
Università degli studi della Calabria

Facoltà di Economia

Corso di dottorato in Scienze Aziendali XXI ciclo
Settore disciplinare SECS-P/08

ECONOMIA E GESTIONE DELLE IMPRESE

Dipartimento di Scienze Aziendali

Tesi di Dottorato

THE ANALYSIS OF HETEROGENEITY AMONG FIRMS

ANTECEDENTS, COMPONENTS

AND MAIN DISSEMINATIONS

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One of the main research areas within strategic management studies is the Resource-based view (RBV). The Resource-based view has gain prominence in the last years in the explanation of firm's competitive advantage. This perspective has helped in understanding how firms are able to build and sustain their competitive advantage with their own resources and capabilities. Resources have been defined as organizational strength and weaknesses linked to the firm and considered as the indirect cause of competitive advantage, besides firm's product portfolio (Wernerfelt, 1984).

The earlier RBV research was mainly interested in highlighting how resources owned by firms are responsible of firm's competitive advantage instead of superior position in an industry (Barney 1986, 1991). The RBV over the years has emerged as a leading perspective within strategic management studies. The first formalization of the theory in a clear framework of analysis has been carried out by Barney (1991), who identified two assumptions of the theory: resources are heterogeneous among firms, and they are imperfectly mobile. Following the first contributions, there has been a great increase in the number of studies on resources. Most of them have been interested in the first stage of the theory, to highlight the relevant insights about the characteristics of resources in order to build and sustain competitive advantage. Barney(1991) has contributed to the literature with his famous VRIN framework, used to highlight that only those resources that are valuable, rare, non imitable and non substitutable might lead to superior performance. Other studies on have highlighted other resources attributes that firms should own in order to rich a competitive advantage. Amit and Schoemaker (1993) have pointed out that not tradable, scarce, appropriable, complementary and firm specific resources are the key determinants of organizational rents. Peteraf (1993) has highlighted

the four conditions that should be met in order to sustain competitive advantage: heterogeneity, imperfect mobility, ex-ante and ex-post limits to competition. Lippman and Rumelt (1992) have highlighted that another potential feature of competitive advantage is the causal ambiguity surrounding resources, since this impedes the imitation from rivals. The inimitability has been put forth by Rumelt (1984) who introduced the concept of “isolating mechanisms”, to highlight those factors unique of a given firm that limit the rival imitation attempts and thus protect a firm’s rent. Following the same reasoning, Dierickx and Cool (1989) suggested that resources built over time are better candidate for determining firms’ rents since they are subject to time compression diseconomies, are causal ambiguous and are linked to other resources by means of interconnections and combinations.

After this first stage of research within RBV, other studies have been carried out to assess the impact of specific types of resources on firm performance. The focus was shifted from resource characteristics to types of resources, like R&S strategy (Henderson and Cockburn, 1994), culture (Barney, 1986), knowledge (Grant, 1996; Conner and Prahalad, 1996), competencies (Prahalad and Hamel, 1990), reputation (Rao, 1994) etc.

This line of research gave rise to some debate due to the potential infinite regress that the theory might produce (Conner, 1991). Indeed, the search for the ultimate source of competitive advantage has led to analyze different kinds of resources and to assess their impact on firm performance. Superior performances have been attributed to many kinds of resources, thus weakening the usefulness of such analysis. The emphasis on a given resource endowment has led to disregard how resources change and are improved over time. Besides the inherent superiority given by resource stocks, firms that attain superior performance are those able to exploit the bundle of resources.

More recently the theory has been blamed to be tautological (Priem and Butler, 2001). The tautology arises from the exploration of successful firms’ resources to maintain that those same resources are the sources of competitive advantage. This approach renders the theory not falsifiable (Powell, 2001), thus limiting its explanatory power.

For this reason, while RBV has gain prominence as a theory of firm’s competitive advantage, recent contributions have pointed out that there are inconsistencies in the

theory itself, since it is not able to provide clear explanations for firms in order to build a competitive advantage.

Moreover, some point out that little attention has been placed on providing empirical evidence about the source of competitive advantage (Boyd, Gove & Hitt 2005), thus maintaining that RBV has not been able to provide insights about intra-industry heterogeneity. The problem of which are the sources of heterogeneity is even more stringent in the case of high-velocity markets (Eisenhardt and Martin, 2000), where the theory is not able to explicate which actions prove to be useful.

The main focus of the RBV since its infancy was the analysis of firm's differences considered as main determinant of firm's differential performance. However, the critiques moved to the theory show that the concept of Heterogeneity has not been dealt with in a precise manner. In more detail, what emerges is that the theory is not able to identify from where Heterogeneity comes and how to build it within firms. The problem of Heterogeneity has been shared between Strategic Management and Organization Theory. Over the last two decades, many attempts have been made to answer this question from the resource-based view (hereafter RBV - Barney, 1991; Wernerfelt, 1995), the competence-based perspective (Henderson and Clark, 1990; Prahalad and Hamel, 1990) and the capabilities approach (Leonard-Barton, 1992; Kogut and Zander, 1992; Teece et al., 1997). Although all these contributions assume that heterogeneity among organizations is a prerequisite for firm success and performance sustainability (Sakakibara, 1997; Noda and Collis, 2001; Hoopes et al. 2003; Knott, 2003a), to date, the drivers of Heterogeneity have not been explicitly identified, nor has the relation with firms' performance been assessed from this perspective.

Heterogeneity has been treated as an assumption by RBV researchers, thus creating an apparent methodological shortcoming: that is, RBV assumes what should be, instead, demonstrated (Hoopes, Madsen & Walker, 2003). As regards the link between resource heterogeneity and superior performance/competitive advantage, this shortcoming hampers the development of a robust theory, as it has been observed by many scholars (Priem & Butler, 2001a, 2001b; Powell, 2001; Lado et al., 2006; Sirmon, Hitt & Ireland, 2007). Heterogeneity should thus be investigated in order to understand how it is created and what are the forces shaping firms' differences. From different sources it comes a call

for more empirical investigation about the sources of firm's heterogeneity (Lado et al., 2006). Moreover, the strategic management special issue on Heterogeneity published in 2003 has pointed out the need to advance the research on Heterogeneity by taking different and complementary perspectives along with empirical assessments of the role of resources (Hoopes et al., 2003).

This work draws mainly from RBV to analyze in greater detail heterogeneity. Since it is still at the heart of the research on strategic management, the comprehension of this relevant concept can provide useful insights into the sources of competitive advantage. The first empirical work is an attempt to measure Heterogeneity within firms, thus filling in one of the main gap in RBV studies, linked to the lack of empirical assessment of its basic statements. The literature is analyzed not only through a subjective study, but also by means of a more objective tool derived from bibliometric studies: the cocitation. This method is used to identify the Invisible Colleges existing on the theme of Heterogeneity, which could prove useful for further research. Besides gaining a clear understanding of the research carried on over time on heterogeneity, this method might provide suggestions about the areas underpinning heterogeneity.

This work is organized in different sessions. This chapter deals with the RBV literature review in general, with a focus on the contributions provided on Heterogeneity. The next two chapters are the two empirical tests conducted on the theme and are reported as two distinct and independent research articles. The first empirical research is an exploration of the drivers behind heterogeneity, with a measurement scale developed for the construct. The second is a conceptual attempt to identify how the literature on heterogeneity has developed toward specific school of thought. This enables to identify the different streams that are actually under investigation to date within the field. Finally, conclusions and prospects for future directions are provided.

THE RESOURCE-BASED VIEW

In the last two decades the importance of resource-based view as a theory of competitive advantage has been widely recognized (Rumelt, 1984; Wernerfelt, 1984; Barney, 1991; Conner & Prahalad, 1996). Specifically, unique firm resource endowment,

generated by a specific accumulation process, is broadly considered as source of competitive advantage.

Since Penrose (1959) emphasized the relevance of resources for the growth of firms, several authors have contributed to the development of this theory. Within the domain of strategic management, RBV has sought to identify the sources of competitive advantage in the resource endowment of firms (Barney 1991, Grant 1991, Peteraf 1993). Nevertheless, not all resources are the base for sustainable competitive advantage, but only those that are valuable, rare, not imitable and not substitutable (Barney 1991). Sources of sustainability advanced in RBV are attributed to isolating mechanisms, path dependency, casual ambiguity and social complexity (Barney 1991, Dierickx & Cool 1989, Peteraf 1993, Reed & De Filippi 1990, Amit & Schoemaker 1993, Black & Boal 1994; Knott 2003). The resource accumulation process itself can thus be conceived as a main isolating mechanism in that it provides firms with resource bundles that cannot be imitated or duplicated by rivals (Lippman & Rumelt 1982; De Carolis 2003).

Regarding the way in which firms can obtain their resource stock, two approaches have emerged in RBV (Newbert, 2007; Makadok 2001), a static and a dynamic one. The first approach maintains that firm should identify and acquire their resources (Wernerfelt 1984), thus highlighting the relevance of owning superior information about the value of a given resource when used in combination with other pre-existent resources (Barney 1991). In this perspective, Makadok (2001) observed the ex-ante nature of the firm ability to identify opportunities, since it should apply before the acquisition takes place. However, it should be noted that firms don't only buy useful resources but also build them internally. The second view is thus dynamic since it emphasizes the firm skills and capabilities in developing and deploying resources, thus focusing on an accumulation process internal to the firm where resources are combined and integrated with the objective to build a specific resource stock (Dierickx and Cool 1989; Prahalad and Hamel 1990; Mahoney and Pandian 1992; Peteraf 1993; Henderson and Cockburn 1994; Nelson and Winter 1982; Miller and Shamsie 1996). This approach is useful to recognize several kind of "high-order" resources coming from the combination of the basic ones (Black and Boal 1994), such as competences (Fiol 1991), combinative capabilities (Kogut and Zander 1992) and core capabilities (Leonard-Barton 1992).

Research on capabilities emerged in the dynamic capabilities perspective, which pointed out to the need to “explain how combinations of competences and resources can be developed, deployed and protected” (Teece, Pisano and Shuen 1997:510). The dynamic approach thus refers to a firm ability to reconfigure internal resources, following a “capability-building” effort taking place after the acquisition of resources (Makadok 2001). What really matters in this approach is the implementation and deployment phase, going a step further from the static view where only the decision phase about which resources to buy is relevant (Makadok 2001). Resources and capabilities rising from an ongoing accumulation process are embedded within the firm, thus conferring a nature of specificity to the coming bundle (Brush and Art 1999, Coff 1997).

While RBV researchers have offered great contributions to the field of study, it seems that doubts still remains in the theory (Priem and Butler 2001; Newbert 2007; Lado, Boyd, Wright and Kroll 2006).

RBV research is mainly focused on the adoption of many concepts not clearly defined (Lado, Boyd, Wright and Kroll 2006), such as path dependence, tacitness and specificity, thus leading to causal ambiguity (Lippman and Rumelt 1982; Reed and De Filippi 1990), meant as the impossibility to trace out the link between resources and outcomes. This limitation could affect the falsification process giving rise to tautology since RBV proposition are true by definition without having the chance to empirically test them (Lado, Boyd, Wright and Kroll 2006; Priem and Butler 2001). In the search for the sources of uniqueness and competitive advantage, RBV initial approach was static, since focused on those assets already owned by firms or acquired in an imperfect strategic factor market (Barney 1991; Amit and Shoemaker 1993). In this respect, the research has missed to take into account that firms do evolve over time and during this evolution they add new flow of resources to the extant ones (Penrose 1959) not only by acquiring them but also developing them internally.

RBV has recently been blamed to be tautological in that its assumptions are considered true without having the possibility to empirically test them (Priem and Butler). The lack of empirical testing in some of the key concepts, is given, among other causes, by the impossibility to identify the causal link between resources and results, as outlined by the causal ambiguity sustainers. What emerges is a paradox in that resources should

keep their intangible and inimitable nature to be considered source of competitive advantage. Any attempt to understand how resources are created is not only impossible, even for managers internal to the firm, but also counterproductive since it allows the understanding of successful strategies to external competitors.

Within RBV many studies have maintained the need for firms to pay attention to resources needed when facing the competitive environment, thus maintaining the need to regenerate the resource asset position (Smith, Collins and Clark 2005). This task can be accomplished by adopting a resource picking approach or a capability-building one (Makadok 2001). Capabilities are the result of a complex interaction among resources developed over time. Being embedded in the organization they become firm specific, giving the possibility to managers to allocate time and efforts on the relevant areas. Another limitation relates to an early static approach to resources, leading to focus on those assets already owned by firms as source of uniqueness and competitive advantage (Priem and Butler 2001; Wernerfelt 1984).

Focusing on firm specific resources as the main driver of superior performance, RBV has missed to take into account that firms do evolve over time (Penrose 1959) and during this evolution they add new flow of resources to the extant ones not only by acquiring them, but also developing them internally. In order to face the competition and the turbulence in their environment, firms need to continuously engage in investments decisions, thus updating and modifying their resource bundle (Teece, Pisano and Shuen 1998; Eisenhardt and Martin 2000).

In this respect, a major contribution to the theory has been provided by those studies recognizing the importance to look not only at resources owned by firms (Wernerfelt 1984; Rumelt 1984), but also at the process carried out in the effort to create a specific resource bundle (Dierickx and Cool 1989; Mahoney and Pandian 1992; Nelson and Winter 1982; Mahoney 1995). Even if several contributions began to redirect the attention to the process side, there has been little empirical support on it, as for others well established concept within RBV (Boyd, Gove and Hitt).

Another critical point in RBV is related to the uncertainty surrounding the resource bundle definition and composition (Lado, Boyd, Wright and Kroll 2006). The main hurdle to cope with is the inherent lack of predictability in RBV (Barney and Arikan

2001) due to the impossibility to trace out the causal link between resources and outcomes, a widely known concept defined as causal ambiguity (Reed and De Fillippi 1990). One of the main limitations in the RBV field of study thus consists in its weakness in providing prescriptions on how to achieve a competitive advantage. In fact, its somehow “paradoxical” logic is that competitive advantage lies on owning unique and inimitable resources, and any attempts to unravel the resource bundle composition is counterproductive since it gives room for imitation and competitive advantage erosion.

The major shortcomings in RBV can be summarized in:

- static nature
- adoption of many concepts without definition
- causal ambiguity
- lack of empirical testing

HETEROGENEITY AMONG FIRMS

Why are firms different? Over the last two decades, many attempts have been made to answer this question from the resource-based view (hereafter RBV - Barney, 1991; Wernerfelt, 1995), the competence-based perspective (Henderson and Clark, 1990; Prahalad and Hamel, 1990) and the capabilities approach (Leonard-Barton, 1992; Kogut and Zander, 1992; Teece et al., 1997). The analysis of interfirm differences can be traced to early contributions in the field of Business Policy. Central to this field are studies highlighting superior managerial capabilities (Barnard, 1938; Selznick, 1957), material and human resources (Penrose, 1959), and distinctive competencies and strengths as sources of heterogeneity (Andrews, 1971).

Although it seems widely accepted in the field of strategic management that firms are unique and socially complex entities and not just, or even not at all, production functions or maximizing actors (Kogut and Zander, 1992), the source of uniqueness, heterogeneity, has only recently been carefully scrutinized and studied to understand how it contributes to a firm’s competitive advantage (Knott, 2003 “a”; Hoopes et al., 2003). Unfortunately, the way Heterogeneity is generated by the tacit and socially embedded processes (Kogut and Zander, 1992) through which resources are transformed into

products, has been treated as either an ambiguous phenomenon which defies definition, or considered only within the context of market failure (Barney, 1986).

Penrose (1959:75) was the first scholar to direct our attention to interfirm heterogeneity by observing that “*it is the heterogeneity, and not homogeneity, of the productive services available or potentially available from its resources that gives each firm its unique character*”. In essence, it is the *use* of resources, and not resources *per se*, that creates heterogeneity among firms and, thus, the potential for value creation (Tsoukas, 1996; Sirmon et al., 2007; Levinthal, 2000). In fact, extending this observation by Penrose, many have proposed that a firm’s heterogeneity rests upon unique, scarce or rare, inimitable and costly-to-build idiosyncratic, firm-specific resources (Teece, 1982; Wernerfelt, 1984; Rumelt, 1984; Dierickx and Cool, 1989; Barney, 1986; 1991; Castanias and Helfat, 1991; Grant, 1991; Mahoney and Pandian, 1992; Peteraf, 1993; Hoopes et al., 2003). The issue of firm-specific resources represents the cornerstone upon which the focus of business theory has diverted from explanations of performance based on purely industry-based competition towards those approaches in which firms earn above-average returns (Reed and DeFillippi, 1990) and rents (Mahoney, 1991; Amit and Schoemaker, 1993; Peteraf, 1993) through the leverage of assets such as R&D competencies (Helfat, 1997) and marketing capabilities (Srivastava et al., 2001).

Nelson (1991) contributed to the understanding of heterogeneity by analyzing differences between neoclassical studies and strategic management. He debates the validity of neoclassical approaches for understanding innovation and change, pointing out that working with theoretical models which presume that all possible outcomes of economic activities are known to all the competing firms within an industry, is of little help for understanding competitive dynamics in which some firms may not be aware of the opportunities pursued and actions conducted by their competitors Nelson (1991). Nelson (1991) stressed the relevance of routines and capabilities, drawing from Schumpeter (1911; 1942), Chandler (1962), Teece (1980; 1982) and his own work with Winter (1982) (*why firms do differ*), highlighting that it is the differences which exists among firms which accounts for differences in their performances (*why it matters*).

Among studies on heterogeneity, some have defined it as an unobserved phenomenon (Mundlak, 1961; Griliches 1986; Barney, 1991), while others addressed

performance differences as a result of heterogeneity in capabilities and positioning (Henderson and Cockburn, 1994; McGahan and Porter, 1997).

Although different contributions assume that heterogeneity among organizations is a prerequisite for firm success and performance sustainability (Sakakibara, 1997; Noda and Collis, 2001; Hoopes et al. 2003; Knott, 2003a), to date, the drivers of Heterogeneity have not been explicitly identified, nor has the relation with firms' performance been assessed from this perspective.

The way RBV studies usually measure heterogeneity is by taking a given resource and assessing its impact on performance. However, this approach is not properly applied, since heterogeneity is measured by taking a single resource.

Many studies have treated Heterogeneity as a rather monolithic concept and tried to observe it by means of the impact of a given resource leading, which in turns leads to competitive advantage. Since firms employ a bundle of resources in order to compete in their industries, this approach in measuring is not appropriate. In particular, there is a striking contradiction since, if Heterogeneity is deemed a relevant phenomenon given that it is considered as a source of competitive advantage, it is surprising that, to date, there is not a clear definition of it and that researchers can not measure it and assess its impact on firms' performance.

The lack of definition for the Heterogeneity phenomenon is the result of both a theoretical and empirical limitation. On the one hand, from the theoretical point of view, the RBV has to face an inherent problem since those resources deemed as relevant in order to gain a competitive advantage are difficult to measure due to their intangibility (Godfrey and Hill, 1995); on the other hand, from an empirical point of view, extant studies show a weakness since they mainly focus on too narrow elements of organizations (Foss, 1997), or show a tautology in the choice of resources to be analyzed (Priem and Butler, 2001), thus undermining their usefulness in providing suggestions (Newbert, 2007; Armstrong and Shimizu, 2007). Moreover, this prevalent approach in resource-based empirical studies can lead to an infinite regress (Conner, 1994), making it impossible to find the final source of competitive advantage. It is rather more useful to focus on the inherent attributes resources should own in order to give rise to heterogeneity and sustainable competitive advantage (Foss, 1997).

The relevance of Heterogeneity is testified by the growing number of studies which have recently addressed the concept of heterogeneity as the source of a firm's sustained competitive advantage. Several perspectives have been advanced, ranging from the analysis of heterogeneity at the founding stage (Noda and Collis, 2001), in R&D-intensive industries (Cockburn et al., 2000), in geographical clusters (McEvily and Zaheer, 1999), and in effective network and relationship management (Rodan and Galunic 2004). Then, an extensive number of empirical studies have attempted to operationalize heterogeneity, in particular within the RBV. Some of these studies have used patent data (Henderson and Cockburn, 1994), while others have relied on property rights data (Miller and Shamsie, 1996), surveys (McGrath et al., 1995), simulations (Knott, 2003a) and network analysis (McEvily and Zaheer, 1999; Rodan and Galunic, 2004). Other researchers, instead, have identified that the differences in resource endowment among firms determine whether the strategic attainment of goals such as innovation (Knott, 2003 "a") and interorganizational learning (Sakakibara, 1997) can actually be achieved. These contributions notwithstanding, the concept of heterogeneity has, to date, either not been defined at all or has only received a generic definition in the area of strategic management. Specifically, what is missing is the understanding of the nature of Heterogeneity, with a definition of it able to provide useful guidance for further research and moreover for practitioners. While many studies within strategic management have a practical impact, since provide suggestions for firms, the concept of Heterogeneity still remain as a rather theoretical concept, without a clear appreciation of its usefulness in real contexts.

The thesis is a collection of two research papers. The first deals with one of the main gaps in BV, the lack of empirical assessment. This problem is even stronger for the topic of heterogeneity, since it is often taken for granted and not measured or investigated. The first empirical paper aims to develop a scale to measure the heterogeneity construct, which might be useful for further studies aiming at assessing its impact of superior performance and on sustainability.

To understand the nature and underpinnings of Heterogeneity it is necessary to explore the strategic management literature and to highlight which are the different

streams of research followed in the last years. This task is accomplished in the second research paper of this collection.

The following table summarizes the structure of the thesis

	First Chapter	Second Chapter
Title	Measuring Heterogeneity	The Intellectual Structure of Heterogeneity
Aim	Develop a measurement scale for Heterogeneity. Assess its impact on firm performance	Identify the streams of research on the topic of Heterogeneity
Method	Survey administration and Structural Equation Model	Co-citation Analysis
Findings	Results confirm the positive effect of Firm Heterogeneity on firms' performance.	Different invisible colleges on Heterogeneity exist. There is still the need to converge on common interests.

MEASURING HETEROGENEITY

Research within strategic management has been interested in finding the causes of differential performance among firms in a given context. Earlier explanations in strategy have focused on firms' distinctive competencies which enable firms to pursue a strategy more efficiently and effectively (Selznick, 1957). Other contributions have highlighted that strategies contribute to create organizations (Chandler, 1962) and there is a need to investigate strengths and weakness within firm (Andrews, 1971).

However, the leading contribution on the topic of heterogeneity dates back to Penrose's study (1959), with the statement that "it is heterogeneity and not homogeneity of the services rendered by products, that give each firm its unique character".

With Penrose the focus of analysis is the way firms use and combine their resources, instead of limiting the analysis to a specific resource endowment.

After the initial contributions in strategy, the topic of Heterogeneity was analyzed mainly from the Resource-based view. The new resource approach emerged with the Wernerfelt's (1984) contribution, where a resource perspective should be used instead of a product one.

Since Wernerfelt's seminal article, other contributions have been provided within RBV which investigated the sources of firm's distinctiveness and superior performance. The research have emerged in two different perspectives over the years: those investigating firms' resource characteristics and those involved in identifying the kind of resources more capable to lead to competitive advantage. (Newbert, 2007)

Heterogeneity has also been analyzed independently in some recent studies, where it was each time described in somehow different ways.

Some of them have focused on heterogeneity in capabilities and positioning (Henderson and Cockburn, 1994; McGahan and Porter, 1997). Others have analyzed patent data (Henderson and Cockburn, 1994), property rights data (Miller and Shamsie, 1996), surveys (McGrath et al., 1995), simulations (Knott, 2003a) and network analysis (McEvily and Zaheer, 1999; Rodan and Galunic, 2004)

Although all these contributions assume that heterogeneity among organizations is a prerequisite for firm success and performance sustainability (Sakakibara, 1997; Noda

and Collis, 2001; Hoopes et al. 2003; Knott, 2003a), to date, the drivers of Heterogeneity have not been explicitly identified, nor has the relation with firms' performance been assessed from this perspective.

Early contributions have defined heterogeneity as an unobserved phenomenon (Mundlak, 1961; Griliches 1986; Barney, 1991). Other studies addressed performance differences as a result of heterogeneity in capabilities and positioning (Henderson and Cockburn, 1994; McGahan and Porter, 1997). However, the dimensions governing the generation of Heterogeneity have not been investigated. Because the vast majority of studies of Heterogeneity have been carried out within the Resource based view (RBV) (Barney, 1991; Peteraf, 1993), this work is drawn from RBV to investigate the heterogeneity concept and (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993).

The most recurrent methodology within Resource-based studies measures Heterogeneity by means of a single resource. In this respect, extant studies have treated Heterogeneity as a rather monolithic concept and tried to observe it by means of the impact of a given resource leading, which in turns leads to competitive advantage. Since firms employ a bundle of resources in order to compete in their industries, this approach might be not appropriate, and a more complete picture of the Heterogeneity dimensions should be developed. If Heterogeneity is deemed a relevant phenomenon given that it is considered as a source of competitive advantage, it is surprising that, to date, there is not a clear definition of Heterogeneity. This limits the ability of researchers to measure it and assess its impact on firms' performance.

The lack of definition for the Heterogeneity phenomenon is the result of both a theoretical and empirical limitation. On the one hand, from the theoretical point of view, the RBV has to face an inherent problem since those resources deemed as relevant in order to gain a competitive advantage are difficult to measure due to their intangibility (Godfrey and Hill, 1995); on the other hand, from an empirical point of view, extant studies show a weakness since they mainly focus on too narrow elements of organizations (Foss, 1997), or show a tautology in the choice of resources to be analyzed (Priem and Butler, 2001), thus undermining their usefulness in providing suggestions (Newbert, 2007; Armstrong and Shimizu, 2007). Moreover, this prevalent approach in resource-based empirical studies can lead to an infinite regress (Conner, 1994), making it

impossible to find the final source of competitive advantage. It is rather more useful to focus on the inherent attributes resources should own in order to give rise to heterogeneity and sustainable competitive advantage (Foss, 1997). The combination that takes place within organizations shows unique features depending on the way resources are combined. Therefore, the goal of this paper is to analyze with more precision the concept of Firm Heterogeneity, considered as a second-order construct whose underlying dimensions are related to resources' combination.

First of all a definition of Firm Heterogeneity is provided. Taking into consideration that Heterogeneity within firms is the results of the way resources are combined, in this work Firm Heterogeneity is defined as:

Firm Heterogeneity is the characteristic of firms to be different, with a heterogeneous nature and qualities. It originated by the ways resources are combined when used by firms.

The definition of Firm Heterogeneity allows developing its measurement scale, subsequently used to explore its impact on performance.

Methodology

Generation of Items

In order to develop the measurement scale for the Firm Heterogeneity construct, it is used the shared approach in scale development (Churchill, 1979; DeVellis 1991). First, the literature is reviewed to develop a list of items to be included in the questionnaire for survey administration. To provide content validity to the measurement scale for the Firm Heterogeneity construct, the criteria used during the generation of items are specified. Given the previous definition of Firm Heterogeneity as related to the way resources are combined, a literature search was conducted to find out the main articles dealing with the process of resource utilization. The ABI/Inform General database was used to perform a literature search. This database is widely used in management studies (Newbert, 2007; David and Han, 2004) since it comprises all the main research journals. At the first stage the keywords and the criteria for searching articles related to Heterogeneity were specified. The analysis was restricted the search to only published articles in scholarly

journals to enhance quality control, due to the blind-peer review process used in such journals (David and Han, 2004). Due to the explosion of articles taking a resource-based approach in the last three decades, the search was restricted to only the main journals in management and strategic studies, where the concept of Resource-based view originated and then exploded. The period of observation starts in 1984, with Wernerfelt's publication, and ends in 2008. The journals analyzed are: *Academy of Management Journal*, *Academy of Management Review*, *Administrative Science Quarterly*, *California Management Review*, *Decision Sciences*, *Journal of Management*, *Journal of Management Studies*, *Management Science*, *Organization Science*, *Organization Studies* and *Strategic Management Journal*.

The search was made for articles whose key words and abstracts were related with Resource, Competitive Advantage, Performance and Heterogeneity.

All the abstracts were analyzed to test for substantive relevance and to exclude those articles not related with the use of resources within firms. Even though the search produced a quite broad number of articles, the search was focused on those relevant for the analysis of the sources of Firm Heterogeneity as defined in this paper, that is, that Firm Heterogeneity is measured by the way resources are used and combined within firms. The procedure reduced the overall number of articles to seventy-five. The complete list of articles with a brief description of their main content is shown in Appendix B.

Obviously, this method is not free from limitations, since it does not take into account potentially relevant publications not appearing in main journals. To mitigate this problem it was also used a comprehensive literature reviews on Resource-based studies documented in recent works (Acedo and Barroso, 2006; Barney and Arkan, 2001). Drawing on these reviews, some of the articles that have been given a prominent role for the development of RBV in recent years were selected even if not appearing in the initial journal's list. Among these, an article by Prahalad and Hamel (1990) was retrieved, due to its discussion about the learning processes characterizing each firm. Other relevant works included at this stage are studies published in books, by authors like Winter (1987), Teece (1987), Rumelt (1984), Nelson and Winter (1982), Tsoukas (1994, 1996, 2001).

At this stage, the studies comprised in the list of main contributions have been carefully read to find out the items that are the main characteristics of resources'

utilization within firms. The vast majority of articles share the idea that firms show unique features as the result of their resource combination processes. In this respect, Firm Heterogeneity arises from the way resources are utilized. Many features pertaining to resource utilization have been depicted in the literature and many terms have been used to express similar concepts. Based on the insights gained from each article analyzed, the main items of resource utilization were retrieved. These items are shown in Appendix A.

Dimensions of the Firm Heterogeneity Construct

The list of items was used to identify the number of areas underlying Firm Heterogeneity. Indeed, analyzing all the features, it was possible to highlight the commonalities among some of them due to shared conceptualizations. The requirement for the identification of the areas of resource utilization was that they internally comprise features with similar content and meaning and those features were different from those attributed to other areas. Three categories could be established from the list of features analyzed. At this stage it was expressed the initial definition of the categories and a label was assigned to each of them. Three dimensions emerged:

- a) the locus specificity (that is, the idiosyncraticness and the non-tradability) of the resource utilization process;
- b) the complex composition of a given resource bundle;
- c) the characteristic of “*interrelation*” of resources during their utilization.

a) The first point regards locus-specificity and idiosyncraticness and thus the non-tradability (Dierickx and Cool, 1989; Barney, 1991) of the outcome of the resource utilization processes. Wernerfelt (1984) dealt with locus-specificity adopting the concept of resource position barrier. Rumelt (1984), instead, addressed non-tradability by introducing the concept of isolating mechanisms (i.e. team-embodied skills, reputation and image, consumer and producer learning), a vehicle for establishing idiosyncraticness and thus a barrier to imitation. From a different perspective, Dierickx and Cool (1989) focused on the internal accumulation of asset stock (i.e. resources) in the presence of imperfect strategic factor markets, while Barney (1991) more explicitly attributed market imperfections, and hence heterogeneity, to resource immobility among firms. In contrast

to this emphasis on external factors, Kogut and Zander (1992) observed that what constitutes a firm's source of uniqueness is the bundle of knowledge and capabilities which is embedded within the organization. Rumelt (1995) emphasized the role of inertia as a result of firm-specific routinized processes and, likewise, Teece et al. (1997) maintained that resource endowments are *sticky*. A number of contributions are consistent with these studies (Peteraf, 1993; Amit and Schoemaker, 1993; see, also, special issues edited by: Barney and Zajac, 1994; Helfat, 2000; Hoopes et al., 2003; Coff 1999; McEvily and Chakravarthy 2002; Vincente-Lorente 2001; Galunic and Anderson 2000). All these contributions converge to identify that it is the locus-specificity of the resource utilization process which determines a firm's uniqueness, and hence its heterogeneity.

b) The second point concerns the complexity derived from using and employing resources within firms. Complexity has been analyzed in literature as related to the number of ways resources can interact when being used by a firm (Tsoukas, 2001). Simon (1947) drew upon the concept of complexity in business administration as a means for criticizing the assumption of perfect rationality of managerial cognition. Other studies have introduced the concept of routine to delineate socially complex changes within firms (Nelson and Winter, 1982). In this vein, Prahalad and Hamel (1990) highlighted the importance of core competencies which have been developed through collective learning, while Leonard-Barton (1992) maintained that a firm's core capabilities represent an interrelated and interdependent knowledge system. Likewise, Grant (1991) observed that organizational capabilities differ in their complexity, since they involve the integration of ideas, skills, knowledge and a wide variety of technologies, while Collis (1994) pointed out that organizational capabilities can be conceived as socially complex routines which affect the process of transforming inputs into outputs; also, Verona (1999) drew attention to the role that multiple levels of interactions have within the firm, across its functions, and during innovation-related processes.

c) The third point refers to the unobservable network of intertwined interrelations among resources when these are being utilized. Teece (1986) addressed this point maintaining that any innovation, in order to be a source of profit, must rely on co-specialized resources. Likewise, Dierickx and Cool (1989) also observed that increments in resource stocks depend on complementary resources. Barney (1991), instead, focused

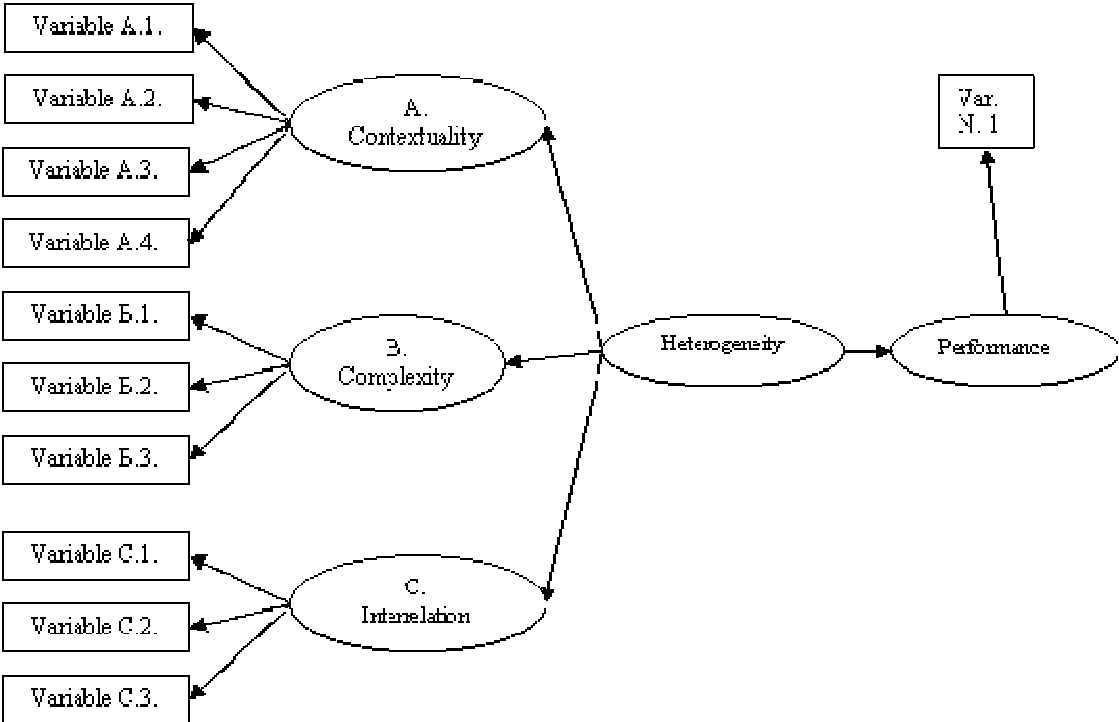
on the concept of resource bundle, suggesting that it is necessary to adopt a holistic approach in analyzing a firm's resource endowment. Similarly, Amit and Schoemaker (1993) emphasized the entangled nature of strategic assets, such that during their application or deployment, the strategic value of each asset may increase as a function of an increase in other strategic assets. Besides, when resources are being utilized, they complement each other systemically, thus creating an underlying bundle not completely observable (Teece, 1986; Teece et al., 1997; Makadok, 2003; Miller, 2003; Christmann, 2000). Drawing from control theory, Winter (1987) maintained that firm's resources can be compared to state variables and control variables, whereby the former are not subject to change in the short term, but the latter can be; adopting an heuristic frame, which is a systemic, yet not completely coded, network of action, both the variables of state and control (i.e. a firm's resource portfolio) are deployed in order to solve a strategic problem. In a similar vein, Henderson and Clark (1990) dealt with architectural and component competence to emphasize the interconnected nature of a firm's resource endowment, while Black and Boal (1994) introduced the concepts of contained and system resources to highlight how these interact during an organization's life, and showed that while contained resources are based on a simple network of resources, system resources emerge from a complex network. Finally, Lippman and Rumelt (1982) used the concept of isolating mechanisms to explain why competitors find it difficult to understand the causal connection between actions and positive results, and, likewise, Reed and DeFillippi (1990) emphasized causal ambiguity as a barrier to imitation, since external observers cannot completely comprehend the experience-based relations which take place among individuals involved in routinized team-based practices.

Summarizing, these three issues [(a) *locus specificity and idiosyncraticness of resources utilization process*; (b) *complexity surrounding resources under utilization*; and (c) *entangled/unobservable network of relationships among resources*], may therefore be synthesized into the following dimensions:

- a -> 1) Contextuality;
- b -> 2) Complexity;
- c -> 3) Interrelation.

Analyzing these areas, the Firm Heterogeneity construct is a construct existing at a deeper level, according to a *latent model* of multidimensional constructs (Edwards 2001), shown in Figure 1.

Figure 1. Heterogeneity as Superordinate Construct as a Cause



In particular, following the guidelines provided in literature to discern among different multidimensional constructs (Jarvis et al., 2003), and drawing from the insights gained from the analysis of contributions in all areas, we maintain that the three areas are the manifestation of Heterogeneity among firms. Indeed, differences among firms can be verified by focusing on the degree of contextuality, complexity and interrelation among resources. The existence of OH gives rise to resources which show a strong relation with the context where originated; such resources are complex in their use and highly interrelated. We also expect the three areas to be correlated, since they all share a same underlying nature.

Then, Heterogeneity can be defined as a reflective higher order construct, defined as follows:

Heterogeneity is a multidimensional construct which defines interfirm differences in terms of how resources are utilized. It is constituted of the three dimensions of contextuality, complexity and interrelation that characterize the process of resources utilization

Then the hypothesis about the role of Firm Heterogeneity is the following

H: Heterogeneity, as a second-order construct, positively affects performance

In order to test the hypothesis, it was first developed the measurement scale for the Firm Heterogeneity construct.

In order to develop the measurement scale, it was followed the main approach in literature (Churchill, 1979; DeVellis, 1991). The first step was to administer the items generated by means of the literature review to 18 expert academics chosen among the main researchers for each area of investigation. Specifically six experts were chosen for each sub-dimension of Firm Heterogeneity with published works on their respective topic. Authors have been taken randomly from the main publications in organizational and strategic studies. The experts were asked to express their agreement with the content of items and with the list of items as a whole. They were asked to signal potential redundant or not useful items. When four experts, representing the majority for each dimension,

converged to express their disagreement with a specific item, that item was deleted. Other items have been slightly modified to take into consideration the suggestions obtained.

The final list of items used in the survey is shown in Table 1.

TABLE 1. Heterogeneity Dimensions, Main Authors and their Contributions

AUTHORS	MAIN CONTRIBUTION	DIMENSIONS
<ul style="list-style-type: none"> • Wernerfelt (1984) • Rumelt (1984) • Dierickx and Cool (1989); Kor and Mahoney (2004); Lado and Wilson (1994); Ahujia and Katila (2004); Montealegre (2002) • Barney (1991); Knott (2003) • Rumelt (1995) • Peteraf (1993); Amit and Schoemaker (1993); Barney and Zajac (1994) • Schroeder et al. (2002) • Miller (2003); Hatch and Dyer (2004); Morrow et al. (2007); De Carolis (2003); Lado and Zhang (1998); Fiol (2001) • Teece, Pisano and Shuen (1997); Spender (1996) • Coff (1999); McEvily and Chakravarthy (2002); Vincente-Lorente (2001); Galunic and Anderson (2000); Hansen et al. (2004); Lavie, (2006); Meyer (2006); Spanos and Lioukas (2001); Madhok and Tallman (1998); Dan (1994) • Oliver (1991); Miller and Shamsie (1996); Collis (1994); Galunic and Rodan (1998) • Peteraf and Bergen (2003); Newbert (2007); Castanias and Helfat (2001) • DeSarbo et al. (2006) 	<ul style="list-style-type: none"> • Resource position • Non-tradability • Accumulation • Immobility • Inertia • Non-replicability • Non-substitutability • Non-imitability • Stickiness • Specificity • Context dependent • Rareness • Distinctiveness 	<i>Contextuality</i>
<ul style="list-style-type: none"> • Nelson and Winter (1982) • Kogut and Zander (1992); Barney and Zajac (1994); Grewal and Slotegraaf (2007) • Grant (1991); Aral and Weill, 2007 • Prahalad and Hamel (1990); Leonard-Barton (1992); Collis (1994); Rivkin (2000); Lado and Wilson (1994); Fiol (1991) • Barney (1985); Coff(1999) • Toukas(1996); Tsoukas (2001b); Verona (1999); Kor and Leblebici, (2005); Galunic and Rodan(1998); Carmeli and Tishler (2004) • Villalonga (2004) • Berman et al. (2002); Ambrosini and Bowman (2001); Galunic and Rodan (1998) 	<ul style="list-style-type: none"> • Routine • Social embeddedness • Coordination • Collective Learning • Social complexity • Interactions • Intangibility • Tacitness 	<i>Complexity</i>
<ul style="list-style-type: none"> • Teece (1986); Powell and Dent-Micallef (1997) • Teece (1986); Teece et al. (1997); Makadok (2003); Miller (2003); Christmann (2000); Somaya et al. (2007); Stieglitz and Heine, (2007); Shang and Sun (2004) • Winter (1987) • Dierickx and Cool (1989); Helfat (1997) • Combs and Ketchen (1999); Hoopes and Postrel (1999); Lorenzoni and Lipparini (1999); Barki and Pinsonneault (2005) • Henderson and Clark (1990) • Barney (1991); Bates and Flynn (1995); Foss and Ishikawa (2007); Sirmon et al. (2008; 2007) • Black and Boal (1994) • Lippman and Rumelt (1982); Reed and DeFillippi(1990); King and Zeithaml (2001); Powell et al. (2006) • Ray et al (2004); Wiklund and Shepherd (2003); Ari (1994); Lepak and Snell (1999); Lado and Wilson (1994) 	<ul style="list-style-type: none"> • Co-specialization • Complementarity • Heuristic frame • Interconnectedness • Integration • Architectural aggregation • Resource bundle • Systemic • Causal ambiguity • Relations 	<i>Interrelation</i>

Managers have been asked to give their agreement to the following statements (1 = totally disagree; 7 = totally agree). The term “resource bundle” is used to refer to all the resources used by firm, either internal or accessed through social relations.

Sample

The study was conducted on a sample randomly drawn from the machine tool industry (Mazzoleni, 1999), referring to the ATECO 2001 code^[2].

The machine tool industry has been chosen for its characteristics in terms of high technological rate, great dynamism and high involvement with decisions that affect the combination of several resources. In fact, the Italian machine tool industry is a relevant one for the Italian economy, since it contributes to the national growth (Bank of Italy, 2006). The Italian Tool-machine industry is one of the main industrial productions realized in Italy. It is considered, along with the other main Made in Italy productions, as one of the context more relevant and interesting to be analyzed (Fortis, 2005; Evagenlista e Sirilli, 1999; Basile, 1998).

The Italian Tool-machine industry has recently contributed to the success of the Italian productions and growth. The stronger contribution can be found in the commercial “balance” between import and export, which has highlighted the strong role of the Italian industry at an international level (Banca D’Italia, 2006; Ucimu, 2006).

In terms of export, the industry has entered one of the main industries worldwide, facing the competition coming from other strong countries, such as Japan, China, USA. In 2006 Italy has reached the 4th position, after China, Germany and Japan (Ucimu, 2006).

The Italian Tool machine industry is also relevant for its organizational as an industrial district. Industrial districts characterize today many industries and countries. Their relevance is mainly attributed to their organization as a complex interrelation among different organizations, each one with his own history and accumulation of capabilities. Due to the presence of many different units working together to reach a shared ends, and due to the high level of exchanges and interrelations, the Italian district show unique strengths and abilities not able to be imitated. Organizations belonging to this industry show a great willingness to share their knowledge and information with the aim to cooperate in reaching global success and prestigious rewards.

The Tool-machine industry is composed of many firms and is also characterized by a great production specialization. Each company, indeed, has reached a strong specialization by operating in specific productive areas, thus accumulating specific competencies and the ability to take the pace of global evolution. Firms in the industry

are diffused in different regions, with the stronger presence in Lombardia, Piemonte, Emilia Romagna and Triveneto. The great majority of firms, about 70%, has a medium-low dimensions, with a number of employees lower than 100.

Moreover, another peculiarity of these firms is their difference in terms of dimensions, ability, area of specialization, knowledge etc. For this reason this industry can be considered an ideal context to study the drivers and the dimensions creating firm heterogeneity. The Italian Tool- machine industry owes its success to the ability to face global competition and to stay ahead of international players.

In order to face the strong competition taking place worldwide, the Italian Tool-machine industry has developed the ability to find out new and innovative solutions for final customers, thus creating a strong reputation as a reliable and innovative context. Firms within this industry have shown that they were able to experiment and to research new solutions, thus investing in new technologies. Moreover, they have shown that they also had the ability to produce machines in a perfect way, with high level of quality, also satisfying customer's needs. Moreover, the industry has shown in general a high tendency to change over time, in line with the necessities and developments taking place in the environment. Another feature of firms operating in this industry has been the ability to create a direct and strong link with customers, in order to develop products specifically adapted to their needs.

In this context, what has emerged as a key source of success has been the ability to identify technologies that will prove to be useful in the future, thus contributing to the strategic relevance of the whole country.

Firms in the Tool-machine industry show their strengths in both decision taking and development of new technologies. Moreover, in order to sustain their advantage in the long run, they have identified and developed new basis of competition by providing services and post acquisition maintenance to customers. This has great relevance since the main destination of the majority of products realized within this industry is other firms, where the machines are used to produce other products. In this sense, the Tool-machine industry also contributes to the development that can be reached in all the Italian productions in general, where the role of the machine can be especially relevant. What the Tool machine firms have been able to create is mainly the ability to talk with customers

coming from other industries, thus identifying what can be considered as central element in a machine. In this way, firms have been able to adapt to customers' needs, realizing what they believe is the right solution for their ends. Firms belonging to other industries thus look at the Tool-machine industry as one of their more relevant strategic partners, which can be very useful for the attainment of higher success and for the creation of high value productions. What customers ask to firm in this industry if the identification of what is really relevant and the comprehension of valid solutions for their productions. Moreover, many decisions are often taken by firms operating in this industry since they need to continually update their operations and product characteristics to meet external demand and technological evolution.

For this reason the Italian machine tool industry can be considered as an ideal context to investigate the relation among resources and to show how heterogeneity among organizations arises.

The data have been collected by administering a questionnaire to firm executives of 365 firms. The questionnaire, comprised of the 31 items shown in Table 1, adopted a seven point Likert scale. The questionnaire was administered to firm executives due to their involvement with the main decisions concerning the employment of resources. A single respondent was used due to the peculiar areas investigated. Since the aim was to assess the features of resource utilization, firm executives were the most appropriate persons since they are informed about the resource utilization process and the way resources are used. To test the assumption about the role played by the firms' executives, it was conducted a preliminary test. Prior to administering the survey, the entrepreneur/owner of each firm was contacted to explain the research aim. It was clarified the need to have answers to a questionnaire especially dealing with the ways resources in their firms are used, and clarifying what it is meant by resources in the research; It was also explicitly asked, for every single firm, to administer the questionnaire to the most influential decision maker of the considered firm. In most of the cases, the entrepreneur was the owner of the firm and, as such, the most influential decision maker, who takes decisions on virtually all the activities taking place within his firm. Only for a minority of firms, twenty-seven (20,4% of our sample), did the entrepreneur explain that decisions were taken after the advice of other executives, mainly

accounting executives. Given the narrow focus of the job carried out by those persons, this role was not considered in the survey. The questionnaire was only administered to the entrepreneur of the twenty-seven firms. The questionnaire was administered by asking to each firm's executive to express his agreement with each single item, where 1 means that they totally disagreed, and 7 that they totally agreed with the statement. The questionnaire is shown in Appendix A. After collecting data, some incomplete questionnaires have been deleted, leading to a final number of 132 complete questionnaires, with a response rate of about 38 percent.

Scale Purification

The next step in scale development is the analysis of the data collected through the survey. To obtain the measurement scale for each of the three sub-dimensions of Firm Heterogeneity it was conducted first an exploratory factor analysis. In order to identify the number of factors to retain, the final list of 26 items, shown in Table 1, was used to run a factor analysis, based on principal component and with promax rotation, since we maintain that the three factors are related among them and to Firm Heterogeneity. In this stage, the eigen-values greater than 1 are seven. To assess the proper number of factor to retain it was conducted the parallel analysis, which have proved to be more reliable than the scree-plot (Keeling, 2000). The result of the parallel analysis confirmed the presence of three factors to retain from the 26 variables used for the exploratory factor analysis, thus confirming our assumption about the three dimensions of the Firm Heterogeneity construct. The first three eigenvalues at this initial stage are: 8.98, 2.21, and 1.75. The factor analysis also showed the existence of many cross-loadings and many variables with a factor loading lower than 0.40. Data have been purified so as to obtain only items loading on one of the three constructs; therefore, several variables were discarded before obtaining a clearer structure. The final structure was composed of a total of 10 items, each loading on the expected construct. Specifically it was obtained four items for the 'Contextuality' construct, three for the 'Complexity' construct, and three for the 'Interrelation' construct. All the scales have high Cronbach's alpha and item-to-total correlation, thus showing good reliability and internal consistency, as can be observed from Table 2.

Table 2. Scales Reliability

	Cronbach Alpha	Item-to-total correlations
Contextuality	0.79	
Resource Position		0.61
Non-replicability		0.60
Asset Accumulation		0.56
Non-tradability	0.64	
Complexity	0.76	
Routine		0.57
Collective Learning		0.59
Variety	0.61	
Interrelation	0.86	
Complementarity		0.75
Interconnectedness		0.78
Resource Bundle	0.70	

Confirmatory factor analysis

The model was run on Lisrel as a Second-order confirmatory one, to test the existence of the Firm Heterogeneity construct as a superordinate one, affecting firm performance (Hypothesis 2).

The correlation matrix is reported in Table 3.

Table 3. Descriptives and Correlation Matrix

	Mean	ST.D.	1	2	3	4	5	6	7	8	9	10
1. Resource position	5.25	1.24	1									
2. Non-replicability	5.23	1.23	0.517**	1								
3. Asset accumulation	5.18	1.24	0.392**	0.502**	1							
4. Non-tradability	4.93	1.35	0.590**	0.471**	0.496**	1						
5. Routine	4.65	1.42	0.369**	0.322**	0.225**	0.288**	1					
6. Collective Learning	4.50	1.26	0.367**	0.250**	0.159	0.380**	0.490**	1				
7. Variety	4.69	1.33	0.396**	0.279**	0.148	0.414**	0.513**	0.549**	1			
8. Complementarity	5.00	1.27	0.462**	0.302**	0.361**	0.509**	0.307**	0.449**	0.436**	1		
9. Interconnectedness	4.89	1.36	0.413**	0.443**	0.353**	0.410**	0.315**	0.358**	0.310**	0.737**	1	
10. Resource bundle	4.99	1.22	0.476**	0.416**	0.325**	0.390**	0.282**	0.365**	0.325**	0.631**	0.672**	1

The goodness of fit indexes shows a very good fit of the model to the data. This result confirms that Firm Heterogeneity is a second-order construct whose reflective measures are three latent constructs: Contextuality, Complexity and Interrelation.

The chi-square was equal to 50.73(32), with a p-value equal to 0.01892. Even if this result is not optimal, we need to consider the sample sensitivity of the chi-square statistics (Bagozzi and Baumgartner, 1994). The other fit indexes show a very good fit. Indeed, GFI was equal to 0.93, AGFI was equal to 0.88, NFI was equal to 0.92, and CFI was equal to 0.97. The other results, RMR = 0.045, RMSEA = 0.067, show a good fit, taking into account that they indicate perfect fit when they are equal to zero. Besides the goodness of fit model results, it is necessary to consider the measurement results. The measurement model refers to the relations between each of the observed variables and the latent constructs. In this case, all the factor loadings linking the items to latent constructs are high and significant, indicating reliability and convergent validity of the scales used to measure the three constructs (Anderson and Gerbing, 1988). The measurement results are reported in Table 4.

Table 4. Measurement Results from the Superordinate Model

Construct	Observed Variable	Unstandardized values	Completely standardized values	R ²	Standard errors	T-Values
Contextuality	Resource Position	1.00	0.76	0.57	--	--- ^a
	Non-replicability	0.88***	0.67	0.45	0.12	7.08
	Asset accumulation	0.80***	0.60	0.36	0.13	6.36
	Non-tradability	1.11***	0.77	0.59	0.14	8.00
Complexity	Routine	1.00	0.67	0.45	---	---- ^a
	Collective learning	0.97***	0.73	0.54	0.15	6.47
	Variety	1.05***	0.75	0.57	0.16	6.54
Interrelation	Complementarity	1.00	0.85	0.73	---	---- ^a
	Interconnectedness	1.07***	0.86	0.73	0.10	11.10
	Resource bundle	0.87***	0.77	0.59	0.09	9.81

*** p-value < 0.001; ^a t-values are not computed since the first parameter for each construct has been fixed to 1 for parameterization

The three dimensions are all highly and significantly correlated to the Firm Heterogeneity construct, thus confirming it as a second-order multidimensional construct with three reflective constructs as indicators. Results are shown in Table 5.

Table 5. Relations between the First-order Constructs and the Second-order Heterogeneity Construct

First-Order construct	Unstandardized coefficient	Standardized Coefficient	t-Values
Contextuality	1.00	0.85	----
Complexity	0.86***	0.73	4.74
Interrelation	1.10***	0.82	5.35

*** p-value < 0.001

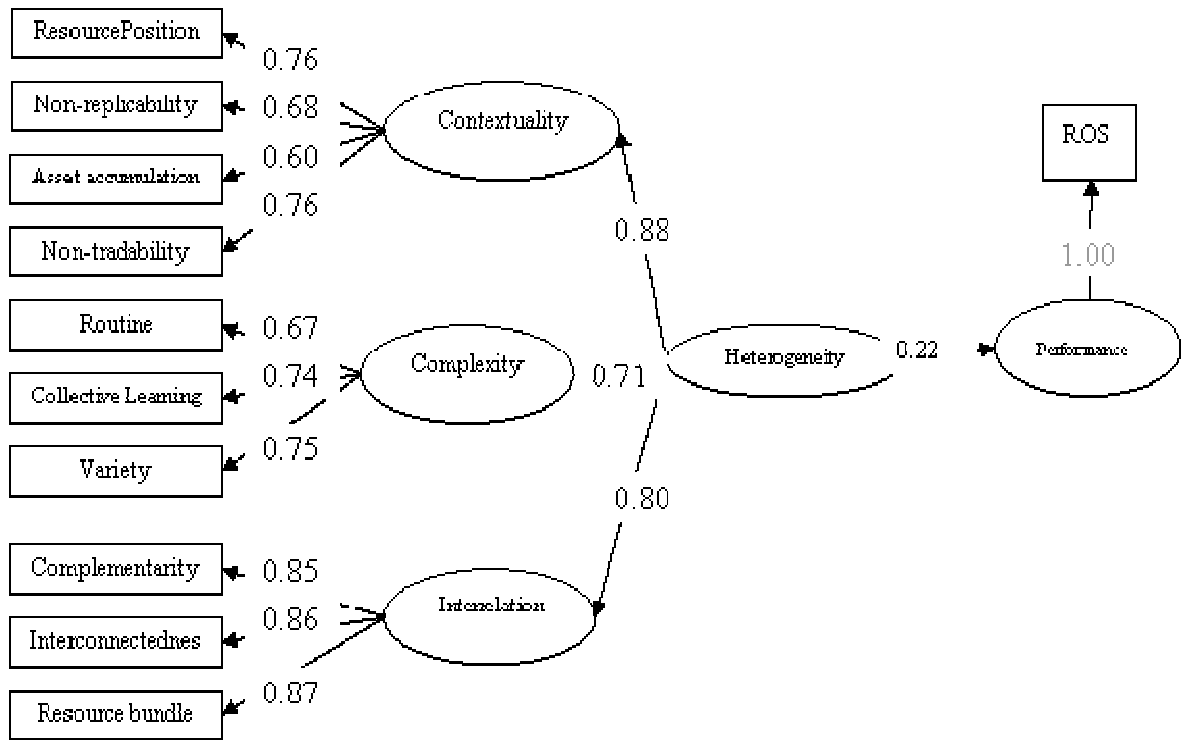
Structural model results

In order to assess the relation between Firm Heterogeneity and Performance it was run a second model to take into account this relation.

The goodness of fit indexes of this model is the following: the chi-square was equal to 73.95(41), with a p-value equal to 0.00122. Even if this result is not optimal, we need to consider the sample sensitivity of the chi-square statistics (Bagozzi and Baumgartner, 1994). The other fit indexes show, instead, a very good fit. Indeed, GFI was equal to 0.91, AGFI was equal to 0.85, NFI was equal to 0.88, and CFI was equal to 0.95. The other results, RMR = 0.26, RMSEA = 0.078, show a good fit too (these indexes indicate perfect fit when they are equal to zero).

The standardized coefficient obtained was equal to 0.22 and it is significant, as shown by the t-value equal to 2.15. The result shows that the Firm Heterogeneity construct positively affects firm performance, thus confirming the hypothesis. The final results are summarized in Figure 2, where standardized coefficients are reported, showing both the measurement and structural model results.

Figure 2. Model Results



DISCUSSION

This paper contributes to enhance the explanatory power of RBV by providing a measurement scale for the Firm Heterogeneity construct. Indeed, albeit the assumption of heterogeneity among organizations is at the heart of many areas of investigation, to date, only limited efforts have been made to measure this relevant construct (Hoopes *et al.*, 2003). Drawing from the RBV literature the inherent characteristics of the combination of resources and capabilities realized within firms were found. Consistent with earlier contributions (Penrose, 1959), it emerged that differences among organizations are not merely a result of owning single valuable resources, but are created from the specific resource utilization processes carried out by organizations.

Yet, studies within the strategic management field have emphasized the weakness in RBV research due to the use of concepts and assumptions defined “a priori”, without further exploration and empirical tests. This inherent problem in RBV studies has hindered subsequent research efforts and, thus, the empirical utility and theoretical robustness of RBV (on this point, see the dialogue between Priem and Butler, 2001, and Barney, 2001a). Therefore, by providing a means to measure the Firm Heterogeneity construct, this study makes several contributions to the resource-based theory and to the practice of resource management. First, it was developed a measurement scale for the Firm Heterogeneity construct, considered as a multidimensional phenomenon. Multidimensional constructs are scarcely adopted within the strategic management literature in general, and in studies focusing on heterogeneity in particular. So far, studies on RBV have used single variables to measure differences among firms, such as R&D, innovation, and organizational capabilities (Knott, 2003; Sakakibara, 1997; Cockburn *et al.*, 2000). This prevalent approach has focused on the firm resource endowment as a “black-box” (Priem and Butler, 2001; Sirmon *et al.*, 2007), hindering any real comprehension of the link among different resources. To overcome this gap, it was maintained the need to look at the attributes that resources must own in order to lead to performance (Foss, 1997).

In dealing with heterogeneity, this study is an attempt to go beyond a static view of the kind of resources to invest in to reach a competitive advantage. Resources and capabilities are combined within organizations in several ways. For this reason the analysis of resources ability in driving firm performance should be directed at an aggregate and organizational level. Indeed, organizations are the result of a collective action (Tsoukas 1996), involving multiple levels and various internal resources, being financial, human, technological and so on. The combination of those resources when in use within organizations shows some inherent characteristics which are at the heart of research on heterogeneity and performance differences. This work provides a detailed analysis of these characteristics, pointing out the need to look inside the firm black box in order to find out the actual sources of firm heterogeneity. The measurement of the Firm Heterogeneity is based on a global analysis of the dimensions involved in the resource utilization process. Specifically, a first dimension of Firm Heterogeneity, contextuality, takes into account the firm specificity of resource utilization; then a second dimension, complexity, analyzes the complex mechanisms linking resources; and a third dimension, interrelation, addresses the interconnections among resources when they are used. These variables highlight the cognitive and collective components of the resource utilization process. The context where resources are combined assumes a high relevance since it highlights the need to understand the firm's specific and unique ways of producing and combining resources that cannot be easily accumulated or reproduced by imitators. Organizations' unique features come from the way they are managed, that is dependent upon internal cognitive and discretionary structures, making it impossible to find the same bundle within other contexts. The complexity surrounding resources, during their utilization process, shows that the resources should be linked in such a way to avoid an easy replication by other firms. Also, in order to be a source of competitive advantage, resources should be combined with other complementary ones, with which a mutual dependence ought to be established, in ways not discernable by competitors. Thus, the interrelation among resources shows the collective nature of the resource utilization process, where several resources are combined to obtain a desired end. Hence, higher-order resources are so intricately combined that any effort to disentangle them would be unsuccessful. This result further extends preliminary insights offered by those

contributions pointing out that the unit of analysis in current Resource-based studies is too narrow (i.e., the contribution of a single resource to competitive advantage - Foss, 1997), in that it empirically shows how the interplay among resources contributes to competitive advantage. The paper also provides contribution to the positive effect of Firm Heterogeneity on firms' performance. More precisely, while in the RBV literature the relation between firms' heterogeneity and firms' performance has always been taken for granted, this work provides a relevant contribution, because it allows to empirically assess the link between Firm Heterogeneity and performance, thus giving robustness to this concept as a prerequisite for firms' performance. Future research may adopt this construct for further investigation on the role of Firm Heterogeneity. In particular, it would be interesting to analyze the relation between Firm Heterogeneity and other phenomena of interest, as maintained within the RBV field of study.

Limitations to the study have also to be taken into account. For example, although the sample size was wide enough to guarantee that an optimal fit was achieved between theory and data, involving a larger sample may provide a better understanding of how Firm Heterogeneity affects performance.

The link between Firm Heterogeneity and performance was positive in this study, albeit not quite strong. This limitation might be dependent upon the use of a single industry. A single industry was chosen in order to avoid any potential influences on the Firm Heterogeneity measurement associated with industry factors, since the purpose was that of measuring firm specific attributes. This choice is adopted also in recent studies (Holcomb, Holmes and Connelly, 2009). Future research could try to deepen the understanding about the impact of Firm Heterogeneity on firm performance by investigating its role in other industries. For example, the relation could change in a context characterized by different competitive or technological rates. The model proposed in this study could be integrated by considering other variables so as to control for different industry effects.

As regards the individuals to whom the questionnaire is administered, a subjective survey might incur biases and distortion, mainly related to the 'single-respondent' effect. In this study it was used the single respondent method because of the small dimension of the firms involved in the survey. Because the Italian tool-machine industry mainly

consisted of small and medium firms, the decision-making activity was concentrated in a single individual, quite often corresponding to the owner of the firm. Future studies could try to involve multiple respondents for each firm in firms of larger size. Finally, as regards performance indicators, although extant research confirms the relevance of the variable adopted here (return on sales, ROS) using different performance indicators, both financial and non financial, may provide meaningful insights about the kind of effects which heterogeneity may engender.

Implications for practice

Managers involved in the resource utilization process could find useful directions from the comprehension of the link between firm specific dimensions and performance.

In fact, this study has shown that it is the resource utilization process, and not only resource ownership, which plays an important role in explaining differences in interfirm performance. In this vein, managers should avoid acquiring relevant resources from the outside with the only purpose of increasing the value of the firm's resource base. Since the real advantage lies in integration among resources, it would be better to accumulate them internally or, in case of acquisition, to integrate the new resources with the extant ones in order to create those linkages that are important for heterogeneity and competitive advantage.

Indeed, this work contributes to the managerial practice shedding light on how managers can leverage the internal resource base in order to foster the firm competitiveness. In order to reach a competitive advantage, organizations should aim at creating 'uniqueness' by committing their firms in resource combinations, taking into account the role of contextuality, complexity and interrelation. For example, assuming the case of a firm opting for a new market entry, differentiation and segmentation choices should eventually lead this company to challenge incumbent leading firms, and, mainly in hostile environments, this may prompt managers to opt for an imitative conduct (Lanza, 2005). Yet, this imitation strategy may be unsuccessful if it overlooks an incumbent's advantage stemming from the high specificity of the context where resources are in use,

the complexity inherent in the resource combination and the interrelation involving many different resources.

Besides, from the analysis of the Organizational Heterogeneity phenomenon we collected new insights about the collective nature of the resource utilization process as a means for acquiring a sustainable capability-based competitive advantage (Makadok, 2001), also showing the subsequent difficulty associated with imitation efforts. For example, a firm coping with a new positioning strategy due to a successful newcomer in its market will try to understand the reasons behind the competitor's success and, then, strategically counter-manoeuvre. Yet, observing a rival's strategies will probably not allow an incumbent to fully comprehend the origins of a newcomer's competitive advantage. Instead of trying to imitate rivals' strategies, organizations should strategically counter-manoeuvre by combining their resources in such a particular and unique way that no other organizations in the market would be able to copy.

Future Research

The measurement scale for the Organizational Heterogeneity construct can be considered as a first step in a more general research design aiming at investigating organizations' actions. In order to advance this area of research, the tool could be integrated with approaches from other areas of research. For instance, the institutional and social context, given by firm's tradition, network ties, regulatory pressures, could be taken into account to assess the resource selection decisions (Oliver, 1997). As recent research has highlighted (Peng, 2003, 2008; Wright *et al.*, 2005), there is the need to integrate the resource-based and institutional perspectives. Thus the relations existing between these external forces and the Organization Heterogeneity could be analyzed.

Further research could also analyze how resources are built, integrated and reconfigured (Teece *et al.*, 2007) in order to find an additional source of Heterogeneity in change management. In this paper Heterogeneity is assessed in a specific moment, thus providing a measure of the level of firm's differences in a given industry. It seems interesting to expand the focus of the analysis to take into account the evolution of Heterogeneity over time due to changes in technology and/or market features. To reach

this goal the dynamic capabilities approach could be used, which provides an additional lens to investigate the dynamic of resource creation during the firm's evolution and that is critical to face environmental change.

Moreover, as the Resource Dependence Theory suggests, firms need to access resources from external sources (Pfeffer and Salancick, 1978; Aldrich and Pfeffer, 1976). The theory recognizes that firms are influenced by external actors and interest groups which can exert pressure on firm's actions. From this perspective, it is relevant to analyze the relations between organizations and environment, since the way administrators manage their external environment could impact on Heterogeneity.

Further research could thus employ the Firm Heterogeneity construct along with other measures of external influences to assess how Firm Heterogeneity could evolve over time and its implications on firm's performance.

CONCLUSIONS

In this study it was developed the measurement scale for the Firm Heterogeneity construct and it was tested how it affects performance. Consistent with studies invoking a more robust theory for understanding resource-based competitive advantage, the research contributes to the literature by highlighting how the relation between resource utilization and performance should be analyzed and understood. Future research can extend our study to different industries under different environmental conditions so as to prove its empirical robustness and managerial usefulness.

Appendix A– Items for the sub-dimensions of Firm Heterogeneity

Items of the questionnaire	Labels
<u>Contextuality Scale</u>	
-We have a specific position in the market due to our physical and intangible resources	Resource Position
-Our resources cannot be sold to other firms	Non-tradability
- Our resource bundle has been accumulated over time with continuous investments	Accumulation
-Our resource bundle is not transferable	Immobility
-We can't modify our resource bundle in the short term	Inertia
-Our resource bundle can not be replicated by competitors	Non-replicability
-Our resources are so relevant for us that we can't find valid substitutes for them	Non-substitutability
-Our rivals find it difficult to imitate our resource endowment	Non imitability
- Our resource bundle is related to the context of creation	Stickiness
- Our resources are specific to our organization	Specificity
-The relevance of our resources depend on how and where they are utilized	Context-dependent
- Our resources are not widely available on the marketplace	Rareness
- We show unique features due to the resources we use	Distinctiveness
<u>Complexity Scale</u>	
- We use informal mechanisms for our managerial and operation practices	Routine
- We rely on strong social relations in our daily practices	Social Embeddedness
-We draw on different skills and competences when carrying out our activities.	Coordination
- All people tacitly share coordination mechanisms	Social complexity
-We all learn how to solve problems by sharing problems and solutions.	Collective Learning
- We try to create interactions among the resources	Interactions
- We need the contribution of human knowledge to carry out our activities	Intangibility
- We strongly rely on our employees' personal experience in doing things	Tacitness
<u>Interrelation Scale</u>	
-The resources making up our resource bundle depend on each other to properly behave	Complementarity
-Each resource making up the resource bundle is built to meet other resources characteristics	Cospecialization
-We rely on shared understanding and vision to carry out our activities	Heuristic Frame
-The resources making up the resource bundle are used in conjunction to carry out a specific task	Interconnectedness
-Our resources are integrated when in use	Integration
-Our competencies at different levels, from the lower one (single operations) to the higher one (decisions), are interrelated.	Architectural aggregation
-Our resource bundle is more than the sum of the single components	Resource Bundle
-The deployment of the resource bundle in each activity implies a coordination of the single components	Systemic
-We are not able to discern the contribution of each single resource to the resource bundle creation	Causal Ambiguity
- We can identify many relations among the resources we use	Relations

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Appendix B – Results from the literature review		
Authors	Main content	Features of resource utilization
Ambrosini and Bowman, 2001	The paper sets out to define the term tacit knowledge	Tacitness, intangibility
Amit and Schoemaker, 1993	An emerging strategy literature that views the firm as a bundle of resources is built on, and conditions that contribute to the realization of sustainable economic rents are examined.	Non-replicability, specificity, discretionary decisions
Aral and Weill, 2007	Variations in results from IT investments are attributed to differences in firm's IT investments allocation and their IT capabilities	coordination, combination
Ari, 1994	An analysis is developed to examine the processes through which managerial cognitions lead to sustained competitive advantage	Cognition, relation between human and organizational resources
Ahuja and Katila, 2004	We find that <i>path-creating search</i> that generates resource heterogeneity is a response to idiosyncratic situations faced by firms	Path-dependency, accumulation
Barki and Pinsonneault, 2005	The notion of integration is central to the understanding of organization	Integration
Barney and Zajac, 1994	Recent developments in the resource-based view of the firm reaffirm the importance of studying the strategic consequences of behavioural and social phenomena within a firm	Behaviour, social nature, organization
Barney, 1991	Building on the assumptions that strategic resources are heterogeneously distributed across firms and that these differences are stable over time, this articles examines the link between firm resources and sustained competitive advantage	Value, Rareness, Inimitability, Non substitutability
Bates and Flynn, 1995	Firms will have different patterns of manufacturing innovation adoption practices	Resource bundle
Berman et al, 2002	A central tenet of RBV, tacit knowledge as source of sustainable advantage, is investigated	Tacitness
Black and Boal, 1994	Resources are made up of factor networks	Inter-firm relations, system resources

Carmeli and Tishler, 2004	This paper the impact of a set of independent intangible organizational elements and the interactions among them on a set of objective organizational performance measures	Intangibility, interactions
Castanias and Helfat, (2001)	Managerial resources are important contributors to the entire bundle of firm resources	Non imitability, value, scarcity
Christmann, 2000	This study analyzed whether complementary assets are required to gain cost advantage from implementing best practices	Complementarity
Coff, 1999	It is argued that the factors leading to a resource-based advantage also predict who will appropriate rent	Firm-specificity, Social complexity, Causal ambiguity
Collis, 1994	An infinite regress could be found in the search for the ultimate source of sustainable competitive advantage	Organizational capabilities, context-dependent capabilities
Combs and Ketchen, 1999	Interfirm cooperation and performance implications	Integration
Dan 1994	It discusses the role of resources possessed by firms on firm performance	Specificity
De Carolis, 2003	The articles tests the impact of technological competencies and the imitation of firm knowledge on performance	Non imitability
DeSarbo et al, 2006	A model is built to account for firm capabilities and performance outcomes,	Distinctiveness, competences, contingency
Dierickx and Cool, 1989	Given incomplete factor markets, appropriate time paths of flow variables must be chosen to build required stocks of assets	Accumulation
Fiol, 2001	The paper questions the assumption that it is possible to gain a competitive advantage based on any core competence, no matter how inimitable	Non imitability
Fiol, 1991	The culture concept is reframed to highlight the role of contextual identities in linking behaviors and their social meaning in organizations	Culture, collective learning
Foss and Ishikawa, 2007	It argues that RBV theory may profitably draw on insights in entrepreneurship theory	Combination, complementarity
Galunic and Anderson, 2000	This paper considers the impact of different investments in human capital on employee commitment to the firm	Firm-specificity, organizational resources, worker commitment

		to the firm
Galunic and Rodan, 1998	The notion of resource recombinations within the firm is explored	Tacitness, context-specificity, dispersion
Grant, 1991	The key to a resource-based approach to strategy formulation is understanding the relationships between resources, capabilities and competitive advantage	Coordination
Grewal and Slotegraaf, 2007	Managers must regularly make decisions on how to access and deploy their limited resources in order to build organizational capabilities for a sustainable competitive advantage	Embeddedness
Hall, 1993	This article is concerned with the role of intangible resources in business strategy	Intangibility
Hansen et al., 2004	A Bayesian model is proposed to examine the relationship between administrative decisions and economic performance	Specificity, individual firms
Hatch and Dyer, 2004	It seeks to identify the sources of wide and persistent variations in learning performance in the semiconductor manufacturing industry	Inimitability, intangibility, firm-specificity, social complexity
Henderson and Cockburn, 1994	It measures the importance of heterogeneous organizational competence in competition	Organization, Architectural competence
Hoopes and Postrel, 1999	It analyzed the relations between integrating practices and superior performance	Integration, interrelation, shared knowledge
King and Zeithaml, 2001	Relations between causal ambiguity and performance	Rarity, Location of knowledge within the firm, Tacitness
Kor and Leblebici, 2005	The paper develops and test a theory of how firms can successfully deploy and develop their strategic human assets	Interaction
Kor and Mahoney, 2004	The paper discusses the relevance of Penrose's contributions to the RBV	Firm-specificity, accumulation
Knott, 2003	The resource-based view (RBV) of strategy holds that superior organizational routines can be a source of value if and only if there is an isolating mechanism preventing their diffusion throughout industry	Nonimitability, immobility, tacitness

Lado and Wilson, 1994	The potential of human resource systems to facilitate or inhibit the development and utilization of organizational competencies is explored	Accumulation, collective learning, relations
Lado and Zhang, 1998	The paper proposes how expert systems generate sustained competitive advantage	Value, rareness, imperfect imitability, non-substitutability
Lavie, 2006	The RBV is extended to interconnected firms	Specificity, imperfect mobility, non-imitability and non-substitutability
Lepak and Snell, 1999	A human resource architecture is developed, consisting of 4 different employment modes	Coordination, relationships
Lorenzoni and Lipparini, 1999	The paper focuses on the ability to coordinate competencies and combine knowledge across corporate boundaries	Coordination, integration
Madhok and Tallman, 1998	A theoretical explanation is offered for why interfirm collaborations form yet fail	Firm-specificity
Majumdar, 1998	The ability of firms to utilize resources is a key indicator of their competitive abilities	Coordination
Makadok, 2003	It models the joint impact of two determinants of profitable resource advantages	Interaction, Complementarity
McEvily and Chakravarthy, 2002	Clarify whether and how specific attributes of knowledge based resources affect the persistence of performance advantages	Complexity, tacitness, specificity
Meyer, 2006	On a global stage, key competitive advantages are gained through internationally fungible resources	Specificity
Miller and Shamsie, 1996	Difference between property and knowledge based resources	Context-dependent, specificity
Miller, 2003	Some firms have reached a sustainable competitive advantage based on asymmetry	Rarity, inimitability, non-substitutability, complementarity, organization
Montealegre, 2002	This study seeks to understand the process of capability development	Accumulation
Morrow et al, 2007	Firms that have failed to meet the performance expectations of investors must seek new ways of creating	Value, difficult-to imitate, recombination

	value	
Newbert, 2007	The paper empirically examines the relationship between value, rareness, competitive advantage and performance	Value, rareness
Oliver, 1997	The context and process of resource selection have an important influence on firm heterogeneity	Context-depedent, Process
Pacheco de Almeida and Zemski, 2007	The paper formalized the notion of barriers to imitation	Non imitability
Peteraf and Bergen, 2003	A firm-level approach to competitor identification and analysis is proposed to take into account the heterogeneity among rivals	Substitutability, Rareness
Peteraf, 1993	Four conditions underlie sustained competitive advantage	Superior resource, Heterogeneity, Imperfect imitation, Accumulation, Asset specificity
Powell and Dent-Micallef, 1997	The study investigates linkages between information technology and firm performance	Complementarity, cospecialization, embeddedness,
Powell et al, 2006	The paper extends and integrates research on causal ambiguity	Causal ambiguity
Ray, Barney, and Muhanna, 2004	While literature has focused in the past on the impact of firm-specific resources on the overall performance of a firm, they focus on effectiveness of business processes as dependent variable	Process, Relations among resources
Reed and DeFillippi, 1990	Reinvestments in causally ambiguous competencies is necessary to protect competitive advantage	Causal ambiguity, tacitness, complexity, specificity
Rivkin, 2000	The proposition that the complexity of a successful business strategy can deter imitation of the strategy is analyzed	Complexity, learning
Schroeder, Bates, and Junttila, 2002	Explores the role of resources in manufacturing plants	Non-substitutability, Non-duplicability, Cross-learning among employees
Shang and Sun, 2004	The paper examines taxonomy in logistics management	Complementarity
Sirmon et al., 2008	The paper analyzes the role of resource management for	Bundle

	competitive advantage	
Sirmon et al., 2007	Components of the resource management model include structuring the resource portfolio; bundling resources to build capabilities; and leveraging capabilities to provide value to customers	Bundling
Somaya et al., 2007	This paper examines how the combination or bundling of resources influences firm-patenting performance	Complementary, bundle
Spanos and Lioukas, 2001	The paper investigates the relative impact of firm-or industry-specific factors on sustainable competitive advantage	Firm-specificity
Spender, 1996	The paper deals with knowledge used and created by firms	Stickiness
Stieglitz and Heine, 2007	Despite the importance given to complementary assets, their creation has not been fully discusses	Complementarity, cooperation, coordination
Teece et al., 1997	The competitive advantage of firms is seen as resting on distinctive processes, shaped by the firm's asset position, and the evolution path it has adopted	Co-specialization, complementarity
Verona, 1999	The relations between resource based view and the management of product development is explored	Interactions
Vicente-Lorente, 2001	It examines the effects of strategic investments on the financial policy of the firm	Non tradability, Specificity
Villalonga, 2004	The paper tests the hypothesis that the greater the intangibility of a firm's resources, the greater the sustainability of its competitive advantage	Intangibility
Wernerfelt, 1984	The paper deals with how resources contribute to creating a firm's specific position	Resource position
Wiklund and Shepherd, 2003	Resource-based research has paid little attention to the relationship between resources and the way firms are organized	Relations, utilization

THE INTELLECTUAL STRUCTURE OF HETEROGENEITY

Having delineated the main contributions within the RBV related to resources and in particular to heterogeneity, the concept of heterogeneity is more deeply investigated by means of a more analytical technique, the analysis of co-citations.

Co-citation is a technique developed within bibliometric studies that have the aim to analyze the structure of a field of research by focusing on the relations among authors cited within the same field.

This method has been recently adopted in management studies in order to contribute to a theoretical clarification of relevant themes and an assessment of the state of the art in a particular area of research. The results obtained from a co-citation analysis are promising since they not only enhance the comprehension of a relevant theme that is under investigation, but it also helps to identify relevant authors, period of main research activity and publications, connections among different works and which are the areas most investigated within the field.

This method is applied in this work to the analysis of Firm Heterogeneity, with the aim to identify the main areas of investigation within the field. Indeed, the analysis of the theory on RBV in general conducted on the first chapter, has highlighted that heterogeneity has been widely defined and studied from different perspectives, even if it is still considered as a central tenant of RBV. For this reason it is useful to analyze more deeply in which directions have gone different authors in the analysis of Firm Heterogeneity in order to understand the areas which have been investigated and which one are still in infancy. This work can thus help future research, providing useful directions in the analysis of heterogeneity, also contributing to identify potential relevant areas that are under investigation.

The next session analyze the co-citations tool and its role in the recent years, especially in management studies. Then the analysis of heterogeneity by means of co-citations is described and the findings reported. The chapter concludes with the discussions of the results.

Co-citation Analysis

Co-citation analysis is a method developed within bibliometric studies to analyze patterns of research within a given field. Bibliometric studies are based on mathematical and statistical analysis of patterns that appear in the publication and use of documents (Diodato, 1994). They have been usually used to count and analyse citations of articles. Within bibliometric techniques, the cocitation analysis has assumed great relevance. Cocitation can be carried on by taking documents or authors (White and Griffith, 1981) and is still considered as a useful tool to deeply analyze scientific works. Different authors have adopted this method over the years due to its usefulness in mapping the structure of scientific research (Small, 1993; Garfield, 1979). This task can be accomplished since it has been noticed that bibliographic references can be considered as the main theoretical and empirical background on which the field itself is based. Citations are indeed considered as a formal indication of linkages among papers, since authors cite those papers they consider relevant. Citations are thus a formal expression of support, illustration or elaboration of a specific research (Garfield, 1979). When studies are more cited in a given field of research, it means that they have exerted a great influence on that stream of research (Culnan, 1986, 1987; Tahai and Meyer, 1999). Moreover, the citations used to identify relations among authors are considered a valid tool since citations reported on an article are precise and can be considered a real representation of a subject. For this reason they are also a stable over time.

From the analysis of references we can be found networks of scientific documents, which can be considered useful in analysing the structure of science in a given field (Garfield, 1963; Price, 1965). Indeed, networks of research can be considered as group of authors sharing the same subject, theory or common methodology (Garfield, 1993). This can also allow to understand the current investigation within a field (Zitt and Bassecoulard, 1996). The methods is based on the assumption that when two authors are jointly cited in other works, they can be considered as sharing the same interpretation of an event, thus adhering to the same perspective. For this reason it can be inferred that the higher the co-citation between two authors, the higher is their relevance within a research area and the stronger is their view in the study of the theme under investigation.

The method is thus based on the count of the number of times two documents have been jointly cited by the same work. This count makes possible to analyze the relation among different authors or studies, thus highlighting where the research has been directed in the past.

The same analysis can produce, as useful finding, the structure of the research in a given field, that can be considered as a relevant tool in analysing the structure of science.

The co-citation can be conducted on papers, books (Ramos-Rodriguez and Ruiz-Navarro, 2004), authors (White and Griffith, 1981a, 1981b; McCain, 1990; White and McCain, 1998; Culnan et al., 1990) or journals (Podsakoff *et al.*, 2005). The cocitation of authors looks at those papers which cite any work of authors in reference lists. Documents, and especially published works, can be considered as a more precise source in the investigation of a given field (White and Griffith, 1981). Focusing on documents, however, it can be found that articles lead to two types of information, one based on a visible part and another one based on an invisible part. The visible part is usually the list of references used to write an article, which can be considered as the sources of the work and can be used to identify relevant perspective within a field. From another side, there are also invisible relations which consist of all the authors citing the same source work, thus signalling that they adhere to the same perspective. It can be thus useful to find which authors have started to conduct research on a theme based on a given source, and thus publishing after that same source.

One of the main contributions in carry on a co-citation analysis is McCain (1990). The main steps to take in order to conduct a co-citation analysis are:

- 1) Identifying the field of study
- 2) Identifying the main articles within the field analyzed
- 3) Build a co-citation matrix
- 4) Conduct a multivariate analysis on the co-citation matrix

1) In this step researchers have to specify what they intend to analyze through co-citation analysis. This means to recognize which would be an interesting stream of research to analyze. Sometimes the co-citation is used to analyze the entire structure in a given discipline or in a specific theoretical perspective developed within it. Moreover, the analysis can be used to analyze a given theme that has been analyzed within a given field, thus restricting the attention to a limited topic.

2) The critical step is the first one, since the choice of the main articles creating the core of the research could determine the results obtained.

Different approaches exist for the identification of the core articles. Some authors have used an a priori threshold, choosing to limit the analysis 50 or 100 papers (Ramos-Rodriguez

and Navarro, 2004). However, this method is more subjective and might not lead to identify the relevant articles for a given topic. Others have used a more objective approach, choosing to delimit the core of articles to papers which have been cited a number of times greater than a given threshold (McCain, 1984; Acedo et al., 2006). The list of articles can be retrieved by bibliographic database widely available or could be created “ad hoc” by researchers. The first approach is more objective and is not biased by author’s background or interests.

Recently, different works have been conducted in management studies. (Ramos-Rodriguez and Navarro, 2004; Acedo et al., 2006; Nerur et al., 2008).

The list of articles can be retrieved by bibliographic databases such as Social Science Citation Index (McCain, 1990). After delimiting the core of articles for a given theme, retrieving all the papers that cite the articles in the core is based on the assumption that when authors cite a work in their paper, they also refer, either in a positive or a negative way, to that literature. This helps in identifying the research trends and disseminations. It also enables the identification of those perspectives that are mainly shared among a community of researchers. The choice of the criteria used to find articles on a given theme research is a critical step. Depending on the key words chosen, the research can produce different results. For this reason it is of great importance to specify the theme on which the co-citation has to be carried on and then to identify the most pertinent words related to that theme.

3) From the list of articles citing the core it can be obtained a matrix with the number of times two authors have been cited together. This count can then be used to apply the main multivariate statistical analysis. The main analyses are factor analysis, multidimensional scaling and cluster analysis. These techniques are useful because they identify main streams within the field analyzed, or main perspectives developed on a given topic.

4) When the matrix of co-citation is obtained, different analyses can be done on it. Applying the multivariate analysis on the matrix it is possible to identify the subfields that are investigated in a given field of research or for a specific theme of interest. Techniques can also be used to produce visual maps. From the analysis of these maps insights can be gained about the similarity of different works published on the topic under investigation. Moreover, it is possible to identify the presence of clusters of points, which are considered as groups sharing research specialties or schools of thought (McCain, 1990).

Firm Heterogeneity and co-citation

Heterogeneity has emerged as a basic concept within much of the research in strategic management. Since the first conceptualization of heterogeneity by Penrose (1959), the theme has been analyzed and mainly developed within RBV. Penrose's (1959) contribution had the great merit to highlight that it is heterogeneity, and not homogeneity of the services rendered by resources that give each firm its unique character.

The main elaboration of this concept in RBV dates back to Peteraf (1993) article, where heterogeneity is considered as one of the four cornerstones of competitive advantage. Research on the sources of competitive advantage has then focused on identifying those main resources and capabilities responsible for the attainment and sustainability of competitive advantage. However, this approach has missed to analyze the main concept of heterogeneity.

What different researchers have recently analyzed about RBV is its inherent weakness in that it tries to find out the main resources that lead to competitive advantage, thus incurring in tautological results (Priem and Butler, 2001).

Other contributions on heterogeneity have emerged in the last years, but it has been analyzed from different perspectives (Knott, 2003; Sakakibara, 1997; Leiblein and Madsen, 2009). A special issue of Strategic Management appeared in 2003 in order to share the contributions provided to the theme and to state the critical issues which have yet to be resolved.

Nonetheless, the basic question still remains: Since Heterogeneity is deemed an important phenomenon for competitive advantage, how is it created within firms?

Since heterogeneity is a basic concept within strategic management, we should expect to find a shared approach and a shared conceptualization among different contributions. However still today there are different perspectives on heterogeneity. This is mainly due to different approaches about this phenomenon that have been developed over time. While the existence of different perspectives can be fruitful in providing new answers to the question of how heterogeneity arises, it might also lead to some inconsistencies. The lack of a unique approach on heterogeneity could potentially undermine its usefulness in explaining differences in performance among organizations. From a theoretical point of view, the risk is to develop different perspectives without a real comprehension about the drivers and the antecedents of heterogeneity.

For a practical point of view, problems could arise since there are not convergent suggestions for organization in order to maintain heterogeneity in the long run, which could be instead positive for the sustainability of firm competitive advantage.

In order to advance the field, in this work it is carried out a bibliometric analysis. By means of cocitation on published articles, we can obtain a clearer picture on what heterogeneity is and which are the different streams of research which have analyzed it over the years. Cocitation is thus used to map the intellectual structure of the research on Heterogeneity.

Methodology

In order to carry on a cocitation analysis, the main steps described in McCain(1990) have been followed. The unit of analysis in this work is published articles on heterogeneity. Indeed, the choice of authors as a unit of analysis could lead to different findings since the same authors could have published on different topics. The first step to take is the choice of the field to be analyzed.

In this work it is analyzed the concept of Heterogeneity among organizations since it has been highlighted that on this theme different perspectives have emerged along the years.

The main steps followed are analyzed in detail in the following sessions.

Identifying the core

In order to conduct the analysis of cocitation, having identified the topic to be analyzed and the unit of analysis, the next step is to identify the main articles published on heterogeneity. These articles constitute the core of the research on Heterogeneity. Along the years these articles could have been cited by different contributions. Those who cited a specific article have, in an indirect manner, signalled to share a given approach or a specific school of thought. It is thus important to identify those who have cited the articles comprised in the core.

In order to identify the core of articles on heterogeneity, the Social Science Citation Index (SSCI) of Thomson-ISI Web of Science has been used. This web data base contains bibliographic data on the most important scientific journals in more than 50 disciplines.

The analysis on Heterogeneity has been conducted by referring to all articles published from 1990 to 2009. The list of articles used in this work has been retrieved on the mid October in 2009.

The areas on which the articles have been searched are Business and Management, since these are the main field on which Heterogeneity among organizations has been analyzed. This first delimitation of the field is important in order to specify the area that is to be analyzed and to avoid the risk to identify articles dealing with heterogeneity in other scientific disciplines, distant from the managerial area. The research has been carried out by searching all the articles which have as main topic the word Firm Heterogeneity.

This word has been chosen since it is referred to Heterogeneity in general and not to any given approach on the topic. Indeed, we already know that Heterogeneity has been analyzed from different perspectives, mainly from the resource-side. For this reason, a research where heterogeneity is combined with other words, such as resources or capabilities, could have biased the analysis itself, leading to analyze only a given perspective on the theme. Since the main task here is to analyse the intellectual map of science on the topic Heterogeneity among firms, the appropriate key word chosen is Firm Heterogeneity. The search yielded 790 articles. After restricting on the Business and Management categories, the articles left are 336. These articles have then to be further restricted in order to take those articles constituting the main core of the research. In order to do so, the number of times they have been cited has been chosen as a criterion for choice since it signals the existence of articles which are more cited than others, and thus have been the reference points for much of the research on the theme. This can be useful to identify different schools of thought on the topic.

Other studies on co-citation have used other parameters to choose the core of articles. Sometimes a cut-off has been established in 50 or 100 articles. Thus runs the risk to take also articles not mainly related to the theme under investigation. In order to reduce this risk, in this work it is used the h-index provided by the same Web of Science. On the list of the total numbers of articles obtained in the Business and Management, the h-index (Hirsch, 2005) is used as number of citation because it discounts the disproportionate weight of highly cited papers or papers that have not yet been cited.

It thus discounts the effect of time, since older articles could have been cited more compared to the more recent ones (Brown and Gardner, 1985). H-index in this case has been found equal to 42 articles, which have received more than 42 citations.

The core of the research retrieved comprises articles published in the main journals in management studies. The Journals, with the number of articles published on each of them, are: Strategic Management Journal (17), Academy of Management Journal (6), Organization Science (5), Management Science (2), Journal of Management (2), Journal of Management Studies (2), Journal of International Business Studies (2), Academy of Management Review (1), Journal of Business Research (1) Journal of Marketing (1), Administrative Science Quarterly (1), Research Policy (1), Journal of Business Venturing (1).

The list of the 42 articles retrieved is shown in table 1.

Table 1- The core of articles on Firm Heterogeneity

ARTICLE N.	ARTICLE
a1	Peteraf 1993
a2	Zollo and Winter 2002
a3	Wiersema and Bantel 1992
a4	Fornell 1992
a5	Priem and Butler 2001
a6	Oliver 1997
a7	Helfat and Peteraf 2003
a8	McEvily and Zaheer 1999
a9	Simons et al 1999
a10	Halblian and Finkelstein 1993
a11	Mahoney 1995
a12	Westphal and Zajac 1995
a13	Chatman and Flynn 2001
a14	Cockburn et al 2000
a15	Shaver and Flyer 2000
a16	Wiersema and Bantler 1993
a17	Stuart and Sorenson 2003
a18	Miller et al 1998
a19	Carpenter and Fredrickson 2001
a20	Gimeno and Woo 1996
a21	Mauri and Michaels 198
a22	Hoopes et al 2003
a23	Sakakibara 1997
a24	Westhead and Wright 1998
a25	Sambharya 1996
a26	Helfat 2000
a27	Adner and Levinthal 2001
a28	Carpenter et al 2004
a29	Adner and Helfat 2003
a30	Martin and Salomon 2003
a31	Priem et al 1999
a32	Kamoche 1996
a33	Adner 2002
a34	Ferrier 2001
a35	Helfat 1994
a36	Murthi and Sarkar 2003
a37	Kotabe et al 2002
a38	Zahra et al 2006
a39	Rodan and Galunic 2004
a40	Kilduff et al 2000
a41	Carpenter 2002
a42	Kraatz and Zajac 2001

Building the cocitation matrix

The data used as input in the cocitation analysis is the matrix of cocitation among the core articles already identified. The matrix is square and symmetric, and each cell is the number of times the two authors on the row and on the column have been cited together by following published articles. The number of rows and columns is the same and is equal to the 42 articles in the core. Divergent opinions exist on how to treat the diagonal of the matrix. Some prefer to assign a value given by summing the three highest values on row or columns, and then dividing by two. Another approach, also indicated by McCain (1990), is to take them as undefined values. The differences between the two approaches are not big in terms of results. Moreover, since the diagonal should be the number of times an authors cites his own work, it can be considered as missing.

The raw co-citation matrix is usually converted in a correlation matrix in order to have standardized coefficient in the matrix and to limit the number of zeros on the matrix itself (McCain, 1990). In this study it is used the r-Pearson as a measure of similarity between document pairs, since it has been highlighted that this coefficient can be interpreted as the likeness in shape of their co-citation count profiles over all other documents in the set (White and McCain, 1998). The advantages of using the r-Pearson correlation are:

1) For any given pair of documents, Pearson's correlation coefficient indicates not the frequency with which the two were cited (raw citation frequency), but of the degree of similarity between their co-citation profiles.

2) The correlation coefficient also overcomes differences of scale between a document that is very frequently cited and other very similar ones less frequently cited, because this fact would limit their possibility of being co-cited (Kerlinger, 1973; White and McCain, 1998)

The cocitation matrix thus reports data about how often two authors are cited together. This matrix is useful since it is highlighted that if two articles are often cited together within a given field, they are perceived as similar since they share a main question under investigation, even if they don't completely agree on the same perspective (White and Griffith, 1981).

The matrix of co-citation has been produced by means of private software that, after collecting all the articles citing those in the core, combined the data and provided the number of times two authors of the core have been cited together.

The literature on co-citation method maintains that the co-citation matrix should be transformed in a correlation matrix in order to be a better basis for subsequent statistical analysis (Rowlands, 1999).

Analyzing the intellectual structure on Firm Heterogeneity

The techniques used in this work to analyze the matrix of correlation among authors are the main used in multivariate statistical analysis: factor analysis and multidimensional scaling.

Factor analysis is technique used reduce the number of variables analyzed in few factors. These factors can be considered as latent concepts which are shared among groups of variables. Those variables linked to the same factor can be considered as sharing some concept or idea. From the analysis of the variables comprised in each factor it can be understood the meaning of the factors.

The same concepts apply here to the analysis of cocitation. The 42 authors comprised in the core can share some idea since they are often cited together. It is thus useful to identify the factors behind the co-cited authors. These factors can be thought of as schools of thought emerged on the topic of Firm Heterogeneity. From the analysis of the articles linked to each factor it can be identified the meaning of each factor and thus the different streams of research constituting the intellectual structure on Firm Heterogeneity.

The second statistical technique used for the analysis of heterogeneity is multidimensional scaling (MDS). In general, the goal of the analysis is to detect meaningful underlying dimensions that allow the researcher to explain observed similarities or dissimilarities (distances) between the investigated objects.

Even though there are similarities in the type of research questions to which these two procedures can be applied, MDS and factor analysis are fundamentally different methods. Factor analysis requires that the underlying data are distributed as multivariate normal, and that the relationships are linear. MDS imposes no such restrictions. As long as the rank-ordering of distances (or similarities) in the matrix is meaningful, MDS can be used. In terms of resultant differences, factor analysis tends to extract more factors than MDS; as a result, MDS often yields more readily, interpretable solutions. Most importantly, however, MDS can be applied to any kind of distances or similarities, while factor analysis requires us to first compute a correlation matrix. In summary, MDS methods are applicable to a wide variety of research designs because distance measures can be obtained in any number of ways (for

different examples, refer to the references provided at the beginning of this section). The difference between the two techniques is that in factor analysis, the similarities between variables are expressed in the correlation matrix. With MDS one may analyze any kind of similarity or dissimilarity matrix, in addition to correlation matrices. The MDS, moreover, is useful since it produces a visual representation of the variables under examination on a space. From this we can infer relevant information about the data. In general, MDS attempts to arrange "objects" in a space with a particular number of dimensions so as to reproduce the observed distances. As a result, we can "explain" the distances in terms of underlying dimensions.

In this work the two techniques have been applied by mean of SPSS 13.

As regards Factor Analysis, the matrix of raw cocitation has been used as input since the Factor Analysis performed by the software transforms the input matrix in a correlation matrix.

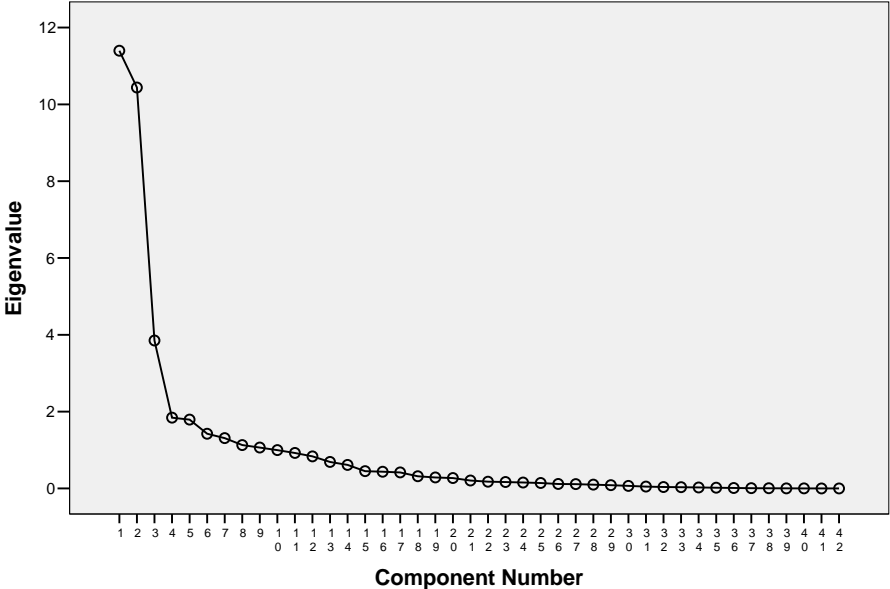
Factor Analysis has been carried out with a principal component as extraction method and varimax rotation. Varimax has been chosen since it allows for a better split of the articles on different factors, thus enhancing the interpretability of results. The analysis of the variance explained by each factors and the analysis of eigenvalues, shows that 11 factors should be taken.

Tab. 2 - Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	11,396	27,133	27,133
2	10,440	24,856	51,989
3	3,852	9,171	61,161
4	1,842	4,386	65,547
5	1,792	4,267	69,814
6	1,424	3,390	73,204
7	1,310	3,120	76,324
8	1,130	2,690	79,014
9	1,065	2,535	81,549
10	,997	2,375	83,923
11	,924	2,200	86,123

This result confirms that the theme of Firm Heterogeneity has been analyzed from different perspectives within the Business and Management categories of research. However, from the analysis of the scree plot it can be inferred that the ideal number of factors is 5.

Figure 1 - Scree plot



Retaining five factors gives more useful indication about the data than the solution with more factors. Fields that are similar are thus combined, and emerging factors are more interpretable, even if with a larger and wide meaning. The cumulative variance explained by 5 factors is equal to 69.8%, thus signalling a good percentage. Moreover, after the fifth factor, the percentage of variance explained by each single factor is lower.

Table N 3 - Rotated Component Matrix

		Factor				
		1	2	3	4	5
a1	Peteraf 1993			,627		
a2	Zollo and Winter 2002		,613			
a3	Wiersema and Bantel 1992	,446			,496	
a4	Fornell 1992				,666	
a5	Priem and Butler 2001		,840			
a6	Oliver 1997		,880			
a7	Helfat and Peteraf 2003			,829		
a8	McEvily and Zaheer 1999		,616	,415		
a9	Simons et al 1999	,842				
a10	Halblian and Finkelstein 1993	,927				
a11	Mahoney 1995		,845			
a12	Westphal and Zajac 1995	,857				
a13	Chatman and Flynn 2001	,664			,683	
a14	Cockburn et al 2000			,883		
a15	Shaker and Flyer 2000					,500
a16	Wiersema and Bantler 1993	,932				
a17	Stuart and Sorenson 2003					
a18	Miller et al 1998	,861				
a19	Carpenter and Fredrickson	,859				
a20	Gimeno and Woo 1996		,885			
a21	Mauri and Michaels		,808			
a22	Hoopes et al 2003		,607	,660		
a23	Sakakibara 1997		,580			,619
a24	Westhead and Wright 1998		,404			,432
a25	Sambharya 1996	,914				
a26	Helfat 2000		,563	,703		
a27	Adner and Levinthal 2001					
a28	Carpenter et al 2004	,943				
a29	Adner and Helfat 2003			,842		
a30	Martin and Salomon 2003			,684		
a31	Priem et al 1999	,832				
a32	Kamoche 1996		,883			
a33	Adner 2002			,558		
a34	Ferrier 2001	,807				
a35	Helfat 1994		,866			
a36	Murthi and Sarkar 2003					
a37	Kotabe et al 2002			,478		
a38	Zahra et al 2006			,927		
a39	Rodan and Galunic 2004					,848
a40	Kilduff et al 2000	,768			,463	
a41	Carpenter 2002	,844				
a42	Kraatz and Zajac 2001	,405	,518	,613		

Taking into consideration the indications provided by McCain(1990), only those articles with a factor loading greater then 0.40 have been retained. This led to discard 3 papers on 42. The three articles eliminated are:

- N. 17, Stuart T., and Sorenson O., 2003, The geography of opportunity: spatial heterogeneity in founding rates and the performance of biotechnology firms, *Research Policy*, 32(2), 229-253;

- N.27, Adner R., and Levinthal D., 2001, Demand Heterogeneity and technology evolution: implications for product and process innovation, *Management Science*, 47(5):611-628;

- N. 36, Murthi BPS. and Sarkar S., 2003, The role of the management sciences in research on personalization, *Management Science*, 49(10):1344-1362

Rerunning the factor analysis with the 39 remaining articles, the variance explained is shown in Table 4.

Table 4 - Variance explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	11,368	29,149	29,149
2	10,397	26,659	55,809
3	3,791	9,719	65,528
4	1,834	4,703	70,231
5	1,781	4,567	74,798
6	1,300	3,332	78,130
7	1,132	2,903	81,033
8	1,069	2,740	83,773
9	,891	2,286	86,059

Moreover, the KMO measure of sampling adequacy is 0,445 and the Bartlett's test of Sphericity is significant (chi-square 2073,63 with df=741)

The rotated solution from the list of the 39 articles left is shown in the following table.

Table 5 - Rotated solution

		Component				
		1	2	3	4	5
a1	Peteraf 1993			,637		
a2	Zollo and Winter 2002		,592	,424		
a3	Wiersema and Bantel 1992	,447			,496	
a4	Fornell 1992				,668	
a5	Priem and Butler 2001		,830			
a6	Oliver 1997		,874			
a7	Helfat and Peteraf 2003			,833		
a8	McEvily and Zaheer 1999		,603	,434		
a9	Simons et al 1999	,845				
a10	Halblian and Finkelstein 1993	,928				
a11	Mahoney 1995		,838			
a12	Westphal and Zajac 1995	,860				
a13	Chatman and Flynn 2001	,664			,686	
a14	Cockburn et al 2000			,899		
a15	Shaver and Flyer 2000					,507
a16	Wiersema and Bantler 1993	,935				
a18	Miller et al 1998	,861				
a19	Carpenter and Fredrickson	,858				
a20	Gimeno and Woo 1996		,890			
a21	Mauri and Michaels		,804			
a22	Hoopes et al 2003		,578	,684		
a23	Sakakibara 1997		,592			,609
a24	Westhead and Wright 1998					,431
a25	Sambharya 1996	,915				
a26	Helfat 2000		,534	,729		
a28	Carpenter et al 2004	,944				
a29	Adner and Helfat 2003			,857		
a30	Martin and Salomon 2003			,667		
a31	Priem et al 1999	,832				
a32	Kamoche 1996		,891			
a33	Adner 2002			,560		
a34	Ferrier 2001	,807				
a35	Helfat 1994		,861			
a37	Kotabe et al 2002			,501		
a38	Zahra et al 2006			,939		
a39	Rodan and Galunic 2004					,846
a40	Kilduff et al 2000	,769			,465	
a41	Carpenter 2002	,843				
a42	Kraatz and Zajac 2001		,491	,641		

In order to identify the streams of research emerged over years on the theme of Firm Heterogeneity, the meaning of the factors has to be identified. In this stage the analysis of

articles loading on each construct can lead to the identification of the streams of research that each factor represents.

The three factors thus identified are:

FACTOR 1 Managerial Heterogeneity	
Article N.	Article
3	Wiersema and Bantler, 1992
9	Simons et al., 1999
10	Haleblian and Finkelstein, 1993
12	Westphal and Zajac, 1995
13	Chatman and Flynn, 2001
16	Wiersema and Bantel, 1993
18	Miller et al, 1998
19	Carpenter and Fredrickson, 2001
25	Sambharya, 1996
28	Carpenter et al., 2004
31	Priem et al, 1999
34	Ferrier, 2001
40	Kilduff et al., 2000
41	Carpenter, 2002

Factor 1 comprises articles dealing with Top Management Team characteristics. The articles linked to this factor share the area of investigation since they all focus on managerial heterogeneity as a main cause of performance differences and of competitive actions taken by firms. The field of study related to management characteristics dates back to Hambrick and Mason (1984). However, it is still analyzed in many studies. The papers under this factor look at cognitive sources of difference among firms, directing attention to the team management characteristics. The majority of them analyze the relation between demographic characteristics of the managerial team and organizational decisions. Indeed, they highlight that a relevant source of heterogeneity among organizations is the composition of the managerial team, since this can affect what type of decisions are taken. Demographic characteristics are also taken into account since they signal the existence of managers with different background and expertise, thus contributing with their own abilities to the firm's success. Other papers under this factor also maintain that cognitive aspects of managers are relevant to take into account. The first factor can thus be interpreted as "Managerial Heterogeneity".

FACTOR 2 Resource-Capabilities Heterogeneity	
Article N.	Article
2	Zollo and Winter, 2002
5	Priem and Butler, 2001
6	Oliver, 1997
8	McEvily and Zaheer, 1999
11	Mahoney, 1995
20	Gimeno and Woo, 1996
21	Mauri and Michaels, 1998
23	Sakakibara, 1997
32	Kamoche, 1996
35	Helfat, 1994
42	Kraatz and Zajac, 2001

Factor 2 is instead comprised of those articles analysing Heterogeneity from both a resource and a capability approach. While Heterogeneity has been investigated as a factor creating differences among firms, the analysis in classical RBV literature has started from the firms' resources endowment. This focus on resources led to some inconsistencies, since it was taken a static approach in the analysis of the sources of competitive advantage (Priem and Butler, 2001). Some efforts to join research from resource, dynamic capabilities, and organization has been taken by Mahoney (1995), who suggested to analyse both resources and learning taking place within firms. With the same approach, Kamoche (1996) has called for an interaction of the two mutually reinforcing perspectives of resources and capabilities. Mauri and Michaels (1998) have indeed tried to reconcile the resource-based and industrial organization schools of thought, showing that not only firm effects but also industry effects affect firm performance. The articles loading on the second factor have recognized the existence of heterogeneity in a industry shaped by firms' relations. McEvily and Zaheer (1999) recognize that a factor relevant in creating differences among firms is the embeddedness in a network of ties, leading to access new information and opportunities. Relevant is also the institutional context in which firms operate, since it consists of cultures, values and norms guiding firm's actions and affecting firm' results (Oliver, 1997). In essence, the second factor can be thought of as "Resource-Capability Heterogeneity".

FACTOR 3 Evolutionary Heterogeneity	
Article N.	Article
1	Peteraf, 1993
2	Zollo and Winter, 2002
7	Helfat and Peteraf, 2003
8	McEvily and Zaheer, 1999
14	Cockburn et al., 2000
22	Hoopes et al., 2003
26	Helfat, 2000
29	Adner and Helfat, 2003
30	Martin and Salomon, 2003
33	Adner, 2002
37	Kotabe et al., 2002
38	Zahra et al., 2006
42	Kraatz and Zajac, 2001

Factor 3 is linked to articles mainly dealing with firm capabilities. Within this group it is comprised one of the basic article on heterogeneity from a resource perspective: Peteraf (1993). In this article Heterogeneity is assumed as one of the four dimensions for firm's competitive advantage sustainability. Other articles are more recent but they share the focus on how firms are able to build and sustain a competitive advantage based on their internal strengths. These articles, however, point out that it is not resource endowment *per sé* that can lead to sustainability, but the ability to develop new solutions and to face external environment demands. Great emphasis is put by these articles on firms' dynamic capabilities that are built over time and allow to face uncertainties coming from the environment (Cockburn et al., 2000; Helfat, 2000; Helft and Peteraf, 2003). It is also highlighted the need to take a demand perspective, as a useful starting point to understand how firms react to different market preferences (Adner, 2002). The need to extend the research on heterogeneity besides the usual static approach developed within the classical RBV is also reported by Hoopes et al, (2003). With their article within the SMJ special issue on heterogeneity, they identified the main steps to take in order to advance the research on heterogeneity and to deal with some of the inconsistencies previously generated by the research. The lack of empirical investigation on the theme was highlighted, with suggestions to conduct research from different perspectives in order to have a better understanding about the real sources of heterogeneity among firms. Applying the dynamic-capabilities perspective, articles under this factor have extended the approach for the explanation of entrepreneurial moves and survival in turbulent environments. This factor can be interpreted as "Evolutionary Heterogeneity".

FACTOR 4 Behavioural Heterogeneity	
Article N.	Article
3	Wiersema and Bantel, 1992
4	Fornell, 1992
13	Chatman and Flynn, 2001
40	Kilduff et al., 2000

Factor 4 shares some of the conceptual tenant of the first factor, analysing how team diversity at the managerial level within firms affects both a firm's ability to change and its performance. However, this factor also comprises articles dealing with some specific aspect of heterogeneity, not so much investigated by the literature. Chatman and Flynn (2001) take a social perspective to analyse how cooperation within groups is favoured or constrained on the basis of demographic diversity. Kilduff et al., (2000) focus on cognitive team diversity and its impact on change and firm performance. This shades light on more social aspects that can produce heterogeneity among firms, besides the ones already found in the first three factors. The social nature of heterogeneity is also considered by Fornell (1992) that was published in the Journal of Marketing and was mainly aimed at analysing how firms are able to monitor and meet customer satisfaction. The article shows that it is relevant to match heterogeneity/homogeneity from supply and demand. Finally, Wiersema and Bantel (1992) takes a strategic choice perspective to study manager's choices, since they are considered responsible for setting the firm direction.

The articles loading on the fourth factor share a common interesting on how firm's actions are determined by the specific behaviour taken by individuals. Behaviours are analyzed both from a managerial perspective and from a demand view. For this reason they can be considered as a "Behavioural Heterogeneity". The low number of articles on this factor shows that micro determinants of behaviour as drivers of heterogeneity are less investigated in strategic management studies, more specifically those that are at the intersection between firm and customer perspective.

FACTOR 5 Network Heterogeneity	
Article N.	Article
15	Shaver and Flyer, 2000
23	Sakakibara, 1997
24	Westhead and Wright, 1998
39	Rodan and Galunic, 2004

Factor 5 is characterized by articles dealing with cooperative decisions driven by heterogeneity among firms. These articles share the main point of investigation, which is the

analysis of how heterogeneity among firms can affect agglomeration choices (Shaver and Flyer, 2000) or R&D consortia (Sakakibara, 1997). Heterogeneity is found to play an effect on cooperative decisions, since firms are interested in merging with other firms when they expect benefits in terms of knowledge or skills higher than the total costs supported. Differences are also found from an entrepreneurial perspective among different types of entrepreneurs (Westhead and Wright, 1998). Moreover, Rodan and Galunic (2004) focus on the content of managers' network drawing from social networks theory and from psychology. They highlight that not only the structure of the network, but how managers exploit their social networks can lead to differences in managerial performance. The articles loading on this factor are thus originated from a social network perspective. This area, as the one related to the fourth factor, is less investigated compared to the areas that constitute the bulk of the research on Heterogeneity. The fifth factor can thus be interpreted as "Network Heterogeneity".

Looking at the five factors, we can see a convergence of the articles in the main task, the identification of potential sources of heterogeneity. However, the articles locate the sources at different factors or level within organizations. The first factor, "Managerial Heterogeneity", takes an individual perspective and is mainly devoted to the analysis of Team Management Heterogeneity as the main explanation for firms' performance differences. The second one, "Resource-Capabilities Heterogeneity" is reconciliation between the static approach of earlier RBV and the evolution toward the capabilities perspective. Articles on the second factor call for an integration between resources and capabilities studies in order to understand the real sources of firm's differences and competitive advantage. The third factor can be considered as the extension of the resource heterogeneity toward dynamic capabilities. Indeed, the main focus is on how firms are able to evolve over time due to the accumulation and regeneration of their capabilities. The first three factors constitute the bulk of the research on Heterogeneity. They draw from economic, behavioural and industrial theories to investigate the same topic. While the first and the third factors are positioned at two extreme of the resource endowment vs capabilities debate, the second one takes an integration of the two, considering them as complementary rather than conflicting.

The fourth and fifth factors represent areas of research less diffused and on which a lower emphasis has been put. Sociological aspects related to customers and network perspectives have thus been neglected by research in the identification of potential sources of firm's differences.

Useful indications can also be obtained by looking at the cross loadings. In normal factor analysis, variables which load on more than 1 factor should be eliminated since not useful for the analysis. This is not the case with cocitation, where cross loadings inform us about the bridge existing between different streams.

As we can expect, the second and the third factors share several articles, since they both take a capabilities perspective to study firm's heterogeneity. Helfat (2000), and Hoopes et al. (2003), Zollo and Winter (2002) deal with the capabilities and learning as the main explanation of firms' Heterogeneity, and call for an extension of the traditional static analysis. Hoopes et al (2003), moreover, highlight that it is useful to combine different perspectives on the topic of heterogeneity. Another article that is shared among the second and the third factors is the one by Kraatz and Zajac (2001). This article analyses how firms are able to change and how this affects firm performance, drawing from both behavioural and economic-based literature, thus creating a merge among the two streams of research. Other cross-loadings are found between the first and the fourth factors, both dealing with team management demographic characteristics.

Factor Analysis on the cocitation has thus provided interesting results about the streams of research found in the field. However, in order to have a fuller picture about the intellectual structure of Firm Heterogeneity, MDS should be conducted. This allows the identification of a map where all articles are positioned. The map should be analyzed with respect to:

- distance among articles
- distance from the main axis
- existence of groups of articles

From MDS it is obtained a map where the articles are positioned. The map has been created by using the map of Pearson's correlation coefficients as input. Then the map shows the position of each article with respect to other articles in the core and with respect to the dimensions. When articles are located close to each other, they are perceived as similar within the intellectual structure of the research on Heterogeneity. The matrix of correlation has been used as input also for MDS since it provides a standardized measure on the relation among different papers and it is not subject to the frequency of citation of main articles. If one decides to use the raw cocitation matrix, findings might be biased since greater weight would be given to most cited articles to the detriment of the less cited. Instead, what we are interested in is the relation among articles, despite their relevance in terms of times cited. The

real relations among articles can thus be identified by using the correlation matrix. The software then converts this matrix to a distance one, based on Euclidean measure, to elaborate the position of articles on the map. Papers that are more similar are put close to each other, revealing some overlap between their researches. The goodness of the model is given by a sufficient Krushkal's stress test, equal to 0,071, and a high RSQ index, equal to 0,98.

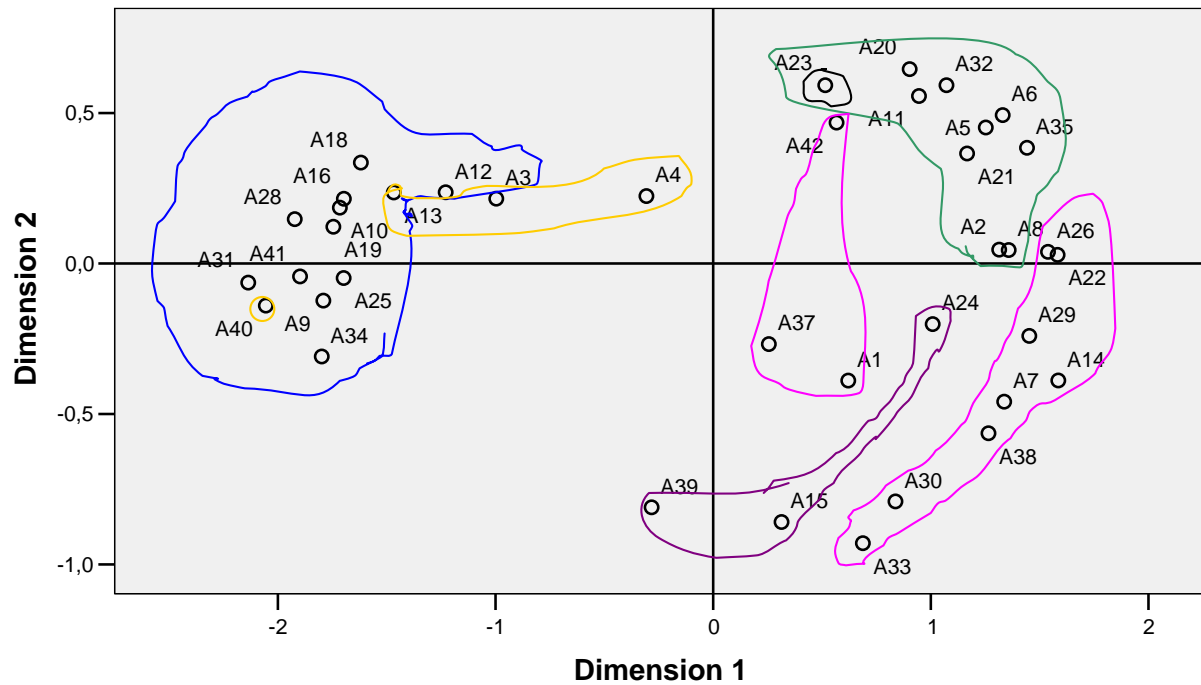
The map obtained from MDS shows the articles positioned along two dimensions. The two dimensions have to be interpreted based on the position of the articles on the map and have not the same meaning of the factors identified through factor analysis.

When articles are positioned close to the (0,0) point, it signals that they have been cocited with a higher number of papers in the core of 39 articles. Instead, articles distant from the centre have been co-cited with a lower number of papers in the core.

Looking at the groups of articles on the map in Figure 2 we can understand how much consistency there is among articles within a same group and thus sharing a same perspective.

The first thing done in this work for the interpretation of the axis is the identification of the articles comprised in each factor extracted by factor analysis.

Figure 2 - Map of dissimilarity among Heterogeneity Articles



Factor 1 Managerial Heterogeneity	Factor 2 Resource-Capabilities Heterogeneity	Factor 3 Evolutionary Heterogeneity
A3. Wiersema and Bantel, 1992	A2. Zollo and Winter, 2002	A1. Peteraf, 1993
A9. Simons et al, 1999	A5. Priem and Butler, 2001	A7. Helfat and Peteraf, 2003
A10. Haleblan and Finkelstein, 1993	A6. Oliver, 1997	A14. Cockburn et al., 2000
A12. Westphal and Zajac, 1995	A8. McEvily and Zaheer, 1999	A22. Hoopes et al., 2003
A13. Chatman and Flynn, 2001	A11. Mahoney, 1995	A26. Helfat, 2000
A.16 Wiersema and Bantel, 1993	A20. Gimeno and Woo, 1996	A29. Adner and Helfat, 2003
A18. Miller et al, 1998	A21. Mauri and Michaels, 1998	A30. Martin and Salomon, 2003
A19. Carpenter and Fredrickson 2001	A23. Sakakibara, 1997	A33. Adner 2002
A25. Sambharya 1996	A32. Kamoche 1996	A37. Kotabe et al., 2002
A28. Carpenter et al, 2004	A35. Helfat 1994	A38. Zahra et al., 2006
A31. Priem et al., 1999		A42. Kraatz and Zajac, 2001
A34. Ferrier, 2001		
A40. Kilduff et al, 2000	Factor 4 Behavioural Heterogeneity	Factor 5 Network Heterogeneity
A41. Carpenter, 2002	A3. Wiersema and Bantel, 1992	A15. Shaver and Flyer, 2000
	A4. Fornell, 1992	A23. Sakakibara, 1997
	A13. Chatman and Flynn, 2001	A24. Westhead and Wright, 1998
	A40. Kilduff et al, 2000	A39. Rodan and Galunic, 2004

Looking at the map we can see a distance on the horizontal axis between the group of articles on the left and those on the right. Articles on the left side belong to the first factor, studying individual and team management characteristics. As already emphasized in the discussion on factor analysis, these articles have taken a more static approach, linking the

sources of heterogeneity and performance to management characteristics in terms of educational level, demographic features, specialization, team size etc. This shows that on the left side there are articles more focused on a firm's resource-endowment, mainly attributed to cognitive and individual factors. The articles on this area of the map are based on social and psychological theories in the explanation of firm's Heterogeneity.

On the right side of the map there are articles dealing with the "how" questions of firm's differences. They try to explain how firms are able to evolve over time and to build capabilities that are deemed useful under changing circumstances. The articles on the right side belong to the second, third and fifth factors. Even if they have different perspectives, what they share is the emphasis on learning and capabilities as the key variables in Heterogeneity explanation, integrating RBV and organization theory.

From the position of the factors on the map, we can infer that the x-axis should be read as the *Resource endowment approach*, on the left side, against the *Capabilities approach* on the right one. Moreover, the left side draws from social and psychological theory, while the right one draws from resource and organizational theories.

Looking at the vertical axis, it can be noted that in the higher part of the map there are articles dealing with heterogeneity within firms, trying to identify the sources of it in cognition or specific features of managers. Articles in this area focus on those factors of diversity found within each single firm which can be useful in creating differences among firms. The emphasis is thus on internal firm aspects of heterogeneity. The articles on the higher part of the map are from the second factor, "Resource-Capabilities Heterogeneity". This shows that articles under this factor are mainly aimed at understanding sources of Heterogeneity within firms, in the interaction of their resources and capabilities.

On the bottom of the map there are articles, both from the third factor "Evolutionary Heterogeneity" and from the fifth, "Network Heterogeneity", which look at differences among firms. Articles in this part of the map focus on cooperative relations among firms which lead to the creation of heterogeneity or are the result of heterogeneity among firms in terms of skills and capabilities. Firms' agglomerations or cooperative R&D consortium are example of the phenomena analyzed. The factors under the "Evolutionary" approach show that the stream of dynamic capabilities has evolved in the exploration of organizational and relation capabilities besides the focus on individual firm capabilities. For this reason, the y-axis can be thought of as the opposition of *Internal perspectives* of firm's Heterogeneity on the top area, and *Relational theories* on the bottom.

A global look at the map, thus, reveals how the topic of Heterogeneity has been treated in the literature. The first impression is that the theme has received attention from two divergent perspectives, one focusing on individual internal resources, and another one looking at organizational level factors. Moreover, within the organizational perspective, a stream of research has devoted greater attention to factors internal to the firms, while another school of thought has also looked for relations among firms. From the map it can also be identified the position of the articles by Kraatz (2001), that shows cross-loadings among the first three factors. This signals that this article has gained acceptance from different schools of thought, representing a link between individual cognitive studies and organizational capabilities ones.

We can also note that there are not papers close to the (0,0) point, testifying that no article in the core has been co-cited with a great number of articles in the paper. On the contrary, most of the papers lie on external parts of the map, thus showing that there is not great convergence about how to treat Heterogeneity.

These findings confirm that the theme of Heterogeneity among firms can be still considered a central topic within strategic management since no unique and convergent approach on it exists. Moreover, it shows that the theme has given rise to different schools of thought, each of them privileging a specific perspective against others.

DISCUSSION

The analysis of Heterogeneity carried on in this work has allowed the identification of the patterns of co-citation among the main published articles on the topic. The matrix has been analyzed by means of Factor Analysis and Multidimensional Scaling, two of the most widely known techniques in multivariate statistical analysis.

Factor Analysis has revealed the existence of 5 factors underlying the research on Heterogeneity. The factors have been interpreted based on the articles loading on each of them. The five factors are: “Managerial Heterogeneity”, “Resource-Capabilities Heterogeneity”, “Evolutionary Heterogeneity”, “Behavioural Heterogeneity”, and “Network Heterogeneity”.

These results show that Heterogeneity has been analyzed within management studies from different perspectives. The most influential works, since most cited, and those that comprise a longer number of papers, are those loading on the first three factors. This shows

that Heterogeneity among firms is driven by both initial resource conditions, in terms of resource assets and managerial characteristics, and capabilities accumulated over time. Less emphasis has been put by research on the micro perspective of Behaviour within firm, driven by both managers and customers. The factor 4 on Behaviour is indeed comprised of only 4 articles, which are also shared with the first factor. Few articles load on the fifth factor, the one dealing with Network Heterogeneity. This shows that some effort has been made in order to understand how heterogeneity is caused by relations among different firms, and how this could contribute to firm performance.

The findings from Factor Analysis should be integrated with those from Multidimensional Scaling. The application of MDS has led to the visualization of the map constituting the intellectual structure of research on Heterogeneity.

The analysis of the map is illustrative in that it allows the identification of invisible colleges, defined as relations found in science among scientist with common interests (Price, 1963; Crane, 1972). Invisible colleges are used to figure out which communication authors aim to direct by looking at the product of their research, namely published works. It has been highlighted by those investigating the property of bibliometric studies that invisible colleges are the results of the adherence of authors to specific school of thought. Such adherence can be communicated by direct contact, such as conference presentation or personal interactions, but also in an indirect manner, the citation of articles in references (Crane, 1972). The indirect communication is not easy to interpret, since citing an article does not necessarily implies sharing the same idea. However, it has been considered as a useful tool to analyze the structure of an intellectual field of research.

From the map obtained in this study it can be inferred that the articles on heterogeneity are positioned along a continuum from a resource-endowment perspective to the capabilities one. Some of the papers take the analysis of resource characteristics as main determinant of firms' differences. Among these articles there is the stream of research aimed at identifying top management team characteristics in terms of education, experience, demographic features. These articles have drawn from cognitive and psychological theories to investigate how features pertaining to given managers influence what kind of actions are taken within firms, thus also determining the rate of success attained. Another stream of research takes, instead, a capability perspective. Among this group there are those articles maintaining that it is the way resources inside a firm are combined that is responsible for firms' differential results. Firms that have developed learning mechanisms and are able to change and adapt their stock of resources are though to be more able to attain sustainability of

competitive advantage. The issue of sustainability of competitive advantage in the long run it thus dealt by focusing on evolutionary path followed by firms.

Another dimension on which articles on heterogeneity are differentiated is the level of analysis. Some papers have been mainly interested in what characterizes individual firms. The analysis on firm level has led to an examination of forces and strengths behind firms' actions in terms of unique resources or unique managerial competences. Another level of analysis is instead the industry. Indeed, those papers taking a network perspective have highlighted that heterogeneity should be investigated on a wider basis, highlighting firms' connections and interactions. When firms operate in a context, they are not in isolation from others companies. They need to keep contact with other firms and to be informed about their competitive moves in order to find out what relevant strategies should be pursued or adapted to changing circumstances. The relevance of relations among firms is also testified by articles within a capabilities stream, but whose main area of investigation is dynamic and evolution of firms in turbulent environments or under highly challenging circumstances.

In summary, the Intellectual Structure of Heterogeneity appears "variegate", with specific areas of investigation developed over time. Authors who have cited specific pairs of articles in the list, have agreed to some extent to one of the streams, taking an internal or external perspective, or focusing on either firms' resource assets or firms' capabilities.

CONCLUSIONS

In this work it has been analyzed one of the central concepts within strategic management studies: Heterogeneity among firms. While this concept lies at the heart of firms' differences explanations, there is no convergent definition of it in the literature. During the last years the theme of heterogeneity has given rise to different contributions. However, no clear definition of the concept exists. There is a need to identify the relevant streams of research on this topic in order to clarify in which direction has gone the research. This work has aimed at identifying the intellectual structure on Heterogeneity by adopting a widely used and shared tool within bibliometric studies, the co-citation of published documents. The analysis of the matrix of co-citation among pairs of published articles in Business and Management, from 1990 to 2009, has led to identify 5 areas of research: Managerial Heterogeneity, Resource-Capabilities Heterogeneity, Capabilities Heterogeneity, Behavioural Heterogeneity, and Network Heterogeneity. These areas represent the different schools of thought emerged on the

topic. Moreover, the visual map obtained from the analysis shows that the research has proponents from an internal perspective whose main focus are resource stocks or capabilities, or contributions from an industry investigation from a network and capabilities perspective.

The findings indicate that the topic of heterogeneity is more nuanced than expected, and to date there is not a shared approach about its antecedent and components. The results of the work can be useful as a guide for future research, in order to show what has already been done and which might be the relevant areas to analyze for a better examination of the theme. Moreover, it can be a useful starting point to enable greater convergence among different studies.

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CONCLUSIONS

This study has been aimed at analyzing one of the main concepts developed within the strategic management literature: the Heterogeneity among firms. Research within strategic management has been interested in finding the causes of differential performance among firms in a given context. Earlier explanations in strategy have focused on firms' distinctive competencies which enable firms to pursue a strategy more efficiently and effectively (Selznick, 1957). Other contributions have highlighted that strategies contribute to create organizations (Chandler, 1962) and there is a need to investigate strengths and weakness within firm (Andrews, 1971).

The leading contribution on the topic of heterogeneity dates back to Penrose's study (1959), with the statement that "it is heterogeneity and not homogeneity of the services rendered by products that give each firm its unique character". However, it is with the resource-based view that the concept is introduced as one of the main sources of differential performances among firms (Barney, 1991; Peteraf, 1993).

After the first examination of the concept, subsequent studies in RBV and in strategy in general have taken it for granted, without investigating on the real drivers behind this concept. If Heterogeneity is deemed a relevant phenomenon for firm's success and sustainability of competitive advantage, it should be better explored and a definition of the terms should be provided.

This work has been guided by the need to investigate more deeply the concept of heterogeneity. It has drawn mainly from RBV in order to analyze the contributions on the topic and to identify the main driver of heterogeneity. After a conceptual paper with a literature review, the thesis has been split in two different, yet convergent, research papers.

The first paper in this collection was an attempt to measure the Firm Heterogeneity construct, mainly drawing from RBV. The Heterogeneity was defined as a second order construct, whose main dimensions have been identified by a literature review on RBV. The areas which have been explored in RBV as main dimensions of Firm Heterogeneity have been grouped in three dimensions: contextuality, complexity and interrelation.

This work has provided interesting findings in understanding one of the main assumptions within the strategic management field. Drawing from the RBV literature the inherent characteristics of the combination of resources and capabilities realized within firms

were found. Consistent with earlier contributions (Penrose, 1959), it emerged that differences among organizations are not merely a result of owning single valuable resources, but are created from the specific resource utilization processes carried out by organizations.

The paper also provides contribution to the positive effect of Firm Heterogeneity on firms' performance. More precisely, while in the RBV literature the relation between firms' heterogeneity and firms' performance has always been taken for granted, this work provides a relevant contribution, because it allows to empirically assess the link between Firm Heterogeneity and performance, thus giving robustness to this concept as a prerequisite for firms' performance

From a practical point of view, the measurement of Heterogeneity provides suggestions for managers. In fact, this study has shown that it is the resource utilization process, and not only resource ownership, which plays an important role in explaining differences in interfirm performance.

The second paper of this collection analyzed Heterogeneity by applying a widely known bibliometric technique, the cocitation. Cocitation has been applied in many studies since it is a useful tool to analyze the Intellectual Structure of the research on a given topic of interest. The cocitation matrix is the input of the analysis and it represents the number of times two authors have been cited together by following studies. The articles considered in the matrix have been retrieved by using SSCI, a widely diffused database collecting bibliographic information in many disciplines.

The matrix of co-citation among the pairs of the 39 articles constituting the core of the research on Heterogeneity has been analyzed by means of multivariate statistic techniques: factor analysis and multidimensional scaling.

Factor analysis has led to the identification of 5 factors. From the analysis of the articles loading on each factor it was possible to interpret each factor. The 5 are: managerial Heterogeneity, Resource-Capabilities Heterogeneity, Evolutionary Heterogeneity, Cognitive Heterogeneity, and Network Heterogeneity.

The findings suggest that the topic of Heterogeneity has been analyzed from different perspectives in the strategic management field of study, each focusing on a specific source of differences.

From multidimensional scaling it was obtained a map where all the articles are positioned. From the analysis of article position and distance among each other it was possible to identify the dimensions on which literature on the topic can be broken up. The

dimensions are an internal vs relational perspective, and an assets vs capabilities one. These two dimensions shows the schools of thought created on the topic of Heterogeneity by indirect communication channels among authors by mean of citations.

L'ANALISI DELL'ETERogeneITÀ TRA IMPRESE

Una Sintesi

Il presente lavoro di tesi è stato motivato dall'individuazione di un'area grigia nella ricerca realizzata negli studi di strategia. Alla base del campo di studi di strategia vi è l'assunzione di eterogeneità tra imprese, considerato quale elemento essenziale per il raggiungimento e il mantenimento nel tempo del vantaggio competitivo.

Tale problema sorge, in parte, per la natura degli studi in cui il fenomeno dell'eterogeneità è stato principalmente introdotto: la Resource-based view (RBV) (Wernerfelt, 1984; Barney, 1991).

La RBV è stata considerata da molti studiosi come 'tautologica' (Priem e Butler, 2001a, 2001b) e 'paradossale' (Lado, Boyd, Wright e Kroll, 2006). Infatti, molte relazioni ipotizzate risultano vere secondo logica (Priem e Butler, 2001°, 2001b). Powell (2001) ha affermato che molte delle assunzioni ipotizzate dalla RBV sarebbero respinte se ci si basasse sulle norme convenzionali della filosofia della scienza. Per tale motivo, le principali critiche relative alla tautologia e alla paradossalità della RBV sono riconducibili alla mancanza di definizioni chiare e condivise dei suoi principali fenomeni ed entità, rendendo difficilmente testabili le relazioni ipotizzate.

Uno dei principali limiti della RBV è rappresentato dal fatto che si assume ciò che dovrebbe essere dimostrato (Hoopes, Madsen e Walker, 2003). Dunque, l'eterogeneità delle risorse viene trattata come assunzione, tuttavia, non viene fornita una definizione teorica. Ciò determina conseguenze importanti in termini di testabilità della sua relazione con le performance (anche questa relazione viene assunta in letteratura). Quindi, l'assenza della definizione teorica del costrutto di eterogeneità ha effetti sulla robustezza teorica della RBV e sulla sua stessa utilità (Priem & Butler, 2001a, 2001b; Powell, 2001; Lado et al., 2006; Sirmon, Hitt & Ireland, 2007).

Tale lavoro di tesi ha l'obiettivo di approfondire la ricerca sul tema dell'Eterogeneità tra imprese, cercando di colmare le principali debolezze riscontrate.

Il lavoro è articolato in forma di raccolta di articoli di ricerca. Dopo lo sviluppo di un capitolo introduttivo che analizza a livello concettuale il fenomeno dell'eterogeneità tra imprese e ne illustra i principali risultati realizzati negli anni, la tesi prosegue con lo sviluppo di due articoli autonomi, sebbene altamente correlati nel tema prescelto.

Il primo lavoro, muovendo dalla lettura e dall'analisi degli articoli pubblicati nei principali journal internazionali sul tema dell'eterogeneità d'impresa, con una prospettiva d'analisi rivolta alle risorse presenti all'interno delle stesse, mira a definire il concetto di Firm Heterogeneity. Dalla definizione di un fenomeno legato alle modalità con cui le risorse sono combinate all'interno dell'impresa, piuttosto che al mero possesso di asset idiosincrici, il lavoro sviluppa una scala di misurazione del costrutto Firm Heterogeneity. Essa viene definita come un costrutto di secondo ordine, le cui dimensioni sottostanti sono rilevate in: contestualità, complessità e interrelazione.

Le tre dimensioni esprimono tre modalità con cui le risorse possono essere combinate nel loro utilizzo e impiego interno alle organizzazioni aziendali. Il costrutto di Firm Heterogeneity così misurato, viene poi posto in relazione con le performance aziendali per verificarne l'impatto sui risultati finanziari. L'ipotesi di influenza positiva esercitata dalla Firm Heterogeneity risulta confermata, colmando in tal modo uno dei principali limiti della ricerca nel campo delle strategie aziendali riguardante l'assunzione del ruolo positivo dell'eterogeneità del determinare risultati positivi per le imprese. Tale studio contribuisce, quindi, alla ricerca in campo strategico fornendo non solo una prova empirica della rilevanza dell'eterogeneità, ma anche uno strumento d'indagine di grande utilità per gli studi futuri. Le future ricerche potranno, infatti, utilizzare la stessa scala di misurazione per testare altre ipotesi sul ruolo dell'eterogeneità, potendo verificarne la forza d'azione in contesti diversi o in specifiche decisioni e manovre competitive aziendali.

Il secondo lavoro di ricerca utilizza una tecnica molto diffusa nell'ambito della bibliometria, la co-citation, per identificare in maniera analitica e oggettiva le differenti aree di ricerca sul tema di eterogeneità in campo strategico. La co-citation prevede la raccolta preventiva delle citazioni di coppie di autori che rappresentano il fulcro della ricerca sul tema trattato. Una lista iniziale di articoli è stata identificata con un criterio di rilevanza, basato cioè sul calcolo del numero di citazioni ricevute. Per ogni coppia di articoli in tale lista è stata poi identificato il numero di co-citazioni. La matrice ottenuta è poi analizzata con le tecniche di statistica multivariata della factor analysis e multidimensional scaling per l'identificazione dei fattori, o aree di ricerca, negli studi sull'eterogeneità. Le cinque aree emerse sono: "Managerial heterogeneity", "Resource-Capability Heterogeneity", "Evolutionary Heterogeneity", "behavioural Heterogeneity", e "Network Heterogeneity". L'applicazione della tecnica multidimensional scaling ha permesso, inoltre, di visualizzare gli articoli analizzati su una mappa a due dimensioni. Dall'analisi della posizione di tali articoli sulla

mappa e della loro vicinanza, è stato possibile identificare le differenti scuole di pensiero che si sono sviluppate sul tema di Eterogeneità tra imprese, in tal modo scoprendo gli “invisibile collages” presenti in tale campo. Gli articoli analizzati presentano una contrapposizione tra prospettive d’analisi interna alle singole imprese, in cui si evidenziano fattori e asset ritenuti fonti di vantaggio competitivo, e studi che guardano alle relazioni tra imprese in una prospettiva di cooperazione sociale. Una seconda suddivisione tra gli articoli sul tema riguarda la contrapposizione tra ricerche sulla singola dotazione di risorse posseduta dalle imprese e l’accumulazione delle stesse nel tempo, con lo sviluppo di capacità e abilità.

Tale lavoro di tesi ha permesso quindi, di approfondire la comprensione dell’eterogeneità tra imprese, identificando sia dal punto di vista concettuale le aree di ricerca presenti, con l’individuazione degli articoli appartenenti ad una specifica scuola di pensiero. Tale studio dimostra, quindi, la necessità di continuare la ricerca su un tema, quello dell’eterogeneità, che vede ancora la contrapposizione tra diversi filoni di studio, e che necessita una maggiore convergenza affinché mostri ancora validità per gli studi nello strategic management.

Oltre all’analisi puramente teorica del tema, si è proceduto a sviluppare una scala di misurazione dell’Eterogeneità stessa, colmando così un principale limite nella letteratura sulle Risorse riguardante l’assenza di contributi empirici.