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DOES COOPETITION STRATEGY IMPROVE MARKET PERFORMANCE? AN EMPIRICAL STUDY IN MOBILE PHONE INDUSTRY

Abstract

A central question about coopetition is its impact on performance. Past researches on this question obtained mixed results. No past researches have attempted to evaluate the impact of coopetitive strategies on performance compared with other strategies vis-à-vis competitors: aggressive, cooperative or coexistence strategies. In addition, there have been few studies that attempt to establish a relationship between coopetitive strategy and market performance. In order to fill these gaps, this research studies the impact of coopetitive strategy on market performance, compared to the impact of aggressive, cooperative and coexistence strategies. An empirical study is conducted in the mobile telephony industry. The method is a structured content analysis that identifies the strategic movements of mobile operators from different countries and geographical regions. The results show, first, that only three strategies may be identified in the industry: aggressive, cooperative and coopetitive. The results show, second, that the market performance depends on the strategy adopted toward competitors. A coopetition strategy seems to perform better than either an aggressive or a cooperative strategy. An aggressive strategy is more effective than a cooperative strategy.

Keywords: *aggressiveness, cooperation, coopetition, market performance, mobile telephony industry.*

Introduction

Since the seminal book of Brandenburger and Nalebuff (1996), coopetition has been the subject of an increasing amount of research in the field of strategic management. Researches on coopetition have been developed in many directions, to the point that today it is difficult to make a complete synthesis (Yami et al., 2010; Bengtsson and Kock, 2014; Czakon et al., 2014). An essential question asked about coopetition is that of its impact on performance. From the beginning, coopetition theory has been resolutely normative. For Brandenburger and Nalebuff (1996), coopetition is a strategy that will lead to better performance. This normative point of view has not been questioned and is always considered as relevant in coopetition theory (Bengtsson and Kock, 2014; Czakon et al., 2014).

Some past researches are dedicated to establish empirically a relationship between coopetition strategies and performance. In this way, some first studies

highlight the impact of alliance between competitors on economic and financial performance (Luo et al., 2007; Ritala et al., 2008; Oum et al., 2004; Kim and Parkhe, 2009). Other studies attempt to show the impact of cooperation among competitors on innovation (Belderbos et al., 2004, Neyens et al., 2010; Nieto and Santamaria, 2007; Peng et al., 2011). Latest studies directly use the concept of coopetition to attempt to establish its impact on economic performance (Marques et al., 2009; Morris et al., 2007), on innovation (Quintana-Carcias and Benavieds-Velasco, 2004; Le Roy et al., forthcoming) or on market performance (Ritala, 2012).

Researches which study the link between coopetition strategy and performances are however far from exhausting the subject. They do not identify the impact of coopetition strategies on performance compared with the impact of other strategies. The supposed superiority of coopetition strategies over other strategies, like aggressive strategy or cooperative strategy, has therefore never been tested empirically. It is also noteworthy, except Ritala (2012), that none of this research addresses the impact of coopetition on market performance. In the original definition of Brandenburger and Nalebuff (1996), coopetition is supposed to allow rivals to increase the overall value they create for the customer, which should enable them to develop their sales. But just one empirical study is dedicated to this central point of coopetition theory (Ritala, 2012). The present research therefore aims to fill this double gap, by trying to establish empirically the impact of coopetition strategy on market performance, and by comparing it with the impact of cooperative and aggressive strategies.

To this end, this research analyzes the strategies implemented by firms in the sector of mobile telephony. The method used is structured content analysis. This method makes it possible to identify the strategic movements of mobile operators from different countries and geographic regions. The results show that mobile operators adopt different strategies in the same industry, deciding to follow an aggressive strategy, a cooperative strategy or a coopetitive strategy. There is also the possibility that firms might adopt a strategy that we describe as the coexistence strategy, where show neither a strong tendency to cooperate, nor a strong tendency to aggression. However, in our sample there appear to be no firms that adopt this strategy. The results also show that the market performance of a firm depends on the strategy it adopts toward its competitors. A coopetitive strategy appears to perform better than either an aggressive strategy or a cooperative strategy. An aggressive strategy appears to perform better than a cooperative strategy.

The results obtained in this research contribute significantly to the literature on coopetition. This is the first study comparing the relative impact of aggres-

sive, cooperative and coopetitive strategies on market performance. It is the first time that these three strategies have been clearly identified in a sector of activity. It is also the first time that the superiority of coopetitive strategy over the other two strategies has been shown empirically. Finally, this research shows that an aggressive strategy is the second best strategy, while a cooperative strategy appears less effective for market performance.

1. Theoretical background

Coopetitive Strategies

Coopetition theory was first formulated by Brandenburger and Nalebuff in the mid-1990s (Brandenburger and Nalebuff, 1996). Authors use game theory to propose a first model of coopetition centered on the "value network". Coopetition appears when two rival actors decide to cooperate together to create value for customers. Coopetition is a reconciliation of interests between "complementors" who cooperate while remaining competitors. In this way of thinking, coopetition is "a dyadic and paradoxical relationship that emerges when two companies cooperate in some activities, and at the same time compete with each other in other activities" (Bengtsson and Kock, 1999).

The idea of cooperating while remaining competitive is a break from the dominant conception (Yami et al., 2010; Czakon et al., 2014; Fernandez et al., 2014). In this dominant conception, competition and cooperation are seen as opposites, implying that as competition increases, cooperation decreases, and vice versa. The concept of coopetition introduces a cognitive revolution in which cooperation and competition can occur simultaneously between actors who become partner-adversaries, in other words coopetitors. The simultaneity of competition and cooperation is thus the foundation of the concept of coopetition (Czakon et al., 2014; Fernandez et al., 2014).

This new conception and its implications have been initially developed by Lado et al. (1997), although, paradoxically, these authors did not use the term of coopetition. Lado et al. (1997) observe that more and more companies are combining aggressive and cooperative strategies. They rely on game theory, the *Resource Based View* and social network theory to show that, although competition and cooperation have been previously regarded as opposite ends of a continuum, they must now been understood as two independent dimensions. So firms could choice their cooperative orientation, high or low, independently from their com-

petitive orientation, also high or low. In the same way, for Luo (2007), firms could choice independently to maintain or not a strong competition with rivals and to maintain or not a strong cooperation with these rivals.

The recognition of this independence between competition and cooperation is fundamental because it leads to the idea that a company can have four types of strategies (Table 1). It could decide to be aggressive toward its competitors while limiting cooperation with them. This strategy is called "competitive rent seeking behavior" by Lado et al. (1997) and "contending situation" by Luo (2007). We called here this strategy "aggressive strategy". Conversely, the company could decide to be less aggressive as possible with its competitors while cooperating strongly with them. This strategy is called "collaborative rent seeking behavior" by Lado et al. (1997) and "partnering situation" by Luo (2007). We call this strategy "cooperative strategy". The company may also decide to be as less aggressive and as less cooperative as possible with its competitors. This strategy is called "monopolistic rent seeking behavior" by Lado et al. (1997) and "isolating situation" by Luo (2007). We call this strategy "coexistence strategy". Finally, the company may choose to be very aggressive toward its competitors while cooperating also strongly with them. This strategy is called "syncretic rent seeking behavior" by Lado et al. (1997) and "adapting situation" by Luo (2007). We call this strategy "coopetitive strategy".

Table 1. Strategies vis-à-vis competitors

		Propensity to aggressiveness	
		low	high
Propensity to cooperation	high	cooperative strategy	coopetitive strategy
	low	coexistence strategy	aggressive strategy

Sources: Adapted from Lado et al. (1997) and Luo (2007).

The concept of propensity to aggressiveness has its roots in competitive dynamic researches (Smith et al., 1992; Young et al., 1996; Ferrier et al., 1999; Ferrier, 2001; Ferrier et al., 2002; Offstein and Gnyawali, 2005). This school of thought considers competition from a behavioral point of view. Strategy is defined as a set of competitive actions and reactions. The competitive aggressiveness of a company is a multidimensional concept that is defined as the propensity of the company to proactively and intensively initiate competitive actions and

respond quickly to competitive actions of its rivals (Ferrier et al., 2002). According to competitive dynamic researches, a company will be considered as having a high propensity to aggressiveness if it initiates many competitive actions, more varied and faster than competitors, and respond rapidly to competitive actions initiated by competitors (Ferrier, 2001).

The concept of propensity to cooperation has its roots in networks researches (Granovetter, 1985; Burt, 1992; Miles and Snow, 1992; Nohria, 1992; Baum and Dutton, 1996; Gulati et al., 2000). According to Granovetter (1985), Thorelli (1986) or even Jarillo (1988), firms are considered as part of a network of relationships that influence their behavior. The network itself refers to two or more organizations involved in cooperative relationships (Thorelli, 1986). This network provides a number of resources and allows the company to develop its own stock of resources and skills. The position in the network is considered as the key element that determines the resources and expertise that the company can control. This position is expressed in the form of centrality within the network. According to Faust (1997), centrality is defined as the ability to be active in a network, or "degree centrality", the capacity to intermediate the flow of resources between actors, or "betweenness centrality", or the ability to be in relationships with other actors who are themselves central, or "eigenvector centrality". According to network researches, a company will be considered as having a high propensity to cooperation if occupy a central position in the network by multiplying formal and informal exchanges with competitors.

Once defined propensity of aggressiveness and propensity to cooperation it's possible to define aggressive, cooperative, coexistence and coopetitive strategies.

1. The aggressive strategy consists in having a high propensity to aggressiveness and a low propensity to cooperation. In this strategy firms 1) initiate many competitive actions, more varied and faster than competitors, and respond rapidly to competitive actions initiated by competitors while 2) not occupying a central position in the network and minimizing formal and informal exchanges.
2. The cooperative strategy consists in having a low propensity to aggressiveness and a high propensity to cooperation. In this strategy 1) firms initiate competitive actions on fewer occasions, with less variety and less rapidly than competitors while 2) occupying a central position in the network by multiplying formal and informal exchanges with competitors.
3. The coexistence strategy consists in having a low propensity to aggressiveness and a low propensity to cooperation. In this strategy 1) firms initiate

competitive actions on fewer occasions, with less variety and less rapidly than competitors while 2) not occupying a central position in the network and minimizing formal and informal exchanges.

4. The coopetitive strategy consists in having a high propensity to aggressiveness and a high propensity to cooperation. In this strategy firms 1) initiate many competitive actions, more varied and faster than competitors, and respond rapidly to competitive actions initiated by competitors 2) while occupying a central position in the network and increasing formal and informal exchanges with competitors.

In our framework, aggressive strategies, cooperative strategies, coexistence strategies and coopetitive strategies are conceptually distinct. However, there was no empirical study that determines if these strategies are significantly different in an industry. In line with theories of coopetition, we assume that the coopetitive strategy is a specific strategy, distinct from aggressive, cooperative and coexistence strategies. We formulate, thus, the following hypothesis:

Hypothesis 1: Coopetitive strategy is a strategy significantly distinct from aggressive, cooperative and coexistence strategies.

2. Coopetitive strategy and performance

The pioneering researches on coopetition consider that this strategy should become an alternative to strategies based on pure cooperation and strategies based on pure competition. Brandenburger and Nalebuff (1996), Lado et al. (1997) and Bengtsson and Kock (1999, 2000) agree that coopetition is a strategy that holds the greatest potential for firms' performance or, at least, has the greatest impact on variables clearly identified as likely to make them more efficient. Cost savings, sharing of resources and stimulation that promote innovation are among the potential gains from this strategy.

A company that follows a coopetitive strategy is in a position where it can benefit from the advantages of both competition and cooperation. Competition pushes firms to introduce new product combinations, to innovate, to improve products-services, and so on. It is therefore a progressive factor for companies. In addition, it enables companies to improve their market position and their performance at the expense of rivals (Lado et al., 1997). Cooperation, in turn, allows the company to have access to almost-free resources, skills and knowledge that are necessary or indispensable (Lado et al., 1997).

Coopetition is therefore intended, in its foundations, as a normative theory which promises superior performance to the companies that adopt it as a strategy. This fundamental assertion of the theory of coopetition has resulted in some empirical verification. Several studies attempt to determine the impact of strategies of alliances between competitors on economic and financial performance (Luo et al., 2007; Ritala et al., 2008; Oum et al., 2004; Kim and Parkhe, 2009). Other studies try to determine the impact of cooperation between competitors on innovation performance (Belderbos et al., 2004, Neyens et al., 2010; Nieto and Santamaria, 2007; Peng et al., 2011; Le Roy et al., forthcoming). Last past researches directly use the concept of coopetition to attempt to establish its impact on economic performance (Marques et al., 2009; Morris et al., 2007), on innovation (Quintana-Carcias and Benavieds-Velasco, 2004) and on market performance (Ritala, 2012).

Some studies establish a negative relationship between coopetition and performance (Nieto and Santamaria, 2007; Ritala et al., 2008; Kim and Parkhe, 2009). Nieto and Santamaria (2007) show that cooperation with competitors has a negative impact on the newness of innovation. Ritala and colleagues (2008) show that a relatively high number of alliances within a group of competing firms contributes negatively to performance. Kim and Parkhe (2009) show that competing similarity between alliance partners is negatively related to alliance outcomes. Another previous study shows first a negative, then a positive link between cooperation with competitors and innovation performance (Luo et al., 2007). Luo and colleagues, (2007) show that the impact of company alliances with a company's competitors on performance is curvilinear. Oum et al. (2004) show that horizontal alliances have a positive impact on productivity but not on profitability.

Some studies find a negative or positive impact depending contingency variables. Ritala (2012) shows that the relationship between coopetition strategy and market performance is moderated by market uncertainty, network externalities and competitive intensity. Le Roy et al. (forthcoming) found that, for French firms, coopetition strategy has a deep impact on innovation when coopetitors are located in other countries in Europe or in USA, and no impact when coopetitors are located in France.

Other researches show a positive relationship between cooperation with competitors and performance (Belderbos et al., 2004; Quintana Carcias and Benavieds-Velasco, 2004; Marques et al., 2009; Morris et al., 2007; Neyens et al., 2010; Peng et al., 2011). Quintana Carcias and Benavieds-Velasco (2004) show that coopetition strategies increase technological diversity and the devel-

opment of new products. Morris et al. (2007) show that there is a strong and positive relationship between coopetition strategies of SMEs and their performance. Belderbos et al. (2004) show a positive impact of coopetition on labour productivity and the number of sales per employee. Marques and colleagues (2009) show that coopetition between french football clubs does not improve their athletic performance, but does improve their economic performance. Neyens and colleagues (2010) show that there is a positive impact of "continuous strategic alliances" with competitors on the performance of radical innovation. Peng et al. (2011) show that cooperation with competitor leads to better performance.

If investigations on the link between coopetition and performances lead to conflicting results, they share two limitations. On the one hand, they do not distinguish the impact of coopetition strategies on performance from the impact of other strategies toward competitors. The assumed superiority of coopetition strategies over pure cooperation and pure competition has never been tested empirically. On the other hand, these studies, at the exception of Ritala (2012), didn't include market performance. However, in the initial definition of Brandenburger and Nalebuff (1996), coopetition is supposed to allow rivals to increase the overall value they create for customers, which should allow both partners to increase their sales. It is therefore necessary to try to establish empirically the impact of coopetitive strategies on market performance compared with the impact of aggressive, cooperative and coexistence strategies.

3. Coopetitive strategy and market performance

One of the key issues raised by research on competitive aggressiveness is that of its impact on performance (Ferrier et al., 1999; Ferrier, 2000). It is argued that a company needs to be more aggressive than its competitors. In this purely competitive vision, only the most aggressive companies can hope to achieve market leadership and maintain their position. The most successful companies are those that have the greatest number of competitive actions; that respond more quickly to competitive actions of their rivals and are more unpredictable in their behavior. Conversely, the least successful are those that introduce the fewest competitive actions, which take more time to respond to competitive actions of their rivals and initiate predictable competitive actions and reactions (Mac Crimmon, 1993; Miller and Chen, 1996; Ferrier et al., 1999; Ferrier, 2001).

In contrast, researchers on cooperative strategies agree that membership in a network has a significant impact on performance, mainly because the networks create asymmetrical access to resources (Granovetter, 1985; Nohria, 1992; Baum and Dutton, 1996; Gnyawali and Madhavan, 2001). Research suggests that the links between companies help to develop and "absorb" technology (Ahuja, 2000), to withstand environmental and technological shocks (Powell, 1990) and, most importantly, to increase performance (Hagedoorn and Schakenraad, 1994; Singh and Mitchell, 1996; Zaheer and Zaheer, 1997; Baum et al., 2000). For a company, making many alliances in the sector is a source of competitive advantage (Eisenhardt and Schoonhover, 1996; Galaskiewicz and Zaheer, 1999). The company will be more successful because it is involved in cooperative relationships and is located in the heart of cooperative relations that take place in its industry. By being central in the network, that is to say, at the centre of cooperative actions taking place in the industry, the company benefits from more resources than companies that are not central, and consequently they should perform better (Ibarra and Andrews, 1993).

Research on aggressive strategies considers that these strategies have a positive impact on performance (Young et al., 1996; Ferrier et al., 1999, Ferrier, 2001; Ferrier et al., 2002; Offstein and Gnyawali, 2005). However, these strategies benefit the company only through the advantages of aggressiveness. Research on cooperative strategies also considers that cooperative strategies have a positive impact on performance (Granovetter, 1985; Nohria, 1992; Baum and Dutton, 1996; Gnyawali and Madhavan, 2001). However, these strategies benefit to the firm only through the advantages of cooperation. Coopetitive strategies combine aggressive and cooperative strategies. A priori, they should therefore allow the company to benefit simultaneously from the advantages of these two strategies. Overall, companies that follow coopetitive strategies should, thus, have better performance than companies that only follow aggressive strategies or cooperative strategies. So we formulate the following hypotheses:

Hypothesis 2: Firms that follow coopetitive strategies have better market performance than firms that follow aggressive strategies

Hypothesis 3: Firms that follow coopetitive strategies have better market performance than firms that follow cooperative strategies

4. Method

The mobile operators

A mobile operator is a company that provides communications services remotely. It is a company that sells services using telecommunication infrastructures. It can be an independent company or a subsidiary of a constructor of a public company. There are several types of mobile operators. A simple classification contrasts traditional operators, who have telecommunication networks with virtual operators, who use the networks of traditional operators. It is not easy to identify the activity of virtual operators. The study therefore focuses only on traditional operators.

Mobile telephony is a rapidly evolving industry, experiencing a spectacular development. The mobile operators industry is also a multi-market industry. Competition in the industry of mobile operators is both localized and globalized. Before 2000, national telecommunications markets were closed to competition and national operators were directly controlled by the state. However, the deregulation of the early 2000s resulted in the entry of new operators into domestic markets. These new operators are either creations ex nihilo or foreign competitors wishing to expand outside their domestic markets. These foreign competitors usually enter national markets by forming alliances with national operators.

This situation makes it difficult to understand the relationship of competition in the industry. A narrow vision suggests that all the operators present in a single domestic market should be thought of as competitors. However, this vision does not take into account existing agreements between competitors in the national market, and ignores competitors that are not present on the market. Cooperation provides technology and product innovation for the competitors present in the domestic market. So there is indirect competition through cooperation agreements between operators who are not present on the same national markets. To take into account this specific characteristic of the sector, we have adopted a broad view of competition, considering that all the mobile operators are in situation of potential and indirect competition.

Data collection

Secondary data are widely used to observe companies' competitive actions and their cooperative relationships. Here, we mainly use secondary data to detect companies' strategic actions. As a first step, we conducted four semi-structured interviews with experts in the telecommunications sector and mobile telephony.

We interviewed four IDATE (*Institute of Audio Visual and Telecommunications in Europe)* consultants, three consultants who had a thorough knowledge of mobile telephony and telecommunications and the head of studies on telecommunications. This enabled us to establish a list of periodicals that identify all the relevant strategic moves in the sector.

Data on strategic actions were obtained from issues of *Global Mobile* and *3G Mobile* or *3GWireless*. All the strategic movements which took place in the sector have been identified. About 6,300 pages of documentation were analyzed. Mobile operators considered in the analysis are traditional operators who initiated at least one cooperative and/or competitive action between 2000 and 2005. During this period, the mobile industry experienced major changes with digitization and liberalization in the telecommunications sector.

Around the period 2000 to 2005, a series of mergers and acquisitions had a particular impact on the industry. These changes led us to study this industry during this period. We considered the strategic actions of mobile operators, whatever their original focal/domestic market place (Europe, Asia / Pacific, Africa / Middle East, etc.). Indicators on the country and on the measures of performance were obtained from *World Telecommunications International Data.*

Identification of strategic actions

A competitive action is a direct external movement, specific and observable, initiated by a firm to enhance its competitive position or defend it (Smith et al., 1991; Smith et al., 1992; Miller and Chen, 1996; Grimm and Smith, 1997). Cooperative action is defined as any type of action that establishes a link between at least two firms and involves exchange, sharing, co-development, and so on (Gulati, 1995). It includes strategic alliances, joint ventures, research and development, national and international roaming agreements, participating in trade associations and technological consortia, and the like.

To detect strategic movements, we proceeded by structured and detailed content analysis (Jaugh et al., 1980; Ferrier and Lyon, 2004) of each issue of *Global Mobile* and 3G *Wireless*. This method is effective and recommended for exploring the strategic processes of a large multivariate sample (Ginsberg, 1988). In a first step, we developed an annual directory of traditional operators in each country. We then distinguished between the strategic actions of mobile operators and those of their controlling telecom operators. For example, we recorded the competitive actions of Telefonica de Espana and not those of Telefonica, which is its

controlling telecom operator, who also has a fixed line network, and provides other services.

Then we made the distinction between cooperative and competitive actions by searching for keywords in articles (Grimm and Smith, 1997). For instance, "price cut", the "launch of new service or new product", have been associated to competitive actions while "roamings'deals", "joint venture", "alliances" have been associated to cooperative actions (see appendix for more details). Then, 706 cooperative actions and 2.595 competitive actions, divided between 190 mobile operators, were detected. Competitive actions were classified into six categories of competitive actions in accordance with the classification existing in previous research (Ferrier and Lee, 2002).

Regarding cooperative actions, we considered only cooperative actions between two or more mobile operators. Those between a mobile operator and its controlling telecom operator, or with another telecom operator, were ignored. A cooperative action including several operators was recorded as a cooperative action of each of the operators involved (Fjeldstat et al., 2004). For operators who changed names during the period of study, we used the new name of the operator, while recognizing the competitive and cooperative actions that were carried out under the former name.

Measurement of variables

Aggressive Propensity

The measure of the aggressive propensity of the operator includes the three main measures of competitive aggressiveness, namely the volume of competitive actions and reactions, the time it takes between each consecutive competitive action and reaction and the complexity of the competitive actions and reactions.

The volume of competitive actions (CONC) of the operator is measured by the number of competitive actions initiated by it during the period of study (Ferrier, Smith and Grimm, 1999) and the number of responses to competitive actions of other operators.

$$\textit{Competitive activity of the firm} = \Sigma\ NT^{*}$$

The time of the competitive actions (TIME) is the average time it takes the firm between two consecutive competitive actions and/or reactions. We calculated it for a given operator by the annual average number of days separating two

* Where NTL = number of competitive actions of the firm.

actions and/or reactions. Actions and reactions were treated as equivalent (Young, Smith and Grimm, 1996). The dates of competitive actions selected are those that were explicitly given in the articles. Where this was not available, we used the date of publication of the journal. When there were two dates for the same competitive action, we selected the earlier.

$$\textit{Average time} = \sum (t - t') / NT_L^{*}$$

The complexity of competitive actions (COMPLEX) of the firm is evaluated using the method used by Ferrier and Lee (2002), Ferrier et al. (1999) and Nayyar and Bantel (1994), by a Herfindahl-type index.

$$\textit{Complexity} \quad = 1 - \sum \left(N_a / NT_L \right)^{2} \; ^{**}$$

A high score indicates that the operator initiates complex sequences of competitive actions while a low score indicates that the competitive actions of the firm varied very little.

Cooperative Propensity

The cooperative propensity of the firm was calculated by measuring the centrality of each mobile operator in the network of cooperative actions that occurred in the sector. The concept of centrality has several meanings in network analysis. Our concept of centrality is adopted from Faust (1997), which is the most complete. Faust (1997) defines the centrality of an actor as its ability to be active in the network, or "degree centrality", its ability to intermediate the flow of resources between actors, and its capacity to be in relationship with other actors that are themselves central, or "eigenvector centrality".

Three measures of centrality were identified: "degree centrality" (DC), "betweenness centrality" (BC) and "eigenvector centrality" (EC). The measurements were obtained from 6,178 observations and Ucinet Netdraw 2.069.

Degree centrality reflects the direct relational activity of the firm with other members of the network. In this study, it is measured by all the direct links forged by a mobile operator with other mobile operators during the study period.

* Where t and t' are the dates of two consecutive competitive actions of the firm and NTL is the total number of competitive actions/reactions of the operator during the year.

** We first calculated the ratio that represents each type of competitive action as a proportion of all the competitive actions of the firm. Then, to take into account the weight of the distribution of each type of actions initiated (Na), these ratios were squared. Finally, we calculated the sum of the mean squares obtained, which gives us the complexity of the competitive actions of the firm.

We considered one of the most widely used measure of centrality (that of Freeman, 1979) to capture it.

$$C_D = d(n_i) = X_{i+} = \sum_j X_{ij} .$$

Betweenness centrality reflects the intermediate position occupied by a mobile operator in relationships between several other mobile operators; the ability of the operator acting to facilitate interactions between other operators. The Betweenness centrality of firm (n_i) is obtained following Faust (1997) by the equation:

$$C_B(n_i) = \sum_{j<k} g_{jk}(n_i) / g_{jk} \quad ^{*}.$$

The eigenvector, seeks to highlight the number of direct connections of an operator, as well as the centrality of the operators with whom it has links (Bonacich et al., 2004). Denoting the eigenvector centrality of node n_i in a one-mode network by $C_E(n_i)$, eigenvector centrality is expressed as:

$$C_E(n_i) = C_E(n_j).x_{ij} \quad ^{**}.$$

The measurements were obtained from 6,178 observations and Ucinet Netdraw 2.069.

After the identification of cooperative actions, we proceeded first to the codification of all operators who participated in at least one cooperative action with another mobile operator during every year from 2000 to 2005. Each mobile

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* With g_{jk} the number of geodesics between n_j and n_k; $g_{jk}(n_i)$ the number of geodesics between n_j and n_k that contain n_i and $C_B(n_i)$ = the betweenness centrality of firm n_i. According to Faust (1997), an intermediate step in calculating betweenness centrality is to find the 'partial betweenness' of nodes in the network (Freeman, 1979). Node n_i 's partial betweenness counts the number of pairs of other nodes whose geodesic(s) contain node n_i. If there is more than one geodesic between a given pair of nodes, then n_i receives fractional credit, where the fraction is reciprocal of the number of geodesics between the pair. Let g_{jk} be the number of geodesics between n_j and n_k, and let $g_{jk}(n_i)$ be the number of geodesics between n_j and n_k that contain n_i. If all geodesics are equally likely, then the probability that a geodesic between n_j and n_k contains node n_i is equal to $g_{jk}(n_i) / g_{ik}$.. The betweenness centrality of node n_i, denoted by $CB(n_i)$, is defined as the sum of these quantities across all pairs of nodes. For a graph with g nodes, $CB(n_i)$ reaches its maximum value of (g – 1)(g – 2)/2. when node n_i is on geodesics between all other pairs of nodes.

** According to Faust (1997), the centrality of a node is proportional to the centrality of the nodes to which it is adjacent, weighted by the value of the tie between the nodes. Finding centrality values, $C_E(n_i)$ that satisfy this equation for all nodes in a graph involves solving a system of simultaneous linear equations. This standard eigenvectoreigenvalue problem is expressed by the equation $\boldsymbol{Xc} = \boldsymbol{\lambda c}$ where X is a g × g sociomatrix, $\boldsymbol{\lambda}$ is its largest eigenvalue, and c is a vector of centrality scores (the eigenvector corresponding to the largest eigenvalue).

operator has been assigned a code. We introduced these codes into Ucinet who performed the calculation of the centrality for each operator from the code that had been assigned.

Market performance

In general, in the mobile industry, data on financial performance are few or not available. In addition, because they derive from very different accounting systems, comparing operators' financial performances would not make sense. Similarly, measures of market share are not available for all operators. The most common and available measures of market performance are: 1) the number of subscribers of the operator, in thousands or millions of subscribers, and 2) the annual increase in the number of subscribers of the operator, which is obtained by averaging the annual differences in the number of operators during the period of study.

$$\text{Average annual variation in the number of subscribers} = \\ = \frac{\text{Number of subscribers}_{\,t} - \text{Number of subscribers}_{t-1}}{\text{Number of subscribers}_{\,t-1}}$$

Data treatment

To define groups of strategically similar operators and formalize a typology of strategies in the sector, we conducted a principal components analysis and a K-Means clustering. A nonparametric test of comparison, the Kruskall Wallis's test, was used to highlight the differences that exist between the performances of operators according to their strategy.

The classification into groups of mobile operators according to their strategy was obtained experimentally by two methods conducted concomitantly: a principal component analysis (PCA) and a K-Means clustering. We proceeded by back and forth between the two methods (PCA and K-Means), in order to identify the smallest number of groups of operators constituted in terms of possible elements that might explain the greatest proportion of total variance, while at the same time comprising, for each group, at least 10% of the observations.

Because the number of variables varied between two and six, we carried out PCA with two to six components, as well as K-Means Clustering using the same components, focusing on the total variance explained in PCA, and on the number of observations in each class for K-Means clustering.

To compare the groups obtained, we opted for a nonparametric comparison test, which does not assume specific probability distribution of the variables. A test of

normality of distribution (Kolmogorov–Smirnov's test), indicated that the performance data were not normally distributed and influenced our choice of test. We adopted a Kruskal Wallis's test, which is a comparison of medians, and is an alternative non-parametric test for analysis of variance (ANOVA), and in particular makes it possible to compare more than two groups simultaneously. We tested the null hypothesis that there were no differences at the level of performance of operators according to the strategy adopted, the alternative hypotheses being the research hypotheses. The results of the factor analysis, K-Means Clustering and the comparison tests are presented and interpreted in the next section.

5. Results

Categorization of operators

Table 2 presents the descriptive statistics of the variables used and Table 3 presents the correlation matrix of the variables used. The results in Table 4, with a Kaiser–Meyer–Olkin (KMO) index equal to 0.774 (> 0.6) and a significant Barlett's test of sphericity at 5% (with a value of 0.000), make the method of factor analysis appropriate for treatment of the data.

Table 2. Descriptive Statistics

	Mean	**Standard Error**	**N**
CONC	1.64	2.968	1140
TIME	278.06521627	131.444623094	1125
COMPLEX	.8903114200	.22057832564	1107
DC	1.12	2.281	1138
BC	33.48696	151.622667	1140
EC	2.77606	9.268697	1139
SUBS	8579383.76	2.019E7	925
SUBSINC	.71	6.356	300

Table 3. Correlation matrix

		CONC	**TIME**	**COM-PLEX**	**DC**	**BC**	**EC**	**SUBS**	**SUBSIN C**
1	2	3	4	5	6	7	8	9	10
CONC	Pearson Correlation	1	–,735**	,629*	,513***	,481**	,304*	,331***	,032**
	Sig. (two–way)		,03	,040	,000	,000	,000	,000	,021
	N	1140	1125	1107	1138	1140	1139	925	300
TIME	Pearson Correlation	–,735**	1	–,745	–,389**	–,297*	–,233	–,290***	–,033**

table 3 cont.

1	2	3	4	5	6	7	8	9	10
	Sig. (two-way)	,03		,700	,042	,076	,340	,000	,042
	N	1125	1125	1104	1123	1125	1124	910	295
COMPLEX	Pearson Correlation	,629*	-,745	1	,299**	,209**	,242	,262**	,013
	Sig. (two-way)	,040	,700		,031	,047	,530	,048	,519
	N	1107	1104	1107	1105	1107	1106	901	293
DC	Pearson Correlation	,513***	-,389**	,299**	1	,721***	,733**	,347***	,051***
	Sig. (two-way)	,000	,042	,031		,000	,026	,000	,001
	N	1138	1123	1105	1138	1138	1137	923	300
BC	Pearson Correlation	,481**	-,297*	,209**	,721***	1	,481*	,105***	,025**
	Sig. (two-way)	,000	,076	,047	,000		,080	,000	,032
	N	1140	1125	1107	1138	1140	1139	925	300
EC	Pearson Correlation	,304*	-,233	,242	,733**	,481*	1	,099*	,192
	Sig. (two-way)	,000	,340	,53	,026	,080		,092	,592
	N	1139	1124	1106	1137	1139	1139	924	299
SUBS	Pearson Correlation	,331***	-,290***	„262**	,347***	,105***	,099*	1	,029**
	Sig. (two-way)	,000	,000	,048	,000	,000	,092		,612
	N	925	910	901	923	925	924	925	300
SUBSINC	Pearson Correlation	,032**	-,033**	,013	,051***	,025**	,192	,029**	1
	Sig. (two-way)	,021	,042	,519	001	,032	,592	,612	
	N	300	295	293	300	300	299	300	300
***. P < 0.01, ** p < 0.05, * p < 0.1									

Table 4. Index KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser–Meyer–Olkin Measure of Sampling Adequacy		.774
Bartlett's Test of Sphericity	Approx. Chi-Square	732.360
	df	15
	Sig.	.000

The PCA presented in Table 5 identifies three groups of mobile operators with at least 10% of the total number of operators in each group and explaining the greatest proportion of variance (88%). This first result allows us to identify three types of strategy toward competitors among companies in the mobile telephony industry.

Table 5. Total variance explained

Com-ponent	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	total	% of vari-ance	cumu-lative %	total	% of vari-ance	cumula-tive%	total	% of vari-ance	cumu-lative%
1	3.507	58.446	58.446	3.507	58.446	58.446	3.190	53.163	53.163
2	1.016	16.929	75.375	1.016	16.929	75.375	1.110	18.499	71.662
3	.800	13.333	88.708	.800	13.333	88.708	1.023	17.046	88.708
4	.379	6.317	95.025						
5	.222	3.699	98.724						
6	7.653E -02	1.276	100.00 0						

Tables 5 and 6 present the results of the K-Means Clustering. Table 6 shows that each group of operators consists of at least 10% of the total number of operators. Table 6 shows the final cluster centres and gives the "profiles" of the three groups of operators. It shows an allocation of operators according to their propensity for cooperation and/or aggressiveness.

Table 6. Number of observations in each group

Group	1	49.000
	2	18.000
	3	120.000
Valid		187.000
Missing		3.000

Table 7. Final cluster centres

	Group		
	1	2	3
CONC	1	3	16
DC	1.566	.875	1.975
BC	1	0	2
EC	3.8	3.2	7.8
TIME	2160	865	197
COMPLEX	1	2	3

The first group is composed of 49 operators (Group 1). These operators are not very aggressive. They have the lowest number of competitive actions and reactions of the three groups (CONC = 1). These are also the operators who take most time to respond to competitive actions of their rivals (TIME = 2160) and initiate the simplest competitive actions and responses (COMPLEX = 1). On the other hand, they obtain relatively high centrality scores (DC = 1566, BC = 1, EC = 3.8)

compared to the second group of operators (DC = 875, BC = 0, EC = 3.2). The operators of the first group are therefore considered to be operators that follow a cooperative strategy.

The second group is composed of 18 operators (Group 2). These operators are more aggressive than the first group. They have a greater number of competitive actions and reactions than those of the first group (CONC = 3). They also initiate more frequently, and have more complex competitive actions and reactions (TIME = 865, COMPLEX = 2) than the first group. Conversely, the operators in the second group are less cooperative than those of the first group. They have measures of centrality (DC = 875, BC = 0, EC = 3.2) that are all lower than those of the first group (DC = 1566, BC = 1, EC = 3.8). Operators in the second group are considered to be the operators that follow an aggressive strategy.

The third group consists of 120 operators (Group 3). These operators are more aggressive than those of the first or second groups. They have a greater number of competitive actions and reactions (CONC = 3) than those of the first or second group. They also initiate more frequent (TIME = 197) and more complex (COMPLEX = 3) competitive actions and reactions than the operators in the first and second groups. The operators in the third group are also more cooperative than those in the first and second groups. They have higher centrality scores than the operators in the other two groups (DC = 1.975, BC = 2, EC = 7.8). These operators are both very aggressive and very cooperative. We therefore consider them to be operators adopting a coopetitive strategy operators, according to the definition of coopetition previously adopted.

In summary, three strategies have been identified: cooperative strategy which corresponds to Group 1, aggressive strategy corresponding to Group 2 and coopetitive strategy which corresponds to Group 3. Hypothesis 1 can be considered as partially validated. A strategy of coopetition is significantly different from aggressive and cooperative strategies, which are themselves significantly distinct from each another. However, the coexistence strategy has not been identified.

Comparison of market performance of the three groups

Tables 8 and 9 show that in terms of the number of subscribers and variation of the number of subscribers, the performance of the groups of mobile operators are significantly related to the strategy adopted. In accordance with Hypotheses 2 and 3, the coopetitive operators (*i.e.* those that are both very aggressive and very cooperative) perform better than simply aggressive operators or simply cooperative operators. These two tables also show the superiority in terms of market performance of aggressive operators compared with cooperative operators.

Table 8. Strategy and number of subscribers

Ranks		
Group	N	Mean Rank
Cooperative Operators	36	45.81
Aggressive Operators	14	51.75
Coopetive Operators	112	96.69
Total	162	
Test Statistics*		
Chi-squared	38.222	
df	2	
Asymp. Sig.	0.000	

* Kruskal Wallis Test; Grouping Variables: Classification (K Means).

Table 9. Strategy and number of subscribers

Ranks		
Group	N	Mean Rank
Cooperative Operators	35	59.89
Aggressive Operators	14	66.64
Coopetive Operators	110	88.10
Total	159	
Test Statistics*		
Chi-squared	11.262	
df	2	
Asymp. Sig.	0.004	

* Kruskal Wallis Test; Grouping Variables: Classification (K Means).

6. Discussion

The aim of this research is to establish a link between coopetition strategies and market performance. In coopetition theory, strategies that consist of simultaneously combining aggressiveness and cooperation are inherently considered superior to purely cooperative or purely aggressive strategies (Bengtsson and Kock, 1999; Brandenburger and Nalebuff, 1996; Lado et al., 1997). However, there is little empirical evidence for this assertion. This research thus evaluates the impact of coopetitive strategies on market performance compared with the impact of aggressive, cooperative and coexistence strategies.

The results obtained in this research show, first, that aggressive, cooperative and coopetitive strategies are statistically distinct and correspond to different choices for firms in the sector of mobile telephony. As postulated by coopetition theory, a range of strategic stances toward competitors can be adopted (Lado et al.,

1997; Luo, 2007). The aggressive and cooperative propensity may well be regarded as independent, which means that firms have to make choices.

When choosing the best strategy toward competitors, three main theories disagree. In competitive dynamic theory, firms are considered to perform better if they are aggressive (Ferrier, 2001). In network theory, firms have an interest in searching for a relational advantage (Contractor and Lorange, 1988; Dyer, 1997). In coopetition theory, the most successful firms are those that benefit from both aggressiveness and from cooperation (Brandenburger and Nalebuff, 1996; Lado et al., 1997; Bengtsson and Kock, 1999, 2000).

The results of the present study make clear, first, that coopetition strategies are statistically significantly distinct from aggressive and cooperative strategies. The basic postulate of coopetition theory, that a firm can choose whether to be highly aggressive and lowly cooperative, or to be lowly aggressive and highly cooperative, or to be both highly aggressive and cooperative, is validated.

The results obtained then make it possible to decide on the best strategy in relation to market performance. The results show that, in terms of number of subscribers and variation in the number of subscribers, the strategy adopted toward competitors has an impact on performance. Coopetition strategies are shown to be better than aggressive and cooperative strategies. This result is original, as there is no comparable previous research. It is the first time that the supposed superiority of coopetitive strategy over aggressive and cooperative strategies has been established statistically.

These results do not refute the findings of previous research on aggressive strategies or on cooperative strategies. They simply show that each of these strategies, conducted in opposition with each other, leads to lower levels of performance than strategies that combine them. In this sense, the results confirm previous work, indicating that coopetition is a successful strategy (Belderbos et al., 2004; Quintana Carcias and Benavieds-Velasco, 2004; Marques et al., 2009; Morris et al., 2007; Neyens et al., 2010; Peng et al., 2011; Ritala, 2012; Le Roy et al., forthcoming).

The research results should be considered as a confirmation of the validity of coopetition theory as defined by its founders (Brandenburger and Nalebuff, 1996; Lado et al., 1997; Bengtsson and Kock, 1999, 2000). The strategy of being both aggressive and cooperative appears as the most frequent adopted and most profitable for mobile operators. This result is consistent with challenging western ways of thinking, which tend to perceive competitive and cooperative behaviour as two ends of a continuum, rather than as two independent dimensions

(Lado et al., 1997; Luo, 2007). The results lead to a new conception of strategies toward competitors, which cannot be reduced to a simple choice between competition and cooperation, but is conceived as a complex combination of competition and cooperation. In this complex combination, strategies that combine high levels of aggressiveness and cooperation are the most successful.

Another original result obtained in this research is that an aggressive strategy is better than a cooperative strategy. In previous research, the merits of these two strategies have been never been directly compared. Past researches focused on the impact of one or the other, namely on the impact of cooperation or competitive aggressiveness (Gnyawali et al., 2006). We show here that an aggressive strategy performs better than a cooperative strategy. This result points to the success of the theory of competitive dynamics, which recommends firms to adopt an aggressive behavior for better performance (Young et al., 1996; Ferrier et al., 1999; Ferrier, 2001; Ferrier et al., 2002; Offstein and Gnyawali, 2005). Conversely, this result challenges studies that affirm that social networks and embeddedness have a direct and positive impact on performance (Granovetter, 1985; Nohria, 1992; Baum and Dutton, 1996; Gnyawali and Madhavan, 2001). If cooperative strategies appear to be unavoidable in the industry, this strategy should be considered a necessary condition for success rather than a discriminating factor that promotes better market performance.

This result can be partly explained by the characteristics of the sector. The mobile industry requires a high level of compatibility between the services and products offered by competing operators. This compatibility is both enforced by legal frameworks and decisive for customers. Competitors must necessarily cooperate with each other to provide this compatibility. Another feature of the industry is that products are combinations of several basic components. The different components belong to separate markets but are highly interdependent. Market players must work together to provide complex products-services to customers. Cooperation is therefore an almost inevitable strategy in the mobile telephony industry. In this context, the difference is created not only by the ability to cooperate more than other operators, but also by the ability to develop an aggressive strategy. An aggressive strategy can be implemented by reducing the necessary cooperation to a minimum and maximizing aggression. This is achieved by operators in Group 2. This strategy then performs better than the strategy that relies only on cooperation in terms of market performance. An aggressive strategy can also be established, not by reducing the cooperative effort, but by increasing it. This is the case of the operators in Group 3, which follow a coopetitive strategy. This strategy performs better than the other two strategies.

Conclusion

Researches on coopetition are more and more common in the field of strategic management (Yami et al., 2010; Bengtsson and Kock, 2014; Czakon et al., 2014). These researches are developed even though the normative aspects of coopetition theory have not been fully confirmed. Past researches highlight the impact of alliance between competitors on economic and financial performance (Luo et al., 2007; Ritala et al., 2008; Oum et al., 2004; Kim and Parkhe, 2009), the impact of cooperation among competitors on innovation (Belderbos et al., 2004, Neyens et al., 2010; Nieto and Santamaria, 2007; Peng et al., 2011; Le Roy et al., forthcoming) and the impact of coopetition on economic performance (Marques et al., 2009; Morris et al., 2007), on innovation (Quintana-Carcias and Benavieds-Velasco, 2004) and on market performance (Ritala, 2012). Among these researches, none compares the effects of coopetition strategies on performance with those of aggressive, cooperative and coexistence strategies. Similarly, none of these researches, except Ritala (2012), deals with market performance.

To fill this gap, the present research studies the relative effects of relational strategies toward competitors on market performance. An empirical study is conducted, using secondary data in the mobile telephony industry. This study shows that the three strategies of aggressiveness, cooperation and coopetition are well represented in this industry. No firm was identified that adopted the coexistence strategy. The study also shows that a coopetitive strategy performs better in increasing market share than the other two detected strategies. This result is original and has not been shown previously in the literature. Finally, the study shows that aggressive strategies perform better than cooperative strategies, which is also an original result.

The managerial implications of this research are important. They lead to specific recommendations for companies in this industry that aim to increase the number of their subscribers. Indeed, the results lead us to recommend that companies should adopt a strategy that is simultaneously cooperative and aggressive rather than a purely aggressive strategy or a purely cooperative strategy. To increase the number of subscribers, being more active both on the aggressive and on the cooperative front is clearly the best strategy. The second best strategy is an aggressive strategy. Finally, an essentially cooperative strategy is advisable for companies who wish to have a large number of subscribers.

These results should be considered in relation to the limitations of the research. One of the major limitations is that the various operators whose perfor-

mances we are comparing are of very different sizes, and are operating in different geographical areas and different domestic markets, which means they do not necessarily deal with identical environmental situations and conditions of competition. It would therefore, in future research, be better to study the impact of environmental conditions on strategic choices and performance.

A second limitation is that we focused in this study on volume measures of performance, because they are the measures of performance of reference in the industry, and the only measures that are completely accessible. This raises the problem of operators that do not adopt strategies of volume, but rather have niche strategies with high added value. This is very often the case with virtual operators. An extension of the research would consist of looking for other measures of performance and consideration of all operators (traditional and virtual).

Another limitation is that we have restricted this study to a single industry. This choice has certain advantages, but the results obtained certainly depend partly on the characteristics of the industry. It would therefore be beneficial to undertake similar studies in other industries, to determine if there is invariance in terms of results or if these results can only be observed in the mobile telephony industry.

A last limitation concerns the use of the method of analysis, namely structured content analysis based on articles published in journals dedicated to the sector (Smith et al., 1992; Chen et al., 1992; Ferrier, 2001; Gnyawali and Madhavan, 2001). This is a highly specific method that, although it makes it possible to observe the behaviour of firms, has the weakness that it is difficult to replicate, making it difficult to generalize the results. Further research could use a different method of analysis, such as using primary data, to see if similar results can be observed and to establish more precisely the scope of the results of this research.

Generally, the results obtained here are as good as those of many contributions to the literature, which require further confirmation and, therefore, argue for further research. Comparing the merits of different strategies to adopt toward competitors is still a relatively unexplored field of research. The relative performance of aggressive, cooperative and coopetitive strategies is not well established. There are probably multiple contingent factors that should be introduced for a better theoretical explanation. Only further research will support these theoretical developments.

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Appendix

Examples of categorization of competitive actions/reactions

Types of actions	**Date**	Example
1	2	3
Competitive Action		
Pricing Action	08/05/02	**E-Plus** cuts prices to boost i-mode. German operator E-Plus has slashed the price of its i-mode handset.
Marketing Action	05/03/02	**EuroTel** offers free usage: Czech operator EuroTel is offering customers three months of free data usage when they sign up for its GPRS service.
Product Action	31/07/02	Wind launches mobile video. Italian cellco Wind announced that subscribers can now watch moving film pictures on their handsets, with content supplied via the LIBERO mobile portal.
Capacity Action	28/02/01	**Telekom Italian Mobile** paid Real 1.54 billion for PCS operating licenses in Sao Paolo and the region of southern Brazil. The third license, covering the northern region, was awarded to telemar for US$ 556 million.
Service Action	23/03/05	**MobilTel** launches EDGE: Leading Bulgarian operator MobilTel announced last week that it had launched EDGE services in Sofia and is working on a nationwide rollout.
Signalling Action	02/02/05	**Mobilkom** makes 3G push: Austrian operator Mobilkom says it expects to offer nationwide 3G coverage by the summer using UMTS and EDGE
Cooperative Actions		
Cingular Wireless and VoiceStream	05/07/00	Cingular finds Voice. **Cingular Wireless** (formerly BellSouth/SBC) and **Voicestream** last week exchanged spectrum that will allow Cingular to gain access to New York City, and VoiceStream to obtain additional spectrum in Los Angeles and San Francisco.
Telstra (Australia) and PCCW (Hong Kong)	31/01/01	Telstra, PCCW launch JVs. Australian operator **Telstra** and Hong Kong's **PCCW** have launched their Asia-Pacific alliance with three 50/50 joint venture companies.
Telefonica Moviles (Spain)	17/04/02	Telefonica signs roaming deals. **Telefonica Moviles** has signed a roaming agreement

appendix cont.

1	2	3
NTT DoCoMo (Japan) SK Telecom (South Korea)		with **SK Telecom** and **NTT DoCoMo**, enabling Telefonica's subscribers to send and receive voice, SMS and data services in time for this summer's soccer World Cup