longitudinal study about four leading Italian firms in the packaging industry (Lorenzoni and Lipparini, 1999), showing how the integration of internal and external knowledge emerges as a distinctive organizational capability. Dyer and Hatch (2006) wonder if it is possible for a firm leveraging on supply networks to reach a competitive advantage although its competitors purchase the same components from the same suppliers. Basing their study on a comparative analysis between Toyota and a group of US automakers, the authors show that Toyota performs better thanks to higher levels of knowledge sharing and coordination. Focusing on assemblers' decisions and performance emerges as a common trait in this stream of literature. However, singling out one agent when observing a dyad or a group provides an unbalanced perception of the unit of analysis and can result in an incomplete picture of competitive dynamics. Then why did scholars choose to concentrate their attention on one part of the network only?

First, in medium-technology and even high-technology industries, the assemblers have been playing a prominent role for decades. They drove the innovation processes by controlling the whole product design and by outsourcing only basic manufacturing to external players. For example, in automotive supply chains, the automaker would design the entire vehicle and coordinate the integration of the different part suppliers. Under these conditions, the so-called "core" firms intuitively represent the most interesting player within the relation. Their primary role in capability development is a good reason to justify scholars' interest. However, the increasing international competition that affected the majority of markets has accelerated technological development. Markets have become hypercompetitive (D'Aveni and Gunther, 1994; Ilinitch, D'Aveni and Lewin, 1996), and innovation demand has increased tremendously. As products became more complex, core firms have struggled to control innovation processes as a whole. According to literature, they started to progressively rely on their strategic suppliers to develop innovations.

Suppliers have developed skills to innovate single parts or components, while assemblers have become *knowledge integrators,* leveraging on product modularity (Brusoni *et al.*, 2001). In several cases, suppliers' high degree of specialization has pushed different OEM firms to rely on the same partners for their supplies. For instance, Takeishi (2001) and Dyer and Hatch (2006) reported that different assemblers tend to share the same supply network and, hence, attempt to outperform competitors through coordination and knowledge sharing capabilities rather than supplier selection. This dependency caused by supplier specialization has affirmed the pivotal role of suppliers in innovation processes and relational rents generation.

The second reason why many scholars explore the core rather than the periphery is the availability of data. It is easier to retrieve reliable data on a buyer or an assembler, rather than data related to suppliers. Peripheral firms are usually smaller and mostly unknown to the 'general public'. We probably know which company manufactured our car, but we rarely know who manufactured the brakes or the chassis. Media, academia, and the general public talk rather about the big and successful firms than about the small and little known firms. Therefore, data about focal firms are not only easier to find, but also richer and more detailed. Moreover, peripheral firms are often privately owned and small sized (Gomes-Casseres, 1997), which implies less hierarchical and organizational structure, less codification of knowledge and past activities, and thus less

TABLE 2
Peripheral View Studies: Literature Review

Author/s	Year	Journal	Title	Focus	Method	Results
Gulati and Singh	1998	*Administrative Science Quarterly*	The Architecture of Cooperation: Managing Coordination Costs and Appropriation Concerns in Strategic Alliances.	Alliance	Quantitative	The magnitude of hierarchical controls in contractual relations is influenced by the anticipated coordination costs and by expected appropriation concerns.
Gulati	1999	*Strategic Management Journal*	Network location and learning: the influence of network resources and firm capabilities on alliance formation.	Alliance	Quantitative	Accumulated network resources arising from firm participation in the network of accumulated prior alliances are influential in firms' decisions to enter into new alliances.
Lorenzoni and Lipparini	1999	*Strategic Management Journal*	The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study.	Focal firms	Qualitative	The relational capability accelerates the lead firm's knowledge access and transfer with relevant effects on company growth and innovativeness.
Dyer and Nobeoka	2000	*Strategic Management Journal*	Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case.	Focal firms	Qualitative	Participating in the core firm knowledge sharing networks (1) motivate members to participate and openly share valuable knowledge (while preventing undesirable spillovers to competitors), (2) prevent free riders, and (3) reduce the costs associated with finding and accessing different types of valuable knowledge.
Gulati, Nohria, and Zaheer	2000	*Strategic Management Journal*	Strategic Networks	Network	Theoretical	Identification of five key areas of strategic research: (1) industry structure; (2) positioning within an industry; (3) inimitable firm resources and capabilities; (4) contracting and coordination costs; (5) dynamic network constraints and benefits.
Kaufman, Wood and Theyel	2000	*Strategic Management Journal*	Collaboration and Technology Linkages: A Strategic Supplier Typology.	Peripheral firms	Quantitative	Four-types classification of strategic suppliers.
Takeishi	2001	*Strategic Management Journal*	Bridging Inter- and Intra-Firm Boundaries: Management of Supplier Involvement in Automobile Product Development.	Inter-firm and intra-firm relations	Quantitative	An automaker needs capabilities to coordinate various activities both externally with a supplier and internally within its own organization, in order to gain better component development performance.
Kale, Dyer and Singh	2002	*Strategic Management Journal*	Alliance Capability, Stock Market Response, and Long-Term Alliance Success: The Role of the Alliance Function.	Alliance	Quantitative	Firms with a dedicated alliance function achieve greater abnormal stock market gains (average of 1.35%) and report that 63 percent of alliances are successful whereas firms without an alliance function achieve much lower stock market gains (average of 0.18%) and only a 50 percent long-term success rate. Initial stock market response to a key event positively correlates to the long-term performance and value of the event.
Koka and Pescott	2002	*Strategic Management Journal*	Strategic alliances as social capital: A multidimensional view	Alliance	Quantitative	Social capital is defined as a multi-dimensional construc leading to three benefits: (1)binformation volume; (2) information diversity; (3) information richness.
Dyer and Chu	2003	*Organization Science*	The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea.	Focal firms	Quantitative	Trust minimizes transaction costs and has a mutually causal relationship with information sharing, which positively affet value creatino in the exchange relationship.
Grant and Baden-Fuller	2004	*Journal of Management Studies*	A Knowledge Accessing Theory of Strategic Alliances.	Alliance	Theoretical	Alliances contribute to the efficiency in the application of knowledge; (1)by improving the efficiency with which knowledge is integrated into the production of complex goods and services, and (2) by increasing the efficiency with which knowledge is utilized. These static efficiency advantages of alliances are enhanced where there is uncertainty over future knowledge requirements and where new products offer early-mover advantages.
Dyer and Hatch	2006	*Strategic Management Journal*	Relation-specific capabilities and barriers to knowledge transfers: creating advantage through network relationships.	Focal firms	Quantitative and Qualitative	(1) Networks are critical unit of analysis fro explaining firm performance, even when networks appear to be similar. (2) Firms with useful knowledge can outperform competitors by leveraging knowledge resources through the supplier network. (3) Network contraints represent a potential barrier to knowledge transfer, expecially within a value chain producing customized, complex products.
Gulati, Lavie and Singh	2009	*Strategic Management Journal*	The nature of partnering experience and the gains from alliances.	Alliance	Quantitative	Effects of "partner-specific" and "general partnering experience" on value creation. The firm's own technological and financial resources increase the benefits of partner-specific experience. The value of partner-specific experience will increase under high levels of firm-specific uncertainty.
Kang, Mahoney, and Tan	2009	*Strategic Management Journal*	Why firms make unilateral investments specific to other firms: The case of OEM suppliers.	Peripheral firms	Qualitative	Firms are more likely to make relation specific investments when the investment yields positive economic spillover values for other transactions with the same exchange partners as well as for third-party transactions.

economic data available. Scholars may find it frustratingly difficult to retrieve data about these firms. Finally, convincing readers and reviewers that a small, unstructured, and probably unknown organization deserves academic attention is not a trivial task. Although literature has, in some cases, underlined the importance of these firms (Cooper *et al.*, 1986), the lack of incentives may have led to a neglect of peripheral firms in scholarly works.

WHY SHOULD RESEARCH STUDY PERIPHERAL FIRMS?

Suppliers are deeply different from buyers and assemblers. Hence, the so-called peripheral firms need to be addressed with special attention because of their specific nature. Due to this fact, operations management literature, among others, has been dedicating specific attention not only to buyers' strategies in suppliers selection and management (Sarkis and Talluri, 2002; Spekman, 1988), but also to suppliers' internal organization and strategy. Scholars in this field have been developing specific works about suppliers, especially in the last twenty years. For example, Choi and Krause defined the concept of "supply base" through three dimensions: (1) Number of suppliers; (2) Degree of differentiation; (3) Level of inter-relationships among the suppliers involved. Through a qualitative analysis they provide a set of propositions explaining the relation between the supply base complexity and both suppliers and focal firms performance. Specifically, while on the one hand reducing the supply base, complexity decreases costs and increases responsiveness at the supplier level, on the other hand it also has also a negative impxact on supply risk, supply innovation, and therefore core firms' competitiveness. Forker (1997) affirmed that a supplier's quality performance is conditioned on the way the supplier addresses effectiveness and efficiency in process optimization. Conversely to what relational view scholars stated, Forker affirmed that investments in asset specificity between buyer and suppliers lead to "poorer component quality and higher transaction costs for the customer firm, above and beyond poor performance determined strictly by the suppliers' quality management practices" (1997 : 263). Suppliers tend to decrease component quality when they believe that the buyer's supplier selection is guaranteed or in the case that resource/material prices increase. Choi and Hong (2002) investigate how supply network structure develops over time. Basing their propositions on three automotive ego-networks (Honda, Acura, and Daymler-Chrysler), the authors advocate that after the first "kick-off" determined by the final assembler's first-tier suppliers selection, the supply network takes shape on its own. Evidence showed that core firms maintain effective control over the first-tier supplier, but they have little knowledge about what happens beyond the first level of suppliers. Among several policies that control a supply networks, the authors particularly focus on cost-cutting requirements, which lead to rigidity and a sense of iniquity at the supplier level, when these requirements are overly formalized. Along these lines, Choi, Dooley, and Rungtusanatham (2001) affirm that assemblers forcing a high level of control in the supply network determine worse performances in innovation and flexibility at the supplier level. However, too few planning negatively affects managerial forecasting and the establishment of work routines. In this work, Choi and colleagues affirm that networks are mostly fortuitous structures rather than the outcome of a singular entity's conscious design. The authors define the supply network as a *complex adaptive systems:* this result underlines the importance of looking at suppliers not as mere pawns in the chess game of a strategizing buyer, but rather as distinctive organizations that define their competitive actions and strategies independently. Scholars of operations management have also turned their attention to comparative studies of firms at different positions in the supply network architecture. Choi and Hartley (1996) demonstrate that assemblers, suppliers, and indirect suppliers place the same importance to consistency (defined as the combination of quality and delivery), reliability, relationship, flexibility, price, and service. However, the two scholars have found statistically significant differences between assemblers and indirect suppliers in regard to the relevance they attributed to technological capability and financial issues. Despite this clear-cut results of operations management scholars, only few strategic management researchers have started to explore suppliers as a specific unit of analysis, which differ from buyers and assemblers. Among those, Clark and Fujimoto advanced a classification of strategic suppliers based on traditional automotive typologies (Clark and Fujimoto, 1991). The three-type classification represents the kind of control that suppliers have over the parts they manufacture, which are: (1) Supplier proprietary parts; (3) Black box parts; (2) Detail-controlled parts (Clark and Fujimoto, 1991 : 140-143). Supplier proprietary parts are standard generic products that suppliers produce and sell to the assemblers mostly via a catalogue. Core firms select these off-the-shelf parts mainly looking for the lowest price. Since these components have no personalization, assemblers have no control on the manufacturing system that suppliers use. Clark and Fujimoto's data reveals that within the automotive industry supplier proprietary parts account for less than 10% of the total vehicle cost. Black-box parts result from a co-development between assembler and supplier. While the former provides general indications on modular architecture, exterior shapes, cost-performance requirements, and other basic information, the latter follows detailed design and engineering requirements for the manufacturing of the total product. Black-box parts allow suppliers to develop innovation and engineering skills, while assemblers attain a bigger control and customization of the part production. When assemblers' part in the engineering process is slightly more relevant, researchers use the term "grey-box". Detail-controlled parts imply an assemblers' tight control on supplier activity. In this scenario, customization is high and core firms are the proprietary of most of the engineering technology. This solution allows suppliers to maintain total control over design and quality of strategic components while preserving bargaining power toward supplier's part pricing. Kaufman *et al.* (2000) criticized Clark and Fujimoto's classification, affirming that (1) It focuses only on dyadic relations between supplier and OEM manufacturer; (2) It considers small and medium suppliers as passive and minor agents in the relation; and (3) It provides a non-theory based taxonomy rather than a systematic theory-grounded typology (Kaufman *et al.*, 2000 : 650-651). Drawing from transaction cost economics literature, Kaufman *et al.* advance a supplier typology of four types based on two dimensions: (1) collaboration and (2) technology. The authors define *Commodity Suppliers* as those having little technology and little interest in collaborations. These firms compete in cost-cutting and low prices, proposing standard products with little or no differentiation. *Collaboration Specialists* have a great degree of involvement in partnerships with their customers, but they provide only low-technology components. They are similar to Clark and Fujimoto's detail-controlled part suppliers. *Technology Specialists* are similar to proprietary parts suppliers (Clark and

Fujimoto, 1991), because they provide highly technological components without engaging in collaborative relations. Their competitive advantage is based on their proprietary knowledge, which they exploit through first-mover advantage, continuous innovation, and high barriers to imitation. In fact, they isolate their activities to avoid possible leaks of knowledge that could benefit competitors and customers. *Problem Solving Suppliers,* just like black-box parts suppliers, provide high-tech solutions through intense collaborations. However, their work flows into small production batches, using their advantage in labor flexibility and process flexibility. Although Kaufman and colleagues advance a contribution that is tailored to the supplier perspective, their article contains a major limitation. As the authors themselves stated (Clark and Fujimoto, 1991 : 660), the taxonomy is static and it provides no longitudinal interpretation of how suppliers' strategies change with exogenous and endogenous variations. Some other recent contributions in strategic management literature tried to provide specific insights on supplier dynamics. For example Kang, Mahoney, and Tan wonder why some weak OEM suppliers are willing to make unilateral specific investments, which place them in a risky bargaining position (2009 : 120). Williamson (1991) provides a micro-analytic solution, affirming that firms tend to anticipate potential dependencies from external players by employing a specific organizational response. Drawing on prior research (Mayer, 2006), the authors of this study demonstrate that OEM suppliers face asset specificity hazards, if they benefit from inter-project knowledge spillovers and reputation spillovers. To conclude, suppliers reshape competition and cooperation through their innovativeness and their partnerships with external organizations (Cooper *et al.*, 1986; Gomes-Casseres, 2006; Stuart, 2000).

TOWARD A PERIPHERAL VIEW:

PATHS FOR FUTURE RESEARCH

So far we have described how operations management scholars have been dedicating more specific attention to supplier dynamics than management scholars. Although relational view researchers have clearly pointed toward the unique contribution of supply firms to the dyad/network value creation (see for an example Stuart, 2000), scholars have failed to provide a balanced analysis. They also have almost completely neglected peripheral firm role, considering them nearly passive agents. However, since some management scholars have first started to question the buyers and assemblers' primary role in supply chain value creation (Brusoni and Prencipe, 2001; Brusoni *et al.*, 2001), literature has consequently started to consider suppliers as active strategizing agents (Clark and Fujimoto, 1991; Kang *et al.*, 2009; Kaufman *et al.*, 2000). Although we do not deny the importance of analyzing suppliers' contribution to core firm strategy and performance (Dyer and Hatch, 2006; Grant and Baden-Fuller, 2004; Lorenzoni and Baden Fuller, 1995; Lorenzoni and Lipparini, 1999; Takeishi, 2001), we see a relevant set of specific supplier-based studies slowly emerging from management journals. Therefore, we believe that in order to address this topic, scholars should reflect on viable future theoretical approaches, methods, and research questions. Here we advance our suggestions based on a critical analysis of former theory.

According to relational view definitions, suppliers' commercial and technological relations influence their economic and innovation performance. Scholars have mostly focused their attention on suppliers' contribution to buyer and assembler value creation. However, suppliers' competitiveness is important for the success of the entire network.

Hence, it would be interesting to deepen the analysis of factors that improve suppliers' performance. We assume that a peripheral firm in "good health" can better perform its role and activities within its environment. For example, suppliers suffer the increasing convergence of cost-cutting, which limits their profits and, hence, the possibility to invest in challenging innovations. For example, North American and European textile suppliers have struggled to compete with Far-East supply firms' price reductions. As a consequence, several textile companies have recently re-located their production to China and India, in order to access lower labor cost. However, the intense focus on efficiency has slowed down the technological development of textiles, decreasing the average quality of products sold to fashion firms. Accordingly, scholars have uttered concerns about assemblers leveraging on their stronger bargaining power to put suppliers under pressure. In several cases, evidence showed that continuous and exaggerated pressure for efficiency led to counter-productive results and lower performance (Kang *et al.*, 2009). Since relational rents depend on both partners' performance, relational view scholars should not only ask what suppliers can do to contribute to assemblers' success, but also what assemblers can do to contribute to suppliers' success. This scenario indirectly maximizes assembler profits as well. According to the literature supporting an active interpretation of suppliers' dynamics, we believe that management scholars should analyze supply capabilities development at the peripheral level. Several questions still warrant answers concerning suppliers' competitive strategies. For example, do suppliers develop specific capabilities due to their position in the network structure? And, if so, what is the role of first-tier suppliers compared to firms that are at different stages of the value chain (i.e. second and third tier)? What kind of governance at the supplier level triggers knowledge acquisition? What kinds of investments reduce default risk at the suppliers level? Are these conditioned by industry technological development? Do relational capabilities developed between first-tier supplier and assembler affect those developed between a first-tier and a second-tier supplier? What about the opposite? Are specific network positions related to different approaches to asset specificity? To respond to these and other questions, strategic management scholars can rely on the greater amount of results provided in operations management literature. However, while the former usually focus on higher level constructs, such a organizational architectures, combinative skills, strategic decisions, and dynamic capabilities, the latter mostly observe lower level actions such as purchases, transformation of raw materials into finished goods, storage efficiency, sales, delivery, and customer satisfactions. We believe that results extracted from operations management studies are complementary to the recent strategic management scholars' intent to focus on *microfoundations* of capabilities. These *microfoundations* of capabilities are defined as "the distinct skills, processes, procedures, organizational structures, decision rules, and disciplines—which undergird enterprise-level sensing, seizing, and reconfiguring capacities" (Teece, 2007 : 1319).

As far as method and data are concerned, we have already underlined how, due to their nature, retrieving data about suppliers is usually harder than collecting information about core firms. Most small and privately-owned firms have simpler systems of financial, economical, and performance reporting, while public firms have to develop reports and make data available to shareholders and stakeholders. Within firm boundaries, knowledge is mostly tacit and uncodified. Still, gathering meaningful and extensive data remains a touchstone for any good piece of research, and scholars have to learn how to leverage on the positive aspects that are typical of supply firms. For example, although suppliers have often less precise and codified performance assessments, OEM customers rate their suppliers through well-established evaluation forms that they develop to support their partner selection. Former studies are useful examples of how to successfully use those datasets (Dyer and Hatch, 2006; Takeishi, 2001). When suppliers are family-owned businesses, it is possible to interview people who have been involved for long parts of the firm's history, or at least somebody that is aware of details such as entrepreneurial motivations underpinning strategic decisions. Starting from these facts and interpretations, scholars may develop in-depth case studies leading to novel grounded theory. Furthermore, longitudinal insights may be the building blocks for dynamic process interpretations to shed light not only on factors affecting competitive advantage at supplier level, but also on how to sustain success when exogenous conditions change.

CONCLUSIONS

The main thesis of this article was that it is impossible to fully understand how dyads and networks of firms compete through unbalanced and biased studies that concentrate on the core firm of a partnership. Since competition between pairs and groups of firms is becoming more and more common (Dyer and Singh, 1998 : 675), focusing on unbalanced research may limit the explanatory power of relational studies. Firms organize in strategic networks, which are mostly built around a firm that literature commonly defines as focal/core firm or assembler/buyer. The other firms within the network are called peripheral firms and they principally supply parts and services to focal firms. Although relational view scholars affirm the importance of understanding peripheral firms in order to explain their contribution to the core firm as well as to the network as a whole, strategic management studies have mainly concentrated their attempts on explaining focal firms' activities and performances. According to a wide set of studies that developed within the operations management theory, suppliers offer specific characteristics due to their nature, position within the network, and bargaining power. Therefore, we cannot assume that implications for general firms or focal firms always apply to for peripheral firms as well. As a result, a supplier-specific literature has emerged from operations management theory. In this way, strategic management scholars have developed some analysis of supply organizations principally considering their development via external ties.

The peripheral view we offer here extends the relational view considerations on suppliers' role and suggests the reconsideration of suppliers' importance in explaining both supplier performance and contribution to other players. In addition, we provocatively suggested turning the traditional perspective upside-down, analyzing the assemblers' policies, strategies and governance supporting the suppliers' value creation and performance. In future research, scholars should explicitly examine supplier characteristics in greater detail. Further research might explain the establishment and effects of supplier-based capabilities and how they change depending on the specific industry, technological development, and tier level.

In conclusion, by promoting the peripheral view of manufacturing networks we emphasize the primary goal of our study, which is to re-balance the focus on a fascinating area of research that explains how dyads and groups sustain competitive advantage over time.

REFERENCES

Acs ZJ, Audretsch DB. 1987. Innovation in large and small firms. *Economics Letters* **23**(1): 109-112.

Badaracco J. 1991. *The Knowledge Link: How Firms Compete Through Strategic Alliances*. Harvard Business School Press.

Barney JB. 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management* **17**(1): 99-120.

Brusoni S, Prencipe A. 2001. Unpacking the black box of modularity: technologies, products and organizations. *Industrial and Corporate Change* **10**(1): 179-205.

Brusoni S, Prencipe A, Pavitt K. 2001. Knowledge Specialization, Organizational Coupling, and the Boundaries of the Firm: Why Do Firms Know More Than They Make? *Administrative Science Quarterly* **46**(4): 597-621.

Chen MJ, Hambrick DC. 1995. Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal* **38**(2): 453-482.

Choi TY, Dooley KJ, Rungtusanatham M. 2001. Supply networks and complex adaptive systems: control versus emergence. *Journal of Operations Management* **19**(3): 351-366.

Choi TY, Hartley JL. 1996. An exploration of supplier selection practices across the supply chain. *Journal of Operations Management* **14**(4): 333-343.

Choi TY, Hong Y. 2002. Unveiling the structure of supply networks: case studies in Honda, Acura, and DaimlerChrysler. *Journal of Operations Management* **20**(5): 469-493.

Clark K, Fujimoto T. 1991. *Product development performance*. Harvard Business School Press Boston, Mass.

Cohen WM, Levinthal DA. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* **35**(1): 128-152.

Cooper AC, Willard GE, Woo CY. 1986. Strategies of high performing new and small firms: A reexamination of the niche concept. *Journal of Business Venturing* **1**(3): 247-260.

Covin JG, Slevin DP. 1989. Strategic management of small firms in hostile and benign environments. *Strategic Management Journal* **10**(1): 75-87.

D'Aveni R, Gunther R. 1994. *Hypercompetition: Managing the dynamics of strategic maneuvering*. Free Press .

Dyer J. 1996a. Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management Journal* **17**(4): 271-291.

Dyer JH. 1996b. Does Governance Matter? Keiretsu Alliances and Asset Specificity As Sources of Japanese Competitive Advantage. *Organization Science* **7**(6): 649-666.

Dyer JH, Chu W. 2000. The Determinants of Trust in Supplier-Automaker Relationships in the U.S., Japan, and Korea. *Journal of International Business Studies* **31**(2): 259-285.

Dyer JH, Hatch NW. 2006. Relation-specific capabilities and barriers to knowledge transfers: creating advantage through network relationships. *Strategic Management Journal* **27**(8): 701-719.

Dyer JH, Nobeoka K. 2000. Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal* **21**(3): 345-367.

Dyer JH, Singh H. 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *The Academy of Management Review* **23**(4): 660-679.

Forker LB. 1997. Factors affecting supplier quality performance. *Journal of Operations Management* **15**(4): 243-269.

Gomes-Casseres B. 1997. Alliance Strategies of Small Firms. *Small Business Economics* **9**(1): 33-44.

Gomes-Casseres B. 2006. How alliances reshape competition. *Handbook of Strategic Alliances*: 39-53.

Gottfredson M, Puryear R, Phillips S. 2005. Strategic sourcing: from periphery to the core. *Harvard business review* **83**(2): 132.

Grant R. 1996a. Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science* **7**(4): 375-387.

Grant R. 1996b. Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal* **17**: 109-122.

Grant R, Baden-Fuller C. 1995. A knowledge-based theory of inter-firm collaboration, *Academy of Management Best Paper Proceedings*, Vol. 38: 17-21.

Grant R, Baden-Fuller C. 2004. A Knowledge Accessing Theory of Strategic Alliances. *Journal of Management Studies* **41**(1): 61-84.

Gulati R. 1998. Alliances and networks. *Strategic Management Journal* **19**(4): 293-317.

Gulati R. 1999. Network location and learning: the influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* **20**(5): 397-420.

Gulati R, Lavie D, Singh H. 2009. The nature of partnering experience and the gains from alliances. *Strategic Management Journal* **30**(11): 1213-1233.

Gulati R, Nohria N, Zaheer A. 2000. Strategic Networks. *Strategic Management Journal* **21**(3): 203-215.

Gulati R, Singh H. 1998. The Architecture of Cooperation: Managing Coordination Costs and Appropriation Concerns in Strategic Alliances. *Administrative Science Quarterly* **43**(4): 781-814.

Hambrick DC, MacMillan IC, Day DL. 1982. Strategic attributes and performance in the BCG matrix--A PIMS-based analysis of industrial product businesses. *Academy of Management Journal* **25**(3): 510-531.

Hamel G. 1991. Competition for Competence and Inter-Partner Learning Within International Strategic Alliances. *Strategic Management Journal* **12**: 83-103.

Ilinitch AY, D'Aveni RA, Lewin AY. 1996. New Organizational Forms and Strategies for Managing in Hypercompetitive Environments. *Organization Science* **7**(3): 211-220.

Kale P, Dyer JH, Singh H. 2002. Alliance Capability, Stock Market Response, and Long-Term Alliance Success: The Role of the Alliance Function. *Strategic Management Journal* **23**(8): 747-767.

Kang MP, Mahoney JT, Tan D. 2009. Why firms make unilateral investments specific to other firms: The case of OEM suppliers. *Strategic Management Journal* **30**(2): 117-135.

Kaufman A, Wood CH, Theyel G. 2000. Collaboration and Technology Linkages: A Strategic Supplier Typology. *Strategic Management Journal* **21**(6): 649-663.

Kogut B, Zander U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* **3**(3): 383-397.

Lerro A, Schiuma G. 2005. Translating Knowledge Resources into Performance Breakthrough: Ducati’s Turnaround, *eBRF Conference Proceedings*: 575-587: Tampere, Finland.

Lorenzoni G, Baden Fuller C. 1995. Creating a Strategic Center to Manage a Web of Partners. *California Management Review* **37**(3): 146-163.

Lorenzoni G, Lipparini A. 1999. The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal* **20**(4): 317-338.

MacMillan IC, Hambrick DC, Day DL. 1982. The Product Portfolio and Profitability--A PIMS-Based Analysis of Industrial-Product Businesses. *Academy of Management Journal* **25**(4): 733-755.

Mayer KJ. 2006. Spillovers and governance: An analysis of knowledge and reputational spillovers in information technology. *Academy of Management Journal* **49**(1): 69.

Mintzberg H, Pascale R, Goold M, Rumelt R. 1996. The "Honda effect" revisited. *California Management Review* **38**(4): 78-117.

Nonaka I. 1994. A Dynamic Theory of Organizational Knowledge Creation. *Organization Science* **5**(1): 14-37.

Pascale R. 1996. The Honda effect. *California Management Review* **38**(4): 80-91.

Peteraf M. 1994. Commentary. In P. Shrivastava, A. Huff, & J. Dutton (Eds.). *Advances in strategic management* **10B**: 153-158.

Porter K, Whittington K, Powell W. 2005. The Institutional Embeddedness of High-Tech Regions: Relational Foundations of the Boston Biotechnology Community. In S Breschi, F Malerba (Eds.), *Clusters, networks, and innovation*. Oxford University Press.

Porter ME. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press.

Powell WW, Koput KW, Smith-Doerr L. 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. *Administrative Science Quarterly* **41**(1): 116-145.

Rumelt R. 1984. Towards a strategic theory of the firm. *Resources, firms, and strategies: A reader in the resource-based perspective*: 131-145.

Rumelt R. 1991. How much does industry matter? *Strategic Management Journal* **12**(3): 167-185.

Sako M. 2004. Supplier development at Honda, Nissan and Toyota: comparative case studies of organizational capability enhancement. *Industrial and Corporate Change* **13**(2): 281-308.

Sarkis J, Talluri S. 2002. A model for strategic supplier selection. *Journal of Supply Chain Management* **38**(1): 18-28.

Spekman RE. 1988. Strategic supplier selection: understanding long-term buyer relationships. *Business Horizons* **31**(4): 75-81.

Stuart TE. 2000. Interorganizational Alliances and the Performance of Firms: A Study of Growth and Innovation Rates in a High-Technology Industry. *Strategic Management Journal* **21**(8): 791-811.

Takeishi A. 2001. Bridging Inter- and Intra-Firm Boundaries: Management of Supplier Involvement in Automobile Product Development. *Strategic Management Journal* **22**(5): 403-433.

Teece D. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy* **15**(6): 285-305.

Teece DJ. 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* **28**(13): 1319-1350.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal* **18**(7): 509-533.

Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171-180.

Williamson O. 1985. *The economic institutions of capitalism: firms, markets, relational contracting*. Free Press: New York.

Williamson O. 1991. Comparative Economic Organization: The Analysis of Discrete Structural Alternatives. *Administrative Science Quarterly* **36**(2): 269-296.

Winter S. 1987. Knowledge and competence as strategic assets. The Competitive Challenge: Strategies for Industrial Innovation & Renewal. In D Klein (Ed.), *The strategic management of intellectual capital*: 165-188. Butterworth-Heinemann.

Zaheer A, Venkatraman N. 1995. Relational Governance as an Interorganizational Strategy: An Empirical Test of the Role of Trust in Economic Exchange. *Strategic Management Journal* **16**(5): 373-392.

Zander U, Kogut B. 1995. Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science* **6**(1): 76-92.

FRAMING THE STRATEGIC PERIPHERIES:

A NOVEL TYPOLOGY OF SUPPLIERS

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ABSTRACT

This paper contributes to the emerging theoretical perspective called the "peripheral view of the network" by proposing an innovative typology of strategic suppliers. Data collected through a longitudinal multiple-case study of eighteen firms in the Italian motorcycle part industry presents a four-type classification of suppliers based on two relation-based dimensions: asset specificity – proxy for relational capabilities – and strategic focus – proxy for operational ambidexterity. Four types of peripheries emerge: (1) Niche Suppliers (low asset specificity – narrow strategic focus); (2) Flexible Suppliers (low asset specificity – wide strategic focus); (3) Committed Suppliers (high asset specificity – narrow strategic focus); (4) Multi-Purpose Suppliers (high asset specificity – wide strategic focus). Results suggest that different levels of relational capabilities correspond to diverse positioning in the industry and thus reveal different types of competitive strategy. Nine theoretical propositions state how the interplay between relational capabilities and operational flexibility affects peripheries' competitive advantage.

Keywords: Suppliers; Typology; Peripheral View; Asset Specificity; Strategic Focus.

INTRODUCTION

In recent years, scholars of the *relational view* (Dyer and Singh, 1998) have explored how firms leverage on strategic partnerships to outperform competitors and obtain sustained competitive advantage. Within this theoretical perspective, scholars have focused principally on *core* or *focal firms* (Dyer and Nobeoka, 2000; Pascale, 1996*)*. In manufacturing networks, scholars have traditionally defined original equipment manufacturers (OEM) as core/focal firms, due to their (1) network centrality, (2) superior bargaining power, (3) primary role in innovation development, and (4) coordination capabilities of network resources. However, scholarship affirms that, due to the increasing complexity of products and technologies, the *locus of innovation* has shifted from core firms to *peripheral firms*, which traditionally scholars identify with part/component suppliers (Gatignon, Tushman, Smith and Anderson, 2002; Powell, Koput and Smith-Doerr, 1996). When technological demand rises, OEMs struggle to drive the innovation of finished products. Hence, they start relying on a selection of strategic suppliers, which have developed superior capabilities in component innovation. While suppliers develop innovation through the introduction of new components, OEMs' develop specific skills in supplier selection and integration of technical knowledge. Accordingly, scholars use the term "assembler" or "buyer" to define OEMs. Since suppliers are quickly becoming the primary source of innovation, studies focusing on core firms fail to explain the processes underpinning innovation and thus generate misleading theory. Although strategic management scholars have often described suppliers' distinctive dynamics and characteristics (Gottfredson, Puryear and Phillips, 2005; Kaufman, Wood and Theyel, 2000; Lipparini and Sobrero, 1994;

Takeishi, 2001), few works have observed them through a tailored analytical lens. While operations management scholars have already shed light on suppliers' activities (Choi and Krause, 2006; Forker, 1997; Johnston, McCutcheon, Stuart and Kerwood, 2004; Wu and Choi, 2005), strategic management scholars have only recently started to pay attention to peripheral firms, their nature (Kaufman *et al.*, 2000) and their contribution to core firms' value creation (Dyer and Hatch, 2006). By proposing a dynamic typology of strategic suppliers, our study nurtures an emerging stream of literature focusing on peripheral firms, which we have identified and called the *"peripheral view of manufacturing networks"*. Leveraging data collected through a multiple-case study of eighteen firms in the Italian motorcycle part industry, we present a four-type suppliers' classification based on two dimensions concerning their relations with original equipment manufacturers (OEM). Data shows that different relational capabilities are connected to diverse positioning within the industry, and, thus, different types of competitive advantage. Continuous interactions with OEMs help suppliers to diversify their activities and to offer a niche service that is differs from that of their competitors. Therefore, increasing relations in a suppliers' network positively affects heterogeneity between peripheral firms. Also, our longitudinal analysis describes how firms tend to adapt their positioning in response to environmental changes and market shocks. We developed a thorough observation of suppliers' dynamics, which we summeed up through a set of theoretical propositions.

Our study develops as follows. Firstly, we present the theoretical background underpinning our research. Then we develop a theoretical typology of suppliers based on relational characteristics and firm performance. Secondly, we present the method we used and the data we collected to advance our theoretical propositions. Thirdly, we describe the empirical field, its history and main players. Fourthly, through a longitudinal analysis that covers 65 years, we study how suppliers' positioning affected their competitiveness. Great attention is dedicated to the interaction between core firms and peripheries. Finally, we briefly sum up our theoretical contribution and highlight a set of managerial implications. Also, we point out the limitations of our work and provide an agenda for future research.

THEORETICAL BACKGROUND

Strategic and operations management scholars have focused their attention on the importance of seeking the reasons for sustained competitive advantage not only within individual firms, but also between networks of firms (Dyer, 1996b; Hansen, Hoskisson, Lorenzoni and Ring, 1997; Kamath and Liker, 1990, 1994; Lorenzoni and Lipparini, 1999; Nishiguchi, 1994; Zhao, Anand and Mitchell, 2005). The *relational view* (Dyer and Singh, 1998) shows how firms leverage ties and alliances to strategically develop knowledge (Anand and Khanna, 2000; Gulati, 1995b, 1998; Gulati and Singh, 1998; Lorenzoni and Lipparini, 1999; Zander and Kogut, 1995; Zhao and Anand, 2009), control unique resources and capabilities (Dyer and Hatch, 2006; Teece, Pisano and Shuen, 1990), and benefit from renewable rents to outperform competitors. Scholars have mainly focused on ego-networks (Ahuja, 2000), which are based on the analysis of core/focal firms. However, as products become more complex and technological demand rises, core firms struggle to drive innovation of finished products. Therefore, they progressively delegate component innovation to a selection of strategic suppliers, which have become the new innovation leaders. Core firms' compete developing skills in supplier selection (Dyer, 1996a) and knowledge integration (Brusoni, Prencipe and Pavitt, 2001). Since scholars demonstrated that the assembler-supplier relation has changed (Asanuma, 1989a) and the locus of innovation has shifted from assemblers/buyers to suppliers (Powell *et al.*, 1996), we suggest that focusing primarily on core firms fails to fully capture the relational processes underpinning innovation. We believe that supply firms deserve specific analysis and *ad hoc* theory, but while operation management scholarship has shown that suppliers have a different nature from buyers and assemblers, and therefore require a specific approach (Choi, Dooley and Rungtusanatham, 2001; Choi and Hong, 2002; Choi, Wu, Ellram and Koka, 2002; Forker, 1997), only few strategic management studies have attempted to develop contributions aimed at understanding suppliers' distinctive nature (Clark and Fujimoto, 1991; Kaufman *et al.*, 2000). To fill this gap, we suggest the adoption of a tailored theoretical perspective that we call the *"peripheral view of manufacturing networks"*. We define the *peripheral view* as the supplier-based theoretical approach that explains the antecedents of relational rents. Since strategic management theory about suppliers is still at a preliminary stage, we believe that research should first clearly define peripheral firms. Therefore, our study develops a dynamic supplier classification that sheds light on peripheral firms' nature and competitive behaviors. But what do we mean when we use the term "classification"? Classification is traditionally considered one of the most generic and central conceptual exercises underpinning advanced reasoning, mathematics, statistics, and data analysis (Bailey, 1994). This is why classification schemes have gained great popularity in developing analytical frameworks to understand firm performance (see for example the classification schemes of Hambrick, 1983; Hatten and Hatten, 1985; Miles and Snow, 1978; Porter, 1980). Scholars affirm that classifications based on theoretically grounded dimensions are a viable option for robust definitions of a complex and heterogeneous group of actors, such as suppliers (Kaufman *et al.*, 2000). Although some strategic management studies have described supplier classification, they present some limitations that inhibit a complete understanding of peripheral firms' role. For example, Clark and Fujimoto (1991 : 140-143) present an automotive supplier taxonomy, based on three types of categories: (1) Black-box parts; (2) Detail-controlled parts; (3) Supplier-proprietary parts. Supplier-proprietary parts are standard generic products that suppliers produce and sell to the assemblers mostly via a catalogue. Core firms' purchase selection is mainly dependent on price convenience. In the case of supplier-proprietary parts, assemblers have no control over the manufacturing system that suppliers use, because these components have no customization. Black-box parts, on the contrary, result from a assembler-supplier joint venture. While the core firm develops modular architectures, exterior shapes, cost-performance requirements, and other basic information, the peripheral firms follow detailed design and engineering requirements for the manufacturing of the total product. Black-box parts allow suppliers to develop innovation and engineering skills, while assemblers attain a bigger control and customization of the part production. When assemblers' part in the engineering process is slightly more relevant, researchers use the term "grey-box". Detail-controlled parts imply an assemblers' strict control on supplier activity. In this case, customization is high and core firms own most of the engineering technology. This solution allows suppliers to keep total control over design and quality of strategic components while preserving bargaining power toward suppliers' part pricing. Although Clark and Fujimoto provide some preliminary definition of suppliers, their research presents some limitations. First, it focuses on a single-link connection between an automaker and a supplier. Conversely, other studies within the automotive industry (Dyer and Hatch, 2006; Takeishi, 2001) describe that strategic suppliers often work with several assemblers at the same time, which affects their capabilities and ambidexterity. Secondly, their study considers suppliers as passive players, neglecting their active role in innovation development and their influence over the assembly firms and the entire industry. Thirdly, the work is tightly industry-specific – automotive – , and it does not allow wider theoretical generalizations. Fourthly, the representation is static and it does not provide a longitudinal process analysis. Kaufman and colleagues' work (2000) also present similar problems. With their four-quadrants typology (based on the level of collaboration and technology) the Kaufman *et al.* provide a more realistic interpretation of the active role of strategic suppliers. Their quantitative techniques and the use of a multi-industry sample allow a wider generalization of the results. However, the static cross-sectional analysis fails to provide any process interpretation of suppliers' competitive behavior. As the authors stated in the conclusion of their study "researchers may want to create a longitudinal database and develop case studies to determine whether a transitional pattern exists for firms between different quadrants of the typology" (Kaufman *et al.*, 2000 : 660). Accordingly, our work contributes to the peripheral view by offering a process theory based on a dynamic classification of suppliers in manufacturing networks. Although different from the classification we reviewed (Henderson and Clark, 1990; Kaufman *et al.*, 2000), our work is still based on conceptual ties derived from theory (Miller, Friesen and Mintzberg, 1984 : 31-36).

Literature presents two forms of classification: taxonomies and typologies. The former is primarily empirical and uncovers theoretically unsupported clusters. The latter concentrates on the construction and verification of conceptual schemes with multiple theoretical dimensions (Kaufman *et al.*, 2000). We chose the second approach due to several reasons. First, peripheral view's goal is to advance theoretically supported definitions about supply firms. A well-constructed typology may help to bring order to chaos by interpreting a complex reality, clustering along few relevant dimensions that have been already tested in management literature. Second, typologies enable the construction of *gestalts* – a symbolic configuration of inseparable elements – since each type is an entire unit of attributes. A typology of strategic suppliers thus provides an exhaustive array of types that allows ascertaining the strategic positioning of suppliers. Third, once identified, types may be used as foundations for further research and theory development. Our types of strategic peripheries can be tested and expanded by relating them to performance figures or using them as a basis for strategic advice. Finally, taxonomies rely on statistical techniques, such as cluster analysis, that are inherently static. This counteracts the second aim of this paper: to demonstrate movements across classification types in a longitudinal perspective and to show empirically proven dynamics across classification types.

FRAMING A RELATIONAL TYPOLOGY OF STRATEGIC PERIPHERIES

A typology is no better than the dimensions or theoretical constructs on which it is based. To ascertain that our classification is founded on key factors we rely on two dimensions derived from literature on strategic and operations management: *assets specificity* and *strategic focus*. Both of them are proxies for relational capabilities developed through partnerships with core firms.

Asset Specificity

Williamson defined asset specificity as durable investments undertaken in support of particular transactions (Williamson, 1985 : 55). Then, Nishiguchi identified (1) Site, (2) Physical, (3) Human, and (4) Dedicated asset specificity as four distinct dimensions of the construct (Nishiguchi, 1994). For a supplier, site specificity implies developing joint infrastructures with a specific partner, such as co-locating manufacturing facilities, R&D centers or exclusive experimental labs (i.e. customers trial centers). These solutions are aimed at minimizing inventory, transportation, and coordination costs (Dyer, 1996b). Physical asset specificity refers to relation-specific capital investments (e.g. in customized molds, tools, machinery, or even production lines). When suppliers customize processes and products, they achieve differentiation from competitors and support final product quality improvements by increasing the integrity and fit of single components (Nishiguchi, 1994). Human assets specificity refers to relation-specific know-how that dedicated supplier negotiators (e.g. engineers or technicians) acquire through long-lasting interactions with the customer. Finally, dedicated asset specificity reflects additional investments in generalized production capacity to meet long-term partners' special requirements. The intensity of asset specificity is a proxy to observe relationship quality (Ariño, De La Torre and Ring, 2001), type of interactions (Takeishi, 2001), level of trust (Barney and Hansen, 1994; Dyer and Chu, 2000; Gulati, 1995a), and quality of capabilities developed between the dyads (Lorenzoni and Lipparini, 1999). Amit and Schoemaker affirmed that "strategic assets by their very nature are specialized" (Amit and Schoemaker, 1993 : 39) and this insight underlines/emphasizes that, by definition, firms must offer specialized or idiosyncratic services to gain competitive advantage. Firms outperform competitors thanks to relational-specific investments and thus generate assets that are unique when combined with those of the partner (Teece, 1987). In our context, investments in asset specificity are relevant for several reasons. First, as investments they are the result of a deliberate strategy, aimed at reinforcing relational capabilities and transforming commercial relations into cooperative projects; in short, they try to transform customers into partners. Second, they modify organizational routines at the supplier level. In fact, interacting with specific customers forces suppliers to change their habits and processes. Creating new routines not only cures organizational *inertia* (Lazerson and Lorenzoni, 1999; Nelson and Winter, 1982), but it also fosters the genesis of new capabilities.

Strategic focus

Strategic focus is defined as the ability of a single firm to deal with multiple types of activities at the same time (e.g. fostering innovation while keeping manufacturing cost low). By monitoring changes in firms' strategic focus, scholars can observe at the same time the suppliers' strategic goal and flexibility in adapting to different goals. Scholarship has used various terms as synonyms of strategic focus: ambidexterity, specialization, organizational flexibility, and multitasking. Although they might have slightly different meaning depending on the contingent situation, they basically define the same capability. At the organization level, scholars observe strategic focus via the analysis of product range, geographic scopes, functional activities, and strategic goals that a firm simultaneously develops (Schilling, Vidal, Ployhart and Marangoni, 2003 : 39). We can define firms "ambidextrous" when strategic focus is "wide", that is when organizations are able to manage different types of activities at the same time (Gibson and Birkinshaw, 2004). On the other side, specialized firms narrow their strategic intent to a limited number of activities, trying to reach niche leadership. Scholars have discussed whether firm specialization accelerates learning. In accord with Adam Smith's argument about specialization, some researchers believe that the learning rate should accelerate when narrow specialization is pursued (Smith, 1776). Others advocate that a wide focus positively affects learning performance (Schilling *et al.*, 2003). In fact, the learning rate increases not only when players apply their efforts to different, although related, problem domains (Loewenstein, Thompson and Gentner, 1999), but also when learners take part in multiple activities that seem unrelated (Schilling *et al.*, 2003). Siding with this literature, we believe that although an intense specialization deepens a firm's knowledge, a wide strategic focus more positively impacts other aspects like flexibility, knowledge absorption from heterogeneous domains/fields, and cognitive understanding. As Ethiraj and Levinthal (2004) affirmed, the pursuit of multitasking is often a problematic issue, since a single decision may have implications for multiple performance goals and consequently may freeze managerial action when a trade-off favors one of the activities over the other. To deal with complexity, firms rely on managerial heuristics such as *goal myopia*, *spatial differentiation*, and *temporal differentiation*, because they mitigate the *status-quo* bias derived from the challenging trade-off (Ethiraj and Levinthal, 2004 : 16). Especially in customer-driven industries, organizations are pushed to accept a certain degree of trade-off, and therefore engage in different strategic tasks. Firms brave these contrasting requests, "and the most successful organizations reconcile them to a large degree, and in so doing enhance their long-term competitiveness" (Gibson and Birkinshaw, 2004 : 209). Market-oriented suppliers are able to effectively supply a larger portfolio of services, products, and technologies at the same time. Also, since peripheral firms often learn from their partners, supply firms attain wider strategic focus by engaging in cooperative relations with large and heterogeneous assemblers. One of the main antecedents of a wide strategic focus is the *embeddedness* in a localized network. Indeed, relational embeddedness fosters "adaptation" (Uzzi, 1996, 1997) through diffusion of tacit knowledge beyond firms' boundaries, which supports the access to a strategic set of dynamic capabilities (Fleming, King and Juda, 2007).

Firm Size

By observing changes in firm size, scholars monitor a firm's performance, its diversification, and its competitive behavior. However, it is problematic to define firm size and to measure it correctly. Firm size can be measured through several types of data, such as number of employees, turnover, sales, and number of products in the portfolio. Kaufman and colleagues (2000) for example take a firms' average number of employees as a proxy to define its size. However, in manufacturing networks this measurement is inconsistent due to the impact that machineries and automation has on firm productivity. For example, a supplier can increase size, despite a reduction in the number of employees, thanks to the adoption of automatic machineries. In other cases, scholars use "sales" as proxy of firm size when employees are not a consistent option. Still, firms' size might not be directly comparable, even when they compete within the same NAICS code.[1] In fact, sales can be very different from case to case, depending on the specific product manufactured. A big producer of buttons, for example, might be significantly smaller than a little fabric producer, although they both work for the textile industry. According to prior literature, these two companies are considered to be directly comparable. Hence, it is misleading to compare supply firm size in absolute terms. A viable solution is to benchmark suppliers that not only lie within the same industrial group, but also produce the same component for the same market (e.g. buttons producers should be compared to buttons producers only).

The Matrix

From our literature review, we have designed a four-quadrants matrix (Figure 1), which classifies the strategic suppliers through a relational perspective with core firms. This typology develops along two dimensions (asset specificity; strategic focus) and it

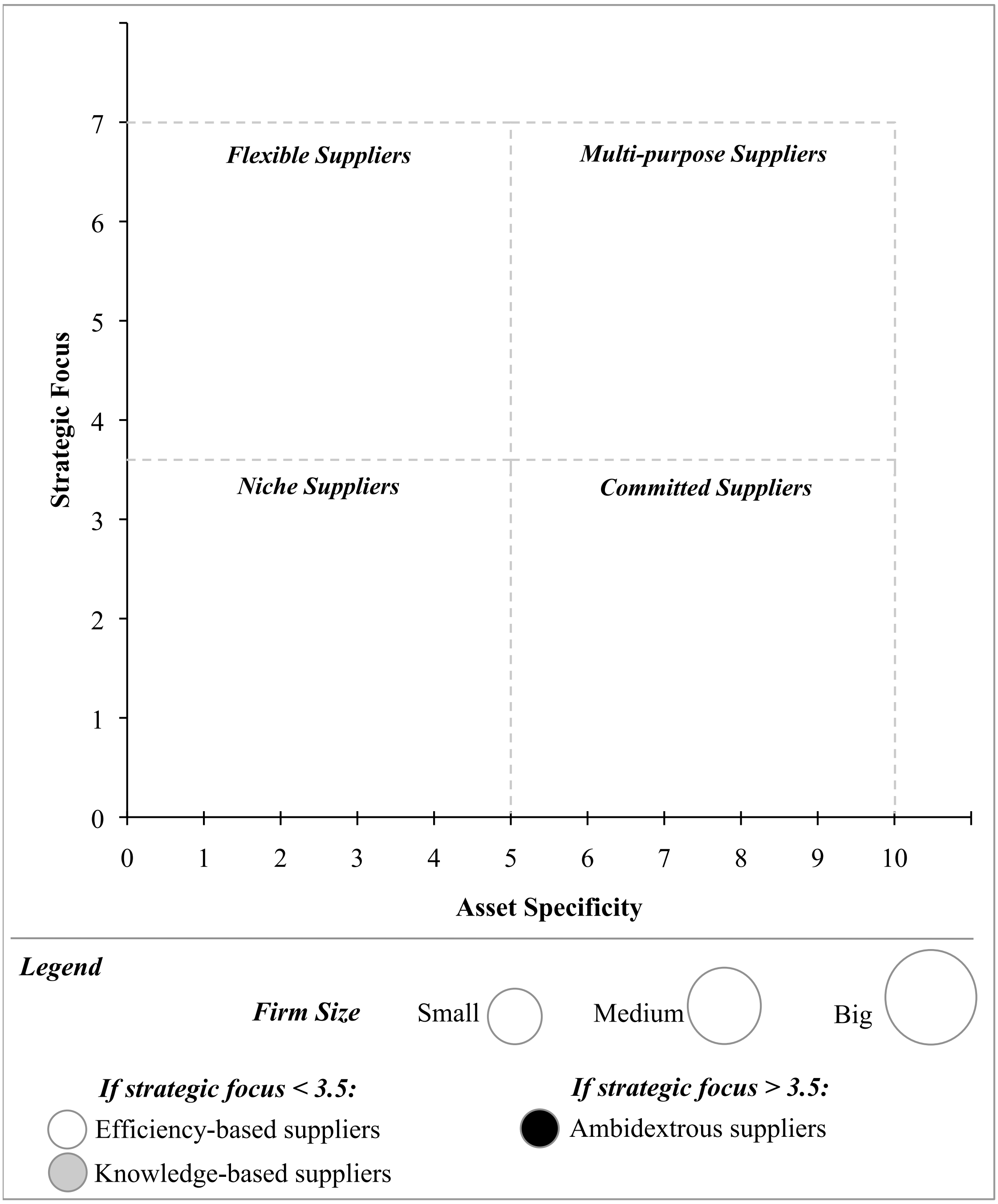
[1] North American Industry Classification System (NAICS) is a number used to specify to which industry a particular company belongs. It replaced the Standard Industrial Classification (SIC) code system in 1997.

observes changes in firm size (represented by three bubble sizes). The two dimensions determine four strategic approaches. However, data revealed the presence of six different strategic approaches, since firms with narrow strategic focus can either be efficiency-based (white bubbles), which means that they concentrate on costs and waste reduction, or knowledge-based (grey bubbles), which indicates that peripheral firms seek continuous innovation both in products and the manufacturing process. We identified four clusters of peripheral firms: (1) Niche suppliers (low asset specificity – narrow strategic focus); (2) Flexible suppliers (low asset specificity – wide strategic focus); (3) Committed suppliers (high asset specificity – narrow strategic focus); (4) Multi-purpose suppliers (high asset specificity – wide strategic focus).

Niche Suppliers

Niche suppliers have low values in asset specificity and strategic focus. The former attribute indicates that these peripheries usually have low engagement in alliance development. The latter may lead to two divergent strategies and, consequently, two types of niche suppliers are identified: knowledge-based or efficiency-based. Knowledge-based suppliers are usually small, have highly educated or skilled human capital, and rare manufacturing delocalization. Their outputs often are beta-version components that core companies require in/for? competitive environments, where competitive advantage is achieved via disruptive innovations. Instead, efficiency-based suppliers are expected to concentrate on high volumes of standardized products. Since cost leadership represents these firms' main competition strategy, innovation activities are mainly related to architectural aspects, and they are aimed at reducing waste and

FIGURE 1
Typology of Suppliers



optimizing efficiency (i.e. business project reengineering). Efficiency-based niche suppliers mostly sell their commodity products to generic customers. Assemblers/buyers select the needed components from a catalogue of standard products. Customization is minimal, or totally absent. However in industries where customization cannot be avoided, supplier engage in customized manufacturing, if customers' orders are big enough to cover personalization costs. Since efficiency is particularly relevant, efficiency-based niche suppliers might undergo off-shoring and outsourcing strategies in countries with lower manufacturing costs. Since standardized production has lower profit margins, efficiency-based niche suppliers struggle to reach the positive effects of scale economies, while knowledge-based niche suppliers do not consider these effects such a relevant aspect. However both types of niche suppliers share the same moderate commitment on nurturing relationships through asset specificity. However, when niche suppliers decide to strengthen one aspect of the supplier-OEM alliance, investments in human capital are the most common option. For example, suppliers engage in dedicated trainings, periods of visiting, and they employ a certain teams of skilled workers to produce for some specific customers only.

Flexible Suppliers

Flexible suppliers are characterized by wide strategic focus and low asset specificity. Their multitasking skills allow them simultaneously to target efficiency and innovation. Flexible machineries, allowing for easy changeover between different production systems, generally support the manufacturing processes. Adopting flexible machinery also implies begin able to offer a wider range of manufacturing possibilities, thus avoiding path dependencies derived from investments in asset specificity. It is crucial for flexible peripheries to explore new technological solutions as well as selecting the most promising ones to start serial production. However, flexible machineries often are more inefficient than dedicated production lines/plants, which might negatively affect time to delivery and manufacturing costs. Flexible suppliers' core capabilities are distinctive skills in innovation selection, which they develop by market seizing (Teece, 2007). The final goal of flexible suppliers is to lead innovation by proposing and establishing new technological standards. To pursue multiple goals, these suppliers adopt both spatial and temporal differentiation, which can be better performed by suppliers that are large (Ethiraj and Levinthal, 2004).

Committed Suppliers

Committed suppliers have high values in asset specificity and low values in strategic focus. Similar examples of these firms have previously been described in literature (Clark and Fujimoto, 1991; Kaufman *et al.*, 2000). They often engage in strong relations with a limited number of customers, whom they leverage in order to jointly develop manufacturing supplies. Physical asset specificity and site specificity are frequent options for committed suppliers, since they force core firms to stick to the partnership. In fact, when core firms participate in capital-intensive joint investments, they have lower incentives toward opportunistic behaviors or frequent supplier switching. Sometimes core firms become so dependent on their strategic suppliers that they decide to partially or totally acquire them in order to have complete control over the manufacturing and innovation processes. After the acquisition, while some suppliers start working exclusively for firms in their group, others maintain their own brand identity and continue to work with previous customers. This strategy is aimed at maximizing profits, increasing production, and saturating the machinery capacity to reach scale economies. High commitment toward relations requires an intense resource involvement – this is why committed suppliers generally deal with fewer customers than niche suppliers and flexible suppliers. They tend to customize their services, which can be either knowledge-based or efficiency-based, depending on the partners' request. Flexible suppliers base their success on relational capabilities (Lipparini and Sobrero, 1994), since a good level of interaction and trust determines equal distribution of relational rents, thus preventing opportunism (Dyer and Singh, 1998; Kale, Dyer and Singh, 2002)

Multi-Purpose Suppliers

Multi-Purpose Suppliers display both high commitment toward asset specificity and wide strategic focus. They are similar to what Clark and Fujimoto defined as suppliers for *black-box parts* (Clark and Fujimoto, 1991), or what Kaufmann *et al.* called *problem-solvers* (Kaufman *et al.*, 2000 : 655). They compete in multi-market environments. Sometimes they are part of conglomerates or engaging in diversification ventures. Multi-purpose suppliers are very significant for core firm strategies, due to their advanced customized service and flexible response to market needs. This is why buyers and assemblers attempt to build strong alliances with them. Multi-purpose suppliers' technological level and independence in design activities allow the core firms to outsource large portions of their work, which reduces design costs, production investments, and capital risks. By delegating to multi-purpose suppliers, core firms can focus on basic design and combination of components for finished products. Also, as suppliers' expertise develops, assemblers obtain higher efficiency with better design quality (Clark and Fujimoto, 1991). Multi-purpose suppliers rely on big scale economies and relevant structural dimensions to attain cycles of continuous product and process innovation. The multi-purpose suppliers' capabilities usually focus on combinative skills, aimed at managing complexity, which is common in multitasking organizations with intense relational activities. Also, multi-purpose suppliers pay great attention to developing absorptive capacity (Cohen and Levinthal, 1990) by leveraging and assimilating knowledge flows between players of the network. Multi-purpose suppliers develop strategic internal functions to monitor and to correct the supplier's diversification portfolio. To avoid *slack of resources,* they stop activities, which generate insufficient added value or profits.

Scholars consider longitudinal approaches a suitable method to understand firms' resource deployment and frame them thorough an evolutionary paths (Leonard-Barton, 1990). This technique is particularly important when scholarship starts developing theory about a new field (Eisenhardt, 1989 : 548). Accordingly, while our typology has developed by critically reviewing of previous literature, we also observe the longitudinal evolution of the four types within an empirical context to attain further theoretical advances. In the next part of this paper, we analyze the evolution of a selected sample of suppliers over a time period of around 65 years. We develop a set of theoretical propositions that confirm the validity of the basic four-quadrants matrix and provide new insights on firms' strategic behavior and its effects on capabilities.

METHOD AND DATA

Sample

Similarly to prior research (Mintzberg, Pascale, Goold and Rumelt, 1996; Pascale, 1996; Wezel, 2005), we decided to develop our contributions analyzing the motorcycle industry. In particular, we have based our research on Italian motorcycle parts manufacturers. Scholars have considered the Italian motorcycle industry as a relevant empirical field to develop theory (Lipparini and Lorenzoni, 2005; Lipparini, Lorenzoni and Zollo, 2001; Muffatto and Panizzolo, 1996) because (1) It is characterized by different types of technologies; (2) Its innovation is developed through a network of strategic suppliers; (3) It is an international hypercompetitive market; (4) It is part of the automotive industry, which scholars have chosen when writing about the relational view (Among others see: Dyer and Hatch, 2006; Dyer and Nobeoka, 2000; Nishiguchi, 1994; Pascale, 1996; Takeishi, 2001). The Italian motorcycle industry is the biggest European network of two wheels vehicles production, and Italy is one of the most important markets in the global motorcycle industry with high national sales and exports. For 2009, official data shows that Italy manufactured 55.49% of a total number of 859,518 vehicles produced in Europe. Italy is also one of the focal areas for innovation development of high-tech motorcycles. Motorcycle manufacturers rely on a small network of local specialized suppliers, and since the majority of big motorcycle firms manufacture and design in Italy, they often share the same peripheries. Takeishi (2001) and Dyer and Hatch (2006), among others, have pointed to the importance of studying situations where competing core firms share the same network of suppliers in order to explain how different governance leads to different performance results.

TABLE 1
Sample of Strategic Suppliers in the Italian Motorcycle part industry

Supplier	Product/Service	Establishment	Multimarket	Nr. of connections	First round of interviews (h)	Second round of interviews (h)	Total interviews (h)
S1	Design and engineering	2002	Yes	7	4	3	7
S2	Brakes and wheels	1961	Yes	37	4	1	5
S3	Mechanical parts	1963	No	10	3	2	5
S4	Carburators and injections	1933	Yes	31	4	3	7
S5	Throttle systems, handlebars	1951	No	44	2	2	4
S6	Electronics	1920	Yes	32	3	2	5
S7	Lights	2001	No	35	3	2	5
S8	Design and engineering	1979	Yes	25	3	2	5
S9	Brakes, frames and wheels	1950	Yes	24	5	2	7
S10	Electronics	1913	Yes	36	5	2	7
S11	Wheels	1988	No	17	5	2	7
S12	Forks and shock absorbers	1949	Yes	30	3	2	5
S13	Engines	1951	Yes	7	5	3	8
S14	Forks and shock absorbers	1945	No	25	4	3	7
S15	Chains	1919	Yes	24	4	2	6
S16	Silencers	1969	No	17	2	3	5
S17	Lights	1969	No	18	3	2	5
S18	Frames	1934	Yes	24	7	2	9
					69	**40**	**109**

We sampled eighteen Italian motorcycle parts suppliers, basing our selection on: (1) Highest market share within the industry (according to official data), (2) Other firms and opinion leaders' suggestions, and (3) Previous studies (Lipparini and Lorenzoni, 2005; Lipparini, Lorenzoni, Ferriani and Aversa, 2009; Lipparini *et al.*, 2001). Table 1 provides the principal characteristics of the firms in our sample.

All of the firms are *first tier suppliers*, which means that they have a direct connection to the assembly firms, to whom they provide finished or semi-finished parts. They manufacture strategic parts of motorcycles (e.g. we consider brakes, frames, electronics to be strategic parts, while we define bolts, batteries, and rear mirrors as irrelevant) or provide some relevant service for the design and manufacturing of the vehicle (i.e. molds production, quality control, design or aerodynamics testing). Furthermore, any supplier's design activity and at least 50% of the manufacturing is located in Italy, and the suppliers deal not only with Italian and foreign customers, but also with customers of different sizes such as (1) *Volume producers*, (2) *Specialist producers* and (3) *Niche specialists* (Muffatto and Panizzolo, 1996).

Data

We developed a longitudinal analysis that covers a period of 65 years (from the end of World War II to the year 2010). We divided this time period into three sub-periods that are determined by the principal turning points of the industry.

t_1: *Establishment of the first integrated network of suppliers* (1950s and 1960s).

t_2: *Entry of foreign firms and introduction of electronics* (1970s and 1980s).

t_3: *Introduction of modern scooters; mergers and acquisitions wave* (1990s and 2000s). For the time period 1945-1960s we mainly found qualitative reports and historical documents. However, from the early 1970s onward we retrieved complete datasets. Hence, we created a collective database that merged the following sources: (1) ANCMA[2] Italian longitudinal database of vehicle registrations (1976-2010), (2)

[2] ANCMA: Italian bicycles motorcycles and accessories manufacturers association.

ACEM[3] European registrations and in use data (1993-2009), (3) ACI[4] Italian vehicle in use per type (1995-2009), (4) World data from national associations of vehicles (MIC, JAMA, MCIA[5]), (5) Various data collected from websites, magazines, trade fair materials, catalogs.

Our research aims at developing grounded theory through direct semi-structured interviews and structured questionnaires, on-site visits, and documental analysis (Eisenhardt, 1989, 1991; Yin, 2008). Leveraging longitudinal data, we offer a process interpretation via theoretical propositions.

Interviews

We developed two rounds of interviews: a set of in-depth, semi-structured interviews (2008-2009) and a survey based on a structured questionnaire (2009-2010). During the first round, we visited and interviewed entrepreneurs and top or medium managers who were in charge of dealing with external production partners, who often are original parts manufacturers (OEM). For the second round of interviews we collected data for our survey (2009-2010). Detailed questionnaires were completed via phone calls to collect mangers' opinions. All of the interviews in both the first and second rounds have been transcribed, translated from Italian to English, and coded simultaneously by three scholars. The coders discussed the sentences until sharing a common interpretation. To avoid over/underestimation biases (Miller, Cardinal and Glick, 1997), we triangulated the coding results with document analysis that included administrative documents and

[3] ACEM: European motorcycles association.
[4] ACI: Italian association for vehicle transportation.
[5] MIC: Motorcycle Industry Council (US). JAMA: Japan Automobile Manufacturers Association. MICA: Motor Cycle Industry Association (UK).

reports, company profiles, catalogues, magazines, newspapers, industry research, previous interviews, and websites. Also, we randomly selected some suppliers' responses and asked partnering firms to confirm what the interviewee had stated. Visits to the production plants helped us to reach a deeper understanding of technologies, innovations, and routines.

Survey, Values, and Scales

In the second round of interviews, we developed a survey, addressed to either two or three top managers (generally involved in R&D, production, and sales departments). Each interviewee compiled three questionnaires, one for each of the three distinct different phases of the motorcycle industry evolution (t_1 1950s-1960s; t_2 1970s-1980s; t_3 1990s-2000s). The collected data helped us to develop our three main dimensions – strategic focus, asset specificity and firm size – defined as follows:

Strategic focus. To measure the width of strategic focus in the supply firms we asked suppliers' managers to self-assess their company's commitment to diverse projects. The questionnaire was based on a seven-item Likert scale (Likert, 1932). We calculated average values of managers' responses for each supplier and confirmed them through the qualitative information we gathered from the semi-structured interviews and the secondary data. Then, we attributed a score between 1 and 7 to every firm at the supplier level, where 1 indicates the adoption of a single-goal strategy, and 7 indicates an equilibrium between a two strategic diverging objectives (e.g. new product development and cost reduction).

Asset specificity. Williamson defines asset specificity as durable investments undertaken in support of particular transactions (Williamson, 1985 : 55). According to Nishiguchi (1994) asset specificity might involve tangible resources such as plants, production lines, machineries, moulds, as well as intangible resources such as human resources, patents, inventions, and knowledge sharing routines. One of the motivations that lead firms to engage in dedicated investments is, among others, the acquisition of new knowledge and capabilities (Dyer and Singh, 1998). As scholarship from transaction costs economics has underlined, asset specificity breeds trusts and helps to avoid opportunism between partners (Williamson, 1975, 1979). In this work, we consider asset specificity as transaction-specific R&D investments that aim at enhancing the relational quality with some selected OEMs. Former studies have demonstrated how relation-specific skills developed between suppliers and their automakers generated surplus profits and competitive advantages for collaborating firms (Asanuma, 1989b; Dyer, 1996a). Since asset-specific investments are not specified in balance sheets, we asked managers to assess their value on a 1-10 scale. We calculated the average value of managers' response and transformed them in a synthetic index (scale 1-10).

Firm Size. We monitored changes in firm size through sales. Although competing in the same industry (i.e. motorcycle components) firm sales in our sample are not directly comparable, due to the suppliers' different nature. For example, comparing sale results of a brake manufacturer with the sales of a company offering services in aerodynamic shield design would be clearly misleading. Accordingly, we benchmarked each sales value with at least three other firms (in the industry worldwide) competing in the same product business. We collected data at t_1, t_2, and t_3. Then, we compared each firm sales to the sale results of at least three other firms (in the industry worldwide). We calculated the average value in terms of sales in the time range. When the firm performs lower than 30% of the average value in the product business, we define it as “small”; when it performs over 30% of the average value we define the firm as “big”; otherwise we define it as “medium”.

Figure 1 represents the basic matrix that emerged from our dimensions. The Y-axis reports strategic focus values; the X-axis shows asset specificity values. The three progressive bubbles explain the suppliers’ change in size from “small” over “medium” to “big”. When suppliers have less than 3.5 as their strategic focus value, it means that they are focused on a single activity. When a supplier has fewer than a strategic focus of 3.5, is focuses on efficiency, we have represented with a white bubble, while when a supplier has fewer than a strategic focus of 3.5, is focuses on knowledge, we have represented with a grey bubble. With a value of strategic focus over 3.5, suppliers are considered ambidextrous (black bubbles). With this data we have built a set of matrices, which represents iterative tabulations to compare the intensity of the peripheries’ strategies with the multiple case studies (Eisenhardt, 1989 : 541).

SHORT HISTORY OF THE ITALIAN MOTORCYCLE INDUSTRY

As several studies have pointed out, the motorcycle industry is an interesting research field for observing intriguing competitive dynamics and consequently for developing theories (Lipparini and Lorenzoni, 2005; Lipparini *et al.*, 2001; Mintzberg *et al.*, 1996; Muffatto and Panizzolo, 1996; Pascale, 1996; Wezel, 2005). In this work we define diverse types of vehicles as follows: A *motorcycle* is a motor vehicle of any engine capacity, excluding cars or commercial vehicles. A *motorbike* is a two-wheeled vehicle with relatively big wheels, multiple-gear engine, which requires a riding position of the driver. A *scooter* is a two-wheeled vehicle with relatively small wheels, a single-gear engine, and front shield, which permits a seated position of the driver. A *moped* is a low-powered motorbike, with maximum 125cc engine, relatively light chassis, no front shield or extended plastic fairings, which allows for a seated position of the driver.

The Italian motorcycle industry has one of the oldest traditions in motorcycle manufacturing and it is one of the most dynamic markets worldwide, representing a challenging environment for OEMs. Over the last 50 years, some Italian producers "disappeared" (e.g. Italjet). Some restarted after long inactivity, sometimes after being acquired by groups (e.g. Moto Guzzi, MV Agusta), and others redefined their product portfolio (e.g. Laverda, Benelli). Some local brands continuously competed in the market (e.g. Piaggio, Aprilia, Ducati, Malaguti), although they struggled to challenge foreign manufacturers, who enlarged their presence in Italy by establishing new plants and R&D centers (e.g. Honda), acquiring local firms (e.g. Harley Davidson over MV Agusta, sold again to the previous owners in August 2010), importing products (e.g. Triumph) or heavily relying on the local supply network (e.g. KTM, BMW). Over the years, local firms developed a wide spectrum of hardly-replicable capabilities and assets. The growth of a technology-specific industry – especially after World War II – favored the establishment of a network of specialized firms to supply motorcycle manufacturers. Most of them started as independent workshops, leveraging technical knowledge that their founders had absorbed working in core firms. Especially after the

1950s, the progress of technology and the increasing complexity of production led manufacturers to rely on the expertise of local suppliers. As a result, motorbike and scooter producers turned into knowledge integrators (Brusoni et al., 2001; Grant, 1996a; Pisano, 1994), turning diverse technological parts into a comprehensive architectural design (Henderson & Clark, 1990). Whereas big assemblers have developed internally some of the core capabilities and manufacturing processes (engines, power-train, and aerodynamics) in recent years, the smaller ones have tended to outsource also strategic activities to specialized suppliers. As a result, peripheral firms manufacture the majority of the components and foster innovation, while core firms coordinate in-house and outsourced design activities (Clark & Fujimoto, 1991; Clark, 1989). The presence of a technologically advanced supply network remains a distinctive feature of the Italian motorcycle industry. Our interviews show how the highly developed network of suppliers constitutes a strong point for the local assemblers and represents one of the biggest attractors for foreign investment. The fact that most of the global motorcycle manufacturers sought commercial partnerships with a limited number of parts producers led to an overlap of collaborations between OEMs and suppliers. Similar to what has happened in the Japanese automobile industry (Dyer and Hatch, 2006; Takeishi, 2001), motorcycle producers in the Italian industry benefit from cooperative relations with suppliers that also work for their competitors. To avoid opportunism, local firms develop specific alliance capabilities (Lipparini *et al.*, 2001), thus fostering trust through intense interactions. Hence, it is crucial to consider relational activities to understand the role of the strategic peripheries, especially because the suppliers' innovation capability is developed through the interaction with core firms. Prior studies have shown how competence-destroying technological changes often modify the competitive forces that rule the industry and challenge the survival probability of the firms. Scholars have demonstrated that, for example, in the typesetter industry (Tripsas, 1997), the photolithographic alignment system industry (Henderson and Clark, 1990), and the aircraft engine control system industry (Brusoni *et al.*, 2001) technological trajectories underwent radical shifts following the path of a *punctuated equilibrium* – which develops through radical innovations (Romanelli and Tushman, 1994). Along these lines, we divide the historical development of the motorcycle industry into three consecutive periods that are related to revolutionary changes in technological standards (Kuhn, 1970). Radical innovations (1) affected the structure of the market, (2) nurtured introduction of new modular products and (3) forced firms to redefine their competitive behavior through evolving sets of dynamic capabilities (Teece, Pisano and Shuen, 1997).

THE EVOLUTION OF PERIPHERAL FIRMS THROUGH A NOVEL TYPOLOGY

Our study analyzes the development of the Italian motorcycle industry over a period of 65 years, which we divide into three phases marked by technological turning points. For each of these phases, we have measured values of asset specificity, strategic focus, and firm size for every competing supplier. These measures observe the quality of suppliers' relational capabilities. We have developed a set of theoretical propositions aimed at understanding the peripheries' role, competitive behavior, and capabilities. The results on our assessments at t_1, t_2 and t_3 are reported in table 2.

TABLE 2
Values of Asset Specificity, Strategic Focus and Firm Size at t_1, t_2 and t_3

	Asset Specificity			Strategic Focus			Firm Size		
Supplier	t_1	t_2	t_3	t_1	t_2	t_3	t_1	t_2	t_3
S1	n.a.*	n.a.*	2	n.a.*	n.a.*	1	n.a.*	n.a.*	1
S2	2	6	8	2	4	6	1	2	3
S3	4	6	9	1	1	2	1	1	2
S4	3	4	6	4	4	5	2	2	3
S5	2	2	2	1	2	4	1	1	2
S6	4	6	9	4	5	5	2	3	3
S7	n.a.*	n.a.*	6	n.a.*	n.a.*	2	n.a.*	n.a.*	2
S8	n.a.*	8	4	n.a.*	1	1	n.a.*	1	1
S9	1	3	4	3	5	5	2	3	3
S10	5	8	9	5	6	7	3	3	3
S11	n.a.*	1	3	n.a.*	2	4	n.a.*	1	2
S12	6	7	6	2	2	1	2	2	2
S13	3	3	8	2	3	3	1	2	3
S14	2	2	2	3	4	3	1	1	2
S15	1	1	1	1	1	2	1	2	2
S16	n.a.*	3	3	n.a.*	1	3	n.a.*	1	2
S17	n.a.*	7	7	n.a.*	2	2	n.a.*	1	2
S18	2	7	9	2	3	4	2	2	3

***n.a. = non active at t_n**

t1 - Establishment of the First Network of Suppliers (1950s and 1960s)

FIGURE 2
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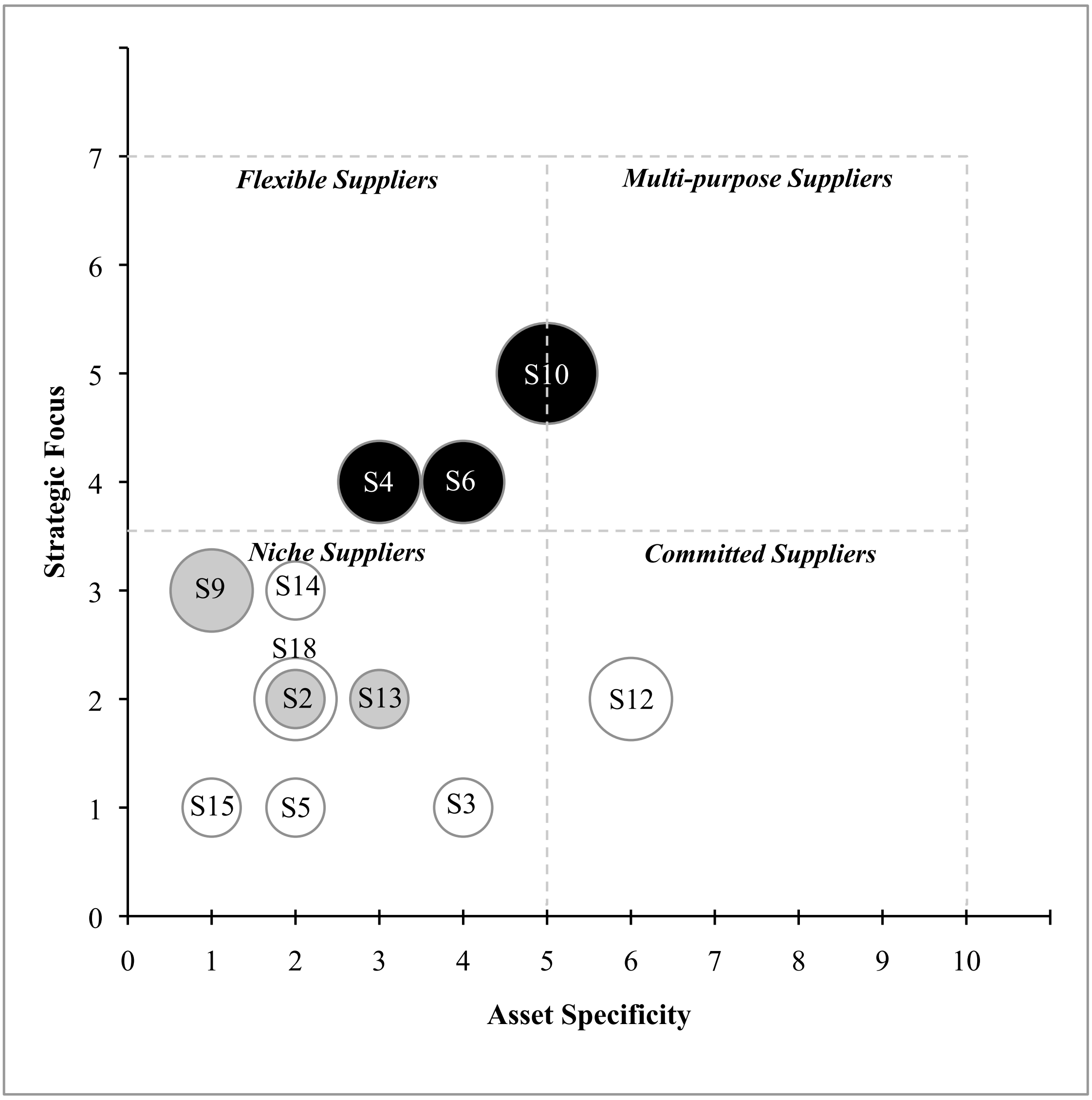


Our first examination of the Italian motorcycle industry covers the 1950s and 1960s. We also considered, when available, relevant insights from the end of World War II (1945). We decided to omit from the analysis of t_1 all those companies that began their activity in 1969 (i.e. S16 and S17) as the data was only related to the first year of start-up activity.

After World War II, the majority of Italian population faced a great need for mobility despite the generally low spending capacity. Two-wheel vehicles and cheap low-powered cars – such as the Fiat 500 – constituted an affordable option. In the motorcycle industry, a network of suppliers emerged to support motorcycle OEMs (e.g. Ducati, Piaggio, Guzzi). Low-capacity motorbikes (up to 250cc) with light frames, 50cc mopeds, and some basic scooters, like the legendary "Vespa" by Piaggio, became especially popular. Suppliers started mainly as independent workshops, where some skilled mechanics, often helped by a small number of co-workers, developed the first serial part productions. Most suppliers focused their capabilities on manufacturing single components or partial assemblies (e.g. S10). In other cases – just like it happened for S2 and S12 – the entrepreneur had previously worked for an automotive firm. Spinning off the core firm, they exported skills and capabilities into their new entrepreneurial firms. The brain drain from the motorcycle companies and the consecutive development of specialized technical skills around single parts started a migration of capabilities that shifted the locus of innovation (Pisano, 1994; Powell *et al.*, 1996) from the core to the periphery of the network.

Figure 2 shows the situation of suppliers at t_1. All of the firms are small or mediu-sized, with the exception of S10. The common small size is due to (1) Young age of suppliers (especially in the niche area), (2) Common undercapitalization of Italian firms (especially in the post-war period) and (3) Relatively low market demand. In addition, OEMs developed most of the components in-house. The supply network played a minor role because the simple product architecture still allowed core firms to design almost the entire vehicle with little effort. Overall, the motorcycle market was not competitive yet.

This situation was due to the long average product life cycle (over 5 years), the limited number of big local competitors (European producers were few, Japanese and Asian competitors completely absent), the longer time-to-market for vehicle product design (about four years), and the low technological complexity (pure mechanics and no electronics). Since the importance of peripheries is higher when the competition between cores is intense, suppliers played a minor role in this period.

Figure 2 shows a concentration of firms in the area of *niche suppliers*. Suppliers with a low level of strategic focus (< 3.5) concentrate either on efficiency-based (white bubbles) or knowledge-based activities (grey bubbles). Firms specialized in cost cutting (S3, S5, S14, S15, S18) are more numerous than the ones concentrating on technological activities (S9, S2, S13). Two reasons justify this. First, it is easier to develop efficiency skills when there is no previous tradition of knowledge activities. Cycles of continuous innovations, R&D centers, and dedicated knowledge workers are strategic assets that require an extensive use of resources and the establishment of routines. While knowledge resources (e.g. patents, design sheets, prototypes, machineries) can be easily transferred or acquired, the recombination of assets through capabilities represents an idiosyncratic process that is often embedded in organizational routines and tacit knowledge (Helfat and Peteraf, 2003). Second, low investments in asset specificity correlates with less intense interactions between suppliers and assemblers. Since literature posits that inter-firm relations are a source of competitive advantage (Lorenzoni and Lipparini, 1999) and that the firms with a higher relational capability are able to outperform competitors in fostering innovations (Owen-Smith and Powell, 2004; Powell and Brantley, 1992; Whittington, Owen-Smith and Powell, 2009), firms that do not invest in building relations are more likely to adopt strategies based on cost cutting and manufacturing optimization. Although efficiency is less relevant during the start-up period, in the early years of standard activity, suppliers' are concerned about efficiency when no prior relational assets are available. This leads us to the first theoretical proposition:

Proposition 1. *Ceteris paribus, suppliers are likely to focus on efficiency-based strategies in the first phase of business, when they cannot leverage former stratifications of relational resources and capabilities.*

Despite the prevalence of efficiency-based firms, three of the *niche suppliers* are mainly dedicated to knowledge-based activities (S2, S9, S13). While S2 and S13 manufacture brake systems, S13 is a traditional designer and manufacturer of engines. In the architecture of two-wheel vehicles, brakes and engines are among the most important parts, because they are often customized on the assemblers' requirements and are distinctive vehicle features. Also, the structure of these parts usually affects other parts' design. For example, frames are commonly designed after defining engine size and volume, and not vice versa. Hence, suppliers who manufacture critical components have more influence on the finished product design and performance. Due to this structural relationship, assemblers consider these suppliers critical. Because vehicle design is adapted to critical parts design, critical suppliers are able to explore technological solutions and suggest more innovations. This is why we affirm that critical suppliers have a higher potential for experimentation and, therefore, innovation.

Proposition 2. *Ceteris paribus, critical suppliers have higher potential for experimentation and, therefore, innovation.*

S4, S6 and S10 are larger than the other firms due to a longer presence in the market, which allowed them to improve their commercial network, maximize production, and enlarge strategic focus. Since efficiency is connected to large production scales and innovation is usually fostered by investment in asset specificity, firms must engage more managerial and economic resources to sustain growth. Consequently, the widening of strategic focus at the peripheral level correlates to firm size growth. The supplier S12 is the only one that at t_1 is in the area of *committed suppliers*. The two entrepreneurs acquired their skills during a previous work experience at Ducati. They collaborated with their former employer as soon as they established their company. The opportunity to derive a positive set of collaborations from spin-off activities, based on shared experience, acted as a trigger for a capability in alliance management and knowledge absorption (Lane and Lubatkin, 1998). The emerging *corporate coherence* (Teece, Rumelt, Dosi and Winter, 1994) between the supplier and the assembler determined an increase in relational skill. Quotes from our interviews confirm this claim:

"We have developed the best collaborations when two aspects were present. First we have to trust the other part. Trust is not merely related to contracts; common values, common ideas, and most of all common knowledge are fundamental. We must somehow talk the same technical language, share the same code, and have a similar vision for our goals. If the communication doesn't work, the understanding doesn't work, and consequently the output can be inferior to our expectations. Second, we tend to build special relations with customers that have worked with us for a long time. [...] For some customers, like BMW or Ducati, we have built dedicated production lines, trial

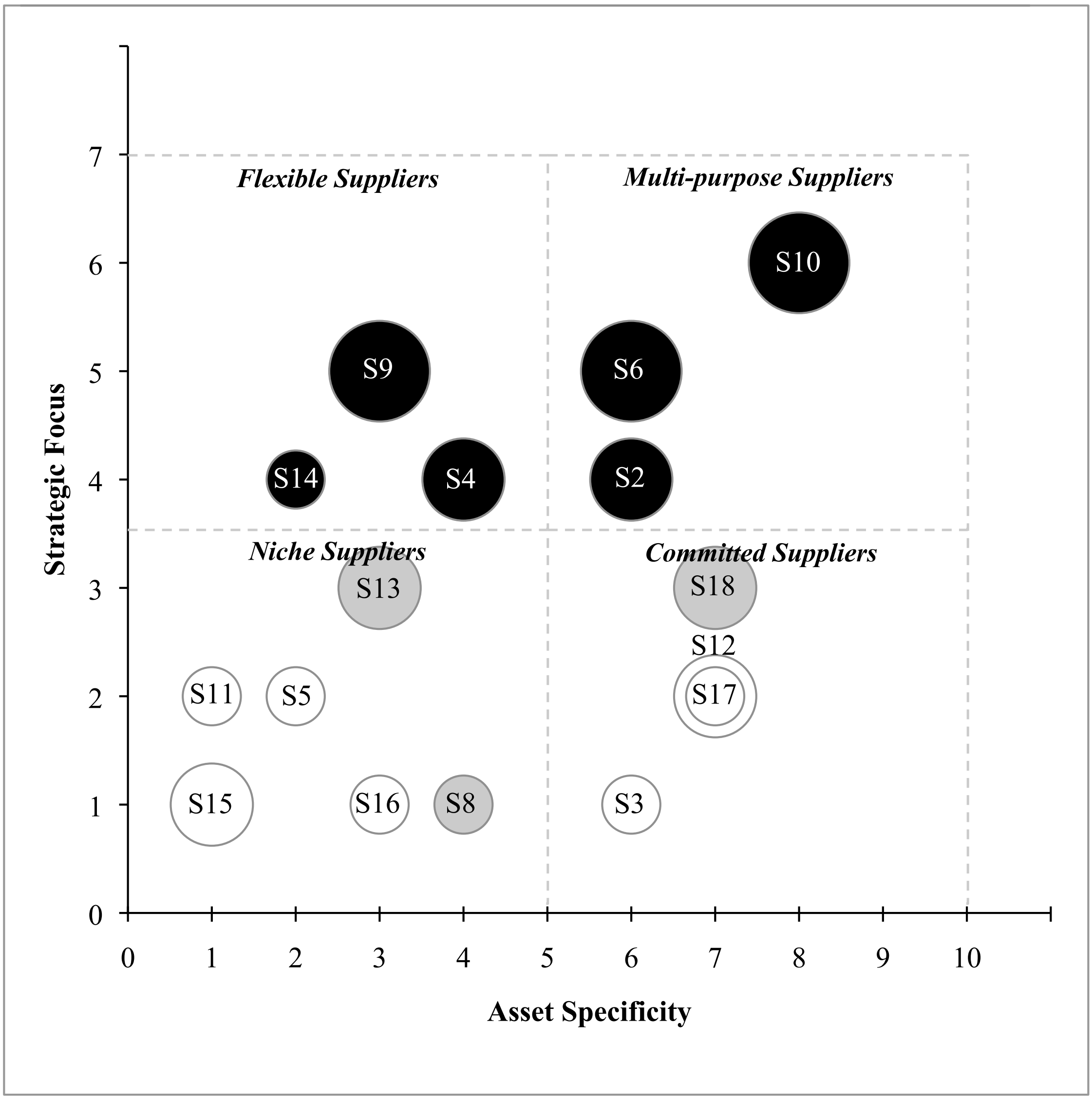
centers, and we trained human resources that work exclusively for them". (S12 Technical Director)

This inherent relational capability is represented by the S12's proactive commitment for asset-specific investments. According to prior studies (Lane and Lubatkin, 1998; Szulanski, 1996), characteristics of the learning relationship affect the firms' performance. However, while relational view scholars have stressed that sharing competences in an alliance improves the core firm's performance (Lorenzoni and Lipparini, 1999), the peripheral view turns the perspective upside down confirming that it positively influences the supplier's relational capabilities as well. Since scholars have demonstrated that superior inter-firm relational capabilities lead to higher performance, we can affirm that:

Proposition 3. *Ceteris paribus, sharing common competences between supplier and assembler positively affects the supplier's relational capabilities and, therefore, performance.*

t_2: Entry of foreign firms and introduction of electronics (1970s and 1980s)

FIGURE 3
t2 - Entry of foreign firms and introduction of electronics (1970s and 1980s)



The second key period of our analysis focuses on the two decades from the beginning of the 1970s to the end of the 1980s, in which two major phenomena changed the competition within the industry. The first is the arrival of foreign motorcycle producers. From the beginning of the 1970s, big international manufacturers (from Japan, Europe and the United States) started to recognize the Italian market's potential.

The increasing presence of international assemblers accelerated the already fierce internal competition. The majority of foreign firms simply started to export their vehicles to the Italian market. However, they soon realized that they needed stronger assets to brave the relentless rivalry with local manufacturers. Hence, the commercial structures turned first into strategic supply points and later into R&D centers. Some firms (e.g. Honda, Yamaha) established manufacturing plants and developed their own supply networks. For example, in 2010 Honda supply network (CISI) involved 18 suppliers and about 920 employees, with a turnover of around $180 billions per year (according to official Honda reports). The OEMs knew that the innovative capabilities embedded in the local Italian industry were a profitable opportunity to foster their competitiveness in Europe as OEM managers' quotes show:

"Of course, the most important reason why Honda decided to come to Italy was related to the relevance of market sales. But the decision to convert a commercial structure into a production plant and an R&D center was motivated by the fact that we wanted to create motorbikes in a place where we could benefit from the positive effects of a strong tradition and passion for two-wheel vehicles. (...) The possibility of accessing specific know-how about components also influenced our decision. There are other places in the world where motorcycles have a long history and are widely used. But a concentration of competence, like the one we have found in Italy, is almost unique". (Honda Italy, Communication Manager)

Newcomers – such as Honda, Yamaha, BMW, and Harley-Davidson – increased the level of competition between core firms, but at the same time fed the local suppliers with higher production volumes and new technological challenges. For example, while the US and European producers benefitted from the local competence in heavyweight motorbike design, the Japanese fostered the development of lightweight vehicles, the use of plastics, and the adoption of electronic systems. The latter aspect caused the second most relevant change at the peripheral level. Until the late 1960s, the electrical components in two-wheel vehicles were limited to basic devices such as batteries, ignition systems, spark plugs, and head and tail lights. Instead, from the early 1970s onward, core firms and peripheries started to develop the first electronic control units (ECU) used to drive and control the electrical systems together with the other subsystems in a motor vehicle. The introduction of ECUs was a radical innovation since it redefined the design of the second-generation engines (the injection systems almost totally substituted the carburetors by the late 1980s) and, becoming a new technological standard, it progressively involved all the players in the supply network. As a consequence, the entire vehicle architecture underwent structural changes and peripheral firms had to cooperate with assemblers to realize them. Similar to what Brusoni, Prencipe and Pavitt recorded regarding loosely coupled networks of suppliers in control systems for aircraft engines (2001), core firms combined suppliers' modular knowledge. The diffusion of technical knowledge through the network empowered the suppliers, who introduced the highest number of innovations at the sub-components level in those years. To exploit this abundance of innovation, all of the motorcycle manufacturers doubled the number of product versions in their portfolios.

Figure 3 depicts supplier positioning in these two decades. Comparing the matrix in t_2 with t_1, data shows that four new firms have enriched the strategic network of peripheries: S8 (design and engineering, est. 1979); S11 (wheels, est. 1988); S16 (silencers, est. 1969); S17 (lights, est. 1969). The emergence of suppliers involved in critical activities (design and engineering) is due to the increasing product complexity that pushed OEMs to outsource their strategic activities. Also, it demonstrates that the locus of innovation has shifted from the core to the industry's periphery (Lipparini *et al.*, 2009; Lipparini *et al.*, 2001), both for single components and architectural design. Quotes from our interviews highlight that the 1973 oil crisis focused people's attention on fuel consumption, which highly influenced motorcycle manufacturing. To increase efficiency, OEMs started a progressive optimization of ECUs and aerodynamics. Designing the shape of motorcycles was no longer a mere matter of styling and aesthetics, but a technical process that implied new engineering capabilities and dedicated investments to tools and machinery (e.g. wind tunnels). Also, to reduce vehicles' weight, firms increasingly used plastics instead of metals. At that time, most motorcycle manufacturers believed that leveraging the market to access these capabilities was the best option. The fact that OEMs rely on specialized suppliers refutes the Transaction Cost Economics (TCE) (Williamson, 1985), which affirmed that firms tend to internalize complex activities in order to attain more control in crucial processes. However, evidence in our field has shown that the development of strong ties, built through suppliers' relational capabilities, counterbalanced OEM's need for control. The overall picture we have provided leads us to the fifth proposition:

Proposition 4. *Ceteris paribus, suppliers' specialization and relational capabilities positively affect assemblers' tendency to outsource complex critical processes.*

The second phenomenon comparing the typologies at t_1 and t_2 is a more homogeneous spread of suppliers along the different strategic areas. From an initial dense presence of *niche suppliers* (t_1), we have recorded at t_2 a more balanced presence among the four quadrants. The matrix shows six *niche suppliers,* three *committed suppliers*, three *flexible suppliers*, and three *multi-purpose suppliers*. Over the first twenty years, industry sales flourished and the stabilization of the core firms helped suppliers to analogously stabilize their presence as well as their cash flow. The firm failure rate in the industry almost reached zero. Indeed, none of the firms in our sample ceased their activities and or decreased in size – five of them actually grew. The suppliers' excess of resources due to positive environmental conditions have partially been used for strategic activities, which first increased the awareness of their own competitive positioning and then helped the firms to reach a more consistent market position. Peripheries sought their own niche in free interstices of competitive spaces – that are managers' "mental maps" defining who is seen as a competitor (D'aveni, Gunther and Cole, 2001 : 10), which increased heterogeneity among peripheral firms. As D'Aveni and Gunther have found, by moving into each competitive area and acting to create a new advantage or to undermine a competitor's new advantage, the firm seizes the initiative. This contributes not only to a better definition of their own position, but also to throw the competitor temporarily off-balance (D'Aveni and Gunther, 1994 : 250). This homoeostatic adaptation within competitive spaces, the positive economic situation and the growth of the market demand due to new entrants at the assembly level created the most favorable environment ever for Italian suppliers. The technological innovation rate at the component level increased and inter-firm cooperation became a standard requirement for each part of the network. Firms involved in the manufacturing of critical components – such as electronics or engines – had to rely on intense interactions to integrate ECUs into the engine system.

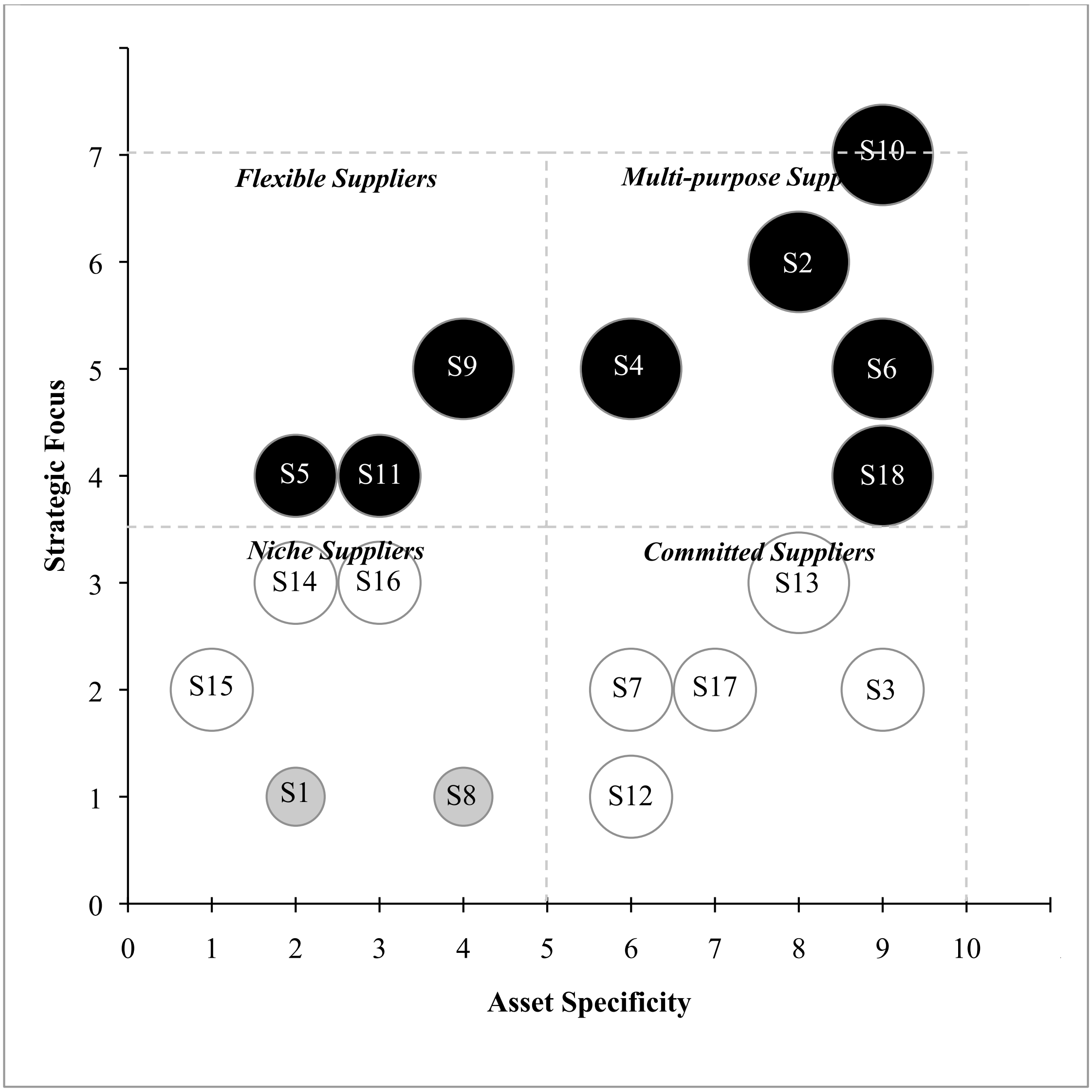
"Our people started to cooperate with other suppliers when a big motorcycle manufacturer required us to integrate our mechanical skills with the ECU unit provided by [supplier's name omitted – S10]. Before that moment we used to work only with our customers. We started to meet the [S10]'s technicians at the customer's plant. Then, when the meetings became more frequent, we felt the need to be independent. So we started to invite the people of [S10] to our labs, where we equipped a specific testing area for our shared projects." (S13 Technical Director)

Although the general peripheries' growth due to excess of resources is in line with Penrose's results (1959), it did not foster the expected diversification. Suppliers leveraged their profits to stress specialization by increasing their investments in technology and in asset specificity, which aimed at reinforcing relationships with OEMs. We summarize these specific peripheral firms' characteristics as follows

Proposition 5. *Ceteris Paribus, positive market conditions and excess of internal resources foster specialization and relational investments at the supplier level.*

t_3: Introduction of Modern Scooters; Mergers and Acquisitions Wave (1990s and 2000s)

FIGURE 4
t_3: Introduction of Modern Scooters;
Mergers and Acquisitions Wave (1990s and 2000s)



The last time frame explains the dynamics of two decades from the early 1990s until today. The introduction of a novel scooter concept radically changed the global market for two-wheel vehicles. The first “Vespa” (invented in 1946) had a light frame, a manual-geared low-power engine – usually no larger than 120cc –, and a chassis with metal front shield. During the late 1980s, OEMs started to design a new generation of scooters, trying to build a vehicle that was easy to drive and to repair and cheap to manufacture. Low consumption was also a major concern. Consequently, the new scooter maintained small capacity engines, small wheels, and front shields, while the chassis was mainly made of plastics and the gear system changed from manual to automatic. At the same time, core firms kept relying heavily on external partners to develop shields that provided efficient aerodynamic cover and appealing design. The start of the new scooter segment increased sales of vehicles and components. Since scooters are marketed as “cheap” vehicles, the suppliers consequently have to push for bigger sale volumes and higher efficiency to satisfy core firms’ requests. Hence, all suppliers in our sample grew in size (the matrix presents seven big and nine medium peripheries), and almost all of those with narrow strategic focus engaged mostly in efficiency-based activities (eight suppliers out of ten). S1 and S8 are the only two suppliers with narrow strategic focus that remained small and continued pure knowledge-based activities, such as top-quality design or costumized engineering for core firm projects. To improve vehicle efficiency, motorcycle producers supported technological development of the ECU, which culminated with the adoption of the electronic fuel injection (EFI) in the early 1990s. The EFI further increased the complexity of the vehicles’ design, and required an additional intensification of cooperation between cores and peripheries as well as between different suppliers. In the late 1990s, scooters became not only an urban means to avoid traffic congestion on short distances, but they also turned into all-purpose vehicles. To guarantee sufficient power train for highways and longer journeys, OEMs started to increase the engine capacity, which progressively moved from the traditional 50cc up to 750cc. Chassis became stronger and plastics were tested to travel at higher speed. Overall, scooters became increasingly similar to the motorbike concept, until they even adopted some typical motorbike sub-systems such as brakes, catalytic converters, and high performance shock absorbers. Moreover, Italian suppliers' innovation capabilities supported assemblers in groundbreaking projects. For example Bertone, a design and engineering supplier based in Turin, coordinated the BMW's C1 project, which developed the first enclosed scooter that pioneered in featuring some of the traditional car accessories such as anti-lock brakes (ABS), intelligent audio system (volume linked to speed), interior reading light, heated grips and sun roof. Zander and Kogut previously affirmed that "the ability to improve a product […] rests on the recombination of already learned skills" (Zander and Kogut, 1995). Along these lines, the interaction among professional networks, which leveraged their shared relational capabilities to transfer new technical skills, attained new technologies and products. In the Italian industry, the physical proximity of the main participants, the stratification of common knowledge and the embeddedness in a professional community that operates as a *community of practice* – defined as "groups of people informally bound together by shared expertise and passion for a joint enterprise" (Wenger and Snyder, 2000 : 139) – fostered product innovation through the recombination of internal capabilities and shared knowledge. However, while former studies described the positive effects of recombination and relational capabilities on core firms' rents (Dyer, 1996a; Dyer, 1996b), we can affirm that they positively affect supplier firms as well. These empirical and theoretical arguments support our seventh proposition.

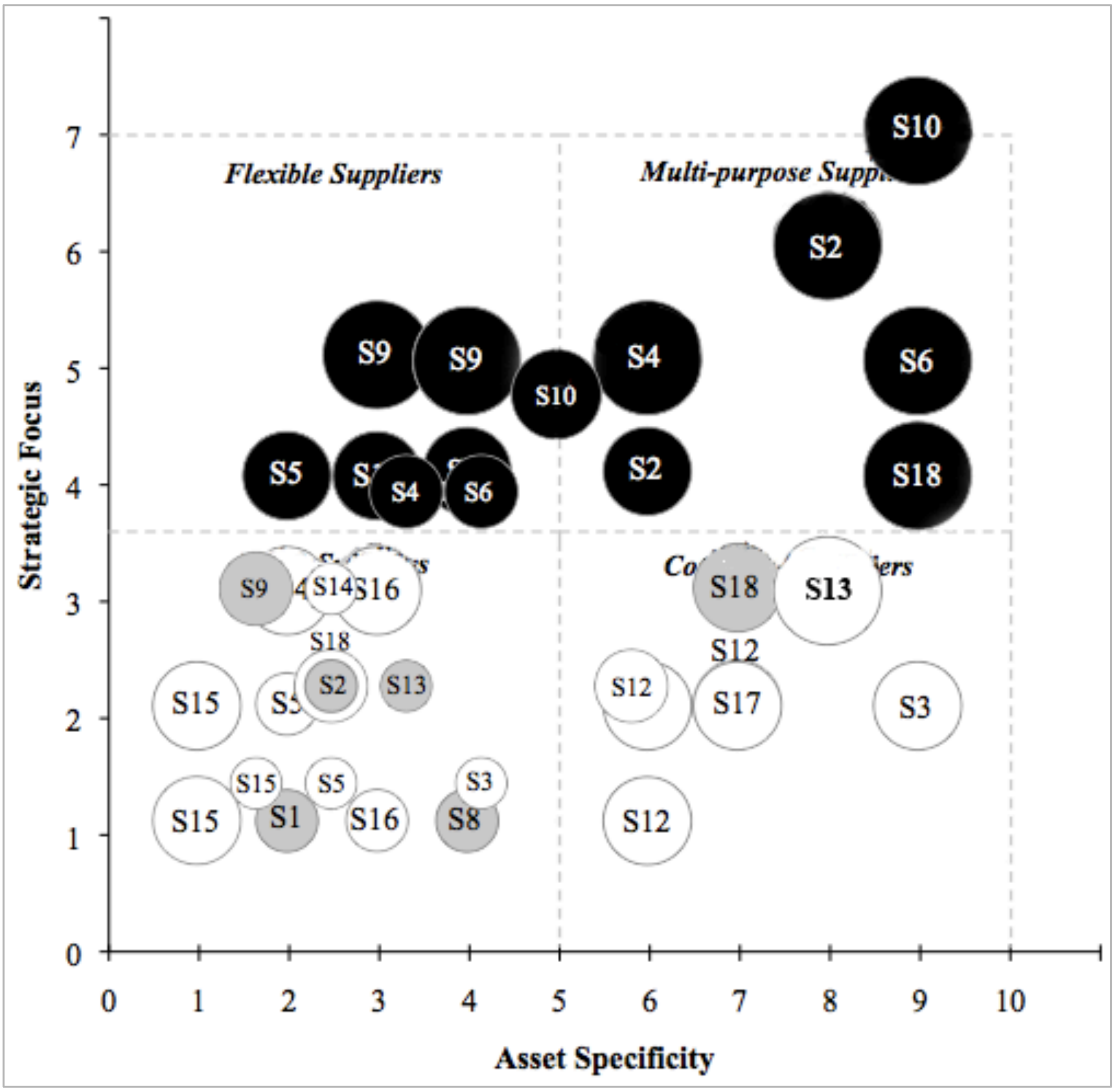
Proposition 6. *Ceteris paribus, the embeddedness of suppliers in communities of practice fosters both supplier and assemblers' innovation, through the recombination of suppliers' internal capabilities and shared knowledge.*

A wave of mergers and acquisitions (M&A) also characterized period t_3. Peripheral firms pursued rapid growth via M&As for several reasons. First, to grow in size and, therefore, access more resources to satisfy market demand. Second, to improve efficiency through higher production scale. Third, to attain complementary resources and capabilities. Since suppliers needed to increase efficiency, partnerships, acquisition and joint ventures aimed at reducing manufacturing costs. For example, partnership firms could develop production plants in emerging countries, enhancing capabilities, and decrease default risk. For example, S2 acquired 70% of S11's shares in 2000, raising their shares to 100% in 2002. Honda acquired S3 in 1988, enhancing the asset specificity investment, which explains the shift from 6 (t_2) to 9 (t_3) in the x-axis. Also Tenneco, a U.S. multinational group acquired S12 in 2008, providing capital and new shared expertise. The output of these activities is reflected in a general increase in size depicted in the matrix. In light of the foregoing evidence, we suggest the following proposition:

Proposition 7. *Ceteris paribus, assemblers' focus on efficiency-based strategies and high-scale production positively influence suppliers' tendency to engage in mergers and acquisitions.*

The last relevant phenomenon at t_3 is related to *multi-purpose suppliers* that followed a common growth trend over the years. All of the multi-purpose suppliers grew through diversification in different but complementary industries. Also, all of them started to supply the automobile industry, which is the closest alternative for firms in motorcycle manufacturing. Interviews confirmed that corporate diversification enhances the diffusion of best practices throughout the organization, and promotes the enhancement of complementary capabilities aimed at fostering innovation.

FIGURE 5
Overlap of periods t_1 t_2 t_3



"We started supplying BMW with motorcycles parts. When BMW asked us to develop some projects for their cars (...) we started to systematically codify all our processes, and we intensified our patenting activity. Also, when we first started the production, we placed the car production lines and the motorcycle ones in different sheds. Then BMW suggested to reposition the lines by customer, and not by industry. We tried it and noticed how people of the two lines started to help each other to solve little problems (like interruptions) on the production flow. Their competencies were somehow complementary and the experiment worked, so we decided to keep it that way". (S4 Production Director)

In figure 5 we have compared the results that emerged from the three different time periods to identify some potential trends. The comparison displays suppliers' tendency to move to multi-purpose positioning following two main directions. They either first increase strategic focus followed by an increase in asset specificity, or *vice versa*. Building on prior research, we have affirmed that strategic focus is a proxy for operational flexibility, while asset specificity is a proxy for relational capabilities. Accordingly, evidence shows that suppliers cannot develop these two capabilities at the same time. Results are consistent with previous research affirming that small organizations usually struggle to develop high levels of ambidexterity at the same time (Gupta, Smith and Shalley, 2006). Accordingly to Ethiraj and Levinthal (2004 : 3), suppliers rely on a "myopic strategy" such as *temporal differentiation*, which means a focus on a single goal, while allowing this goal to vary over time. Hence, peripheries focus on one objective and add another one when the first one is achieved. Evidence leads us to the final proposition:

Proposition 8. *Ceteris paribus, suppliers develop relational and operational capabilities sequentially, relying on temporal differentiation strategies.*

CONCLUSIONS

Our paper contributes to the *"peripheral view of the network"*, a theoretical perspective fostering a specific analysis of suppliers in manufacturing systems. Among several studies that examine the *"relational view"* (Dyer and Singh, 1998), only few papers have dedicated specific attention to suppliers - or "peripheral firms" – and their contribution to buyer/assembler's competitive advantage. Difficulties in retrieving extensive data about suppliers, which are often small and privately owned companies, possibly discouraged scholars from investigating these actors. Yet, these supply firms are nonetheless the new innovation loci for several industries (Gatignon *et al.*, 2002; Powell *et al.*, 1996). Hence, a significant question has remained unanswered: *what drives peripheral firms' competitive advantage?* Through an extensive review of the literature concerning the relational view (Dyer and Singh, 1998), we have proposed a novel typology that contributes to the understanding of strategic suppliers. Assessing strategic focus as a proxy for operational ambidexterity and asset specificity as proxy for relational capabilities, we built a four-quadrants matrix. According to former research (Tripsas, 1997), we established three turning points over a time period of 65 years (1945-2010) to analyze the evolution of eighteen suppliers in the Italian motorcycle part industry. For each of these phases, we highlighted radical internal and external changes, which shook up the market environment and redefined the strategic behavior of both core and peripheral firms. Tracking the changes in the supply network, we tried to build a process theory, which led to eight theoretical propositions. We have explained part of the interplay between strategic positioning of suppliers and their performance in terms of innovation, sales, and alliance capabilities. The level of competition between the assemblers affects the strategic relevance of suppliers, which usually engage efficiency-based strategies in their first life phase, when they cannot leverage on former relational capabilities (proposition 1). Suppliers with narrow strategic focus concentrate on efficiency-based or knowledge-based strategies. The importance of a supplier is related to the kind of component it manufactures. In the case that components have great influence in defining the finished product architecture, suppliers working on these critical components have fewer technological constraints and are able to experiment more. Therefore, critical suppliers have higher potential innovation (proposition 2). As literature points out, sharing the same type of knowledge increases performance (Lane and Lubatkin, 1998). Relational view scholars demonstrated that an overlap of competences between supplier and assemblers increase core firms' competitive advantage. But does this work for suppliers as well? Evidence showed that this overlap positively affects suppliers' performance as well (proposition 3). As product complexity increases, assemblers outsource critical activities when suppliers present advanced specialization and relational capabilities (proposition 4). Outsourcing corresponds to a shift in the locus of innovation, since core firms, in order to delegate some of the design process, disclose their component-specific knowledge. Positive market conditions at the assembly level increase the suppliers' resources that allow peripheries to engage in differentiation strategies, which enhance their heterogeneity (proposition 5). Dense and intense relations nurture communities of practice (Wenger and Snyder, 2000), which furthers the recombination of suppliers' internal capabilities and shared knowledge, thereby increasing cores and peripheries' innovation (proposition 6). We noticed that transformations at the assembly level produce strategic adaptations at the peripheral level. For example, when the demand at the assembly level requires a rapid re-focus on efficiency and high volume production, suppliers are likely to undertake M&A to rapidly reach the required critical mass and gain access to complementary resources and capabilities (proposition 7). The fit between firm size and strategic positioning is still an essential requisite to sustain competitive advantage. Diversification in complementary industries favors an increase in firm size and suppliers' adoption of multi-purpose strategies. However, suppliers rely on temporal differentiation strategies, which means that they develop one capability at a time and invest in another one only once the first capability is achieved (proposition 8). In our analysis, we showed that peripheries develop relational capabilities and operational ambidexterity at different points in time.

Concerning managerial implications, we will advance several contributions. Firstly, firms require different strategies and tools depending on their position in the supply network. Especially in technology based-industries, supply firms are complex ventures, which need dedicated managerial capabilities and fine-tuned instruments. Our matrix offers a better understanding of suppliers' competitive position and gauges the fit between current strategy and expected performance. Secondly, managers should develop multi-level market analyses, as we also proved that environmental changes lie beyond competitive spaces. Finally, our work underlines the importance of focusing on long-term strategies to identify market trends and respond to cyclical industrial patterns.

To foster new research, we underline our work's limitations and unanswered questions. First, we have decided to develop our study on multiple case studies. Although this choice is methodologically consistent with process theory building, it would be useful to integrate this kind of analysis with more quantitative techniques and larger samples. Our classification dimensions are monothetic and based on prior literature. Through cluster analysis, it would be possible to develop a polythetic analysis that would include other characteristics. Future research should continue to bridge the gap between theoretical typology and empirical taxonomy by employing sets of operational indicators that directly relate to our theoretical dimensions on a quantitative basis. Second, we advanced propositions that might not perfectly fit with divergent environments (e.g. the service or creative industry). Future research should develop observations across different industrial settings and geographical areas, while possibly maintaining a longitudinal approach. Finally, we have mainly focused on relations between core firms and peripheral firms. However, the increasing complexity of products and technologies has created further levels of suppliers (second tier, third tier, and subcontractors). We believe that future research should consider these new actors and investigate possible inter-level interactions. Hoping that our study will consequently trigger a novel way of addressing this intriguing topic, we leave readers and scholars with a last provocative question: "*when push comes to shove, how peripheral are 'peripheral firms' really?"*

REFERENCES

Ahuja G. 2000. Collaboration Networks, Structural Holes, and Innovation: A Longitudinal Study. *Administrative Science Quarterly* **45**(3): 425-455.

Amit R, Schoemaker PJ. 1993. Strategic assets and organizational rent. *Strategic Management Journal* **14**(1): 33-46.

Anand BN, Khanna T. 2000. Do Firms Learn to Create Value? The Case of Alliances. *Strategic Management Journal* **21**(3): 295-315.

Ariño A, De La Torre J, Ring P. 2001. Relational quality: Managing trust in corporate alliances. *Working paper, IESE*.

Asanuma B. 1989a. Manufacturer-supplier relationships in Japan and the concept of relation-specific skill. *Journal of the Japanese and International Economies* **3**(1): 1-30.

Asanuma B. 1989b. Manufacturer-supplier relationships in Japan and the concept of relation-specific skill. *Journal of the Japanese and International Economies* **3**(1): 1-30.

Bailey K. 1994. *Typologies and taxonomies: an introduction to classification techniques*. Sage Publications, Inc.

Barney JB, Hansen MH. 1994. Trustworthiness as a Source of Competitive Advantage. *Strategic Management Journal* **15**: 175-190.

Brusoni S, Prencipe A, Pavitt K. 2001. Knowledge Specialization, Organizational Coupling, and the Boundaries of the Firm: Why Do Firms Know More Than They Make? *Administrative Science Quarterly* **46**(4): 597-621.

Choi TY, Dooley KJ, Rungtusanatham M. 2001. Supply networks and complex adaptive systems: control versus emergence. *Journal of Operations Management* **19**(3): 351-366.

Choi TY, Hong Y. 2002. Unveiling the structure of supply networks: case studies in Honda, Acura, and DaimlerChrysler. *Journal of Operations Management* **20**(5): 469-493.

Choi TY, Krause DR. 2006. The supply base and its complexity: Implications for transaction costs, risks, responsiveness, and innovation. *Journal of Operations Management* **24**(5): 637-652.

Choi TY, Wu Z, Ellram L, Koka BR. 2002. Supplier-supplier relationships and their implications for buyer-supplier relationships. *Engineering Management, IEEE Transactions on* **49**(2): 119-130.

Clark K, Fujimoto T. 1991. *Product development performance*. Harvard Business School Press Boston, Mass.

Cohen WM, Levinthal DA. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* **35**(1): 128-152.

D'Aveni R, Gunther R. 1994. *Hypercompetition: Managing the dynamics of strategic maneuvering*. Free Press .

D'aveni RA, Gunther RE, Cole J. 2001. *Strategic supremacy: How industry leaders create growth, wealth, and power through spheres of influence*. Free Pr.

Dyer J. 1996a. Specialized supplier networks as a source of competitive advantage: Evidence from the auto industry. *Strategic Management Journal* **17**(4): 271-291.

Dyer JH. 1996b. Does Governance Matter? Keiretsu Alliances and Asset Specificity As Sources of Japanese Competitive Advantage. *Organization Science* **7**(6): 649-666.

Dyer JH, Chu W. 2000. The Determinants of Trust in Supplier-Automaker Relationships in the U.S., Japan, and Korea. *Journal of International Business Studies* **31**(2): 259-285.

Dyer JH, Hatch NW. 2006. Relation-specific capabilities and barriers to knowledge transfers: creating advantage through network relationships. *Strategic Management Journal* **27**(8): 701-719.

Dyer JH, Nobeoka K. 2000. Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal* **21**(3): 345-367.

Dyer JH, Singh H. 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *The Academy of Management Review* **23**(4): 660-679.

Eisenhardt KM. 1989. Building Theories from Case Study Research. *The Academy of Management Review* **14**(4): 532-550.

Eisenhardt KM. 1991. Better Stories and Better Constructs: The Case for Rigor and Comparative Logic. *The Academy of Management Review* **16**(3): 620-627.

Ethiraj S, Levinthal D. 2004. Modularity and innovation in complex systems. *Management Science*: 159-173.

Fleming L, King CI, Juda AI. 2007. Small Worlds and Regional Innovation. *Organization Science* **18**(6): 938-954.

Forker LB. 1997. Factors affecting supplier quality performance. *Journal of Operations Management* **15**(4): 243-269.

Gatignon H, Tushman M, Smith W, Anderson P. 2002. A Structural Approach to Assessing Innovation: Construct Development of Innovation Locus, Type, and Characteristics. *Management Science* **48**(9): 1103-1122.

Gibson CB, Birkinshaw J. 2004. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *The Academy of Management Journal* **47**(2): 209-226.

Gottfredson M, Puryear R, Phillips S. 2005. Strategic sourcing: from periphery to the core. *Harvard business review* **83**(2): 132.

Gulati R. 1995a. Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *The Academy of Management Journal* **38**(1): 85-112.

Gulati R. 1995b. Social Structure and Alliance Formation Patterns: A Longitudinal Analysis. *Administrative Science Quarterly* **40**(4): 619-652.

Gulati R. 1998. Alliances and networks. *Strategic Management Journal* **19**(4): 293-317.

Gulati R, Singh H. 1998. The Architecture of Cooperation: Managing Coordination Costs and Appropriation Concerns in Strategic Alliances. *Administrative Science Quarterly* **43**(4): 781-814.

Gupta A, Smith K, Shalley C. 2006. The interplay between exploration and exploitation. *The Academy of Management Journal* **49**(4): 693-706.

Hambrick DC. 1983. An Empirical Typology of Mature Industrial-Product Environments. *The Academy of Management Journal* **26**(2): 213-230.

Hansen MH, Hoskisson RE, Lorenzoni G, Ring PS. 1997. Strategic capabilities of the transactionally intense firm: Leveraging inter-firm relationships and trust, *Annual Meeting of the Academy of Management*: Boston.

Hatten K, Hatten M. 1985. Some empirical insights for strategic marketers: the case of beer. In H Thomas, D Gardner (Eds.), *Strategic Marketing and Management*: 275-292. John Wiley: New York.

Helfat CE, Peteraf MA. 2003. The Dynamic Resource-Based View: Capability Lifecycles. *Strategic Management Journal* **24**(10): 997-1010.

Henderson RM, Clark KB. 1990. Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly* **35**(1): 9-30.

Johnston DA, McCutcheon DM, Stuart FI, Kerwood H. 2004. Effects of supplier trust on performance of cooperative supplier relationships. *Journal of Operations Management* **22**(1): 23-38.

Kale P, Dyer JH, Singh H. 2002. Alliance Capability, Stock Market Response, and Long-Term Alliance Success: The Role of the Alliance Function. *Strategic Management Journal* **23**(8): 747-767.

Kamath R, Liker J. 1990. Supplier dependence and innovation: a contingency model of suppliers' innovative activities. *Journal of Engineering and Technology Management* **7**(2): 111-127.

Kamath R, Liker J. 1994. A second look at Japanese product development. *Harvard business review* **72**(6): 154-170.

Kaufman A, Wood CH, Theyel G. 2000. Collaboration and Technology Linkages: A Strategic Supplier Typology. *Strategic Management Journal* **21**(6): 649-663.

Kuhn T. 1970. *The structure of scientific revolutions*. University of Chicago Press: Chicago.

Lane PJ, Lubatkin M. 1998. Relative Absorptive Capacity and Interorganizational Learning. *Strategic Management Journal* **19**(5): 461-477.

Lazerson MH, Lorenzoni G. 1999. Resisting Organizational Inertia: The Evolution of Industrial Districts. *Journal of Management and Governance* **3**(4): 361-377.

Leonard-Barton D. 1990. A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. *Organization Science* **1**(3): 248-266.

Likert R. 1932. A technique for the measurement of attitudes. *Archives of Psychology.* **22**(140): 55.

Lipparini A, Lorenzoni G. 2005. Organizing around strategic relationships: Networks of suppliers as knowledge generators in the Italian motorcycle industry. In Cool KO, J

Henderson, R Abate (Eds.), *Restructuring strategy, strategic management series*: 44-67. Blackwell: Oxford.

Lipparini A, Lorenzoni G, Ferriani S, Aversa P. 2009. From Core to Periphery and Back: Sources of Differentiation in Network-to-Network Competition. *29th Strategic Management Society Conference*.

Lipparini A, Lorenzoni G, Zollo M. 2001. Dual Network Strategies: Managing Knowledge-based and Efficiency-based Networks in the Italian Motorcycle Industry, *21st Strategic Management Society Conference*: San Francisco.

Lipparini A, Sobrero M. 1994. The glue and the pieces: entrepreneurship and innovation in small-firm networks. *Journal of Business Venturing* **9**(2): 125-140.

Loewenstein J, Thompson L, Gentner D. 1999. Analogical encoding facilitates knowledge transfer in negotiation. *Psychonomic Bulletin and Review* **6**(4): 586-597.

Lorenzoni G, Lipparini A. 1999. The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal* **20**(4): 317-338.

Miles RE, Snow CC. 1978. *Organizational strategy, structure, and process*. McGraw-Hill: New York.

Miller CC, Cardinal LB, Glick WH. 1997. Retrospective Reports in Organizational Research: A Reexamination of Recent Evidence. *The Academy of Management Journal* **40**(1): 189-204.

Miller D, Friesen P, Mintzberg H. 1984. *Organizations: A quantum view*. Prentice Hall.

Mintzberg H, Pascale R, Goold M, Rumelt R. 1996. The "Honda effect" revisited. *California Management Review* **38**(4): 78-117.

Muffatto M, Panizzolo R. 1996. Innovation and Product Development Strategies in the Italian Motorcycle Industry. *Journal of Product Innovation Management* **13**(4): 348-361.

Nelson R, Winter S. 1982. *An evolutionary theory of economic change*. Belknap Press.

Nishiguchi T. 1994. *Strategic industrial sourcing: The Japanese advantage*. Oxford University Press, USA.

Owen-Smith J, Powell WW. 2004. Knowledge Networks as Channels and Conduits: The Effects of Spillovers in the Boston Biotechnology Community. *Organization Science* **15**(1): 5-21.

Pascale R. 1996. The Honda effect. *California Management Review* **38**(4): 80-91.

Penrose E. 1959. *The Theory of the Growth of the Firm*. Blackwell: Oxford.

Pisano GP. 1994. Knowledge, Integration, and the Locus of Learning: An Empirical Analysis of Process Development. *Strategic Management Journal* **15**(S1): 85-100.

Porter ME. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press.

Powell WW, Brantley P. 1992. Competitive cooperation in biotechnology: Learning through networks. *Networks and organizations*: 366-394.

Powell WW, Koput KW, Smith-Doerr L. 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. *Administrative Science Quarterly* **41**(1): 116-145.

Romanelli E, Tushman ML. 1994. Organizational Transformation as Punctuated Equilibrium: An Empirical Test. *The Academy of Management Journal* **37**(5): 1141-1166.

Schilling MA, Vidal P, Ployhart RE, Marangoni A. 2003. Learning by Doing Something Else: Variation, Relatedness, and the Learning Curve. *Management Science* **49**(1): 39-56.

Smith A. 1776. *Wealth of nations*. University of Chicago Press: Chicago.

Szulanski G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal* **17**: 27-43.

Takeishi A. 2001. Bridging Inter- and Intra-Firm Boundaries: Management of Supplier Involvement in Automobile Product Development. *Strategic Management Journal* **22**(5): 403-433.

Teece D. 1987. *The Competitive Challenge*. Ballinger: Cambridge, MA.

Teece D, Pisano G, Shuen A. 1990. Firm Capabilities, resources, and the concept of strategy: four paradigms of strategic management. *CCC Working Paper*: 90-98.

Teece D, Rumelt R, Dosi G, Winter S. 1994. Understanding corporate coherence. Theory and evidence. *Journal of Economic Behavior & Organization* **23**: 1-30.

Teece DJ. 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* **28**(13): 1319-1350.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal* **18**(7): 509-533.

Tripsas M. 1997. Unraveling the process of creative destruction: Complementary assets and incumbent survival in the typesetter industry. *Strategic Management Journal* **18**: 119-142.

Uzzi B. 1996. The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review*: 674-698.

Uzzi B. 1997. Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative Science Quarterly* **42**(1).

Wenger E, Snyder W. 2000. Communities of practice: The organizational frontier. *Harvard business review* **78**(1): 139-146.

Wezel FC. 2005. Location Dependence and Industry Evolution: Founding Rates in the United Kingdom Motorcycle Industry, 1895-1993. *Organization Studies* **26**(5): 729-754.

Whittington KB, Owen-Smith JD, Powell WW. 2009. Networks, Propinquity, and Innovation in Knowledge-Intensive Industries. *Administrative Science Quarterly* **54**: 90-122.

Williamson O. 1975. Markets and hierarchies, analysis and antitrust implications. .

Williamson O. 1979. Transaction-Cost Economics: The Governance of Contractual Relations. *The Journal of Law and Economics* **22**(2): 233.

Williamson O. 1985. *The economic institutions of capitalism: firms, markets, relational contracting*. Free Press: New York.

Wu Z, Choi TY. 2005. Supplier-supplier relationships in the buyer-supplier triad: Building theories from eight case studies. *Journal of Operations Management* **24**(1): 27-52.

Yin R. 2008. *Case study research: Design and methods*. Sage Publications, Inc.

Zander U, Kogut B. 1995. Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test. *Organization Science* **6**(1): 76-92.

Zhao Z, Anand J, Mitchell W. 2005. A Dual Networks Perspective on Inter-Organizational Transfer of R&D Capabilities: International Joint Ventures in the Chinese Automotive Industry. *Journal of Management Studies* **42**(1): 127-160.

Zhao ZJ, Anand J. 2009. A multilevel perspective on knowledge transfer: evidence from the Chinese automotive industry. *Strategic Management Journal* **30**(9): 959-983.

WHAT IS BEHIND ABSORPTIVE CAPACITY?

DISPELLING THE OPACITY OF R&D

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ABSTRACT

Strategic management scholarship has identified research and development investments as the main proxy to observe absorptive capacity. However, literature shows that using exclusively R&D figures fails to unravel the dynamic set of processes and routines standing behind firms' commitment toward knowledge absorption and exploitation. This paper unpacks the concept of R&D and presents a four-type typology of R&D strategies based on knowledge scope and asset specificity. In a second step, this study combines the four-type typology with prior scholarly contributions to advance an extension of the absorptive capacity model. Evidence displays significant intra-industry differences in R&D strategies, which affect the ways in which firms develop potential and realized absorptive capacity. Our results disconfirm previous research, showing that regimes of appropriability affect not only the exploitation of knowledge for commercial outcomes, but also the decision-making process that firms face before engaging in R&D activities.

Keywords: Absorptive Capacity; R&D; Typology, Learning Capabilities.

INTRODUCTION

What is behind absorptive capacity? Starting from the seminal works of Cohen and Levinthal (1989, 1990, 1994) scholars have mostly identified research and development investments (R&D) as the best proxy to explain variations in firms' knowledge absorption (Meeus, Oerlemans and Hage, 2001; Mowery, Oxley and Silverman, 1996; Tsai, 2001). Before the appearance of absorptive capacity (AC), economists traditionally interpreted R&D as assets aimed at creating knowledge, and consequently innovation. For example, while observing technological change, Tilton (1971), Allen (1977), and Mowery (1983) affirmed that firms rely on R&D to gather and transform knowledge that is available in the environment. Cohen and Levinthal argued that R&D commitment not only generates innovations, but also contributes to develop the firm's ability to identify, assimilate, and exploit exogenous knowledge – what they called a firm's 'learning' or 'absorptive' capacity (1989 : 569). Cohen and Levinthal's works triggered a great proliferation of related research. Following the early contributions, some studies have leveraged on synthetic measures (such as R&D intensity) and cross-sectional analysis (Grimpe and Sofka, 2009; Meeus *et al.*, 2001; Tsai, 2001). However, soon scholars started to question the validity of traditional approaches to AC research. They argued that since AC was defined as a three-phase process, traditional methods were inconsistently static. Consequently, some researchers have started to develop process-based capability analysis (Lim, 2009; Zahra and George, 2002). In recent years, literature has also consistently shifted toward a relational interpretation of AC, adopting, in several cases, dyads or networks as units of analysis (Koza and Lewin, 1998; Lane and Lubatkin, 1998). The accumulation of works has provided different reflections on determinants and intervening variables affecting AC. Among the numerous contributions, recent studies have attempted to synthesize a general theoretical model of AC, including what scholars defined as the most relevant advances within AC literature (Lane, Koka and Pathak, 2006; Todorova and Durisin, 2007; Volberda, Foss and Lyles, 2010; Zahra and George, 2002). Although several works addressed different theoretical and empirical issues, the traditional operationalization of R&D in AC studies has seldom been questioned. Scholarship has directed little attention toward the nature of research and development processes and only few scholars have recently started to base their research on the microfoundations of knowledge absorption capabilities (Lewin, Massini and Peeters, 2010). Also, AC has been traditionally studied in high-tech industries, neglecting environments where technology plays a minor role. However, firms can develop AC in any kind of industry, including low-tech sectors or services (Grimpe and Sofka, 2009). In this paper we claim that the heterogeneous research around AC must find common ground to foster a consistent and comparable set of results. Although scholars mostly agree about considering R&D as a reliable proxy to observe AC, the definition of this concept is still too general and biased in traditional applications in high-tech industries. We claim that R&D should be the touchstone to create a common ground where scholars nurture future research. However, the use of R&D as an analytical tool to study AC is still too simplified, since synthetic figures cannot depict the complexity of a capability generation process and cannot specify intra-industry differences in learning absorption. Hence, the concept of R&D must be questioned first and then redefined through general terms in order to be applied to any kind of technological environment. Unpacking the building blocks of the well-established R&D concept, we claim that research and development is still the most reliable way to observe AC, but its impact on learning capabilities is conditioned by the forms it takes. We attempt to identify a typology of R&D forms that can be applied both at high, medium-high (HMT), and low, medium-low (LMT) technology firms. Through a longitudinal process approach, this work tries to specify the different natures of R&D, shedding light on the opaque side of learning capabilities and updating the general model of AC.

We unfold this work as follows. In Section 2 we review the main studies that have enhanced the understanding of the AC topic and summarize them in a theoretical model that includes the most recent advances. We dedicate special attention to operationalization of AC, pointing out how scholarship has paid little attention to an R&D definition that goes beyond balance sheet figures. In Section 2 we present the method, the empirical setting, and the data. Section 3 reveals the results emerging from our data collection and analysis. We develop a typology of R&D forms and apply it to a theoretical AC model. The discussion of the main implications, the conclusions, and the limitations of this study are in Section 4.

THEORY

Observing Absorptive Capacity: An Updated Literature Review

In their 1990 work Cohen and Levinthal defined AC as “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen and Levinthal, 1990 : 128). AC shows how R&D investments positively affect learning capabilities (Cohen and Levinthal, 1989) and thus performance and competitive advantage (Lane *et al.*, 2006; Zahra and George, 2002). AC helps developing both *incremental innovations*, which make progress along established paths, and *disruptive innovations*, which redefine technological standards (Christensen and Rosenbloom, 1995). Also, exploiting internal and external knowledge through AC helps firms to predict future technological scenarios (Cohen and Levinthal, 1994). Generally speaking, the ability to identify, absorb, and exploit new knowledge depends on prior investments aimed at increasing knowledge assets and learning capabilities. Scholars have demonstrated that firms mainly develop external knowledge absorption through the accumulation of related knowledge, which improves their skills in new knowledge identification, acquisition, and use (Abernathy, 1978; Rosenberg, 1970; Teece, 1977). As in a virtuous circle, the more a firm invests in knowledge acquisition, the more it learns. The more it learns, the more successfully it acquires new knowledge. Since knowledge fosters innovation and hence, performance, it is a source of competitive advantage (Grant, 1996a, 1996b). Within the last twenty years, AC (Cohen and Levinthal, 1990) has become one of the most cited and diffused concepts in management literature, especially when related to the theme of dynamic capabilities (Teece, Pisano and Shuen, 1997). To date, the academic web crawler *Google Scholar* reports that the main work on AC "Absorptive capacity: a new perspective on learning and innovation" by Cohen and Levinthal (1990) has been cited more than 12,000 times. Three seminal papers by Cohen and Levinthal (1989, 1990, 1994) triggered a great proliferation of research on AC. Among several "hot" issues, scholars have struggled to define how to observe and measure such an "invisible" capability. After twenty years of specific research, scholars are still looking for methods to observe and measure AC. In this fashion, Lim recently affirmed that "the main factor impeding theoretical research is that absorptive capacity is frustratingly difficult to observe" (2009 : 1251). Scholars have struggled to identify variables that are representative of the firm's knowledge absorption capability, but also synthetic enough to favor the use of clear–cut measures. To understand how scholars operationalized AC, we reviewed papers from year 1989 to year 2010, published in *Strategic Management Journal, Administrative Science Quarterly, Organization Science, Academy of Management Journal, Academy of Management Review, Management Science, Industrial and Corporate Change, Research Policy, Management Learning*. Although the *Economic Journal* is not a management publication, we included it in our review, since it published the pioneering work of Cohen and Levinthal on AC (1989). According to Lane, Koka, and Pathak (2006 : 844), we noticed that the variety of contributions can be assigned to two main categories. The first one is closer to Cohen and Levinthal's original approach (1989, 1990, 1994). Focusing on individual firm's activity, it mostly favors cross-sectional analysis and tends to capture the impact of AC through synthetic measures such as (1) R&D intensity (Grimpe and Sofka, 2009; Meeus *et al.*, 2001; Tsai, 2001); (2) patents count/citations (Ahuja and Katila, 2001); (3) expertise of the employees (Davies, 1987). The second group of studies principally focuses on relational process interpretations, mostly considering AC as a dynamic capability (Zahra and George, 2002 : 186). Although the majority of this second group of scholars agrees on observing learning activities through alliances and networks, works siding for a dynamic interpretation of AC present more heterogeneous variables and results than the first group siding for synthetic measure and cross-sectional analysis. Among the different determinants of

AC, scholars considered (1) knowledge creation objectives (Koza and Lewin, 1998), (2) knowledge overlap (Dyer and Singh, 1998); (3) organizational forms, capabilities of coordination and combination (Jansen, Van den Bosch and Volberda, 2005; Van den Bosch, Volberda and Boer, 1999); (4) iterative processes of learning (Lane, Salk and Lyles, 2001); (5) internal knowledge sharing and integration (Zahra and George, 2002); (6) social integration mechanisms and power relations (Easterby-Smith, Graca, Antonacopoulou and Ferdinand, 2008; Todorova and Durisin, 2007); (7) internal and external R&D processes (Lane *et al.*, 2006; Lewin *et al.*, 2010; Lim, 2009); (8) motivation and causal ambiguity (Szulanski, 1996). Only Lane and Lubatkin (1998) stuck to a traditional methodology – i.e. R&D as a weighted participation rate for each of a firm's discipline – while framing AC in a dyadic perspective. Table 1 summarizes our analysis and lists a selection of the most cited papers we encountered during our review. Figure 1 presents an update of the theoretical model presented by Lane *et al.* (2006).

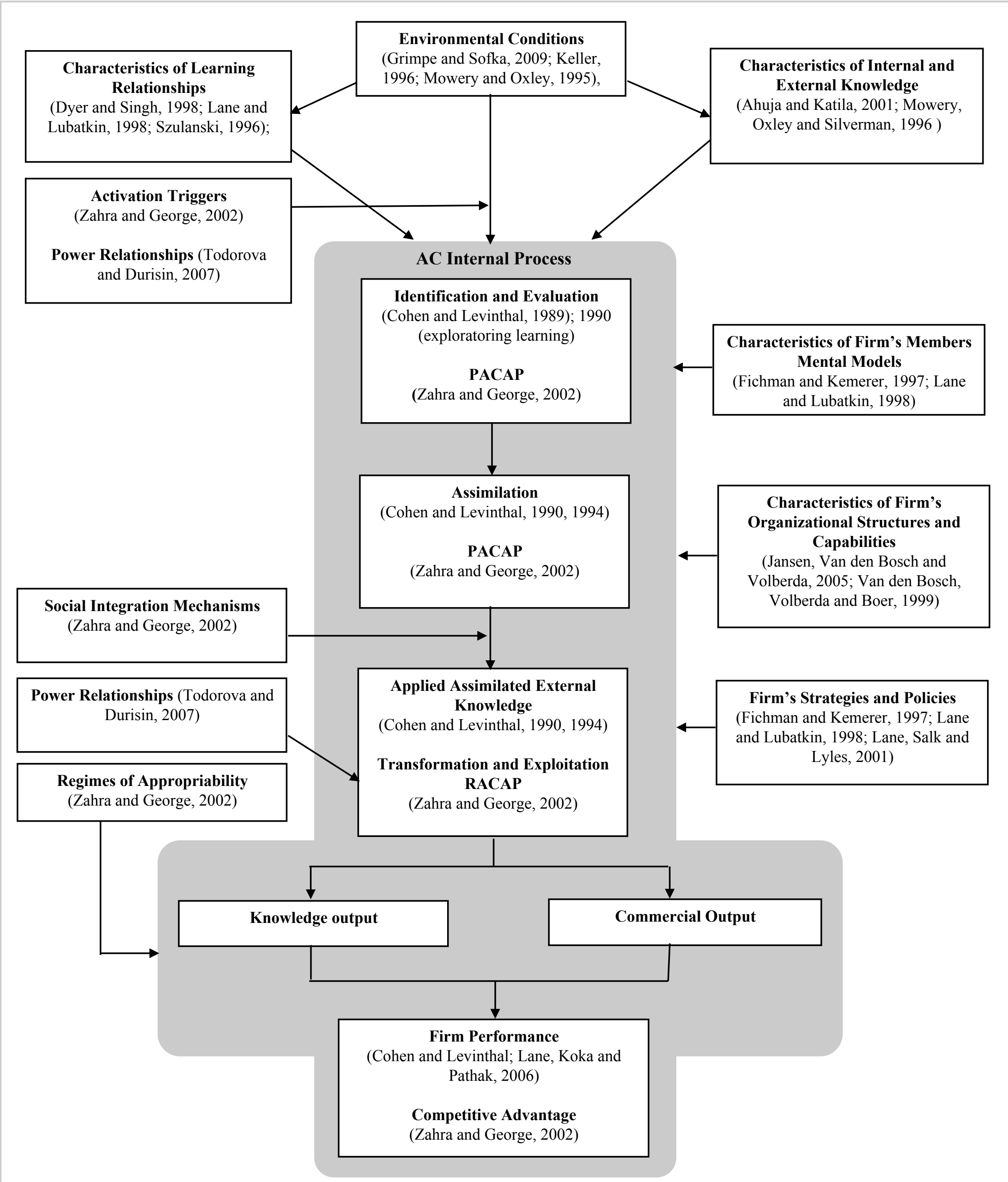
Among scholars' studies, the heterogeneity of methods and approaches rarely allows for a direct comparison of results. Scholars affirmed that the over-proliferation of works seems to increase noise rather than creating common ground to foster deeper understanding (Lane *et al.*, 2006). However, literature has shown that researchers do agree about some aspects. In fact, the majority of scholars affirmed that R&D investments capture, in some way, a firm's engagement in knowledge absorption activities. R&D shows signs of being the consensus on which to foster a consistent understanding of AC.

TABLE 1
Absorptive Capacity: Review and Operationalization of the Main Determinants

Author/s	Year	Journal	Title	Approach	Method	Learning	Theoretical background	AC antecedents
Cohen and Levinthal	1989	The Economic Journal	Innovation and Learning: The Two Faces of R & D.	Theoretical	Simulation	One-way	Original	R&D intensity*
Cohen and Levinthal	1990	Organization Science	Absorptive Capacity: A New Perspective on Learning and Innovation.	Empirical	Quantitative	One-way	Original	R&D intensity*
Cohen and Levinthal	1994	Management Science	Fortune favours prepared firms.	Theoretical	Simulation	One-way	Original	R&D intensity*
Mowery, Oxley, and Silverman	1996	Strategic Management Journal	Strategic alliances and interfirm knowledge transfer.	Empirical	Quantitative	Relational	Original	R&D intensity*; patents citations
Szulanski	1996	Strategic Management Journal	Exploring internal stickiness: Impediments to the transfer of best practice within the firm.	Empirical	Quantitative	Relational	Process	Motivation; Causal ambiguity
Lane and Lubatkin	1998	Strategic Management Journal	Relative Absorptive Capacity and Interorganizational Learning.	Empirical	Quantitative	Relational	Process	R&D intensity (weighted participation rate, for each of a firm's discipline)
Koza and Lewin	1998	Organization Science	The Co-Evolution of Strategic Alliances.	Theoretical	Discussion	Relational	Process	Knowledge creation objectives
Dyer and Singh	1998	Academy of Management Review	The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage.	Theoretical	Discussion	Relational	Process	Knowledge overlap
Van Den Bosch, Volberda, and Boer	1999	Organization Science	Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms and Combinative Capabilities.	Theoretical	Discussion	One-way	Process	Organizational form; combinative capabilities
Meeus, Oerlemans, and Hage	2001	Organization Studies	Patterns of interactive learning in a high-tech region.	Empirical	Quantitative	One-way	Original	R&D intensity*
Tsai	2001	Academy of Management Journal	Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance.	Empirical	Quantitative	Relational	Original	R&D intensity*
Ahuja and Katila	2001	Strategic Management Journal	Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study.	Empirical	Quantitative	Relational	Original	Number of patents; patents citations
Lane, Salk, and Lyles	2002	Strategic Management Journal	Absorptive Capacity, Learnin , and Performance in International Joint Ventures.	Empirical	Quantitative	Relational	Process	Iterative learning in alliances
Zahra and George	2002	Academy of Management Review	Absorptive Capacity: A Review, Reconceptualization, and Extension.	Theoretical	Discussion	Relational	Process	Internal knowledge sharing and integration
Jansen, Van Den Bosch, Volberda	2005	Academy of Management Journal	Managing potential and realized absorptive capacity: How do organizational antecedents matter?	Empirical	Quantitative	One-way	Original	Organizational mechanisms; coordination capabilities
Lane, Koka, and Pathak	2006	Academy of Management Review	The reification of absorptive capacity: a critical review and rejuvenation of the construct.	Theoretical	Discussion	Relational	Process	Internal and external R&D processes
Todorova and Durisin	2007	Academy of Management Review	Absorptive capacity: valuing a reconceptualization.	Theoretical	Discussion	One-way	Process	Social integration mechanisms
Easterby-Smith, Graca, Antonacopoulou, and Ferdinand	2008	Management Learning	Absorptive capacity: a process perspective.	Empirical	Qualitative	One-way	Process	Power relations
Grimpe and Sofka	2009	Research Policy	Search patterns and absorptive capacity: Low- and high-technology sectors.	Empirical	Quantitative	One-way	Original	R&D intensity; expertise of the employees
Lim	2009	Industrial and Corporate Change	The many faces of absorptive capacity: spillovers of copper interconnect technology for semiconductor chips.	Empirical	Qualitative	Relational	Process	Internal and external R&D processes
Lewin, Massini, and Peters	2010	Organization Science	Microfoundations of Internal and External Absorptive Capacity Routines	Theoretical	Discussion	Relational	Process	Internal and external R&D processes

*R&D intensity= R&D spending/Sales

FIGURE 1
A General Model of Absorptive Capacity, its Antecedents, Outcomes and Intervening Variables.



Source: Personal elaboration based on Lane *et al.*, 2006 : 856.

Nevertheless, scholars have expressed their concern about traditional interpretations of R&D: Synthetic figures are not sufficient to describe firms' different approaches to AC, especially when research is aimed at unfolding the dynamic microfoundations underpinning learning capabilities (Easterby-Smith *et al.*, 2008). R&D data needs a more fine-grained disaggregation in order to understand the nature of learning capabilities and allow researchers to apply them to process analysis. Also, R&D definition cannot be tailored on HMT only. The definition of R&D must be applicable to LMT and service firms as well, since learning is a process that affects any kind of organization. Along these lines, Grimpe and Sofka (2009) demonstrated that R&D's search patterns are conditioned on technological intensity of the industry. For example HMT firms, such as pharmaceutical and cutting-edge biotech companies need to obtain new abstract knowledge before being able to develop innovations. Former research supports this point: "Simply put, you cannot do research in either of these two fields without a basic knowledge of biochemistry" (Lane and Lubatkin, 1998 : 468). LMT firms instead tend to gather information directly from the market to apply it into finished products (Grimpe and Sofka, 2009). Along these lines, Lane and Lubatkin suggested that R&D may be targeted at creating both general knowledge – which is also known as basic or abstract knowledge – and specialized knowledge – which is also known as applied or codified knowledge (Lane and Lubatkin, 1998). Seeking different types of knowledge intuitively leads to different outputs and requires different time for development. We believe that, to foster consistent coclusions about AC, scholars should stick to the few results that have shown consistency across the academic community. The general agreement about considering R&D as a critical proxy to observe AC is fertile ground for planting new contributions. However, to date the R&D interpretation is not developed enough to satisfy the recent interest in process interpretation of dynamic learning capabilities. We suggest to question, unpack, and redefine the R&D concept in order to plug it into a general model of AC. This effort will allow for a process interpretation of AC and a wider fit of the concept in different kinds of industries. Dispelling the opacity of R&D?, this paper attempts to foster new directions for future research and greater understanding of firms' competitive advantage.

METHOD AND DATA

Sample

We leveraged data to develop a process theory based on multiple case studies (Eisenhardt, 1989; Yin, 2008). Our goal was to "identify distinct skills, processes, procedures, organizational structures, decision rules, and disciplines, which undergird enterprise-level sensing, seizing, and reconfiguring capacities" (Teece, 2007: 1319). By focusing on *microfoundations* of learning routines we tried to anchor our results in the original concept of AC, avoiding the common problem of *reification* (Lane *et al.*, 2006). Collecting both descriptive statistics and relevant quotations, we advanced a typology of R&D investments that works in any type of industry or technology. Also, after distinguishing between different forms of R&D, we analyzed how these aspects interact within the general model of AC.

We selected a sample of eighteen parts suppliers in the Italian motorcycle component industry (Table 2). We chose this specific setting because (1) it is characterized by different types of technologies; (2) it is particularly well-known for its network of strategic suppliers; (3) it is an international hypercompetitive setting; (4) it is part of the automotive industry, which represents one of the most viable fields for management studies (Dyer and Hatch, 2006; Dyer and Nobeoka, 2000; Nishiguchi, 1994; Takeishi, 2001). Scholars have based earlier studies on the two-wheels vehicle industry (Mintzberg, Pascale, Goold and Rumelt, 1996; Pascale, 1996; Wezel, 2005), even within the Italian context (Lipparini and Lorenzoni, 2005; Lipparini, Lorenzoni and Zollo, 2001; Muffatto and Panizzolo, 1996). The Italian motorcycle industry is the biggest European market for use, production, national sales, and exports. In 2009, official data revealed that Italy accounted for 55.49% of the total 859.518 vehicles manufactured in Europe. Italy is also one of the most innovative areas for motorbike and scooter design and manufacturing. Due to this reason, the firms involved in this industry range from LMTs (e.g. manufacturers of basic mechanical parts) over HMTs (e.g. electronics developers) to service companies (e.g. aerodynamics design and quality control).

These conditions offered us a wide typology of firms within the same industry and territory. We based our selection on (1) relevance of market share according to official data; (2) reference/signaling from motorcycle companies and components manufacturers; (3) analysis of documents and previous studies (Lipparini and Lorenzoni, 2005; Lipparini *et al.*, 2001).

The firms of the sample are first tier suppliers. They manufacture distinctive and strategic motorcycle parts (e.g. we consider brakes, frames, electronics to be strategic parts, while we define bolts, batteries, and rear mirrors as irrelevant) or provide some added-value service in the design and manufacturing of the vehicle (i.e. molds production, quality control, design or aerodynamics testing). The entire engineering activity and at least 50% of the manufacturing is located in Italy. These suppliers deal with both Italian and foreign customers.

TABLE 2
Sample of Strategic Suppliers in the Italian Motorcycle Part Industry

Supplier	Product/Service	Diversified	Customers	Average years of collaboration	First round of interviews (h)	Second round of interviews (h)	Total interviews (h)
S1	Electronics	Yes	7	3	3	2	5
S2	Electronics	Yes	37	21	5	2	7
S3	Chains	No	10	21	4	2	6
S4	Carburators and injections	Yes	31	24	4	3	7
S5	Frames	No	44	25	7	2	9
S6	Forks and shock absorbers	Yes	32	27	3	2	5
S7	Forks and shock absorbers	No	35	5	4	3	7
S8	Brakes and wheels	Yes	25	12	4	1	5
S9	Throttle systems, handlebars	Yes	24	25	2	2	4
S10	Engines	Yes	36	22	5	3	8
S11	Brakes and wheels	No	17	28	5	2	7
S12	Mechanical parts	Yes	30	16	3	2	5
S13	Silencers	Yes	7	35	2	3	5
S14	Lights	No	25	21	3	2	5
S15	Design and Engineering	Yes	24	12	4	3	7
S16	Silencers	No	17	14	5	2	7
S17	Lights	No	18	24	3	2	5
S18	Design and Engineering	Yes	24	12	3	2	5
					69	**40**	**109**

Data

AC is a capability, and thus not directly observable: "Hence, extant theories are often based on deductive rather than inductive logic. Even in empirical studies, absorptive capacity is often not observed directly, but assumed to increase with coauthoring behavior, labor mobility, and R&D investment." (Lim, 2009 : 1251). Therefore, we attempted to gather insights of that kind collecting data through interviews, databases, and archives. We developed two rounds of interviews: a set of in-depth, semi-structured interviews (2008-2009) and a survey based on a structured questionnaire (2009-2010). During the first round, we visited and interviewed entrepreneurs and top or medium managers who were in charge of dealing with external production partners, who often are original parts manufacturers (OEM). Since AC mostly focuses on external knowledge absorption, we targeted managers involved in R&D, manufacturing, innovation, product development, and relations with OEMs or technological partners. We assessed the survey during the second round of interviews (2009-2010). A researcher called the interviewee and filled out a detailed questionnaire during the phone call. The managers responded to open questions. All of the interviews in both the first and second rounds have been transcribed, translated, and coded simultaneously by three scholars. The coders discussed the sentences until sharing a common interpretation. To avoid retrospective call biases, we triangulated the coded interviews with documental analysis that included administrative documents and reports, company profiles, catalogues, magazines, newspapers, industry research, previous interviews, and websites. The visits to the production plants helped to reach a deeper understanding of technologies and innovations. Finally, to avoid problems of overestimation through retrospective call biases (Miller, Cardinal and Glick, 1997), we randomly selected some suppliers' responses and asked firms that were involved as partners in the learning relation to confirm what the interviewee had stated. Our data covers the entire industry lifecycle, from the late 1940s until the late 2000s. Our goal was to assess how suppliers invested in activities aimed at developing learning capabilities and knowledge assets. The longitudinal approach aimed at evaluating the firms' actions and commitment under different circumstances, such as disruptive exogenous changes, which affected the market demand and the technological standards. We identified three turning points within the history of this industry and at t_3 (years 2009 and 2010) we collected data concerning each period. We tried to talk with people who were informed about the whole firm's lifecycle. Being mostly family-owned businesses, it was not that difficult to find people being able to report information about past activities. However, statements have been triangulated through documents and external opinion leaders to avoid retrospective biases. The three technological waves in the motorcycle part industry are:

t_1: *Establishment of the first integrated network of suppliers* (1950s and 1960s). When the Italian suppliers started their activity, parts manufacturing relied on basic mechanical technologies. Hence, component manufacturing was mainly based on efficiency. Collaborative innovation through supply relations was uncommon.

t_2: *Entry of foreign firms and introduction of electronics* (1970s and 1980s). Assembly firms started developing complex vehicles. Introduction of electronics affected the production of every part supplier. Scooters became popular, pushing suppliers to pursue efficiency as well as innovation. The loci of innovation shifted from the core to the periphery of the manufacturing network. Collaborative innovation became common between local parts manufacturers and both local and international motorcycle OEMs.

t_3: *Introduction of modern scooters and mergers and acquisitions wave* (1990s and 2000s). Vehicle innovation rate accelerated and became mainly dependent on suppliers' innovation. Even cheap vehicles (such as scooters) increased complexity, becoming more powerful and requiring higher performances. A massive adoption of electronics throughout the vehicle forced designers to develop interactions between motorcycle sub-parts. Designers focused on ergonomics to increase comfort and aerodynamics. Firms started to offer design and quality control services, which brought new types of non-manufacturing suppliers into the market. In recent years, suppliers pursued dimensional growth via mergers and acquisitions with local and international groups to face international crisis and sustain costs of growing competition.

DISPELLING THE OPACITY OF R&D

Effects of Firms' Technological Level on R&D Approaches

We have affirmed that R&D research should capture the different ways in which firms engage in R&D projects. According to other scholars, we expect that firms develop R&D in various forms, depending on firm specific attributes (Grimpe and Sofka, 2009; Lane and Lubatkin, 1998). Hence, we first tried to establish whether the firms in our sample shared a common definition of R&D. According to literature, a shared interpretation would help in comparing observed phenomena (Eisenhardt, 1991). However, while all interviewees agreed on defining R&D as the investments that their company makes to increase innovation, knowledge, and therefore competitiveness, different opinions emerged when we tried to understand in which kind of activities firms were involved practically. Lane and Lubatkin (1998) suggested that R&D is related to firms' technological level. Accordingly, we noticed that, even within the same industry, firms engage in manufacturing activities requiring different skills. Evidence in our sample showed that R&D follows different paths depending on the firm's technological level. Two kinds of approaches emerged from our interviews. HMT firms tend to consider R&D as an investment aimed at gathering basic knowledge. Their innovation process is usually divided in two steps. Firms first look for knowledge belonging to a higher level of science. This kind of knowledge is usually abstract and non-codified. Only after securing this knowledge asset, they tend to exploit it to develop innovation. As S1 R&D director affirmed: "We have to develop some general knowledge before being able to apply it to a new technology. That's the only way to propose something really new to the market." Another interviewee, the S11 R&D director presented a similar situation: "We've realized quite soon that to increase the quality of our innovations we had to go back to basic science. In our company R&D is a lot about physics, for example. We've just got a new guy who graduated in physics." Instead, firms competing in a lower technological environment (LMT) tend to apply their investments to gathering knowledge for specific products and processes. Their goal is to develop a sufficiently innovative outcome, keeping design and production efficient. As S12 production manager explained:

TABLE 3
Quotations About R&D Investments

Supplier	Product/Service	Interviewee	Technological Level	R&D Focus	Quotations
S1	Electronics	R&D Director	HMT	Abstract	"We have to develop some general knowledge before being able to apply it to a new technology."
S2	Electronics	Production Director	HMT	Abstract	"R&D for us is aimed at enhancing mainly basic knowledge."
S3	Chains	R&D Director	LMT	Applied	"We invest in machineries. We have to find ways to make our chains more robust and reliable."
S4	Carburators and injections	Production Director	HMT	Abstract	"It takes years of research before being able to transform some knowledge into a new product."
S5	Frames	R&D Director	LMT	Applied	"When we invest in R&D, we mainly focus on processes for metal pressing. At the end of our study we often end up upgrading our plant technology."
S6	Forks and shock absorbers	Production Director	LMT	Applied	"We immediately try to think of new applications"
S7	Forks and shock absorbers	R&D Director	LMT	Applied	"Focus on results is our goal. If R&D does not lead to innovations, we consider it useless."
S8	Brakes and wheels	R&D Director	HMT	Abstract	"(…) we use less than 20% of the knowledge we develop. It does not matter: it all helps to have a clearer idea about what to do."
S9	Throttle systems, handlebars	Entrepreneur	LMT	Applied	"Innovation for us mainly consists of new products."
S10	Engines	Production Manager	HMT	Abstract	"I wish we could make a new engine for every discovery we make. Most of the things we find out do not end up into innovations."
S11	Brakes and wheels	R&D Director	HMT		"In our company R&D is a lot about physics, for example.(…) We just got a new guy who graduated in physics."
S12	Mechanical parts	Production Manager	LMT	Abstract	"We don't do much R&D…our products are too simple, anyone can make them. But we spend a lot of energy thinking about how to cut costs keeping the highest quality possible."
S13	Silencers	Entrepreneur	LMT	Applied	"While studying new ideas we directly develop new technologies."
S14	Lights	R&D Director	LMT	Applied	"R&D is quite irrelevant for us. Innovation is pulled by the product management office."
S15	Design and Engineering	R&D Director and entrepreneur	HMT	Abstract	"We always have to know more than our customers know. Always. Sometimes I end up wondering if it's even right to invest so much time in things we might never use."
S16	Wheels	Production Manager	LMT	Applied	"For us R&D means developing a new product or process."
S17	Lights	R&D Director	LMT	Applied	"Our lights must correspond to law requirements. We're not free to be too creative. This is why investing too much on breakthrough innovations for us is almost negative: we won't be able to produce them!"
S18	Design and Engineering	Technology Development Manager	HMT	Abstract	"I consider R&D so important, that my collaborators get higher prizes for the ideas they suggest than for the ones they turn into products or services."

“We don't do much R&D…our products are to simple, anyone can make them. But we spend a lot of energy thinking about how to cut costs keeping the highest quality possible.” S6 production director also stressed how the innovation development is aimed at reducing time from the study phase to the practical application: “We try to immediately think of new applications. We cannot waste time overanalyzing theories.

We need ideas, products, patents, revenues." LMT firms stressed the importance of *time to innovation* – that is the minimum time that a firm needs to obtain revenues from new knowledge – and seemed to value efficiency over originality. Quotations from the companies in the sample (table 3) consistently show that LMT and HMT firms differ in R&D strategies. While, ceteris paribus, LMT firms' R&D investments are mainly targeted at developing specific applied knowledge, HMT firms' R&D investments are principally focused on getting general abstract knowledge.

This result is consistent with recent evidence from literature. Indeed scholars have started to control for technological rates when analyzing AC. For example, Grimpe and Sofka (2009) demonstrated that investments in R&D and consequent AC in LMT industries lead to superior innovation success if they are combined with a search pattern targeting market knowledge (i.e. customers and competitors). Instead, in HMT firms R&D commitment provides superior innovation success when combined with a search pattern targeting technological knowledge (i.e. universities and suppliers). This evidence presents R&D investments as a two-phase process: The first one stresses the "research" nature of activities, aimed at gathering knowledge and innovative contributions of science. Abstract knowledge is the first main outcome. However, only through a codification process do firms reach the following phase, where they benefit from the economic returns of their investments. The second phase, which is more focused on "development", stresses the importance of practical application and transformation of knowledge into outcomes that can be leveraged to increase profitability. In this sense, artifacts, machineries, patents, devices, and products represent the most common output. While HMT firms need to go through both processes of R&D, LMT can directly access the second one. However, managers expressed their concerns about transforming former research investments into tangible profits. They seemed to be aware of the problem that turning research investments into real products is not trivial. Quotations show that managers know that only a minimum part of the firms' knowledge becomes a finished product or tool. S4 production director affirmed: "Of course we try to exploit R&D investments at the best of our abilities. However, we use less than 20% of the knowledge we develop. It does not matter: it all helps to have a clearer idea about what to do." Literature traditionally divides knowledge into abstract and codified (Kogut and Zander, 1992). Boisot (1999) affirmed that abstract knowledge has higher potential, but it requires time and effort to be codified into artifacts. So, on the one hand, we affirm that firms who seek general knowledge (such as mechanical principles or new materials developments) are more likely to reach disruptive innovation, but a longer path separates them from potential revenues, because R&D investments focused on basic knowledge require a codification phase before bringing about innovation. On the other hand, firms who seek applied knowledge face codification issues during the search itself. Hence, the *time to innovation* is shorter, but the outputs are more likely to be incremental, rather than disruptive. Quotations from the field support this perspective: "We noticed that if we try directly to develop a new product, most of the time it will end up being an incremental innovation" (S1, R&D director).

According to the theoretical model proposed by Zahra and George (2002), we believe that general and applied R&D may have different impact on potential AC (PACAP) and realized AC (RACAP). The authors consider PACAP the capability to absorb knowledge without necessarily applying it for practical ends. Instead, RACAP involves transforming and exploiting the assimilated knowledge through firms' operations (Zahra and George, 2002 : 191). Accordingly, we support a distinction concerning the interaction between R&D and AC: While R&D investments for general knowledge are a proxy for PACAP, those for applied knowledge impact RACAP.

To sum up, evidence showed that R&D is divided into two sub-phases. HMT firms are more committed to the first one, which aims at obtaining basic, abstract knowledge. LMTs mainly focus on the second one, looking for codified, applied knowledge. To turn abstract knowledge into finished products, HMT firms need to go through a specific codification phase. It is a misleading assumption that all firms in an industry follow the same strategy. In fact, even within the same industry, internal competition determines commitment to technology and, thus, different R&D strategies. Firms are aware that research in basic knowledge has higher potential for disruptive innovation in comparison to applied knowledge. But they also know that it is not trivial to transform basic knowledge into applied knowledge and outcomes. Hence, not all the firms that obtain basic knowledge manage to transform it into final outputs. Finally, while the investments in the first phase of R&D influence PACAP, investments in the second phase affect RACAP because the former is aimed at developing general knowledge that the latter exploits to obtain new products and solutions.

Effects of Relationships on R&D Strategies

According to prior literature, firms mostly develop AC through external ties, such as dyads and networks (Lane and Lubatkin, 1998; Peters and Johnston, 2009; Tsai, 2001). Similarly, the concept of *relative absorptive capacity* explains that AC is conditioned on dyadic-specific attributes such as similarity of both firms' (1) knowledge bases, (2) organizational structures and compensation policies, and (3) dominant logics (Lane and Lubatkin, 1998 : 461). In a relational perspective, strong ties are believed to increase relational rents, decrease communication costs, and avoid opportunistic behaviors, thus benefiting both partners involved in the collaboration (Dyer and Nobeoka, 2000). For example, scholars have demonstrated that especially in the automotive supply networks trust enhances innovation and economic performance (Dyer and Chu, 2000, 2003). When two firms engage in a partnership, they try to reduce uncertainty and opportunism through *asset specificity*, defined as an transaction-specific investment (Williamson, 1979, 1985). Relational view scholars have shown how firms rely on different ways to develop asset specificity. According to Nishiguchi (1994 : 12) asset specificity investments can be classified in (1) *Site specificity* (e.g. co-location of manufacturing facilities; co-location of labs and R&D centers; customer trial centers); (2) *Physical asset specificity* (e.g. dedicated manufacturing lines; dedicated moulds; dedicated tools); (3) *Human asset specificity* (e.g. dedicated human resources; dedicated investments in training and education). Generally speaking, asset specificity can be leveraged to foster both general and applied knowledge. Literature posits that it is generally easier to protect innovation when embedded into artifacts, technologies, and codified solutions. Instead, abstract knowledge usually belongs to the public domain and therefore tends to be hardly controlled by appropriation regimes. Along these lines, we should expect a higher commitment toward asset specificity for those firms that highly invest in general knowledge. However, evidence from our interviews did not confirm this common intuition. In table 4 quotations report how both HMT and LMT strongly rely on asset specificity to enhance their AC. In a manufacturing network of dense ties like the Italian motorcycle part industry, firms' commitment to alliances is more relevant than their technological level in defining R&D investments toward asset specificity. A firm's alliance strategy affects its engagement in asset specific R&D activities more than technological contingencies. In our sample, suppliers engaged in partnerships and commercial relations since the very beginning of the industry and highly valued being able to continue these relationships. Table 1 shows the average years of collaboration and the number of ongoing relations at t_3. Along these lines, Koza and Lewin affirmed that "strategic alliances are embedded within the firm's history and strategic portfolio and co-evolve with the firm's strategy, the institutional, organizational, and competitive environment, and with management strategic intent for the alliance." (1998 : 261).

TABLE 4
Quotations About Asset Specific Investments

Supplier	Product/Service	Interviewee	Technological Level	R&D focus	Quotations on asset specificity
S1	Electronics	R&D Director	HMT	Abstract	"We constantly invest with our customers for dedicated production lines."
S2	Electronics	Production Director	HMT	Abstract	"Since the last 15 years the co-patenting activity with our customers is definitely increased."
S3	Chains	R&D Director	LMT	Applied	"We made these special sets of moulds for our Japanese customers."
S4	Carburators and injections	Production Director	HMT	Abstract	"Every engine is different from the other. All we do is totally customized and both we and our customers invest in specific machineries to make our fuel injection systems."
S5	Frames	R&D Director	LMT	Applied	"Honda helped us to buidt a production plant in Spain, so that we could manufacture next to their company."
S6	Forks and shock absorbers	Production Director	LMT	Applied	"We dedicate at least one technician to each one of our main customers."
S7	Forks and shock absorbers	R&D Director	LMT	Applied	"We develop joint investments with our customers every year, since every fork fits only a single motorcycle model."
S8	Brakes and wheels	R&D Director	HMT	Abstract	"Most of the co-investments are dedicated to the racing innovations. Most of the time we use what we discover in the racing world to innovate our mass-market products"
S9	Throttle systems, handlebars	Entrepreneur	LMT	Applied	"We are developing with our customer an innovative throttle transmission system. The customer is participating in the costs of development."
S10	Engines	Production Manager	HMT	Abstract	"The engine is the heart of every motorcycle. This is why every product we make is customized on for our customers (…) several times our customers participate in the investments for our
S11	Brakes and wheels	R&D Director	HMT		"We have made this production line with Ducati. They economically helped us to develop it as they wanted."
S12	Mechanical parts	Production Manager	LMT	Abstract	"Every mould is specific for one customer."
S13	Silencers	Entrepreneur	LMT	Applied	"Silencers are usually standard products. But in some cases, like the titanium silencer, we had to develop something specific, following the indications of our trial customers."
S14	Lights	R&D Director	LMT	Applied	"Have you ever seen a two motorcycles with the same lights? Never. Every two-wheel vehicles need its own product, which means, specific moulds, parts and testing lines."
S15	Design and Engineering	R&D Director and entrepreneur	HMT	Abstract	"Most of our services are based on cad-cam scanners. Sometimes to provide new services we are required to upgrade our instruments. In some cases, firms helped us to purchase new machineries just because they fitted with the ones they owned."
S16	Wheels	Production Manager	LMT	Applied	"All the moulds you see are personalized for OEM manufacturers. Only after-sales products can avoid personalizations."
S17	Lights	R&D Director	LMT	Applied	"Ducati asked us to develop a new front light for the Streetfighter model that looked like a led-lights effects. From this collaboration we developed a completely new light technology for the two-wheels vehicles."
S18	Design and Engineering	Technology Development Manager	HMT	Abstract	"Our designers spend time at our customer's plant to better understand their needs. Their training is customized and their activities are totally focused on a single OEM's requirement."

Evidence from our interviews sheds light on another relevant motivation toward relational investments. Since asset specificity is often the result of co-investments between partners, empowered resources allow firms to shorten the *time to innovation*. For example, when in 2005 the firm S6 developed a new front fork for the awarded motorcycle MV Agusta Brutale 750cc, a small team of both the supplier's and the OEM's designers was established. The emerging technology of reverse fork tubes was adapted to the new MV Agusta model in a shorter time thanks to the joint efforts of a team composed of twice the number of designers with different skills than usual. Thanks to human asset specificity, firms have learnt in a shorter time how to apply innovative knowledge of a specific technology to a real finished product (i.e. reverse tube forks). S5 managers who developed the first "fuel in frame" technology and the dual use of the swing fork as an oil tank with Buell (Harley-Davidson group) in the early 1990s reported a similar situation. Other quotes confirm the positive effect of asset specificity on development time: "It is always complicated to transform general knowledge into a product or process. Furthermore it takes a long time. Involving our customers in this process gives us to access to more resources, and hence it reduces the time required to generate an innovation" (S2 production director). Along these lines S18 technology development manager affirmed: "Involving our customers in our R&D projects helps us in two ways: first we speed up the project pace, and, second, it convinces them that we are not wasting time. To obtain outstanding results we need time, and when our customers see what we are doing, they will realize it and maybe be more understanding." Being able to access additional resources permits firms to reduce the codification phase and reach the expected output in shorter time. In industries where time-to-market and first-mover advantage are relevant to outperforming competitors, firms' investments in asset specificity may yield a competitive advantage. According to quotations in table 5, asset specific investments not only discourage opportunistic behaviors, but also decrease *time to innovation,* thus breeding trust between partners.

TABLE 5
Quotations About Benefits of Asset Specificity for HMT Suppliers

Supplier	Product/Service	Interviewee	Technological Level	R&D focus	Quotations on asset specificity benefits
S1	Electronics	R&D Director	HMT	Abstract	"Co-designed project have usually a faster pace than the other ones."
S2	Electronics	Production Director	HMT	Abstract	"It is always complicated to transform general knowledge into a product or process. Furthermore it takes long time. Involving our customers in this process give us to access to more resources, and hence it reduces the time required to generate an innovation."
S4	Carburators and injections	Production Director	HMT	Abstract	"BMW helped us to develop the new production line in a shorte time. After that, our relationship improved a lot."
S10	Engines	Production Manager	HMT	Abstract	"Investing with our customers help to make them trust what we're doing"
S11	Brakes and wheels	R&D Director	HMT		"We built a co-design center with 25 cad and 5 cam design desks. Invoving our customers in this process help us to be faster at transforming ideas into products."
S18	Design and Engineering	Technology Development Manager	HMT	Abstract	"Involving our customers in our R&D projects help us in two ways: first we speed up the project pace, and second it convinces them that we are not wasting time. To obtain outstanding results we need time, and if our customers can see what we are doing, they will realize it and maybe be more understanding."

In summary, firms learn from external ties. External learning relationships are bred via joint investments in asset specificity, which increase resources, promote trust, and inhibit opportunism. As a consequence, it also decreases *time to innovation*. Although firms care about exploiting strategic knowledge, firms' commitment to strategic alliances has a bigger influence on their tendency to invest in asset specificity. Hence, firms with strong ties are expected to be more committed to transaction specific investments than firms with weak ties.

A Classification of R&D Investments

So far, evidence from this study has offered several insights into the opacity of R&D and has fostered a better understanding of the connection between different forms of R&D and learning processes. Firstly, field data has suggested that R&D depends on the type of knowledge that firms want to obtain (knowledge scope) and is thus often related to the individual firms' technological level. In contrast to previous research, we claim that the assumption that all firms within an industry share the same technological level is misleading. The Italian motorcycle industry has shown us that what management scholarship would traditionally consider a medium-technology environment presents firms with different levels of technological skill and, hence, different R&D activities and strategies. Secondly, we have shown how transaction-specific R&D investments provide benefits in building trust among partners and in decreasing *time to innovation.* This is particularly relevant for HMT firms that generally struggle to defend abstract knowledge ownership and need more time to reach returns derived from innovation development. In this section, we contribute to AC literature by suggesting a theoretical framework that specifies the different forms of R&D and provides a classification of knowledge absorption activities. We attempt to provide a tool that scholars can apply to any type of firm and in any industry or technological environment. Combining R&D scope – general knowledge vs. applied knowledge – with relation-specific R&D attributes – generic asset vs. specific asset – we build a matrix that contains four types of R&D strategies. Figure 2 summarizes the main features of the four R&D forms: (1) *αR&D* (abstract knowledge; general assets) aims at creating basic knowledge, such as biochemistry discoveries for a pharmaceutical firm or material engineering discoveries for a mechanical firm. We expect that *αR&D* results have no direct application on practical processes and artifacts. HMT firms engage in *αR&D* on principle without investing in transaction-specific assets. *αR&D's* outcomes need to be codified before being transformed into products, which increases the *time to innovation*. (2) *βR&D* (abstract knowledge; specialized assets) aims at generating basic knowledge through collaborations with other organizations. It implies dedication to relation-specific investments. Similarly to *αR&D*, *βR&D* leads to abstract knowledge and requires a codification process. However, the participation of an external partner reduces the *time to innovation,* thanks to additional resources and trust between the partners. Due to this reason, it is of particular relevance to HMT firms attempting to control abstract knowledge ownership. Deriving from advances in basic scientific knowledge, both *αR&D* and *βR&D* have high potential for disruptive innovations. (3) *γR&D* (codified knowledge, generic assets) aims at gathering applied knowledge to develop products, patents, machineries, and manufacturing solutions. Firms engage in *γR&D* without transaction-specific investments. It is more common among firms whose moderate technology allows for a direct focus on finished products, without necessarily developing basic knowledge first. It usually leads to incremental innovations. (4) *δR&D* (codified knowledge; specific assets) focuses on the development of applied knowledge via transaction-specific investments. Similarly to *γR&D* activities*,* LMT firms leverage directly on *δR&D*, whereby they are often able to avoid investments in general knowledge. Due to the hypercompetition of high-tech environments, HMT firms seek groundbreaking innovations. Therefore, they often engage in *γR&D and αR&D* projects first, whose output are then codified through *δR&D.* The investments in asset specificity, just as in *βR&D,* favor trust and decrease the opportunism between partners. Also, the joint effort of multiple partners reduces the *time to innovation.*

FIGURE 2
Typology Of R&D Investments Based on Knowledge Scope and Asset Specificity

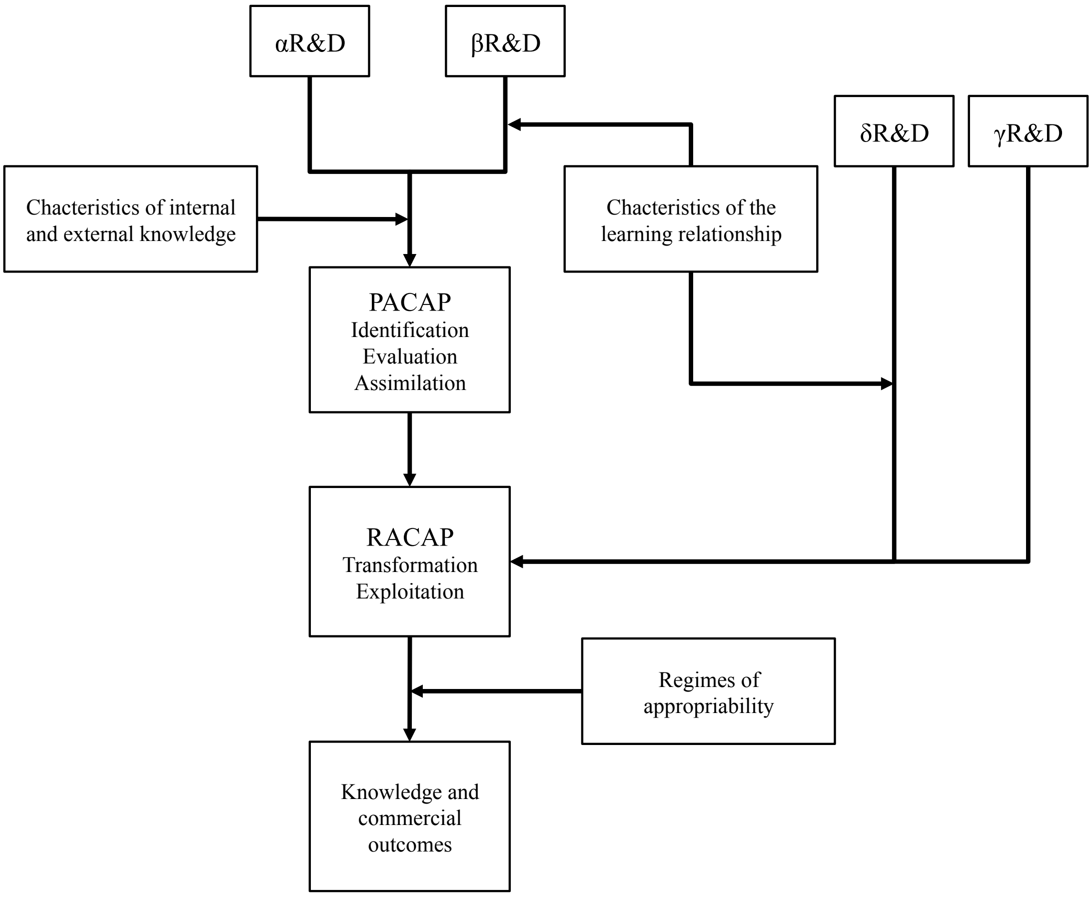
KNOWLEDGE

	Generic	**Specific**
Codified	**γR&D** - Target: codified knowledge - No asset specificity - It is common for firms developing simple innovations, without leveraging on collaborations - It seldom leads to groundbreaking innovations - Outcomes: codified products and processes	**δR&D** - Target: codified knowledge - Asset specificity through relations - Any firm can use it - Partner involvement; increases trust, resources and decrease time to innovation - Outcomes: codified products and processes
Abstract	**αR&D** - Target: abstract knowledge - No asset specificity - Common for HMT firms - Outcomes requires a codification phase to be transformed into products and processes - If codified into products it has potential for disruptive innovations	**βR&D** - Target: abstract knowledge - Asset specificity through relations - Pivotal for HMT firms (need to protect abstract knowledge from opportunistic behaviors) - Outcomes require codification to be transformed into products and processes - Partner involvement; increases trust, resources and decrease time to innovation - If codified into products it has potential for disruptive innovations

ASSETS

While we have affirmed that R&D is a multifaceted concept, we still need to establish how different R&D forms condition a firm's AC process. Figure 3 depicts a novel theoretical model, where the four types of R&D interact with previous results deducted from AC. The model sums up the different strategies that firms may choose while developing a knowledge absorption capability. *αR&D* and *βR&D* seek abstract knowledge. Basic knowledge has great potential, since disruptive innovations often derive from discoveries in basic science.

FIGURE 3
Effects of Different R&D Forms, Through a Synthetic Absorptive Capacity Model



According to Zahra and George (2002), *αR&D* and *βR&D* should be a proxy for PACAP, which stands for the part of AC aimed at absorbing non-applied knowledge. Outcomes of PACAP need to be followed by codification and transformation phases, which require specific investments in knowledge exploitation. This can be achieved by using γR&D and *δR&D* activities. Regimes of appropriability for abstract knowledge are generally less protective than for applied outcomes. Hence, firms engaged in *βR&D* gain a safer standing? Thanks to their investments in asset specificity, which decrease third parties' opportunism. Nevertheless, regimes of appropriability may also affect a firm's decision about which R&D strategy to choose. In fact, a firm may decide not to rely on external parties if it believes that the ongoing appropriation regime sufficiently guarantees protection against knowledge "predators". However, not all knowledge can be protected. When a firm is not able to exploit its own discoveries due to predatory activities of other competitors, the PACAP cannot be activated. In those cases firms tend to consider the R&D investment as an economic failure, since not only misses the developing firm out on quasi-rents derived from new knowledge, but competitors also might attain a competitive advantage. For example, Honda has struggled to protect the performing aerodynamic design of the scooter Honda model SH, which was developed with S18. However, some Chinese and Japanese firms have recently marketed new scooters that clearly imitate the shield and main design of the SH scooter. Honda and its suppliers have not been able to prevent this imitation. In fact, in the scooter industry aerodynamics imitation is legal if the copier changes a few details of the original product. Zahra and George's model (2002 : 192) shows that regimes of appropriability affect the AC model only in the last phase, when firms exploit RACAP to reach a competitive advantage. Our study meanwhile argues that regimes of appropriability affect AC also in previous phases, such as the decision making process that firms face before engaging in any R&D activity, and during the absorption of basic knowledge leading to PACAP. *γR&D* and *δR&D* target the absorption of applied knowledge. Targeting RACAP directly allows a firm to skip the codification process. However, when expertise is based on established knowledge, the likelihood of causing disruptive innovation is lower. *δR&D* and *βR&D* activities evolve through specific assets, which are financed by two or more associates. Literature has demonstrated that in this case the specific characteristics of learning partnerships affect the outcomes of such investments. According to the results from Lane and Lubatkin's study on pharmaceutical-biotechnological R&D alliances (1998), we claim that one's firm ability to learn from the other is conditioned on both firms' (1) knowledge bases, (2) organizational structures and compensation policies, and (3) dominant logics. On the one hand, a firm that engages in an R&D alliance gains a temporary increase of resources. On the other hand, the success of the partnership is more uncertain, since sharing similarities – such as similar approaches to knowledge acquisition, or mental models – with the other parties is an aspect that firms cannot keep under total control. For this particular reason, firms that know their partners' characteristics well are expected to have a better forecasting skill of future outcomes and landscapes.

CONCLUSIONS

Although based on different premises and methods, the majority of studies agree that R&D represents the best proxy to observe AC. We have claimed that research should start from an updated definition of R&D to create a common ground where heterogeneous contributions may concur. Scholarship has dedicated little attention to the definition of research and development. We have shown how prior studies lack a fine-grained analysis of learning investments and routines. Also, with few exceptions, R&D has been associated with high-tech environments only. While lacking a common ground to foster consistent contributions, scholars have followed two main theoretical directions. The first approach has followed the traditional definition of Cohen and Levinthal (1990), principally focusing on R&D figures through cross-sectional approaches. The second group of scholars has gone along with a process interpretation of relational variables, often leveraging on longitudinal analysis. The two streams of literature are so divergent that scholars have considered their results as incomparable and in some cases even inconclusive (Lane *et al.*, 2006 : 844). Consequently, the goal of our study was to unpack the definition of R&D and frame it in a process fashion. We have attempted to provide scholars with a detailed definition of R&D that can be used in process analysis. Our work has advanced a general interpretation of R&D, unpacking it in two main dimensions: (1) knowledge scope (abstract/basic knowledge vs. codified/applied knowledge), and (2) asset specificity (generic assets vs. specific assets). Combining these two dimensions, a four-type classification of R&D forms has emerged. Each one of the four R&D types has different implications for knowledge output and relational strategy: (1) *αR&D* (abstract knowledge; generic assets); (2) *βR&D* (abstract knowledge; specific assets); (3) *γR&D* (codified knowledge, generic assets); (4) *δR&D* (codified knowledge; specific assets). Framing the building blocks of R&D strategies into a theoretical model of AC, we have identified four different paths. Evidence has shown that within the Italian motorcycle industry parts manufacturers vary from LMT to HMT. We have claimed that it is misleading to assume that all firms within an industry have the same level of technology and, hence, R&D strategies. As products become more complex, technological level tends to greatly vary even within the same industry. Hence, assuming homogeneity of R&D strategies within the same industry is misleading. Scholars should consider the possibility that different firms might have different approaches to R&D, even within the same industry or market. Also, we have argued that intervening variables formerly introduced in literature need further specification. Our study argues that regimes of appropriability do not only affect the exploitation phase following RACAP (Zahra and George, 2002), but also influence the decision-making process preceding a firm's commitment in any R&D strategy and the creation of PACAP after a firm's involvement in R&D projects that target abstract knowledge (i.e. during *αR&D* and *βR&D* activities). Finally, we have argued that similarities between a teacher and a student firm are particularly relevant for those firms who seal their alliances through asset specific investments. In accord with Williamson (1985), we agree that asset specificity reduces opportunism and increases trust and resources in learning relationships. However, relational AC is conditioned by partners' (1) knowledge bases, (2) organizational structures and compensation policies, (3) dominant logics (Lane and Lubatkin, 1998), which are not under the complete control of the participants. Therefore, entering in an alliance implies a certain degree of uncertainty. To reduce the risk of predatory behaviors, managers should strive for thorough knowledge of external partners before starting any R&D collaborations.

Although this contribution reveals some of the most hidden issues of AC, it contains some limitations. We chose to examine the Italian motorcycle part industry due to its heterogeneity of firms and technological variety. However, it would be interesting to confirm our results in other environments, especially in low-tech and service industries, which literature has rarely taken into consideration when observing AC. The use of qualitative data is consistent with the process interpretation we presented. Still, it would be interesting to test our results with larger samples and quantitative methods. Finally, our work is based on a localized industry. Although scholars have previously considered the Italian motorcycle industry as an interesting field to develop theory, it would be rewarding to explore different settings in other parts of the world. As global competition becomes tougher and technological development accelerates, managers have to reach a deeper self-awareness of rent-generation dynamics, especially when these underpin intangible resources such as superior learning capabilities. By unpacking R&D, we have tried to shed light on an opaque aspect concerning both research and practice: to observe a firm's learning capability, scholars should use more specific definitions of research and development. We hope that our reflections will provide a useful base for fostering consistent research and successful strategies.

APPENDIX

Examples of questions asked during the non-structured interviews.

How would you define R&D investments?

What is the R&D investment goal in your firm? Give examples.

What kind of activities do you develop through R&D investments?

What kind of activities does your company develop to sustain knowledge acquisition and innovation?

What are the main sources to increase your company's knowledge assets?

How much of what you have developed depends on knowledge you acquired from your customers?

How much of your R&D investments are dedicated to a specific transaction?

How do you protect the outcomes of your R&D investments?

REFERENCES

Abernathy W. 1978. *The productivity dilemma*. Johns Hopkins University Press: Baltimore, MD.

Ahuja G, Katila R. 2001. Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study. *Strategic Management Journal* **22**(3): 197-220.

Allen T. 1977. *Managing the flow of technology*. MIT press Cambridge, MA.

Boisot M. 1999. Knowledge assets: Securing competitive advantage in the information economy. Oxford University Press, USA.

Christensen CM, Rosenbloom RS. 1995. Explaining the attacker's advantage: Technological paradigms, organizational dynamics, and the value network. *Research Policy* **24**(2): 233-257.

Cohen WM, Levinthal DA. 1989. Innovation and Learning: The Two Faces of R & D. *The Economic Journal* **99**(397): 569-596.

Cohen WM, Levinthal DA. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* **35**(1): 128-152.

Cohen WM, Levinthal DA. 1994. Fortune Favors the Prepared Firm. *Management Science* **40**(2): 227-251.

Davies R. 1987. The limitations of cross sectional analysis. In R Crouchley (Ed.), *Longitudinal data analysis*. Aldershot.

Dyer JH, Chu W. 2000. The Determinants of Trust in Supplier-Automaker Relationships in the U.S., Japan, and Korea. *Journal of International Business Studies* **31**(2): 259-285.

Dyer JH, Chu W. 2003. The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea. *Organization Science* **14**(1): 57-68.

Dyer JH, Hatch NW. 2006. Relation-specific capabilities and barriers to knowledge transfers: creating advantage through network relationships. *Strategic Management Journal* **27**(8): 701-719.

Dyer JH, Nobeoka K. 2000. Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal* **21**(3): 345-367.

Dyer JH, Singh H. 1998. The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *The Academy of Management Review* **23**(4): 660-679.

Easterby-Smith M, Graca M, Antonacopoulou E, Ferdinand J. 2008. Absorptive capacity: a process perspective. *Management Learning* **39**(5): 483.

Eisenhardt KM. 1989. Building Theories from Case Study Research. *The Academy of Management Review* **14**(4): 532-550.

Eisenhardt KM. 1991. Better Stories and Better Constructs: The Case for Rigor and Comparative Logic. *The Academy of Management Review* **16**(3): 620-627.

Grant R. 1996a. Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science* **7**(4): 375-387.

Grant R. 1996b. Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal* **17**: 109-122.

Grimpe C, Sofka W. 2009. Search patterns and absorptive capacity: Low- and high-technology sectors in European countries. *Research Policy* **38**(3): 495-506.

Jansen JJP, Van den Bosch FAJ, Volberda HW. 2005. Managing potential and realized absorptive capacity: How do organizational antecedents matter? *Academy of Management Journal* **48**(6): 999-1015.

Kogut B, Zander U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* **3**(3): 383-397.

Koza MP, Lewin AY. 1998. The Co-Evolution of Strategic Alliances. *Organization Science* **9**(3): 255-264.

Lane P, Koka B, Pathak S. 2006. The reification of absorptive capacity: a critical review and rejuvenation of the construct. *The Academy of Management Review* **31**(4): 833-863.

Lane PJ, Lubatkin M. 1998. Relative Absorptive Capacity and Interorganizational Learning. *Strategic Management Journal* **19**(5): 461-477.

Lane PJ, Salk JE, Lyles MA. 2001. Absorptive Capacity, Learning, and Performance in International Joint Ventures. *Strategic Management Journal* **22**(12): 1139-1161.

Lewin AY, Massini S, Peeters C. 2010. Microfoundations of Internal and External Absorptive Capacity Routines. *Organization Science*: orsc.1100.0525.

Lim K. 2009. The many faces of absorptive capacity: spillovers of copper interconnect technology for semiconductor chips. *Industrial and Corporate Change* **18**(6): 1249-1284.

Lipparini A, Lorenzoni G. 2005. Organizing around strategic relationships: Networks of suppliers as knowledge generators in the Italian motorcycle industry. In Cool KO, J Henderson, R Abate (Eds.), *Restructuring strategy, strategic management series*: 44-67. Blackwell: Oxford.

Lipparini A, Lorenzoni G, Zollo M. 2001. Dual Network Strategies: Managing Knowledge-based and Efficiency-based Networks in the Italian Motorcycle Industry, *21st Strategic Management Society Conference*: San Francisco.

Meeus M, Oerlemans L, Hage J. 2001. Patterns of interactive learning in a high-tech region. *Organization Studies* **22**(1): 145.

Miller CC, Cardinal LB, Glick WH. 1997. Retrospective Reports in Organizational Research: A Reexamination of Recent Evidence. *The Academy of Management Journal* **40**(1): 189-204.

Mintzberg H, Pascale R, Goold M, Rumelt R. 1996. The "Honda effect" revisited. *California Management Review* **38**(4): 78-117.

Mowery D. 1983. The relationship between intrafirm and contractual forms of industrial research in American manufacturing, 1900-1940. *Explorations in Economic History* **20**(4): 351-374.

Mowery DC, Oxley JE, Silverman BS. 1996. Strategic Alliances and Interfirm Knowledge Transfer. *Strategic Management Journal* **17**: 77-91.

Muffatto M, Panizzolo R. 1996. Innovation and Product Development Strategies in the Italian Motorcycle Industry. *Journal of Product Innovation Management* **13**(4): 348-361.

Nishiguchi T. 1994. Strategic industrial sourcing: The Japanese advantage. Oxford University Press, USA.

Pascale R. 1996. The Honda effect. *California Management Review* **38**(4): 80-91.

Peters L, Johnston W. 2009. Understanding absorptive capacity from a network perspective. *Journal of Business Market Management* **3**(1): 29-50.

Rosenberg N. 1970. Economic development and the transfer of technology: Some historical perspectives. *Technology and Culture* **11**(4): 550-575.

Szulanski G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal* **17**: 27-43.

Takeishi A. 2001. Bridging Inter- and Intra-Firm Boundaries: Management of Supplier Involvement in Automobile Product Development. *Strategic Management Journal* **22**(5): 403-433.

Teece D. 1977. Technology transfer by multinational firms: the resource cost of transferring technological know-how. *The Economic Journal* **87**(346): 242-261.

Teece DJ. 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* **28**(13): 1319-1350.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* **18**(7): 509-533.

Tilton J. 1971. International Diffusion of Technology: The Case of Semiconductors. The Brookings Institution: Washington DC.

Todorova G, Durisin B. 2007. Absorptive capacity: valuing a reconceptualization. *Academy of Management Review* **32**(3): 774-786.

Tsai W. 2001. Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal* **44**(5): 996-1004.

Van den Bosch F, Volberda H, Boer M. 1999. Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms and Combinative Capabilities. *Organization Science* **10**(5): 551-568.

Volberda H, Foss N, Lyles M. 2010. Absorbing the Concept of Absorptive Capacity: How to Realize Its Potential in the Organization Field. *Organization Science* **21**(4): 931-951.

Wezel FC. 2005. Location Dependence and Industry Evolution: Founding Rates in the United Kingdom Motorcycle Industry, 1895-1993. *Organization Studies* **26**(5): 729-754.

Williamson O. 1979. Transaction-Cost Economics: The Governance of Contractual Relations. *The Journal of Law and Economics* **22**(2): 233.

Williamson O. 1985. The economic institutions of capitalism: firms, markets, relational contracting. Free Press: New York.

Yin R. 2008. Case study research: Design and methods. Sage Publications, Inc.

Zahra SA, George G. 2002. Absorptive Capacity: A Review, Reconceptualization, and Extension. *Academy of Management Review* **27**(2): 185-203.