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The Red Queen Effect: Principle, synthesis and implications for strategy

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Abstract

Organisations competing with others seek a competitive advantage by improving their position compared to that of their rivals. Once they have gained this advantage, their competitors will in turn try to obtain an advantage in order not to be overtaken or left behind. This gives rise to a dynamic within the sector that makes it necessary for firms to invest ever more resources in order ultimately to remain in an identical competitive position. In the literature, this competitive spiral is called the Red Queen Effect (RQE). The aims of our research paper are threefold. First, we present this competitive process together with the main contradictory findings available in the literature. We then attempt to identify the contributions of the RQE theory by positioning it in relation to the main streams of research in strategy in order to highlight where it is similar to them and where it differs. Finally, an examination of the limitations enables us to identify future avenues for research on the RQE.

Keywords: Red Queen Effect, Exploration/Exploitation, Competition, Competitors

Almost research in the field of strategy predicates the existence of a sustainable competitive advantage as an objective that organisations should strive for. However, it seems that it is increasingly difficult for firms to construct and retain a competitive advantage over time in turbulent, uncertain or extremely intense competitive environments (d'Aveni, Battista Dagnino, & Smith, 2010).

The aim of the present article is to examine a specific competitive dynamic, the so-called Red Queen Effect (RQE) (van Valen, 1973; Kauffman, 1995). This process suggests that, faced with competition, organisations will try to stand out and gain a competitive advantage by developing new ways of doing things. They thus create disequilibrium in the environment and their rivals are then faced with an organisation that is more successful than theirs. In turn, the competitors attempt to develop better solutions in order to obtain a new competitive advantage and thus improve their performance (Barnett, 2008). This co-evolutionary approach illustrates the impact of competition on organisations and on the sector overall (Barnett, 1997; Barnett, 2008). The ongoing process means that a competitive advantage is inevitably temporary. In the first part of our paper, we set out the theoretical origins, principles and mechanisms underlying the RQE process. In the second section, we review the RQE-related literature, examining all work done on RQE, and present the principal findings to date. The third part of our paper summarises the main contributions of the RQE to the study of competitive relations, and positions the theory in relation to other, more traditional strategic approaches. Our conclusion identifies the limitations of our study on RQE and suggests further avenues for future research.

RQE: ORIGINS AND GENERAL PRINCIPLE

Before describing the processes and mechanisms underlying the RQE, we believe it is useful to set out its theoretical foundations.

The origins of the red queen effect: theoretical foundations

Research on industrial economics has historically formed the starting point for competitive strategy research (Jacobson, 1992). With its neoclassical inspiration, industrial economics explores competition from a static stance through its Structure-Behaviour-Performance paradigm. However, in a context where developments are numerous and fast-moving, a more dynamic approach is required. Thus, work in the tradition of Schumpeter and the Austrian school¹ offers a valuable alternative. Advocates of these lines of research refute the notion of equilibrium found in the traditional approach to economics. For them, competition is not a state or a situation, but rather a process of discovery (von Mises, 1949; Jacobson, 1992) in which disequilibrium is an inherent characteristic of markets. Thus, competition is considered as a state of continual rivalry for firms whose actions are designed to put them ahead of their rivals; this is subsequently cancelled out by the competitive moves of the latter.

However, views on the competitive process differ considerably, depending on the stream of research (Koenig, 2005). In the Schumpeterian approach, business leaders are encouraged to disrupt equilibriums by initiating radical change. This leads to a process of “creative destruction” (Schumpeter, 1934)

1. The main supporters and initiators of this school are Menger, Böhm-Bawerk, Wieser, von Mises and Hayek. The modern Austrian school is mainly represented by Kirzner.

designed to turn exceptional profits. The vision is less radical in the Austrian school approach, as in the work by Kirzner (1997), for example, where corporate actions are mainly driven by a desire to seize opportunities and to react swiftly rather than to innovate and transform the market.

In this context, firms' advantage gain from their actions is inevitably temporary and continually called into question. Hayek (1978: 191, cited by Bonardi, 1997: 7) suggested that competition may be defined as "a method of discovering particular facts relevant to the achievement of specific, temporary purposes (...). The benefits of [these] particular facts (...) are in a large measure transitory." When considering competition from a dynamic perspective, underscoring the temporary dimension of the competitive advantage and advocating frequent challenging of the status quo rather than acceptance of established positions (d'Aveni, 1994), the RQE largely finds its roots in the Schumpeterian paradigm and the Austrian school, giving us a new angle from which to consider competition.

General principle and mechanisms underlying the RQE

The term RQE was first used by the biologist Van Valen (1973). The metaphor comes from a passage from *Through the Looking Glass* by Lewis Carroll, the sequel to *Alice in Wonderland*. In the book, the Red Queen tells Alice: "Now, here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!" (Carroll, 1965: 210). This metaphor enabled Van Valen (1973) to explain certain biological behaviours and to analyse how species continually adapt to their environment to stay ahead of their competitors, which are also continually adapting. The choices which the RQE offers to species is simple: do nothing and be overtaken or fight to keep your position.

Like the examples from the living world, we can use similar reasoning for organisations developing in competitive environments, where the RQE is described as "competitive rivalry in which firms must increase their investment in order to maintain their existing market position while at the same time failing to earn returns that are commensurate with higher investments" (Lampel & Shamsie, 2005: 4).

The RQE creates a link between organisational learning (March, 1988) and organisational ecology (Hannan & Freeman, 1989), which distinguishes it from the work of the Austrian school and the Schumpeterian approach. As Barnett and Sorenson argue (2002: 290), "(i) competition among organisations triggers internal organisational ecology; (ii) learning increases the strength of competition generated by an organisation." When combined, learning and competition gradually reinforce one another as the organisation develops, giving rise to a self-reinforcing RQE process. The mutual learning that takes place between competitors is another reason why the competitive advantage can only be temporary.

LITERATURE REVIEW AND THE MAIN FINDINGS ON THE RQE

Two lines of research can be distinguished in studies on the RQE. First, studies on the impact of the RQE on the performance of organisations (micro) and on their sector (meso) and, second, the identification of factors that to a greater or lesser extent moderate the RQE's impact at both the organisation and the sector levels. Table 1 presents the research on RQE in chronological order. The variables used, the main findings, the main contributions and the research methods have been included for each article.

The impact of the RQE on performance

The first line of research concerns the impact of the RQE on the performance of firms (micro) and their sector (meso). Whatever the level studied, the outcomes may be positive or negative, depending on the dominant underlying process.

The impact of the RQE on organization performance (micro level).

Studies have shown that changes in response to competition can result in an improvement or a decline in an organisation's performance.

When a firm responds to a market opportunity it has detected with an appropriate action, it also shows the other firm how to respond. With this new information, competitors can imitate the actions perceived as effective. Observing competitive behaviour in this way also facilitates organisational learning (Barnett & Pontikes, 2008), enabling competitors to experiment with and develop new and innovative strategies, which may in turn lead to the launch of new products (Derfus et al., 2008) or new business models based on strategic innovation (Voelpel, Liebold, Tekie, & Von Krogh, 2005; Plé, Lecocq, & Angot, 2010). Thus, the RQE effect has a positive impact on business performance by stimulating organisational learning and encouraging firms to experiment and develop new strategies (Result 1a).

Table 1. Main research on the RQE

Reference	Variables	Results	Contributions	Method
Barnett et al., 1994	Corporate performance (ROA) Competitive position Internal competencies (age, size, activities, etc.)	Competition is beneficial to single-activity firms due to the learning impact and does not benefit multi-unit firms.	Proposal for a co-evolutionary model which enables the link to be made between the firm's internal and external advantages	Quantitative study on 1109 retail banks in Illinois between 1987 and 1993
Barnett & Hansen, 1996	Failure rate of organisations	Positive impact of recent experience on the survival rate of organisations, unlike longer-term experience Higher survival rate when the organisation is confronted with very different competitor cohorts	Identification of conditions in which the RQE may be relevant or not	Quantitative study on 2970 retail banks in Illinois between 1900 and 1993
Barnett, 1997	Failure rate of organisations Rate of creation Population density	Large firms gradually become less and less competitive, unlike smaller firms, thereby reducing their capacity to survive	Proposal of a model that identifies the environmental effects of organisational characteristics in order to explain the RQE process	Quantitative study on the beer sectors in the US from 1663 to 1988, and the phone sector in Pennsylvania from 1879 to 1935
Barnett & Sorenson, 2002	Rate of creation Growth rate	Identification of positive effects (rapid growth, competitive pressure, emergence of barriers to new entrants), and negative effects (competency trap) due to the RQE in an industry	Combination of ideas and models on the theory of organisational learning and organisational ecology with respect to the RQE	Quantitative study on 2970 retail banks in Illinois between 1900 and 1993
Barnett & McKendrick, 2004	Size of company	While large organisations lead the race at the technological level, they gradually become less competitive than the smaller firms	Distinction between two ideas of competition: competition as a race which favours large organisations and competition as a constraint that favours small organisations	Quantitative study on 1538 firms in the hard disk sector between 1956 and 1998
Barnett & Pontikes, 2005	Firm's experience Firm's performance (ROA)	Summary of work by Barnett and Hansen (1996) and by Barnett and Sorenson (2002)	Study showing that competition between organisations depends on history	Quantitative study on 1538 organisations in the hard disk sector between 1956 and 1998 and on 2970 retail banks in Illinois between 1900 and 1993
Lampel & Shamsie, 2005	Amount of sales generated by the studio for each film	Comparison and imitation of strategies adopted by film studios, even if it results in poorer performance	Identification of the cognitive dimension of the RQE in response to the complexity of multi-point competition	425 films spread evenly between 1990-1991 and 2000-2001
Barnett & Pontikes, 2008	Competitive experience Failure rate Rate of market entry	Organisations with competitive experience are more viable in their specific market and less so when they penetrate a new market	Identification of the role of the RQE in the likelihood and impact of organisational change. While exploration is considered as	Quantitative study on 2602 firms from the IT sector in the United States between 1951 and 1994

Derfus, et al., 2008	Focal corporate actions and competitors (price, capacity, geography, marketing, new product launch) Speed of competitors' reactions Corporate performance (ROA and ROS) Sector conditions (Herfindhal index, rate of growth in the industry), Competitive position (market share per year)	The actions of an organisation enhance its performance but also the amount and speed of reaction of its competitors, who, as a result, negatively impact the performance of the focal organisation. The effects of RQE depend on the situation in the sector in question and the competitive position of the focal firm	Identification of three RQE moderating factors (the level of concentration in the sector, the level of demand and the firm's market position)	Quantitative study on 4700 corporate actions from 11 industrial sectors in the United States
Barnett, 2008	Rate of failure Rate of creation Competitive logic	Organisations which outlive the competition become stronger, but only in their market sector The level of an organisation's competitiveness depends on its experience The weakest competitors fail, stepping up the competition and strengthening surviving firms in a dynamic evolutionary process	Identification of the positive and negative impacts of the RQE	Quantitative study on 1538 firms in the global hard disk industry between 1956 and 1998 and on 2970 retail banks in Illinois between 1900 and 1993

When a firm survives competition, it increases its operating capacity, making it better adapted to its environment (Barnett & Sorenson, 2002; Barnett & McKendrick, 2004; Barnett, 2008). As Barnett and Hansen (1996: 142) indicate, "greater resilience would increase an organization's performance". Even if the competitive advantage disappears in the long term, only continual adaptation can enable organisations to maintain their level of performance, even temporarily (Venkatraman & Henderson, 1998). Based on a study on the performance of over 400 companies over a thirty-year period, Beinhocker (1997) argues that it is hard for firms to maintain a level of performance above that of their competitors for more than five years. Enhanced long-term performance is not so much due to a distinct competitive advantage but can rather be achieved by continually evolving and adopting new sources of temporary advantage that enable them to stay ahead in the race.

On the other hand, companies that adopt competitive behaviour based on imitation risk focusing exclusively on the competitors' behaviour to the detriment of real strategic thinking and the exploration of new capacity (Barnett & Hansen, 1996; Barnett & Pontikes, 2008; Lampel & Shamsie, 2005). Such firms are likely to fall into a "competency trap" that prevents them from developing new solutions (Levinthal & March, 1981; Levitt & March, 1981). The earlier they begin this comparison, the more it will lead them to adopt similar behaviours, thereby reinforcing the RQE competitive cycle. This form of competing reduces the number of options available to organisations and steps up the level of competition, with a subsequent decline in the focal firm's performance (Ingram & Simons, 2002). Consequently, we argue that the RQE process has a negative impact on the performance of businesses when the latter adopt imitation as the main behaviour (result 1b).

Thus, organisations are both actors in the competitive process and, at the same time, targets of this same competition. As Barnett and McKendrick (2004: 542)

argued, “even a particularly successful organization wields a two-edge sword in the process, since a dramatic improvement by the organisation is likely to trigger commensurately large improvements (through learning or selection) among its rivals – ultimately intensifying the competition it faces in the future”. Organisations have to respond to competition in order to survive, but in responding and improving, they drive their competitors to surpass themselves, thereby making the competition even more difficult, which has an impact at the collective level.

The consequences of RQE on sector performance (meso level)

QE has both positive and negative consequences at the sector level. The ongoing determination of organisations to produce a better offer than their competitors generates a constant improvement in the offer. This competitive process results in a collective learning process which ultimately leads the whole sector to introduce ever more innovative and appropriate technologies, more efficient production processes and/or a higher level of service (Baumol, 2004). This type of RQE competition can thus result in a positive outcome by improving performance at the sector level (result 2a).

On the other hand, this mechanism can lead to a decline in the performance of the sector as it requires more and more resources for ever lower profits (result 2b). This poorer return on investment can sometimes lead to a decline in the level of product quality, fewer services and/or less innovation (Henderson & Cockburn, 1996). More generally, the negative consequences result in lower performance for all the organisations and consequently a higher failure rate (Smith, Grimm & Gannon, 1992).

Table 2 summarises all of the consequences of the RQE, whether at the micro or meso level, and offers examples for each situation observed.

Table 2. Impact of RQE on performance

	Increase in performance	Decline in performance
Micro level	Learning, development of the firm’s capacity for innovation	Imitation, dependence on tried and tested paths, competency trap
Meso level	Widespread adoption of most innovative technologies, rise in productivity, lower costs, improvement in quality	Increase in intensity of competition, increase in costs for all the organisations

MODERATING RQE VARIABLES

Beyond individual and collective performance, a set of variables that moderate the effects due to the RQE on performance has also been identified. As in the distinctions made for both levels of impact, these variables have been linked to the characteristics of the organisation (micro) and the sector (meso).

Moderating variables at the organisation level (micro level)

At the level of the organisation, two moderating variables were identified:

the firm's competitive position and its experience. With a strong competitive position, leaders find themselves in a paradoxical situation. On the one hand, as they have certain advantages, like an advance in innovation, leaders are less involved in the collective learning process within their sector. However, as they are less affected by the RQE than the other firms, leaders become isolated at the competitive level and tend to see a reduction in their capacity to survive compared to other firms that are continually faced with competition and thus step up their competitive strategy (Barnett, 1997; Barnett & McKendrick, 2004). Firms with a leading position are thus the more vulnerable competitors over time (result 3a). On the other hand, Derfus et al. (2008) show that rather than being isolated from the competition, leaders remain competitive and improve their performance by being more aggressive in what they do (result 3b). Regarding the organisation's level of experience, Barnett and Sorenson (2005) argue that firms with recent competitive experience are well placed to observe and learn which actions to implement to optimize their competitive position. Firms with recent experience of the competition have a higher survival rate, which they keep when they enter a new market (result 3c). On the other hand, those with less experience of competition are likely to end up failing. In parallel to this, businesses with extensive competitive experience will build and develop specific resources and skills which to respond to competition. While these resources and skills can form barriers to new entrants, representing a short-term advantage for the incumbent organisations, this can also have a detrimental impact on the same organisations when new entrants arrive. In the event of rapid change in the environment, competitive experience becomes a "competency trap" (Levinthal & March, 1981; Levitt & March, 1981) for the most experienced firms by skewing their perception of the environment and slowing down their evolution (Barnett & Pontikes, 2008). Thus, prior experience can have a negative impact on the performance of incumbent organisations when new entrants arrive (result 3d).

Moderating variables at the sector level (meso level)

Two moderating variables have been identified at the sector level: the degree of concentration and the rate of growth in the sector. With regard to the level of concentration, Barnett and Hansen (1996) showed that a lower competitive concentration leads to the development of strong competitive relations that promote learning and adaptation. Thus, the RQE has a less negative impact on the performance of firms when an organisation is confronted with a smaller number of different competitors compared to a situation in which it faces a large number of competitors (result 4a). This result is coherent with work by Carroll and Hannan (1989), who studied dependence in terms of population density. With regard to rate of growth, Caves (1980) and Bothwell, Cooley, and Hall (1984) showed that organisations belonging to these high-growth sectors are in environments that offer a large number of opportunities. These environments in fact tend to reduce competitive actions and reactions as rival firms are also more focused on acting than on observing competitive movements. On the other hand, when a sector reaches maturity, or even embarks upon a stage of decline, the incumbent organisations need to make more effort by dropping prices or increasing marketing expenditure, for example, in order to keep their market share, which indicates the start or the stepping-up of the competitive war. Organisations in high-growth sectors are less affected by competition with

their rivals as increased demand is such that the organisations can increase their income simply by maintaining their market share (result 4b).

Having identified the most interesting work on the RQE and presented the different findings, we will now put it all into perspective in order to highlight the contributions of the RQE and to identify the contributions' contradictions and limitations, suggesting further avenues for future research.

CONCLUSION AND RESEARCH AGENDA

The RQE appears to be a co-evolutionary process that is particularly useful for understanding the two antagonistic consequences of the interaction dynamic between firms: learning and adaptation on the one hand and growth in competitive intensity and selection on the other (Lewin & Volberda, 1999). Consequently, this co-evolutionary approach presents a certain number of contributions to studies on competition.

Contributions of the RQE

Three main contributions of the RQE can be identified with regard to existing approaches. First, the RQE considers interdependence between competitors as a positive element and even something to strive for, unlike other approaches in strategy. Historically, whether through avoidance and/or head-on collision (Ndofor, Sirmon, & He, 2011), independence from competitors has been put forward as a coveted performance variable. Some strategy scholars advocate avoiding competition altogether by developing a differentiation strategy (Porter, 1981), the use of specific resources and competencies (Barney, 1986), or the creation of a specific new space (Kim & Mauborgne, 2005). These scholars encourage organisations to find an advantage that protects them from or reduces competitive intensity. In contrast, other scholars advocate head-on collision strategies as a means to promote a situation "of mutual forbearance" between rival firms in order to reduce competitive intensity (Karnani & Wernerfelt, 1985; Jayachandran, Gimeno, & Varadarajan, 1999; Bensebaa, 2001), and the protection of "spheres of influence" (Gimeno, 1999). The RQE process challenges this view, however, suggesting that exposure to competition, and the ensuing interdependence between competitors, is one of the ways that organisational expertise can develop (Barnett & Hansen, 1996; Barnett, 2008). This process may be paralleled with prior work on oligopolies which suggests that a firm's growth can be attributed above all to a search for equilibrium by each of the firms present in the oligopoly, which is ultimately untenable (Cotta, 1969).

Second, the RQE adds to the work on competitive dynamics, which focuses on an analysis of the action-reaction dyad (Bensebaa, 2000; Smith, Grimm, & Gannon, 1992; Chen, 1996; Ferrier, 2001). Studies adopting the action-reaction dyad as a unit of analysis seek first and foremost to identify the determinants, the type of actions to undertake, the intensity and speed of implementation depending on the organisation's characteristics, the sector and past movements and, in return, to predict the potential type of reaction (Smith, et al., 2001; Bensebaa, 2003). The RQE, on the other hand, focuses on the dynamics, the underlying mechanisms (especially learning, imitation, evolution and selection) and the consequences of the sequence of competitive

movements. By refocusing in this way, the RQE offers a new framework for analysis, allowing for the study of competitive sequences which are longer and more complex than the simple action-reaction dyad.

Third, the RQE's multi-level approach enables us to simultaneously study the impact of the environment and businesses on competitive relations. Approaches that focus on the environment (ecology of organisations, SCP paradigm, neo-institutional theory) tend to focus on the importance of the structure and to pay little attention to the choice of managers. Other research streams, however, like that of the competitive dynamic or the theory of resources, give greater importance to the decisions made by individuals. Historically, both of these approaches have been pursued in parallel and separately or, at least, in a sequential manner (Miller & Chen, 1994; Schomburg, Grimm, & Smith, 1994; Young, Smith, & Grimm, 1996). The RQE differs from this type of study by linking the issues of structure and decision so intimately that they can no longer be separated. The organisation may here be considered as an "active unit" (in the sense of Perroux, 1972) that acts on its environment and shapes and adapts it through its actions while simultaneously being affected by the actions of the environment.

Table 3 summarises the positioning of the RQE and its contributions in relation to the main streams of organisation theory.

2. Analysis framework inspired by Jacobson (1992) and Roy (2007).

Table 3. Comparison of the way competition is taken into account and its study in organisation theory²

	SCP paradigm	Ecology of organisations	Theory of resources	Neo-institutional theory	School of competitive relations	Red Queen Effect
Level of analysis	Sector (meso)	Population of organisations (meso)	Organisation (micro)	Fields (meso)	Action/reaction dyad (micro)	Business Industry (micro/meso)
Type of analysis	Static	Dynamic	Static	Static	Dynamic	Dynamic
Nature of the competitive advantage	Sustainable	Sustainable	Sustainable	Sustainable	Temporary	Temporary
Object of analysis	Environment	Environment	Resources and competencies	Institutions	Manoeuvre of firms	Manoeuvre of firms and environment
Competitive logic	Positioning	Selection	Positioning	Isomorphism	Relations	Relations

LIMITATIONS OF THE RQE AND AVENUES FOR FURTHER RESEARCH

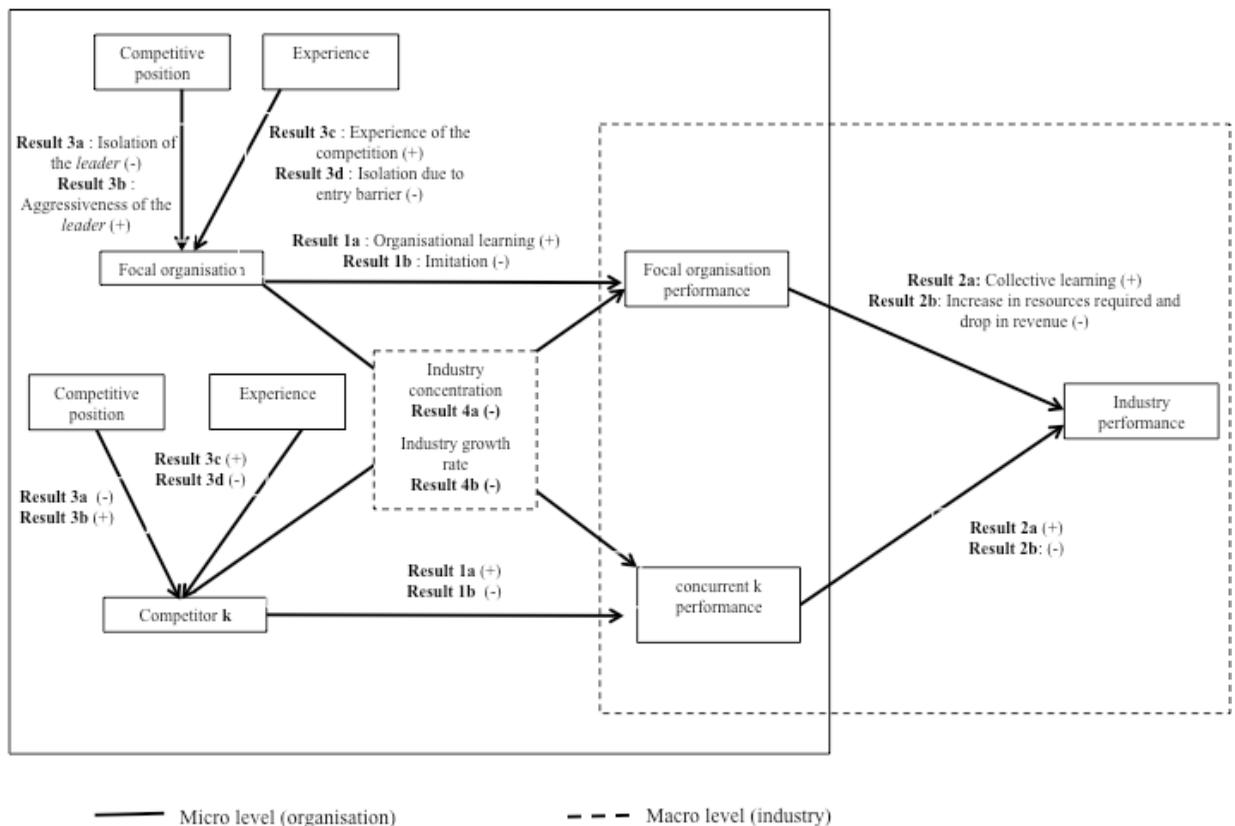
While it is highly enriching, the RQE also presents a certain number of limitations. Seven main limitations were identified which could be used as the basis for future research studies.

First, in our review of the literature, we identified the contradictory effects of each of the elements taken into consideration. Each variable studied can lead to positive or negative outcomes at the level of the organisation (micro) or the sector (meso). Moreover, the findings show that the competitive movements established can have opposing outcomes depending on the level studied. The RQE shows evidence, for instance, of situations where, given the competition, the performance of organisations declines while that of the sector increases. A decline in the situation of firms appears compatible with a rise in collective performance. These contradictory results could be explained by the piecemeal approach to the studies or the fact that the effects are tested variable by variable, or in small groups of variables (as in Derfus et al., 2008). In order to offset this limitation, we propose an integrative model that brings together all of the variables studied in the literature to date (figure 1) in order to obtain an overall view of the processes and impacts of the RQE. The variables and their outcomes at the micro level of the firm (called the focal organisation) or that of its competitor(s) k (micro) is in the full-line box on the left. The variables and their impact at the sector level (meso) are on the right of the model in the dotted-line box. We can take up the models of Barnett (1997) and Derfus et al. (2008) and contribute to them by summarising the main contradictory findings in the literature. However, this model needs to be tested to ensure its validity and to establish stable relations between the variables. This could be done by adopting a research method other than quantitative studies on the specific sectors in question. Using computer simulation we could take all of the variables into consideration, for instance, in order to observe their combined effects. More specifically, techniques like genetic algorithms could help us to analyse both the learning and the imitation phenomena at the level of the organisation and evolution at the sector level (Cartier, 2007). This means we can artificially observe the evolution of the process depending on the opposing effects of the different variables and test the model's sensitivity to more or less significant variations in the weight of the different variables. This would help us to determine at which point the negative effects of the RQE outweigh the positive effects like learning and innovation.

Second, in addition to the test of the integrative model, more theoretical work is needed. As we pointed out earlier, studies that include the RQE fit into the competitive dynamic tradition, generally incorporating work based on Schumpeter and Kirzner. However, these two approaches differ in several ways, some of which appear difficult to reconcile. By introducing a dimension of significant change, the RQE, as a source of disruption to the equilibrium, appears to be of a radical nature in line with research on disruption strategies (Prahalad & Hamel, 1994). On the other hand, its mechanism is the outcome of traditional and frequent competitive behaviours (like imitation, for example). In this case, as Koenig argues (2005: 10), "the designated problem is Schumpeterian, but the observations made correspond to Kirzner's definition of entrepreneurial action." This paradox between the exceptional and the everyday, or between the innovative and the banal, requires theoretical work

that helps us to remove the ambiguity found in work on the RQE. Third, firms have introduced resources to directly promote inter-organisational learning. However, RQE-focused studies, while fostering learning through competition, do not take specific forms of competition into account, combining individual organisation outcomes with the collective outcomes of sectors (Baumard, 2000), like alliances and partnerships. Yet inter-organisational collaboration today forms a source of competitiveness (Josserand, Clegg, Kornberger, & Pitsis, 2004). Relations between competitors wishing to cooperate may be even more ambiguous when each firm simultaneously envisages managing its individual future and the collective future of its sector, through so-called “co-opetition” relations (Brandenburger & Nalebuff, 1996). Within this context, organisations “benefit from both the competition that drives them to continually improve their offer and the cooperation which gives them access to the partner’s resources” (Fernandez & Le Roy, 2010: 156-157).

Figure 1. Proposed integrative model of the RQE



In order to develop a model of competitive relations that corresponds more closely to the strategic practices introduced by business organisations, these new forms of organisation either render traditional approaches to competition obsolete or mean that we need to take them into account and integrate them into work on the RQE. It would be interesting to measure the impact of these

structures on the RQE's effects. More specifically, we need to know if the co-competition relations step up the impact of the RQE or, on the contrary, limit it or even cancel it out.

Fourth, more detailed studies on the pace of competition within sectors could be envisaged. In line with the work on hyper-competition (d'Aveni, 1994), the RQE is particularly well adapted to environments where competitive intensity is continually growing. While many authors (d'Aveni, 1994; Bettis & Hitt, 1995; Brown & Eisenhardt, 1998; Hamel, 2000) have tried to demonstrate the existence and development of these highly competitive environments, other authors (e.g. Porter, 1996) have challenged their existence. We could therefore ask whether a general increase in the level of competition as described by the RQE really exists. More recently, some researchers (McNamara, Vaaler, & Devers, 2003) have indicated that periods of hyper-competition tend to come and go. Studying sectoral developments over very long periods would help to identify the alternating cycles of RQE and competitive lulls. The length of these cycles, the reasons why we move from one type of cycle to another and, consequently, the evolutions in the variables that underpin the competition are just some of the facets that would be interesting to study.

Fifth, it would also be interesting to carry out complimentary studies on co-evolution issues. The RQE is, in essence, a co-evolving mechanism as it is based on a mutual adaptation of firms, induced by competitive mechanisms that govern their relations (Greve, 2002). While mutual adaptation within organisation populations has already been studied (Barnett, 1994; Hannan, 1997), the positive or negative impact of RQE on the processes of co-evolution between different organisation populations remains untapped. However, given the more or less significant proximity between some populations, an impact on populations close to those experiencing an RQE-type competitive process is possible. Through a mechanism of inter-population co-evolution, the RQE at work within a population may impact other populations. By conducting multi-sector studies on identical periods, we should be able to observe and quantify these combined effects.

Sixth, the RQE appears to be underpinned by a dynamic in which the intentionality of business leaders has no place. While the decision to respond to competition is a voluntary one (Barnett & Hansen, 1996; Derfus et al., 2008), once triggered, the RQE process is presented as automatic or taken as read. Its original inspiration from biological models gives weight to this lack of intentionality. However, a psychological dimension may support a large number of behaviours that have a competitive impact (Kilduff, Elfenbein, & Staw, 2010). Some competitors may have a specific motivation, pushing them beyond a simple traditional competitive mindset. However, a competitive process like the RQE, where organisations are caught up in a continual race for the competitive advantage, can add to the psychological involvement of the different actors and thus alter their motivations and intentions with regard to the competitors. The aim to trigger, pursue or opt out of an RQE-type competitive situation may depend more on the way that the competitive relationship is experienced by the actors than on the objective characteristics of the firms or sectors. The introduction of a psychological and intentional dimension in the RQE would, in some cases, create a parallel with the concepts of the "chicken game" (Rapoport & Chammah, 1966) or "escalation of commitment" (Staw & Ross, 1987). Indeed, organisations are committed to or persevere in RQE-

type dynamics even though it would be economically wiser to avoid or to put an end to this type of situation. However, the actors' intentionality is guided by subjective motivations that arise from an unusual perception of competitive relations, inciting them to act in a specific way. There have been few studies on the impact of the psychological dimension on competitive relations in general, and on the intentionality of actors in particular (Kilduff et al., 2010). The analysis of the RQE process through in-depth case studies that explore the motivations and intentions of actors taking part in RQE-type competitive situations could offer a particularly fertile field of research.

Seventh, continuing with the work on intentionality, it appears that the RQE has a negative outcome for organisations as, based as it is on a paradox, it forces them to put more and more resources into maintaining their results and, consequently, they see a decline in their performance. Having acknowledged the decline in results or their incapacity to pursue this "arms race", firms may decide to break out of this vicious circle. It would be interesting to understand at what point actors become aware of the situation in which they find themselves and the resources they use to interrupt the RQE process. One approach would be to investigate the role that regulations could play in this analytical framework (Roquilly, 2009).

Updated by van Valen in 1973 and applied to strategy thanks largely to the work of Barnett (1997), the RQE is an interesting and challenging issue for strategic research, providing a valuable addition to the existing literature as we have shown. Given the diversity of subject areas, methodologies, fields of application and objectives to be pursued, the RQE offers a fertile area for studying competitive relations in the coming years, and we hope to see many contributions arising from this process which creates a link between organisational learning and organisational ecology.

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