

RECIPES OF SUCCESS: THE CASE OF PULP AND PAPER INDUSTRY 1989-2015

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**Nguyen Ngoc Duy Khoa
International Business and Entrepreneurship**

**Supervisors
Juha-Antti Lamberg
Mirva Peltoniemi
Kalle Pajunen**



JYVÄSKYLÄN YLIOPISTO

ABSTRACT

Author Nguyen Ngoc Duy Khoa	
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Abstract <p>Explaining the variation in competitive positioning actions across firms in the face of environmental change has long inspired debates in the field of strategic management. Despite the importance of these questions, little effort has been done to examine the complex interdependencies among industry, organizational attributes, and strategic actions that potentially underlie the organizational performance in one model without controlling one or more of the three factors. Most of the studies on competitive dynamics primarily have focused on independently exploring the effects of organizational characteristics or the industry structure on competitive actions and reactions, which, in turn, impact performance. Such causality is also difficult to model and hence has been largely ignored previously, probably due to the limitations in the correlation-related and variance decomposition approach.</p> <p>The research interest here is therefore to reinvestigate the causally complex relationships between environmental context, strategy choices, firm-level characteristics, and performance outcomes. This was achieved by mainly employing the configurational approach, fuzzy set Qualitative Comparative Analysis (fsQCA) (Ragin, 1987, 2000, 2007, 2008), a novel configurational method that overcomes important limitations of traditional correlational approaches. The analyses were performed based on a unique set of data collected from over 200 firms in the global pulp and paper industry, accounting for approximately 1,400 cases over a range of 27 years (1989-2015). Overall, this thesis attempts to integrate time into QCA, to include possible strategic actions other than exploration and exploitation actions, and to advance the causal complexity literature in the field of strategic management.</p> <p>The empirical findings identify various pathways to success, i.e. positive profitability, as well as to non-success, i.e. non-positive returns. The aggregated recipes of success include the Regenerator, the Renewer, and the Conqueror while the paths to non-success cover the Early Consolidator, the Excessive Consolidator, and the Late Explorer. It is clear that there is no single formula or formula with a single strategy to success, and the configurations are not static. Nonetheless, the results reveal that the number of successful pathways appear getting less. In other word, it might be relatively more difficult to</p>	

be profitable nowadays as compared to the past, partly due to several turbulences and changes. In addition to strategies such as exploitation and acquiring external resources, size and degree of diversification are also among the core conditions that lead to positive performance. It is also implied that on top of financial strength and scale, winning organizations are the ones who are flexible and ready to change with preparation of multiple strategic options on hand.

Keywords

Causal complexity, dynamic capability, resource configuration, strategic positioning, organizational characteristic, industry effects, configurational effects, pulp and paper, fuzzy set, qualitative comparative analysis

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1 INTRODUCTION

Explaining the variation in choices of strategic actions across firms in the face of environmental change has long inspired debates in the field of strategic management. Some firms survive and thrive while others fail. Despite the importance of these questions, too little effort has been done to examine the complex influences of environmental context, strategy choices and firm characteristics on firm performance in one model without controlling one or more of the three factors. Most of the earlier studies, on competitive dynamics for example, have focused on separately exploring the effects of organizational characteristics (Size: Chen & Hambrick, 1995; Miller & Chen, 1994; 1996; Smith, Grimm, Gannon & Chen, 1991; Age: Lant, Millken & Batra, 1992; Young, Smith & Grimm, 1996; Market diversity: Gimeno & Woo, 1996; Baum and Korn, 1996) or the industry structure (Growth: Ferrier, 2000; Miller & Chen, 1996; Schomburg, Grimm & Smith, 1994; Industry concentration: Scherer & Ross, 1990; Young *et al.*, 1996) on competitive actions and reactions, which, in turn, impact performance.

Nonetheless, simply examining such direct relationships might provide an incomplete picture. In fact, similar to other complex social phenomena, organizational outcomes tend to be the product of interactions among several interdependent variables (Siggelkow, 2002; Tushman & O'Reilly, 2002). Based on this notion of configurational theory, there have been calls to integrate firm and industry effects into configurational studies of organizational effectiveness (Short, Palmer, & Ketchen, 2003a, 2003b). Nevertheless, one of the challenges in the past for configurational research was the absence of methodological alternatives (Fiss, 2007; Fiss, Marx, & Cambré, 2013). If analyses relied on conventional correlational methods, the underlying assumption is that effects of causal attributes on the outcome of interest are independently generated.

A more recent robust way to address such causal complexity is set-theoretic approach, using a novel methodology for modelling multidimensional causal relations: Qualitative Comparative Analysis (QCA) (Ragin, 1987; 2000; 2007; 2008). This approach has gained its popularity among organizational and strategy scholars as it offers best features of case-based and variable-based research. Set-theoretic methods (Ragin 1987; 2000; 2008; Ragin & Fiss, 2008; Rihoux & Ragin, 2009), such as fuzzy set qualitative comparative analysis, study cases as configurations and emphasize combinational effects. It addresses the conjunctural, equifinal, and asymmetrical causal relations instead the net effect thinking by general linear modeling. Since then, strategic management scholars have been inspired to investigate the complex interdependencies among industry, organizational attributes, and strategic actions that potentially underlie the organizational performance via the application of QCA. Research work, such as Greckhamer, Misangyi, Elms, & Lacey (2008) and Fiss (2011), might be considered as the pioneers.

In order to continue the advancement of configurational perspective in the field of strategic management, this study sets out to reinvestigate the causally complex relationships between environmental context, strategy choices, firm-level characteristics, and performance outcomes. This is achieved by employing fuzzy set QCA (fsQCA) on a unique set of data collected from over 200 firms in the global pulp and paper industry, accounting for approximately 1,400 cases over a range of 27 years (1989-2015). The research setting is longitudinal-based with analyses made according to sub-periods. In particular, the proposed model will cover three building blocks: firm characteristics, how such firms choose to strategically position themselves, and under what circumstances. For the organizational profiles, variables such as size, age, market, and product diversity are taken into consideration while competition intensity, market growth, and periodization of the studied duration serve as proxies for environmental changes. As for competitive positioning, I develop four categories of competitive actions and reactions based on four modes of dynamic capability by Eisenhardt & Martin (2000). Subsequently, I propose that strategic actions could in-

clude acquiring external resources, or shedding current resources, other than just exploration and exploitation. The observations from these three building blocks should be considered in term of configurations. Given a set of environmental factors, it is expected that firms would behave differently although the resulting performance outcomes could be similar. This is in line with the notion of neutral permutations (extended from the concept of equifinality) (Fiss, 2011), in which different paths can lead to similar outcome. The research question is, consequently, to identify the configuration of types of firm (size, age, diversity of market and product orientation) and choices of competitive actions during a particular period, which results in profitable performance. In addition, I expect that the recipes will be different throughout the sub-periods, which supports the argument that environmental settings influence the firms' competitive positioning behaviours.

Finally, the research hopes to advance the causal complexity literature in the field of strategic management by revealing how variation in performance might be better explained by the interdependent interactions among industry dynamics, firm's characteristics and actions. Such causality is difficult to model and hence has been largely ignored previously, probably due to the limitations in the traditional correlation-related and variance decomposition approach. The proposed model may therefore identify practical "recipes of success" and paths to non-success: what firms did in good and bad times, what were relatively more important (core) and their consequences. Furthermore, such model may be generalized for exploring the causal recipes in other industries.

The next section starts with the review of configurational theory, especially causal complexity in management research. The review goes on with extended literature of dynamic capability (resource configuration as firm strategic capabilities), the impact of organizational characteristics, and the literature on industrial and environmental effects. Within the same section, theoretical framework and research model are to be developed simultaneously with the research purposes. Section III (1&2) explains the research setting, and how the pulp and

paper data is collected through structured content analysis. Section III (3) describes my research methodologies, covering fsQCA. In section IV, fuzzy set analysis results are presented. The empirical findings, aggregation of recipes, and their implications are discussed in sections V, VI and VII.

2 THEORETICAL FRAMEWORK

2.1 Causal Complexity in management research

Understanding causal complexity plays an essential role in both management and organization studies. Indeed, a growing body of organizational literature has long recognized that organizational outcomes tend to be the product of interactions among interdependent variables (Siggelkow, 2002; Tushman & O'Reilly, 2002). Building on this notion, the configurational approach has been the preferred choice for research on organizational design despite being under different labels, such as on typologies, generic strategies, or archetypes (e.g., Burns & Stalker, 1961; Hofer & Schendel, 1978; Miles & Snow, 1978; 2003; Mintzberg, 1979; 1983; Porter, 1980). Two classic examples in the late 1970s are Mintzberg's (1979, 1983) theory of organizational structure, and Miles and Snow's (1978, 2003) theory of strategy, structure, and process. Mintzberg (1979)'s theory argues that there are five ideal types of organization, which are derived from five potentially effective configurations of design and contextual factors that characterize the firm' structure and context respectively. The design factors include coordinating mechanism, organization's dominant group, type and degree of centralization, and other bureaucratic characteristics, such as formalization, specialization, hierarchy. Besides firm age and size, other contextual factors cover the complexity and dynamics of the operating environment and technology. If a firm's profile approximately matches one of the five ideal types, especially also contextual dimensions, it is predicted to be more effective than others. A second example of a configurational theory, developed by Miles and Snow (1978), identifies four ideal types of organization, each of which is as a unique configuration of structure, technology, decision processes as well as strategy. For instance, defenders aim to protect its prominence in the market, adopt cost leadership strategy, and centralize control of organizational operations. In contrast, prospectors focus on change, adopt innovative and differentiation strategies, and tend to have flat and decentralized organizational struc-

tures. Analyzers, nonetheless, lie between those two “extreme” residing “at opposite ends of a continuum” (Miles & Snow, 2003: 68). Furthermore, Miles and Snow posited that except for the reactor, the other three ideal types: prospector, analyzer, and defender, were effective forms of organization. What should be noticed is the similarity of the two theories, in which organizational effectiveness is the product of how organizational and/or environmental factors are combined into distinct configurations. Such observation resembles the configurational perspective, which emphasizes causal complexity.

Indeed, causal complexity, following earlier configurational theory in management, is defined as to be characterized by three aspects: conjunction, equifinality, and asymmetry (Misangyi, Greckhamer, Furnari, Fiss, Crilly, & Aguilier, 2017; Short, Payne, & Ketchen, 2008). Firstly, conjunctural causation implies that outcomes of interest are the results of interdependent attributes, rather than a single cause, that combine into distinct configurations or causal recipes (Ragin, 2008). As for the notion of equifinality, it refers to the idea that more than one configuration is linked to a particular outcome (Katz & Kahn, 1978). For instance, high levels of performance might be achieved through various paths (Gresov & Drazin, 1997). Lastly, asymmetry means that the set of causal conditions leading to the presence of an outcome could be different from that leading to the absence of such outcome (Ragin, 2008). Nevertheless, one of the challenges in the past for configurational research was the absence of methodological alternatives (Fiss, 2007; Fiss, Marx, & Cambré, 2013). Majority of configurational studies in the 1990s and before, for example, Bensaou and Venkatraman (1995); Doty, Glick, and Huber (1993); Ketchen, Thomas, and Snow (1993), still relied on conventional correlational methods to reveal the configurations of organizational and environmental attributes and link them to organizational effectiveness. The findings are still inconclusive, in term of which might be the principal source of performance differences (Bowman & Helfat, 2001). A serious limitation of those statistical methods employed is the underlying assumption that effects of causal attributes on the outcome of interest are independently generated (Greckhamer, et al., 2008). In addition, such methods that rely on

general linear modelling are designed to address the “net effects thinking” (Ragin, 2008) or additive, unifinal, and symmetrical effects (Fiss, 2007; Grandori & Furnari, 2008) instead of conjunctural, equifinal, and asymmetrical causal relations.

Until recently, through the application of the set-theoretic approach proposed by Charles Ragin’s (1987, 2000, 2007, 2008) Qualitative Comparative Analysis (QCA), in which cases are conceptualized as configurations of causal elements, causally complex relationships underlying various organizational phenomena have been brought to light (Fiss, 2007). In fact, since then, strategic management scholars, whose focuses are on the determinants of organizational effectiveness, have been inspired to investigate the complex interdependencies among industry, organizational attributes, and strategic actions that potentially underlie the organizational performance via the application of QCA (e.g., Fiss, 2011; Grandori & Furnari, 2008; Greckhamer et al., 2008). One example of such advancement in the use of QCA is the work by Greckhamer et al. (2008), in which the authors investigate how industry, corporate, and business-unit attributes are configured to lead to superior and inferior performance. The industry-related attributes in question were the supporting level of the industry due to abundance of resources, the level of dynamism, and level of competitiveness. Their sample size of 2,841 cases also marked the application of QCA in the large-N data analysis. Nonetheless, the research timeframe was only four years.

Another important example is the work done by Fiss (2011), who further extends the configurational theory by introducing the concepts of core versus peripheral elements, and neutral permutation. The author argues that within a given cause-effect relationship, there are different permutations of peripheral elements (more than one constellation), of equal effectiveness in term of performance, surrounding the core causal condition. Core element is defined to have relatively stronger causal relationship with, i.e. being essential to, the outcome of interest than peripheral elements do. Fiss (2011) empirically tests his arguments by revisiting Miles and Snow (1978, 2003) typology with a sample of

205 high-technology firms in the United Kingdom based on a set of surveys collected in 1999. Besides the structural and strategic attributes at the organizational level, he added in the environmental factor as part of independent measures. Environmental context was measured using the two constructs of rate of change and uncertainty. The intention was to simultaneously examine the configurations of organizational structure, strategy, and environment and their combinational effects on performance, which appears to be largely ignored in the typology studies (as highlighted by DeSarbo, Di Benedetto, Song, and Sinha, 2005; and Hambrick, 1983).

Therefore, research work, such as Greckhamer et al. (2008) and Fiss (2011), might be considered as the response to the call by previous scholars to integrate firm and industry effects into configurational studies of organizational effectiveness (Short et al., 2003a, 2003b). However, perhaps one factor that has been generally controlled in the above studies was the time dimension as the data was collected during a relatively short period (1995-1998) (Greckhamer et al., 2008) or based on single point of time surveys (Fiss, 2011). Time reference is actually what the literature of competitive dynamics adds in to complement traditional view of strategy by industrial organization (IO) paradigm, in which it is suggested that only relative advantage achieved due to temporary and ripples of market inequilibrium. This is in line with Hambrick (1983), who also emphasizes the importance of time factor besides the environmental contexts. Similarly, Levitt and March (1988), in their discussion of organizational learning, highlights the need of understanding equifinality with time factor integrated, that is a strategy might generate different outcomes at different times, or different strategies might lead to the same outcome at different times due to the complexity of the "ecological structure of the simultaneously adapting behavior of other organizations, and by an endogenously changing environment" (page 319). Indeed, the call for examination of the temporal stability of configurations has been brought up since 1993 by Dess, Newport, & Rasheed (1993). Although some studies have responded to this call, there were still not many of them that examined configurational change in term of strategies over time

(Short et al., 2008). One possible challenge with longitudinal design in this case might be the difficulty in maintaining a strong sample size throughout the study period. Another possible room for advancement is related to types of strategic actions that have been considered in previous configurational research. Studies, such as Miles and Snow (1978, 2003), Fiss (2011), appear limiting strategic actions to two generic types: cost leadership or exploitation, and differentiation or exploration. Nonetheless, a closer look at the literature of dynamic capability literature yields insight to additional modes of actions possibly taken by firms in different situations, such as collaboration, merger & acquisition, and consolidation, divestment.

Consequently, the purpose of this research is to continue the work by Greckhamer et al. (2008) and Fiss (2011) to give more consideration to integrate time into QCA, to consider additionally possible strategic actions rather than just exploration and exploitation, and to advance the causal complexity literature in the field of strategic management. Accordingly, the study draws on the QCA's logic and methodological approach as discussed above, especially with the extension by Fiss (2011), to reinvestigate the link between internal variables, organizational structure, strategy, as well as variables that outside the direct control of management, such as environmental context (Figure 2.1). The next sections review relevant literature that is essential to build the research framework of multilevel analysis, namely the extended literature of dynamic capability (resource configuration as firm strategic capabilities), the impact of organizational characteristics, and the literature on industrial and environmental effects.

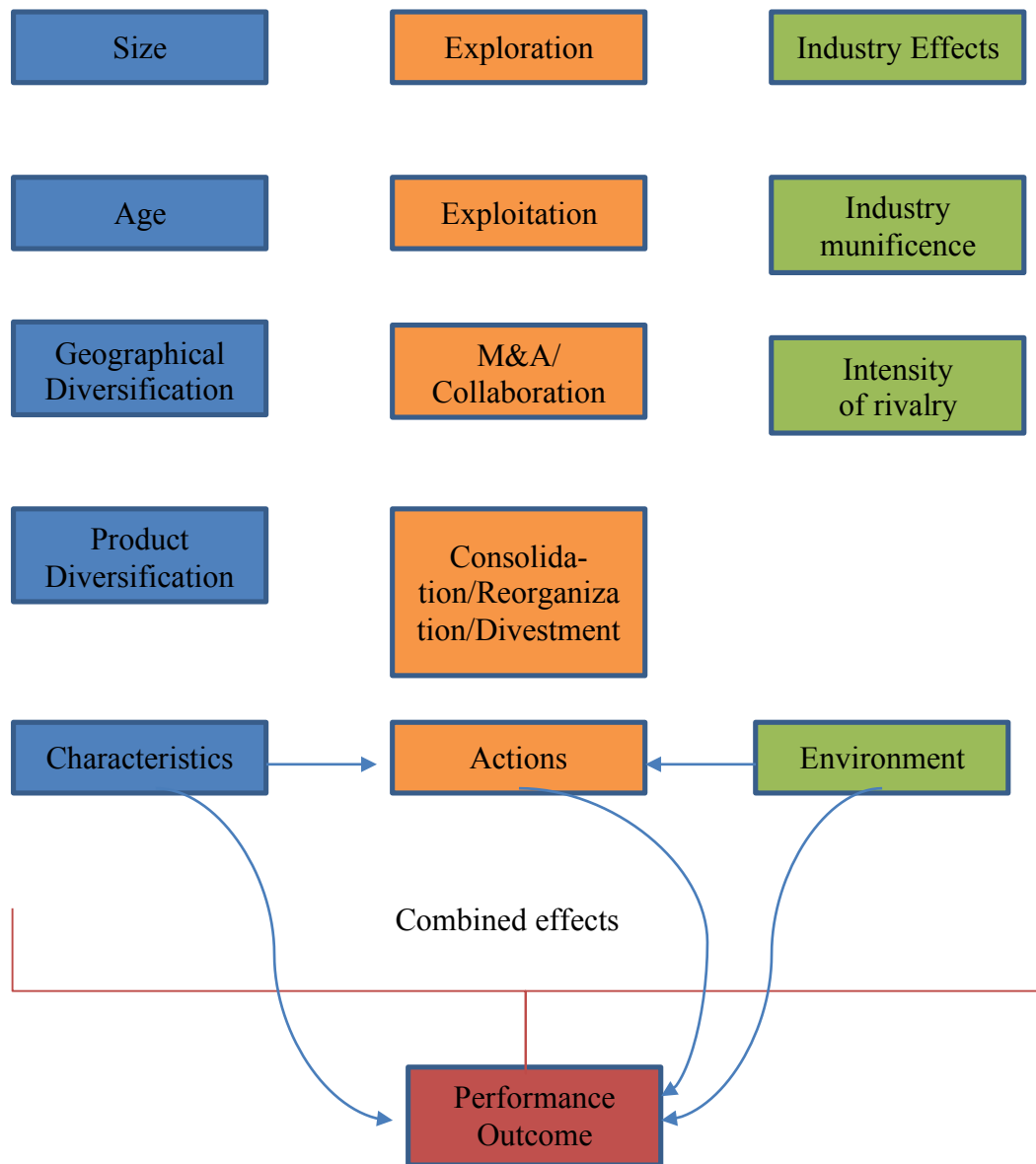


Figure 2.1: Literature review and concept model

2.2 Resource configuration as firm strategic capabilities

The resource-based view (RBV) of a firm is one of the leading theoretical perspectives in strategic management research. The framework puts emphasis on the internal perspective of firms. Earlier treatments of the RBV argued that performance outcome and firm differences could be explained by the ownership of resources that are valuable, rare, inimitable, and non-substitutable (popularly termed as VRIN attributes) (Barney, 1991). Firm resources are defined by Bar-

ney (1991: 101) following Daft (1983) as “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.” Nevertheless, Barney’s (1991) framework has been subjected to criticism by other scholars because it is clearly not sufficient to equate owning VRIN resources to competitive advantage. In order to survive in a constantly changing business environment, managers must be able to alter the resources to the company’s advantage. The roles of managers in Barney’s paper were still relatively static and were not active agents for change. In addition, Porter in his paper at the same year (1991) raised several questions about this RBV framework. One of his arguments was to foster a stronger link between resources and organization activities. It is because resources could be considered as valuable only when they are deployed in ways that create advantages. Moreover, it could be seen that the RBV and IO also share the same static presumption, in which there might be a possibility to create an everlasting advantage (Grimm & Smith, 1997).

For such reasons, scholars such as Teece, Pisano, and Shuen (1997) have extended RBV by introducing the notion of dynamic capabilities. The authors define dynamic capabilities as tools that managers use to manipulate resource configurations in order to generate new value creating strategic moves when there are changes at the environmental level. Resource manipulation might range from acquiring, shedding, integrating, and recombining (Grant, 1996; Pisano, 1994; Teece et al., 1997). A good example is that new product development can be seen as a combination of new product and brand. The constitutive elements of capabilities include routines (also referred as to best known solution to a problem in a certain period), organizational processes (for example, potential ways for product development), capacities and simple rules of thumb. Capabilities are different from and more valuable than ad hoc problem solving (“firefighting” situation); and can be further applied in the long run. It is good to differentiate the concept operational capabilities versus dynamic capabilities. While operational capabilities can be improved by best practices/technical fit-

ness, dynamic capabilities are ones that change the operational capabilities of the company, for example to develop new products or to create market changes.

Further extension on the dynamic capability theory by Eisenhardt & Martin (2000) considered putting resources and dynamic capabilities in the context of market dynamism, which brings in more practical point of view for today's fast changing markets. In addition, the authors believed that long-term competitive advantage could be achieved through competences, which are configurations of company's resources (Eisenhardt & Martin, 2000; Grant, 1991; Verona, 1999). They implicitly suggested that changes in a firm's resource base might be achieved in various ways: leveraging, creating, accessing, and releasing. Leveraging resources enables organizational renewal through drawing on the firm's existing resources. One example of leveraging is to extract additional value from underutilized resources and capabilities to serve a different market fit subject to the fungibility of such resources (Danneels, 2002; Miller, 2003). Second, a new competence may be built through combining newly created resources internally, which requires explorative learning (Levinthal & March, 1993; March 1991). Third, an alternative way to alter the resource base is to access new resources from relationships and interactions with other organizations in its environment instead of building the new one on its own. Examples of this mode include alliances and acquisitions (Das & Teng, 2000; Harrison, Hitt, Hoskisson, & Ireland, 2001). Finally, the last mode of resource modification involves shedding existing resources, such as cutting or deferring capital spending and unessential maintenance, reducing working capital, reducing staff or divesting assets in a business unit when such unit is no longer profitable or in line with the organization's broad strategies. The cut might be also done to support other operations in difficult times with a focus to stay alive.

Dynamic capabilities can be therefore considered as the antecedences of strategic actions by which managers alter their resource base to generate new value-creating strategies (Grant, 1996; Pisano, 1994). The first two resource configuration modes mentioned above correspond to two key mechanisms: respectively

exploitation and exploration that firms employ to develop and create knowledge in order to better fit to their environment according to organizational learning and adaptation theories (Levitt & March, 1988; Levinthal & March, 1993; Lewin, Long, & Carroll, 1999; March, 1991). Exploitation refers to strategic actions leveraging on the existing knowledge and resources with the focus on effectiveness and efficiency (Porter, 1980; Harigan & Porter, 1983), incremental adaption (Gresov, Haveman, & Oliva, 1993), for example, incremental innovation in standardization, upscaling, or refinement on facing hyper-competitive competition. Exploration, on the other hand, refers to the search of new capabilities, resources, and ways of action reaching out to the new knowledge domain. For instance, firms may evade direct competition through research and development, experimentation of new product or less contested market (Kim & Mauborgne, 2005; Dobrev & Kim, 2006; Haveman, 1993). As a result, exploration may yield potentially high but uncertain returns, while returns for exploitation may be moderate but certain and immediate (Lewin et al., 1999; Schulz, 2001).

Furthermore, drawing from the literature on competition-cooperation (Brandenburger and Nalebuff, 1996; Gnyawali and Madhavan, 2001; Hamel, Doz, and Prahalad, 1989; Khanna, Gulati, and Nohria, 1998; Lenz, 1980), and stakeholder theory (Freeman, 1984; Freeman, Harrison, Wicks, Parmar, & de Colle, 2010), Chen and Miller (2015) re-emphasizes alternative views of interfirm competition that go beyond the conventional rivalrous mode of thinking (i.e. to outcompete, to dethrone). By reinstating the competitive-cooperative mechanism and extending it to relational perspectives, the authors argue that firms may not necessarily confine their competitive actions to merely overcome or defend against rivals. Such mechanism enables firms to compete more economically than those only acquire resource unilaterally (Lenz, 1980: 228). This corresponds to the third mode of accessing new resources from outside the organization as mentioned above. In fact, earlier research has attempted to define a similar concept, firm-level cooperative mechanism, which are formal interfirm agreement such as equity purchases, mergers, technology licenses, and partici-

pation in trade associations and technology consortia (Bresser, 1988; Dollinger, 1990; Koh & Venkatraman, 1991). Therefore, there might be different ways to gain advantage, such as by cooperating with one's rivals through sharing human resources, technologies, and patents, or with other related stakeholders, for instance universities, community organizations, or consumer protection agencies to train new experts, reduce pollution or improve product quality (Freeman *et al.*, 2010). These alliances and agreements may nonetheless only pay off in the long run (Ahuja, 2000), as coordinating parties need time to come to trust one another (Gulati, 1995). Lastly, firms may choose to exit a market to avoid rivalry or strategically redefine their market positions. Market exit can be therefore considered as both outcome of interfirm competition as well as strategic move (Baum & Korn, 1996; Caves, 1984; Porter, 1980). This corresponds to the last mode, resource releasing as discussed above.

In addition, from the competitive dynamics perspective, Wiggins and Ruefli (2005) suggested that sustaining a single competitive advantage has no longer been sufficient to survive instead a company needs to look for a series of competitive advantages and explore ways how to integrate them for the best bottom line. This is in line with Porter (1996) in which it was suggested that competitive strategy is achieved through a unique combination of a various sets of activities, which in turn deliver an equivalent mixture of value. Therefore, organizations in various environmental settings may apply a configuration of different strategic actions. For instance, firm could cooperate with its rival to explore a new product. At the same time, it has to find ways to improve current product line in order to fund such new project. Moreover, Lado, Boyd, and Hanlon (1997) argued that a combination of competitive and cooperative strategies would result in a higher syncretic rent. It would be therefore interesting to study when certain modes are more important than the others, that is the balance between competitive positioning categories. Table 2.1 summarizes four action categories that a firm may take on and related corresponding literature.

	Competitive Positioning Categories	Modes of Dynamic Capability Eisenhardt and Martin (2000)	Competitive Dynamics, Organizational Learning and Adaption Literature
1	Exploitation	Leveraging on existing resources	"New way of doing things" (Kirzner, 1973: 79; March, 1991)
2	Exploration	Creating: a competence at adding new competences, at explorative learning	"New things to do" (Kirzner, 1973: 79; March, 1991)
3	Merger and Acquisition / Collaboration	Accessing external resources	Competitive-cooperative and relational modes (Chen and Miller, 2015)
4	Divestment / Reorganization/ Consolidation	Releasing resources	Outcome of interfirm competition as well as strategic move (Baum & Korn, 1996; Caves, 1984; Porter, 1980)

Table 2.1: Summary of four possible general competitive action categories that firms may take on

2.3 The impact of environmental context

The strategy literature largely agrees that choice of strategic actions is related to how closely the organization is aligned with its environment (e.g., Grimm & Smith, 1997; Hofer & Schendel, 1978; Porter, 1980). In fact, it has been contended that some configurations of strategic actions might perform better under a particular context (Short et al., 2008). Early IO emphasizes the importance of industry structure and considers it as the key determinant of performance differences. The famous five-forces model by Michael Porter in his 1980 book on competitive strategy can be considered as the highlight of IO research. According to this model, competitive advantage is achieved if firms are able to identify industry structure and position themselves beneficially against such background. There have been studies showing support that industry really matters. However, majority of such research came from the variance decomposition lit-

erature because the aim is to determine how much performance variation can be explained by various factors. Perhaps two examples of the most influential studies are Schmalensee (1985) and Rumelt (1991). Schmalensee (1985) concluded that industry effects account importantly for variation in performance outcome of American manufacturing firms in 1975. Extending the work by Schmalensee but with the data from 1974-1977, Rumelt (1991) reported that industry effects contributed up to 16% of performance variation although this percentage is relatively lower than the one from Schmalensee's finding of 20%.

Nonetheless, Porter's model and IO in general have been subject to criticism posted by many writers, for example by Grimm and Smith (1997) in their strategic management series published around the same period. The authors highlighted a potential problem with IO in general that the IO models tend to assume industries as in equilibrium and competitive advantage as sustainable. This might be valid in the 80s but today's fast-changing environment might require a constant attention to the dynamics of competitive interaction. As a result, it is implied that a combined analysis of industry structure and dynamic action orientation might provide a more comprehensive guide to the next appropriate strategic choices. In other word, multilevel analysis including both firm and industry level is essential to achieving sustained competitive advantage (Meyer, 1991). Consequently, McGahan and Porter (1997) drew from the models by Schmalensee and Rumelt but extended the data further from 1981 through 1994 from the United States of America public corporations to assess the relative importance of year, industry, corporate-parent, and business-specific effects on profitability. The analyses recognized that variation in firm performance might be explained partly by the resource-based view although the industry effects were relatively more persistent over time.

Two common measures of environmental characteristics that have been used in prior strategic management research are industry growth and competitiveness (e.g., QCA studies: Fiss, 2011; Greckhamer et al., 2008; correlational-related studies: Miller & Chen, 1996; Young *et al.*, 1996). Market growth is often the

prime indicator of market munificence (Castrogiovanni, 1991) as a result of abundance resources (Dess & Beard, 1984). Profitability is theorized to be generally higher in growing industries because competition tends to be more relaxed (Porter, 1980). In the absence of pressure from competition, firms are more reluctant to explore changes or search for alternatives (Barr, Stimpert & Huff, 1992). Therefore, actions tend to focus on the existing domain (Miller & Chen, 1996). In contrast, increasing rivalry due to slower or declining industry demand is more likely to push firms to search for new less competed market arenas (Harrigan & Porter, 1983).

Additionally, studies from IO literature have generally shown that there is a negative relationship between industry rivalry and firm performance (Schomburg, Grimm, & Smith, 1994; Smith, Grimm, & Gannon, 1992; Young *et al.*, 1996). When competition in an industry is intense, the costs of resource acquisition and defending rivals would be high, which effectively results in low profitability. In order to capture the intensity of competitiveness or rivalry in an industry, this paper follows the definition from studies such as D'Aveni (1994); Schomburg *et al.* (1994); Smith *et al.* (1992); Young *et al.* (1996). Rivalry is hence defined as the aggregation of firm-level competitive activity in a particular industry minus the competitive activity of the focal firm (Young *et al.*, 1996: 245). This definition is adopted because it is also consistent with the IO literature and Schumpeter's view, in which it is suggested that rivalry involves interfirm competition based on specific action/reaction dyads (Porter, 1980; Schumpeter, 1942; Smith *et al.*, 2001) and repertoires or streams of actions (Ferrier, 2001; Miller and Chen, 1996). The competition is considered intense when the number of competitive moves in the industry is high. Around the same period, in his book, D'Aveni (1994: 217) introduces the concept of hypercompetition to address environments characterized by extremely vigorous competitive action, in which sustainability of competitive advantage depends on the speed of action and the extent of competitive rivalry.

D'Aveni (1994) argues that rivalry escalates across four arenas of competition, which are cost and quality, timing and know-how, strongholds, and deep pockets. When it is no longer to be able to sustain in one particular arena, competition jumps across to another. The possibly ultimate result of competition in the cost and quality arena would be a price war, which is similarly depicted as the zero-sum game due to the exploitation of cost leadership strategy (Porter, 1980; 1986). Consistent evidence has also been found in the competitive literature, when rivalry starts to escalate, firms are likely to initially focus on current capabilities (Cyert & March, 1963), incremental adaption (Gresov, Haveman, & Oliva, 1993), and cost efficiency (Porter, 1980). Consequently, firms in this arena would have to redefine quality and adjust pricing until some point, the cost of engaging such exploitation action outweigh the potential benefit to be gained. Eventually, some of them have to move to the timing and know-how arena. Actions in this arena involve exploration-driven activities that search for new capabilities, resources, and ways of action reaching out to the new knowledge domain. This would be similar to the differentiation strategic positioning (Dobrev & Kim, 2006; Haveman, 1993; Kim & Mauborgne, 2005; Porter, 1986), which brings out new products that change the rules of the market. Nonetheless, first mover advantages from innovating might soon vanish due quick imitation by rivals even though firms create protected entry barriers. Unfortunately, as strongholds would soon be breached through the entry of increasing numbers of new rivals, the competition shifts to deep-pocket strategy. Large incumbents harness their superior financial resources while smaller firms can join forces through cooperative mechanisms such as strategic alliances, joint ventures, and merger and acquisition. For example, Young et al., (1996) found evidence that cooperative actions have a positive effect on firm's capability to perform more competitive activity, which is in turn positively related to firm performance.

Lastly, under such rivalrous turbulence, some firms survive while there are others deciding to exit their existing line of business because of inability to remain competitive in that industry segment (Lewin et al., 1999). Therefore, it can

be seen that the level of industry rivalry affects how firms position their strategic actions. Indeed, there is no easy path in such hypercompetitive environment with every advantage is just temporary and sometimes battles can happen simultaneously in multiple arenas. As a result, what firms need is again a configuration of strategic actions instead of just focusing at one at a time.

2.4 The influence of organizational characteristics

One important focus of the competitive dynamics research has been on how organizational characteristics of a focal firm influence its choice of strategic actions and how those actions are implemented (Smith et al., 2001). Notable variables are size, age, product and market diversity (Size: Chen & Hambrick, 1995; Miller & Chen, 1994; 1996; Smith et al., 1991; Age: Lant, et al., 1992; Young et al., 1996; Multimarket presence: Gimeno & Woo, 1996; Baum and Korn, 1996; 1999).

It may be since Schumpeter in his 1942's work argued that large firms might be relatively more powerful and innovative, thus be able to maintain competitive advantage. The reasons might be due to the fact that large corporations have the advantage of scales and scopes (Hannan & Freeman, 1984; Scherer and Ross, 1990). It might be relatively easier for them to acquire financing, and their costs can be spread over sales volume. Following that argument, although the focus was more particular into innovation, organizational size has been one of the key characteristics being widely studied to explore its effect on competitive actions. Even though the findings have been mixed, general evidence suggests that large firms might be better in influencing their environment. As a result, they are able to buffer themselves from rivals through carrying out more effective and timely competitive actions (Smith et al., 2001). Other research points out that large organizations are likely to carry out more total competitive actions in a given time period (Young et al., 1996). Large firms are also more likely to respond to competitors' competitive challenges. Relatively smaller organizations, on the other hand, tend to initiate more attacks and be speedier and stealth in executing such activities. They likely to avoid confronting larger

competitors and leverage their invisibility to explore neglected markets (Chen & Hambrick, 1995, MacMillan, 1980; Smith et al., 2001).

Another noteworthy attribute is firm age, which is reported together with size to have influence on firm's search incentives (Miller & Chen, 1996). Drawing from organizational ecology literature, changes are challenging for old organizations due to inertial pressures (Aldrich & Auster, 1986). Prior research also suggests that as firms age, they tend to repeat successful-proven strategies, and form routines toward internal consistency and specialization (Miller & Chen, 1995). Relatively newer firms also face different sets of problems that hamper their adaptation. They face liability of newness, and have to compete with incumbents in their industries in terms of resource acquisition and customers' recognition. Hence, they are motivated to continually scan for any opportunities that may arise (Smith et al., 2001). In addition, young organizations tend to undertake a more complex competitive repertoire to avoid competitive simplicity (Miller & Chen, 1996).

Furthermore, as mentioned earlier in Miles and Snow (1978, 2003)'s typology of generic organizational configurations, size and age represent important attributes characterizing the organizational structure. Quite to the contrary to Schumpeter (1942: 106)'s perspective on large firms being the most innovative, large and established firms, labelled as defenders in Miles and Snow's typology, tend to focus on stability and hence pursue cost leadership (i.e., exploitation) rather than differentiation (i.e., exploration) strategy (Miller, 1986; Segev, 1989; Shortell & Zajac, 1990). In contrast, prospectors, or small but growing new entrants, are more likely to search for new opportunities. Hence, they focus on innovation and product features, which resembles differentiation strategic archetype (Miller, 1986; Parnell, 1997; Segev, 1989). In fact, Aldrich and Auster (1986) argues that the strengths of large and old firms are actually the weaknesses of small and new ones, and vice versa.

Additionally, firms can compete each other across multiple markets within an industry in term of number of product segments offered or of geographic regions that they operate. Product and market diversification thus can be seen as the proxies for market diversity. This paper adopts the position suggested by Baum and Korn (1999) that multimarket contact should be viewed as the dynamic interaction between firms and their rivals across markets in which they engage. This stand is different from other conventional perspectives in which multimarket contact is treated as an aggregate property of industries, markets, firms, or as an external factor. Furthermore, past research reports that firms with multimarket contacts tend to achieve higher profits and survive longer (Scott, 1991; Baum and Korn, 1999; Pilloff, 1999; Haveman and Nonnemaker, 2000; Gimeno, 2002). In fact, organizations that confront several rivals and customers in various markets would face a large number of competitive challenges, but also opportunities (Dess & Beard, 1984). They would observe and absorb a variety of competitive tactics as part of their learning journey (Chen & Miller, 1994). In addition, multimarket research on pricing, profits, and longevity maintains that multiple point competition may lead to mutual forbearance against competition. Mutual forbearance refers to the situation, in which firms tend to less vigorously compete to take market share from each other. Hence, rivalry behaviour may be fairly predictable, and sales grow at uniform rate (Edwards, 1955; Karnani and Wernerfelt, 1985). On the other hand, firms of less market diversity are theorized to be more aggressive with competitive actions in those few markets that they are in.

To summarize the above review, earlier research has identified the antecedents that might affect firm performance, namely environmental context, choice of strategic actions, and organizational characteristics (Appendix 1). Nevertheless, the findings came mostly from the conventional net-effect thinking, in which attributes' impacts on performance outcome are treated independently instead of conjunctural, equifinal, and asymmetrical causal relations. This thus calls for the need to uncover the causally complex interrelationships between organiza-

tional characteristics, strategic choices, environmental change, and firm performance, which is to be carried out in this study.

3 DATA AND RESEARCH METHOD

3.1 Research setting - The pulp and paper industry from 1989 to 2015

The context for analysis in this study is the pulp and paper industry. The term pulp and paper (P&P) industry company refers to firms that are involved in manufacturing various paper and paperboard products from pulp. The P&P industry has increasingly become attractive as a research context as it has been experiencing maturity phase while undergoing radical changes. Recent general observations have shown that P&P industry is mature, capital-intensive, of incremental development in technology, and there has been shifting demand to other types of paper products, and divergence of GDP growth and paper consumption (Lamberg & Ojala, 2006; Lamberg, Ojala, Peltoniemi, & Särkkä, 2012).

Changes at first can be observed from a purely economic point of view, that is there had been relatively strong correlation between the consumption of paper and economic growth until 1990s (Järvinen, Lamberg, Murmann, & Ojala, 2009). This linear relationship, however, has already ended in the 1990s in USA and subsequently in other OECD (The Organisation for Economic Co-operation and Development) countries (Hetemaki & Mikkola 2005). Possible explanations for such divergence from the industry analysts are related to transitions to digital media and paperless communication across most developed economies. On the other hand, academic researchers suspect that there might be a saturation point after which growth in national and individual wealth does not increase paper consumption (Lamberg et al., 2012). In addition, there has been a shift in focus to paperboard and hygiene products in the industry as a whole. The shift in demand, especially the packaging materials, is expected to continue according to a forecast study conducted by Lamberg and his colleagues for the period 2005-2050 though the growth

spreads rather unevenly over different regions. Therefore, the studied interval 1989-2015 represents interesting opportunity to unveil insights of how firms in the industry did to thrive in such period of high turbulence. The period also covers the transition from end of 20th century to the beginning of 21st century.

Indeed, the study interval includes a time period of high competitive activity in P&P industry (Lamberg & Ojala, 2006), as a result of which profitability was affected. A downward trend of average profitability from the sample companies could be seen from Figure 3.1, which is consistent with the notion that competition in the maturity of an industry could turn competition into a zero-sum game (Porter, 1980). Indeed, a series of economic turbulence since the early 1990s has led to a fortified economic integration and set international competition as a norm (Siitonen, 2003). The industry has therefore evolved through a wave of merger, acquisition, and consolidation activities to a global rivalry between a few dominant firms in the early 21st century. The consolidation tended to go for vertical integration, in which firm moved forwards in the production chain, and were diversified into other new paper products. This trend has resulted in similar diversified and multi-divisional corporates since the 1970s. For instance, the number of pulp and paper firms dropped by half by the year 2000 as compared to the beginning of the century. In addition, the number of companies producing only pulp has decreased significantly during the latter part of the 20th century (Lamberg & Ojala, 2006; Toivanen, 2012). Competitive actions therefore appear more visible and to be able to affect rivals broadly.

Moreover, as Chandler (1990: 113) stated, in the paper industry “the technology of production was not complex enough to provide an incentive for a substantial investment in research and development”, the common mode of competing in this industry has been exploitation-driven with the focus on efficient production. Process innovation and introduction of new equipment, for instance towards larger more efficient mills, have been essential for

achieving productivity growth. On the other hand, exploration-driven activities in P&P industry pose a high level of risk, partly due to high cost of initial investment and equipment's fungibility (Diesen, 2007). Technological innovation, as a result, has appeared rather gradual than major breakthroughs leaps (Cohen, 1984; Magee, 1997). Despite the fact that radical changes in such industry might be measured in decades, there have been still technological development recorded from the 20th century, for example, the automation and computerization of the production control systems, increased usage of recycled fiber, and the creation of wood-free paper grades (Diesen, 1998; Ojala, Lamberg, Ahola, & Melander, 2006; Laurila, 1997, 1998).

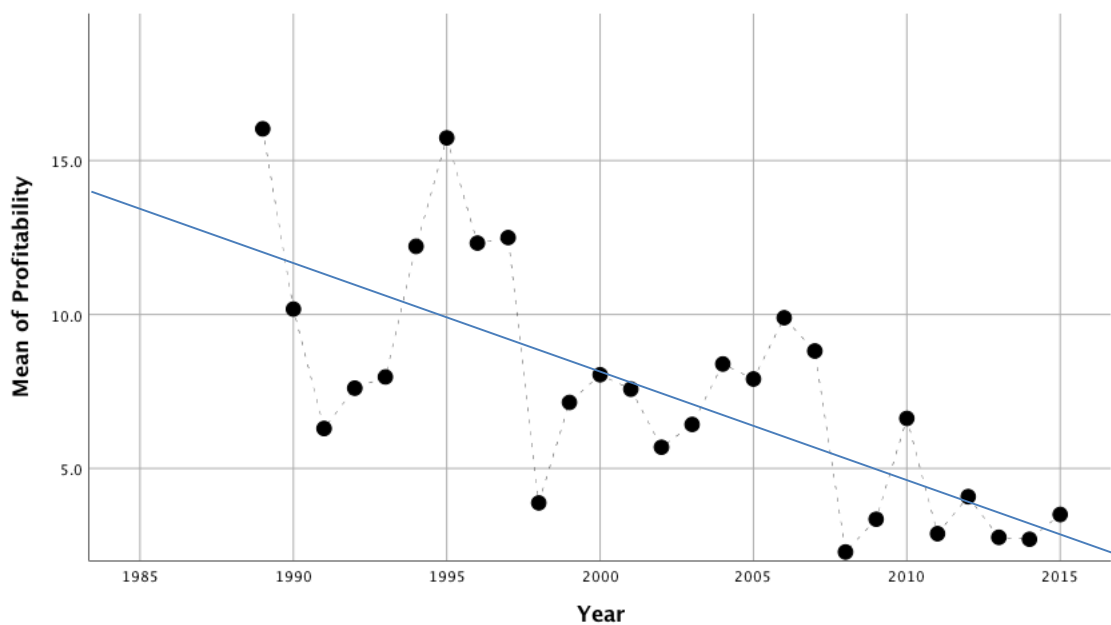


Figure 3.1: Scatter plot of mean of profitability from the sample firms during 1989-2015

For the purpose of temporal comparative analysis, the studied period of 1989-2015 is further divided into different sub-periods. Periodization is based on the global market's paper and paperboard consumption growth rates calculated by utilizing the production, export, and import data retrieved from Food and Agriculture Organization of the United Nations statistics (FAOstat) databases. It can be observed from Figure 3.2 that there were two noticeable peaks in 1999 and 2010. These peaks are used as the dividers to split the whole stud-

ied period into sub-intervals. The sub-periods are 1989-1999, 2000-2010, and 2011-2015. In the first two sub-periods, it can be seen that the growth rate went down, fluctuated, and regained its height as before, which would be interesting to explore how firms rode through those waves. The same pattern could actually be observed from the profitability movement chart (Figure 3.1). During the last sub-period, due to data constraint (the data collection for this study was initiated in March 2016), only the first five years of the cycle was analyzed.

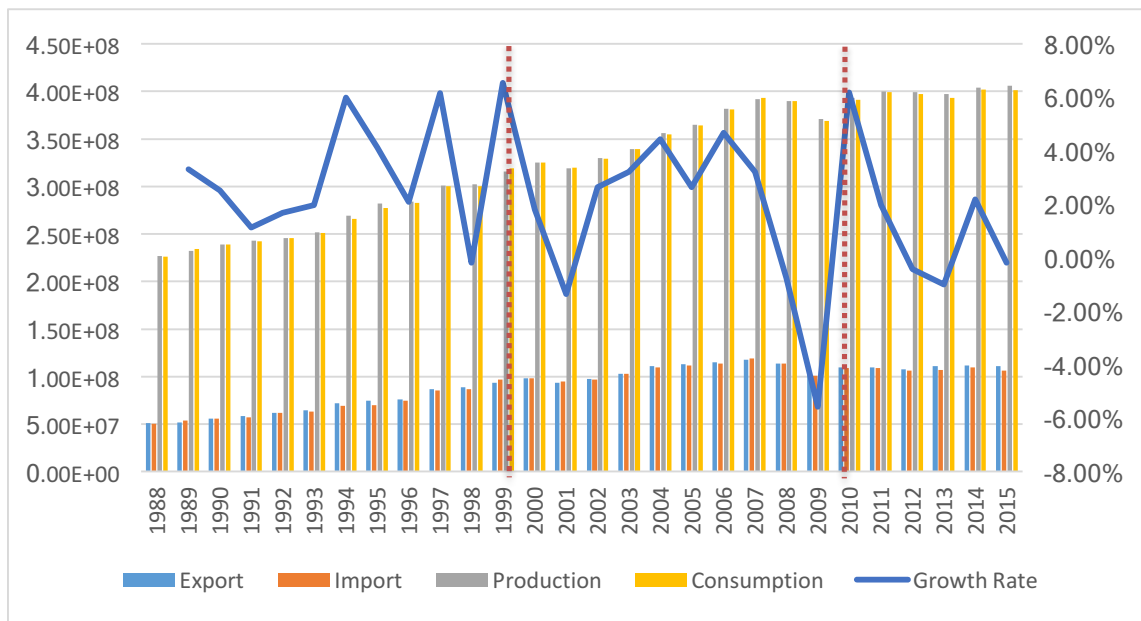


Figure 3.2: Growth rate of global market's paper and paperboard consumption 1989-2015

3.2 Data

Chen and Miller (2015) pointed out that strategic management analysis research has tended to focus on a single industry, and mostly applied U.S.-centric samples. Therefore, in this study, I would like to use world-scale sample data for the analysis. According to Ginsberg (1988) and Jauch, Osborn, and Martin (1980), an effective way to develop large-sample multivariate research designs for strategic process exploration is through content analysis of published histories about firms. This technique has been employed in other dynamic strategy studies (e.g., Chen, Smith, & Grimm, 1992; Smith et al., 1991). Therefore, I used

structured content analysis to categorize strategic actions based on news headlines and abstracts collected from a centralized source Innventia. Innventia hosts Paperbase International database, which contains references to technical, scientific and market-focused information. It covers the entire chain, from the properties of the raw material, to finished products, chemicals and new materials. The database contains over 260,000 references to journal articles, conference papers, research reports, books, etc. from 1975 onwards, and is updated every week (Anon, 2016).

News headlines and abstracts were gathered for Top 100 companies in the pulp and paper (P&P) industry, from 1989 to 2015. The Top 100 ranking is based on the net sales of pulp, paper, converting and merchanting operations, which is published annually on the journal Paper and Pulp International (PPI), for each year from 1989 to 2015. In total, there are 208 firms that have been listed on PPI Top 100 at least one time during the examined period. In addition, other relevant data for each firm was also extracted from the PPI magazine in the September issues of all years between 1989 and 2015. This data includes figures for pulp and paper sales, profit, and the number of employees. Data relating to founding years, product and market diversification was compiled from various sources including companies' reports, database of Paper and Pulp companies of the world (compiled by a group of authors in Lamberg, Näsi, Ojala, Sajasalo (2006)). As for market growth, it was reflected through the growth in global paper and paperboard consumption.

Following one of Langley's (1999) research strategies, the quantification strategy, competitive actions were coded from newswire and abstracts. Coded actions were then categorized according to the proposed four competitive positioning categories: (1) exploitation, (2) exploration, (3) merger & acquisition/collaboration (coded as "MACOLLA"), and (4) divestment/reorganization/consolidation (coded as "CONSOREORG"). Quantification strategies have been widely applied in event data analysis in strategy research (Miller & Chen, 1994; Smith et al., 2001) as well as in organization stud-

ies (Hannan & Tuma, 1979) to facilitate inter-organizational comparisons and to clarify organizational strategy paths. The textual data collected from news abstract were thus scanned and auto-coded into quantifiable data using ATLAS.ti, a proprietary computer assisted/aided qualitative data analysis (CAQDAS) software. Automated content coding utilizing keywords or more complex context specific coding rules has proven its reliability as manual coding in recent studies (King & Lowe, 2003; Laver, Benoit, & Garry, 2003).

For this purpose, I developed a code list (see Appendix 2) covering the most possible actions. In particular, actions such as incremental investments (e.g., new equipment, machinery, mills, or plants, expansion, rebuilding, upgrade, modernization) and process improvements (e.g., automation and integration by new system or software) are viewed as exploitation driven activities. On the other hand, exploration actions include exploratory internal development (e.g., new technologies, new patents, product innovations) or exploratory sensing activities (e.g., research and product development, laboratory experiment). The keywords for merger & acquisition are straightforward whereas collaboration refers to joint venture, partnership, and cooperation. In turn, the last action category covers closure, downtime activities, reorganization, restructuring, and consolidation. News covering market trend information such as market report, trend report, statistics, and case study was excluded from the data. For the avoidance of doubt, one news abstract could be coded as more than one action category if the abstract includes keywords belonging to those categories. Furthermore, to avoid duplication within one news abstract, even auto-coding results return more than one count for the same action category as there are multiple keywords representing such category, the count remained as 1. For example, if the news included “down times”, “foreclose”, and “divested”, such observation would be coded as 1 for “CONSOEORG” category though the count was returned as 3. The final sample includes approximately 1,400 cases for the whole period 1989-2015. A case represents a company in a certain year with full observations for every measure, i.e., no empty cell within that row.

3.3 Method

Fuzzy set Qualitative Comparative Analysis

As highlighted in the review of causal complexity literature, causal relations are frequently better understood in terms of set-theoretic relations rather than correlations (Fiss, 2007; Ragin, 1987, 2000, 2008; Ragin & Fiss, 2008). In order to analyze the configurations resulting in positive performance outcomes in this study, I employ the fuzzy set Qualitative Comparative Analysis (fs/QCA), which can be considered as a relatively novel methodology for modeling causal relation (Ragin 2000, 2007, 2008).

One notable advantage of fuzzy-set approach is that it enables capturing both quantitative and qualitative elements of variables' diversity as a categorical and qualitative distinction (e.g., small versus large firms), and differences in degree of membership in a category (e.g., a firm's membership in a set of positive profitable firms). A set membership score is assigned for each condition (e.g., organizational characteristics, strategic actions, and industrial contexts) for every studied case (e.g., firms). Moreover, fuzzy sets can be negated or combined by using the common logical operators "and" and "or". Interestingly, with fuzzy sets, set membership is not restricted to binary values (i.e., presence/absence dichotomies) as in crisp-set approach. In order to address the varying degree to which different cases belong to a set, the membership score may be assigned to any continuous value between zero and one, with one indicating full membership and zero for non-membership. Any value between one and zero indicates partial or fuzzy membership in the set. Nonetheless, as fuzzy-set approach is not interested in how cases differ from one another in quantifiable magnitude of open-ended variation, it is necessary to establish criteria for the qualitative anchors: full membership, partial membership, and non-membership.

In general, fsQCA proceeds in three steps: data calibration and truth table construction, sufficiency testing, and reduction of truth table to simplified combinations. Detailed discussions on the nature of the causal inference in the fsQCA,

the set-theoretic definitions of necessity and sufficiency can be found in Ragin (2000), on truth table algorithm in Ragin (2007), and on core and peripheral conditions, neutral permutation in Fiss (2011). In brief, the analysis with fuzzy set QCA starts with transforming outcome and independent measures into set calibrated following three substantively meaningful thresholds: full membership, full nonmembership, and the crossover point. The crossover point is “the point of maximum ambiguity in the assessment of whether a case is more in or out of a set” (Ragin, 2008: 30). Determining such breakpoints requires substantive and theoretical knowledge (Ragin, 2000). Uncalibrated measures permit assessment of the positions of cases relative to one another. Calibrated measures, on the other hand, are directly interpretable. For example, calibration would permit one to classify a company as high or not high performer, rather than merely better or poorer performing than other companies. Subsequently, these calibrated set measures are used to construct a data matrix, i.e., the truth table with 2^k rows, where k is the number of causal conditions selected for analysis. Each row represents a specific combination of attributes, and the full table lists all possible combinations.

In the second step, the number of rows is reduced according to two conditions: (1) the minimum number of cases (membership frequency) required for a solution to be considered, and (2) the minimum consistency level of a solution. The current study applies a refined measure of consistency introduced by Ragin (2006), which was also used in Fiss (2011). Accordingly, the lowest acceptable consistency score for solution is set at higher or equal to 0.80, which is above the minimum recommended threshold of 0.75 (Ragin, 2006, 2008). Scores of less than 0.80 generally indicate substantial inconsistency and that a sufficiency relationship does not exist. Furthermore, the minimum acceptable frequency threshold was set from five to one. The frequency threshold identifies the minimum number of observations that must be present for a truth table row to be included in the analysis. For example, if I specify a frequency threshold of five, any truth table row with fewer than five observations will be classified as a “remainder”, i.e., should be treated as if they do not empirically exist. Nonethe-

less, in case solution terms could not be found (maybe due to lower number of observations that correspond to the studied outcome), I still keep consistency cut off level at 0.8 but set a lower frequency threshold to four, and progressively to one if necessary.

Lastly, the Quine–McCluskey algorithm of QCA is employed to logically reduce the truth table rows to simplified combinations. In total, three solution terms are obtained: complex, parsimonious, and intermediate solutions. While the complex solution does not allow for any simplifying assumptions to be included in the analysis, the parsimonious solution reduces the configurations to the smallest number of conditions possible by reanalyzing the truth table with the remainder rows set to “don’t care” (Ragin, 2007). In other words, the complex solution only relies on the empirically observed configurations of conditions. The parsimonious solution, on top of the empirically observed configurations, are also based on some of the non-observed configurations of conditions that are contained in the truth table (i.e., logical remainders). The purpose is to find out the solution, in which the fewest number of conditions are involved and therefore includes the logical remainders that could help simplifying the complex solution. The conditions included in parsimonious solutions are prime implicants, and thus cannot be left out of any solution to the truth table (Ragin, 2008). With regards the intermediate solution, it can be understood as the complex solution being reduced further by the conditions that contradict the focal study’s theoretical assumptions about the presence/absence of conditions. The researcher must therefore select how each causal condition should theoretically contribute to the outcome when being “present”, “absent”, or “present or absent”. Finally, according to Fiss (2011), the notion of core and peripheral conditions is based on these parsimonious and intermediate solutions. Core conditions are those that are part of both parsimonious and intermediate solutions, while peripheral conditions are those that only appear in the intermediate solution.

*Model specification and Data calibration***Outcome measures**

The primary outcome of interest in this study is firm performance, return on sales, measured as net profit margin and calculated as net earnings (after tax and excluding extraordinary items) divided by sales revenue. This is one of the two commonly accepted financial measures of firm performance (return on sales and return on assets) (Young et al., 1996). Data to calculate annual net profit margin was collected from PPI top 100 magazines. I calibrated this measure by benchmarking it to the overall performance of other firms in my sample dataset instead of using another independent anchor, such as industry report. In addition, industry reports might not be able to cover such extended period from 1989 to 2015 due to data unavailability. In order to justify such action, I compared the average net profit margin for companies collected from the PwC Global Forest, Paper & Packaging Industry Survey - 2016 edition with the one from the studied data (Blocker, Bromley, & Murdoch, 2016). The survey by PwC summarizes the 2015 publicly available year-over-year from 2011 to 2015 financial information of the PwC Top 100 - the largest forest, paper, and packaging companies in the world, ranked by sales revenue. For the same period 2011-2015, the average net profit margin from PwC report is 3.6%, which is very similar to 3% calculated from the sample data. The average net profit margin for the whole dataset (208 companies, 1989 - 2015) is 7.75%.

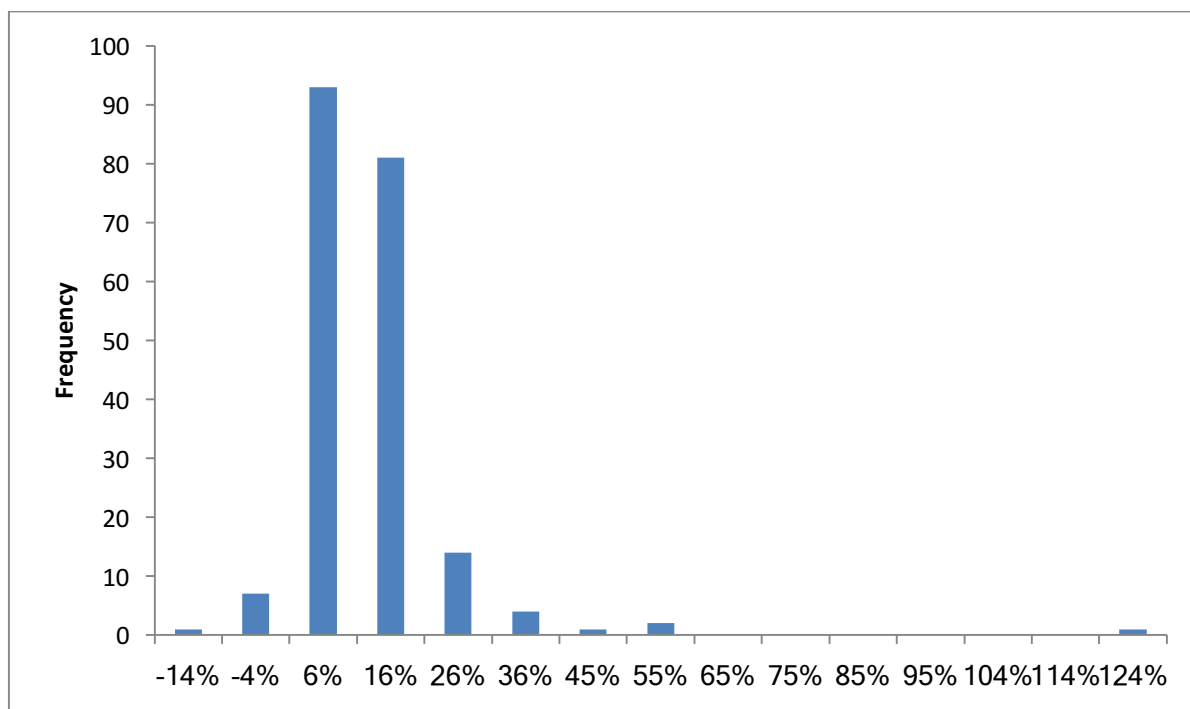


Figure 3.3: Net profit margin distribution from the sample data set

PwC top 100	US bil				
	2015	2014	2013	2012	2011
Sales revenue	317.2	333.2	355.2	352.9	353.8
Net income	12.1	14.3	13.7	10.5	10.7
Net profit margin	4%	4%	4%	3%	3%
Average net profit margin 2011-2015	3.6%				

Table 3.1: PwC Global Forest, Paper & Packaging Industry Survey

In order to analyze the configurations that lead to superior performance, I created three options to measure firm performance: above average performance based on the sample set, above average of PwC Top 100 2011-2015, and positive margin. Performing analysis on three options allows capturing any possible recipes. In Option 1, a fuzzy set measure of above-average organizational performance was created. Membership in this set was coded 0 if a firm shows below average performance (i.e. margin less than 7.75%). In other words, the margin of 8.39% (10th percentile of the above average margin) is equal to full non-membership in the target set (this value is assigned a fuzzy score of 0.05). A fuzzy score of 0.95 (i.e., full membership) is assigned to firms which showed

high performance (margin higher than 28.35%; i.e., the 90th percentile or higher). For the crossover point, I chose the 50th percentile (11.57%). In Option 2, the average net profit margin of 3.6% from PwC Top 100 (2011-2015) is used instead of 7.75% in Option 1. As for the last option, the fuzzy set measure of firms with positive profit margin is created. Membership in this set was coded 0 if a firm shows approximately zero or negative margin. In other words, a margin of 1.13% (10th percentile of the positive margin) is equal to full non-membership in the target set. A fuzzy score of 0.95 is assigned to firms which showed highly positive performance (margin higher than 17.57%). The 50th percentile of 7% margin was chosen as the cross-over threshold. Table 3.2 reports fuzzy scores from the three options for performance outcome together with other independent measures.

Independent measures

Following Smith et al. (1997) and Young et al. (1996), the measure of firm strategic actions was expressed quantitatively as the sum of moves undertaken by a firm in a given year. Nonetheless, in order to avoid the distortion effect due to fluctuation in number of journals that published the news throughout the period, I used relative shares of actions for calibration instead of absolute values. For example, there might be more journals before 2000 than 2015, hence there were more counted actions before 2000. For each firm in each year, I summed up the total actions taken in that year and used that sum to calculate annual percentage shares for four action categories. To calculate the three breakpoints for each action measure, I took the 10th, 50th, and 90th percentiles respectively from the series made of the relative shares from 208 firms throughout 27 years (1989-2015) in that action category. For example, referring to Table 3.2, in EXPLORATION measure, if the relative share of exploration category in a certain year is below 3%, a fuzzy score of 0 would be given, while a share of more than 40% would give that observation a full membership (fuzzy score of 0.95).

Firm age was measured in years between the founding timepoint of a firm and the year of actions undertaken (Miller & Chen, 1996). In turn, organization's size was based on the number of employees (Blau & Schoenherr, 1971). For the measure of market diversity, due to data limitation for previous years, I used the information on geographic and product diversification as of 2015 data with the assumption that such information should be stable in the long-term. Geographic diversification ("GEODIV") of a company is measured as sum of the markets, in which it is present. These markets are America, Asia, Australasia, Europe, Middle East, Scandinavia, and South America. Similarly, product diversification ("PRODIV") is assessed by aggregate of the product segments that a firm produces (Bourgeois, 1980). There are seven product segments identified for product diversification: pulp, paper, tissue, packaging, forest product, other paper & pulp related products, and others. As for the macro indicator, market growth ("MKT") is measured by the global market's paper and paperboard consumption annual growth rates. The rates were calculated by utilizing the production, export, and import data retrieved from FAOstat databases. In addition, industry rivalry, the intensity of competitiveness ("COMPETITIVE"), was defined as the sum of firm moves in the industry. Such definition was simplified as compared to the one used by Young et al. (1996), in which the measure should be calculated by taking the aggregation of firm actions minus the focal firm's own moves. Finally, the determination of breakpoints for the above-mentioned measures was carried out by the same way as in the case of strategic-action measures, i.e., taking 10th, 50th, and 90th percentiles of the whole data series respectively for scores of 0.05, 0.5, and 0.95.

In the current version of the fsQCA software package (3.0), the transformation is automated by using the "compute" command once the three breakpoints have been defined. For a detailed description of the calibration procedure, readers might refer to Ragin (2008: 86-94). Moreover, Ragin (2008) recommended avoiding the use of 0.5 as the membership score for independent measures. Due to the law governing the intersection of fuzzy sets, cases with scores of exactly 0.5 are difficult to analyze. To avoid such technical issue and ensure that

no cases are dropped from the analyses, following Fiss (2011), I added a constant of 0.001 to the causal conditions of scores below 1.

Calibration for Outcome measures

		Fuzzy score	Profit margin option 1	Profit margin option 2	Profit margin option 3
Percentile	0.90	0.95	28.35%	18.41%	17.57%
	0.50	0.50	11.57%	8.37%	7.00%
	0.10	0.05	8.39%	4.19%	1.13%

Calibration for Strategic action measures

		Fuzzy score	EXPLO-RATION	EXPLOI-TATION	MA-COLLA	CONSO-REORG
Percentile	0.90	0.95	0.40	0.36	0.50	0.45
	0.50	0.50	0.21	0.14	0.32	0.25
	0.10	0.05	0.03	0.03	0.14	0.08

Calibration for Organizational characteristic and Industrial context measures

		Fuzzy score	SIZE	AGE	GEO-DIV	PRO-DIV	MKT	COM-PETITIVE
Percentile	0.90	0.95	21,807.48	139.06	5.00	5.00	6.16%	1274
	0.50	0.50	3,478.57	57.08	2.00	3.00	2.19%	689
	0.10	0.05	772.12	10.20	1.00	1.00	- 1.06%	506

Table 3.2: Summary of calibration for outcome and causal conditions

4 RESEARCH FINDINGS

4.1 General information

Table 4.1 shows the origin of firms included in this study. In total, there are 208 firms from 34 countries. Majority of them (33%) came from America continent, followed by 27% from Europe, 19% from Asia, and 11% from Scandinavia.

Company home continent	Country	Number of firms	
Africa	South Africa	3	
America	Canada	19	
	Mexico	2	
	USA	48	
Asia	China	11	
	Hong Kong	1	
	India	2	
	Indonesia	1	
	Japan	17	
	Korea	3	
	Taiwan	2	
	Thailand	2	
	Australasia	Australia	4
		New Zealand	1
Europe	Austria	8	
	Belgium	1	
	France	9	
	Germany	12	
	Ireland	1	
	Italy	7	
	Luxembourg	1	
	Netherlands	3	
	Poland	1	
	Portugal	3	
	Spain	2	
	Switzerland	3	
	UK	5	
Scandinavia	Finland	11	
	Norway	2	
	Sweden	10	
South America	Brazil	9	
	Chile	2	
	Mexico	1	
	Venezuela	1	
Total	34	208	

Table 4.1: Summary of firm origins

In turn, table 4.2 presents descriptive statistics and correlations for all measures. In general, there are positive correlations between size, age, and degree of diversification as expected. Size, age, and geographic diversification measures are also positively correlated with exploration activities, which is consistent with the notion that large firms might have strong balance sheets to support exploration driven projects. On the other hand, there is a positive correlation between the level of exploitation and product segment diversity, which means that firms might need to extend their product types by adding in features to their existing products or incrementally enhancing current equipment. Interestingly, merger & acquisition, and consolidation activities appear negatively associated with both exploration and exploitation ones. A possible explanation could be that firms reorganized for other purposes, for example to merely survive the crises. Perhaps in these cases, firms did not join forces to collaborate on research activities or to incrementally investment on plants and equipment. Finally, as would be expected, the observations that organization performance is positively correlated with market growth but negatively correlated with the competitive intensity actually confirm what has been discussed in the literature review of industry level impact.

	<i>Mean</i>	<i>s.d.</i>	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Profitability option 1	.20	.33	1.00												
2 Profitability option 2	.32	.38	.93**	1.00											
3 Profitability option 3	.40	.36	.87**	.98**	1.00										
4 Size	.63	.30	.11**	.14**	.16**	1.00									
5 Age	.54	.33	.03	.03	.03	.19**	1.00								
6 Geodiv	.57	.36	-.01	.01	.04	.33**	.23**	1.00							
7 Prodiv	.58	.35	.07**	.07**	.07*	.26**	.07**	.01	1.00						
8 Exploration	.47	.42	.06*	.06*	.06*	.19**	.24**	.25**	.03	1.00					
9 Exploitation	.36	.39	.04	.07*	.07**	.04	-.01	.02	.15**	-.05	1.00				
10 Macolla	.43	.42	-.02	.00	.01	.08**	-.07**	.08**	-.07*	-.30**	-.28**	1.00			
11 Consoreorg	.46	.41	-.09**	-.11**	-.11**	-.02	-.07**	-.07*	.02	-.27**	-.22**	-.26**	1.00		
12 Market growth	.45	.34	.24**	.25**	.24**	.05	.01	.04	.06*	.04	.05	-.02	-.05	1.00	
13 Competitive intensity	.51	.30	-.19**	-.19**	-.17**	-.06*	-.01	-.08**	-.08**	.00	-.10**	.04	.10**	-.29**	1.00

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Profitability option 1: above average performance based on the sample set. Option 2: above average of PwC Top 100 2011-2015. Option 3: positive margin.

Table 4.2: Descriptive statistics and Correlations

4.2 Findings

Tables 4.3 and 4.4 show the summary of my fuzzy set analyses for three sub-periods. The notation for solution tables follows Ragin and Fiss (2008), and Fiss (2011). Success solutions (achieving positive profit) are denoted with a capital S (success) in front of the solution name, while a capital N (non-success) is applied for non-success solutions (non-positive profit). Black circles (“•”) indicate the presence of a condition, and circles with a cross-out (“X”) indicate its absence. In addition, large circles refer to core conditions, and small circles represent peripheral conditions. Blank spaces in a solution indicate a “don’t care” situation in which the causal condition may be either present or absent. Only analyses for positive profit margin (option 3) were reported because not all configurations in other two options passed the consistency threshold of 0.80 for three sub-periods. In addition, intermediate and parsimonious solutions were used to determine core and peripheral elements within a configuration.

In terms of overall coverage, the combined success recipes account for about 21 percent of membership in the outcome in sub-period 1989-1999, 15 percent and 14 percent for subsequent intervals respectively. The figures are 8 percent, 22 percent, and 26 percent respectively for non-success recipes. It is noted such overall coverages are relatively low, indicating that there are considerable elements of randomness or idiosyncrasy within configurations leading to positive profitability. In other words, the solutions may not cover all possible recipes for success or non-success. This is in fact intuitive because there are usually many paths to outcome in question with social phenomena. In addition, while consistency resembles the notion of significance in statistical models, coverage provides a measure of empirical relevance rather than theory, and is similar to statistical variance (Thiem, 2010). According to Ragin (2008), there may exist solutions of highly consistent set theoretic relation with low coverage.

Configurations for Achieving Positive Margin

Overall, table 4.3 shows that each solution in all three sub-periods exhibiting acceptable consistency of more than 0.80. However, for sub-period 1989-1999, there are no parsimonious solutions. In this case, there are no logical remainders, and all configurations of conditions in the truth table have been covered. In turn, for sub-period 2000-2010, the consistency levels of parsimonious solutions are below 0.80, not acceptable. Therefore, there exist only peripheral conditions in configurations during 1989-1999 and 2000-2010. Finally, there are both parsimonious and intermediate solutions present in the last sub-period 2011-2015. This shows evidence of core and peripheral conditions as well as neutral permutation in the solutions S3.1 (S3.1a and S3.1b) during the last interval, which indicates effectively there was only one path. Detailed raw fuzzy set analysis outputs can be referred in Appendix 3. The general implication is that although there are paths to positive profitability before 2011, the strength of those single causal conditions leading to the outcome is not emphasized.

At first, it is interesting to note that the number of configurations for positive performance dropped from four to two and then to one pathway from 1989-1999 to 2000-2010 to 2011-2015. This pattern means that it was getting more difficult to be profitable throughout the studied interval, which included many turbulences and changes. Possible examples of changes as discussed could be that the consumption growth rates of paper products hit rock bottoms several times, and the severe downturn was after the global financial crisis 2007-2008. Evidence of such trend can be actually seen from Figure 3.1, in which profitability had declined and remained below the pre-crisis level. The average of firm profit margin was down to below 5 percent after 2010 as compared to over 15 percent in the 1990s.

Configuration	1989 - 1999				2000-2010		2011-2015	
	S1.1	S1.2	S1.3	S1.4	S2.1	S2.2	S3.1a	S3.1b
Size	●	●	●	●	●	●	●	●
Age	●	●	●	●	●	●		●
Geographic diversification	●	●	●	●	●	●	⊗	●
Product diversification	●	●	●	●	⊗	⊗	●	●
Exploration	●	●	●	●	●	●	⊗	⊗
Exploitation	●	⊗	⊗	●	⊗	⊗	●	●
M&A/ Collaboration	⊗	●	⊗	⊗	⊗	⊗	●	●
Consolidation/ Reorganization/ Divestment		⊗	●	⊗	⊗	●	⊗	⊗
Market growth	⊗	⊗	●	●	⊗	●	⊗	⊗
Competitive intensity	⊗	⊗	⊗	●		⊗	●	⊗
Consistency	0.84	0.88	0.86	0.86	0.80	0.81	0.81	0.81
Raw coverage	0.11	0.09	0.10	0.10	0.11	0.09	0.11	0.11
Unique coverage	0.02	0.05	0.03	0.02	0.06	0.03	0.03	0.03
Overall solution consistency	0.84				0.78		0.80	
Overall solution coverage	0.21				0.15		0.14	
N	472				584		341	

Black circles indicate the presence of a condition, and circles with "X" indicate its absence

Large circles indicate core conditions; small ones indicate peripheral conditions.

Blank spaces indicate "don't care"

Table 4.3: Configurations for Achieving Positive Margin (Option 3)

During sub-period 1989-1999, solutions S1.1 and S1.4 indicates the existence of ambidexterity, which resembles the Analyzer type of Miles and Snow typology. The hybrid configuration of exploration and exploitation might lead success in the presence or absence of both market growth and industry competitive intensity. Solutions S1.2 and S1.3 highlight the focus on exploration in

combination with either merger & acquisition or reorganization strategies respectively. Perhaps firms might have joined forces together for incubation activities in both scenarios of whether market was growing or not, which supports the long-term perspective of investments on novel innovation even in bad times. In general, all four solutions in this period resemble similar firm profiles of big, long-established, and well-diversified in both geographies and products, with mostly focus on exploration driven actions.

As for sub-period 2000-2010, solutions S2.2 shows a combination of exploration and consolidation/reorganization activities in the face of market growth and lack of competition. Nonetheless, in solution S2.1, firms appeared focusing only on exploration in the absence of munificent market and regardless of whether the industry competitiveness is intense or not (as marked by the blank space). Again, shared strategic action in these two paths is exploration despite being big, long-established, diversified in geographies (but not in product categories), which is quite in contrast with the Defender typology. Perhaps, the recipe lends some support to the evidence of organizational renewal through innovative activities in established industry incumbents.

Lastly, solution S3.1a and S3.1b illustrate a recipe to success, combining exploitation and collaboration/merger & acquisition strategies with leveraging on firm size and product diversity as core elements. This period does not consider introducing breakthrough innovation or reorganization/consolidation as part of the successful path. Solution S3.1b includes also age and market diversity as part of organizational characteristics when peripheral conditions are taken into consideration. Solution S3.1a differs slightly in that it highlights the operating condition in a highly competitive environment as peripheral elements. It also points out that being large does not mean being established long ago. In fact, newly founded organizations as a result of merger & acquisition belong to this case. The recipe in this period resemble the Defender profile in Miles and Snow, but adds in another important strategy, that is to leverage on scale via acquiring external resources.

Finally, other than the variation in strategic choices, the success recipes indicate existence of three possible necessary conditions in organizational characteristics that are shared across three sub-periods, organizational size, age, and diversification (with an emphasis on product diversification). It is also noted that environment is not a core condition in all success solutions although descriptive statistics shows significant correlation between environmental context and profitability.

Configurations for Achieving Non-Positive Margin

Analyses for non-positive profitability were carried out by negating the outcome measure in Option 3. Overall, table 4.4 shows that each solution in all three sub-periods exhibiting acceptable consistency of more than 0.80. Contrary to configurations for success above, there are both parsimonious and intermediate solutions present in the first sub-period 1989-1999. In turn, for sub-period 2000-2010, the consistency levels of parsimonious solutions are below 0.80, not acceptable. For sub-period 2011-2015, there are no parsimonious solutions because there are no logical remainders, and all configurations of conditions in the truth table have been covered. As a result, there exist only peripheral conditions in configurations during 2000-2010 and 2011-2015. The general implication is that although there are paths to non-positive profitability after 1999, the strength of those single causal conditions leading to the outcome is not emphasized.

Overall, consistent with the asymmetric characteristic of causality in configuration, recipes that lead to the absence of the outcome are different from those leading to the presence of the outcome. Except for the first sub-period, there are multiple paths to be non-performing (seven configurations for the second sub-period, and four for the last sub-period), which means that there were several potential failure traps toward the end of the studied interval. During the sub-period 1989-1999, non-performance path N1.1 in table 4.4 represents a combination of merger & acquisition and consolidation strategies in the ab-

sence of market growth as the core elements. Possible interpretation for this path is that too excessive adoption of consolidation strategy when market growth was still relatively weak might lead to non-positive return. Partly it might be because the challenges of post-merger effects, including difficulties in finding shared strategic directions, and cultural shocks, outweighed the advantages of early adoption (Cartwright & Cooper, 2000; Walsh, 1988). A closer look across all solutions reveals that this recipe also appears in other two sub-periods (N2.1 and N3.4) even though the same conditions were not considered as core ones.

Solutions in sub-period 2000-2010 is characterized with the presence of both fast growing and highly competitive environment. In addition to solution N2.1, there are generally two paths leading to non-positive results: exploration or exploitation in combination with consolidation/reorganization/divestment activities (paths N2.2, N2.4, N2.7 versus N2.3, N2.6). The common condition across these paths is the reorganization-related strategic actions. It is noted that although exploration and consolidation activities were also found in success recipe S2.2 (Table 4.3), the difference is the absence or presence of competitive intensity condition in the configuration.

Similarly, solutions N3.1 and N3.2 in sub-period 2011-2015 resemble S2.1 and S1.2 respectively in term of exploration and/or acquisition activities except for the presence of competition. These solutions in the third sub-period consistently represent an environment with the absence of market munificence but the presence of highly competitive landscape. It appears that exploration type of adaptation is not sufficient to be profitable during the time of intense competition. Possible explanation is that investments for innovation projects take longer payback period. Profitability might come into the picture the next interval.

	1989 - 1999	2000-2010							2011-2015			
Configuration	N1.1	N2.1	N2.2	N2.3	N2.4	N2.5	N2.6	N2.7	N3.1	N3.2	N3.3	N3.4
Size	●	●	●	●	●	●	●	●	●	●	●	●
Age	●	●	●	●	●	⊗	⊗	●	●		●	
Geographic diversification	●	●		●	●	●	●	●	●	●	●	●
Product diversification	●	●	●	●		●	⊗	●		●	●	●
Exploration	⊗	⊗	●	⊗	●	⊗	⊗	●	●	●		⊗
Exploitation	⊗	⊗	⊗	●	⊗	⊗	●		⊗	⊗	⊗	⊗
M&A/ Collaboration	●	●	⊗	⊗	⊗	●	⊗	⊗		●	⊗	●
Consolidation/ Reorganization/ Divestment	●	●	⊗	●	●	⊗	●	●	⊗	⊗	●	●
Market growth	⊗		●	●	●	●	●	●	⊗	⊗	⊗	⊗
Competitive intensity			●		●	●	●	●	●	●	●	●
Consistency	0.83	0.9	0.83	0.89	0.83	0.93	0.93	0.85	0.91	0.96	0.96	0.96
Raw coverage	0.08	0.1	0.07	0.06	0.07	0.05	0.03	0.07	0.17	0.12	0.13	0.1
Unique coverage	0.08	0.06	0.03	0.01	0.01	0.02	0.01	0	0.04	0	0.04	0.03
Overall solution consistency	0.83	0.86							0.91			
Overall solution coverage	0.08	0.22							0.26			
N	472	584							341			

Black circles indicate the presence of a condition, and circles with "X" indicate its absence

Large circles indicate core conditions; small ones indicate peripheral conditions.

Blank spaces indicate "don't care"

Table 4.4: Configurations for Achieving Non-Positive Margin (Option 3)

In general, the non-success solutions indicate that size and (geographical) diversification are the causal condition being shared across three sub-periods. There are two other causal conditions, besides organizational characteristics, that were present in most of non-success solutions: the consolidation/divestment activities and industry competition. In particular, it should be noted that the presence of intense industry competition appears in most of the non-success solutions, even relatively more frequent than the market-growth

condition. On the other hand, as reported above, most of the success recipes do not include the presence of competitive intensity. This highlights the relative importance industry competition as a potential causal condition to failure. Despite such observation, for the avoidance of doubt, there are still success recipes when market is of high competition, solutions S1.4 (ambidexterity) and S3.1a&b (exploitation and acquisition). The typology of these recipes will be discussed in the next section.

5 RECIPES FOR SUCCESS AND NON-SUCCESS

Below are the discussion of the above findings and subsequently, derivation of aggregated recipes corresponding to each sub-period. Table 5.1 summarizes the proposed recipes.

Recipes of Success:

The Regenerator:

Specifically, it was in the 1990s, when the paper sector started losing its market share to electronic applications as a result of convenience offered by technology, and the overall demand for packaging of products and goods also dropped due to the decrease in gross domestic product. Some firms set out to explore opportunities in higher value papers, such as coated papers for advertisement and magazine (Roth, Zetterberg, AcWorth, Kangas, Neuhoff, & Zipperer, 2016). That is why findings from sub-period 1989-1999 show consistent evidence of firms focusing on exploration activities. Depending on the environmental context, exploration strategy was tied together with exploitation, or acquiring external resources, or reorganization action.

Therefore, the aggregated recipe of success in this sub-period is labeled as The Regenerator. Such firms are generally ambidextrous regardless of environmental conditions (market is growing or not, competition is intense or not). This recipe resembles the Analyzer type of Miles and Snow typology. They introduce new products or services, or enter into new markets while balancing incremental improvement, or even taking away existing but non-performing products or services. High performance does not necessarily mean new creation or disruptive innovation but as long as it can capture customer value with the firm's new or improved products or services. Nonetheless, those firms need substantial resources if they want to pursue both strategies concurrently. That

is why big, established and well diversified characteristics are needed for this recipe.

Sub-period	Recipes of Success	Paths to Non-Success
1989-1999	<i>The Regenerator:</i> ambidextrous regardless of environmental conditions, introducing new products or services, or entering into new markets while balancing incremental improvement, or even taking away non-performing products or services.	<i>The Early Consolidator:</i> a combination of merger & acquisition and consolidation strategies when there was no or weak sign of market munificence.
2000-2010	<i>The Renewer:</i> exploratory type of adaptation, motivated to challenge status quo and redefine their relationship with markets and rival by renewing the competition mode in order to maintain the firms' viability, of corporate entrepreneurship spirit.	<i>The Excessive Consolidators:</i> in presence of both market growth and high competition, going for exploration or exploitation in combination with consolidation/reorganization/divestment activities.
2011-2015	<i>The Conqueror:</i> exploitative type of adaptation and acquisition of external resources regardless of whether competitive landscape is intense or not. The focuses are to improve or adjust the firm's internal processes, structures, and capabilities in order to maintain its viability, and leverage on their scale to acquire market shares from rivals to defend their empire.	<i>The Late Explorer</i> a combination of exploration and/or acquisition activities when competition is intense and market is not growing.

Table 5.1: Summary of proposed recipes

The Renewer:

The new millennium presented another stress-test for the industry, the global economic crisis. Several firms entered the recession with high leverage ratio, and consequently sought for bankruptcy protection. As a result, the pulp and paper sector went through a period of significant consolidation especially for small and medium enterprises, which is also reflected in one of the solutions shown in the sub-period 2000-2010. This trend was further intensified by tech-

nological innovation that modernized the paper production machine, increased efficiency, and thus reduced the labor intensity. For instance, according to the Confederation of European Paper Industries (CEPI) 2014 statistics, compared to year 2000, the number of companies in the pulp and paper sector in the European Union had gone down by approximately 30 percent (Roth et al., 2016). It can be seen that in addition to exploration driven strategy, this period suggested divestment as an alternative to take the opportunity even during not-so-good time. Perhaps being leaner and more flexible might help companies to be better positioned to respond to market changes. For example, in 2008, Boise Cascade divested its pulp and paper assets to an investment firm to reduce debt and create a leaner company that focused on other forest products. The transaction was evaluated at that time as profitable and the company sold at the right timing (Armstrong & Stroup, 2009).

Consequently, the typical recipe of success proposed for this sub-period is The Renewer. Those firms focus on exploratory type of adaptation (Lewin et al., 1999). They are motivated to challenge status quo and redefine their relationship with markets and rival by renewing the competition mode in order to maintain the firms' viability. This group of firms resemble the Prospectors in Miles and Snow typology, except in this study they are relatively bigger in size and long-established. This is however quite on the contrary to the notion of structural inertia borne by such industry incumbents according to the population ecology perspective (Hannan and Freeman, 1984). From this viewpoint, innovation is most likely to be inhibited in established organizations. Such new changes often come from new entrants instead (Baum, 1996). Perhaps, this recipe typology lends support to the notion of corporate entrepreneurship, which is defined as entrepreneurial activities performed in searching for creative or new solutions for the firm's challenges, covering the development or enhancement of existing and new products and services, markets, and administrative processes and technologies for operating organizational functions (Antoncic & Hisrich, 2000; Zahra & Covin, 1995). These activities leverage on the established firm's current resources (assets, markets and capabilities) in the process of con-

ceiving, fostering, launching and managing a new business (Wolcott & Lippitz, 2010).

The Conqueror:

Moving on to the most recent period 2011-2015, in spite of the slight recovery, the growth in demand and production in the sector were still below the pre-crisis level. To be successful in this period, firms focused more on streamlining process, implementing measures to improve plant utilization, and reducing production costs, including energy cost (e.g., through moving away from fossil fuel based electricity). Short-term payback investments such as equipment conversion (changing equipment use, for example to produce paperboard instead of paper) was also the trend. At the same time, crisis presented opportunities to acquire distressed rivals. Indeed, buying off market share of other paper companies enables big players to be able to adjust production capacity. For example, in 2011, after having acquired its rival Myllykoski, UPM-Kymmene Corporation ceased production at those paper mills that had been inefficient or not growing. The purpose was to narrow down the supply-demand gap in European paper business, to stabilize prices, and thus profitability. Therefore, it could be interpreted that consolidation might be actually the cure for weak demand, controlling overcapacity situation, and maintaining prices under environmental uncertainty (Armstrong & Stroup, 2009). That is why in 2012, there used to be a proposal for a mega-merger between Finland's paper giants UPM-Kymmene and Stora Enso with a hope to create the world's number one paper company who would have substantial control over capacity and prices (Rosendahl, 2012).

The proposed typical recipe of success in this 2011-2015 interval is The Conqueror. The Conqueror resembles much but also extends from the Defender in Miles and Snow typology. Firms following this path tend to go for exploitative type of adaptation (Lewin et al., 1999) and acquisition of external resources regardless of whether competitive landscape is intense or not. The focuses are to improve or adjust the firm's internal processes, structures, and capabilities in

order to maintain its competitive advantage. In this type, it is not necessary to change or to come up with new strategies. It is rather to improve on the existing ones first such as more efficient execution of strategies or usage of resource allocation. Subsequently, those firms may leverage on their scale to acquire market shares from rivals to defend their empire.

Paths to Non-Success:

The Early Consolidator:

It should be noted that consolidation-related activities can be a double-edged sword. While they can help to control capacity and protect price, their side-effects might outweigh the benefits. This can be clearly seen from non-success recipe N1.1 during the sub-period 1989-1999. The path highlights that a combination of merger & acquisition and consolidation strategies when there was no or weak sign of market munificence would lead to detrimental effect. As mentioned above, the post-merger effect might outweigh the benefit of early acquisition move in this case. It would be beneficial if consolidation-related strategies could be combined with innovation activities as reported in the Regenerator type. The Early Consolidator type was emphasized in the first sub-period, and subsequently appeared in both other studied intervals.

The Excessive Consolidator:

In contrast with the performer of this sub-period 2000-2010 (the Renewer), the Excessive Consolidators, in presence of both market growth and high competition, still went for consolidation/divestment/reorganization strategies. Again, the benefits of exploration/exploitation strategies did not outweigh the disadvantages of consolidation-related activities. Alternatively, it was also due to the tense competition that led to excessive divestment of non-profitable businesses, and subsequently those firms could not sustain.

The Late Explorer:

During the most recent sub-period 2011-2015, in contrast with the Conqueror (focusing on exploitation and acquisition), the Late Explorer focused on innovation activities, while they were supposed to do so in the last decade. It should be noted that the competitive landscape in this scenario represents an environment of highly competitive landscape but without any signal of market growth. As a result, focusing merely on innovation incubation without having incremental improvement to back up the short-term cashflow would lead to non-positive profitability.

6 DISCUSSIONS

This study aimed to better understand the complex interdependencies among industry, organizational attributes, and strategic actions that potentially underlie the organizational effectiveness. Overall, the results provide support for the view that there exist several possible pathways to successful performance (i.e., achieving positive return) as well as non-success (i.e., zero or negative returns). Interestingly, these paths are proven not static, they varied in different sub-periods, especially the choices of strategic actions, even with the same organizational characteristics. These are well-illustrated in various recipes for success as well as non-success.

Both success and non-success solutions indicate existence of three possible necessary conditions belonging to organizational characteristics that are shared across three sub-periods: organizational size, age, and diversification. In particular, size, age, and diversification (product) are among the core conditions in the success recipe S3.1a and S3.1b. Being large and established is generally associated with deep pocket, which means having a strong balance sheet. First, this may help company to survive the downturn without the burden to pay off excessive liabilities. Second, drawing from the literature of organizational evolution and industry organization, with such financial strength, large firms could leverage on scale and scope advantages. They could sustain with thin margin, even at zero operating profit, while weak players would be starved. Eventually, the smaller firms are forced to close or sell off their businesses at distressed prices. Nonetheless, according to the population ecology theory, size is associated with structural inertia (Hannan & Freeman, 1984), which resists to changes. As firms grow, they tend to develop structures, cultures and processes towards the best practices in order to achieve highest efficiency which in turn creates the structural inertia. This may impede the innovation-related activities, which eventually limits the organization's ability to flexibly change, especially in highly fast-changing context. Therefore, while size contributes to the success recipe, this measure also constitutes part of the paths to non-success.

Similar to size, diversification also has both positive and negative impacts on firms' success. Referring to organizational ecology, a diversified product portfolio means that firms can survive even if some of its segments are going down due to the cyclical nature of the industry (Hannan & Freeman, 1984). Therefore, product diversification has appeared as a core causal condition in success recipe in 2011-2015 (S3.1) as well as peripheral element in 1989-1999's recipes. On the other hand, geographical diversification has also been observed in most non-success recipes. Overseas internationalization helps firms extend market boundaries but may introduce new challenges, such as cultural distance and management of international partners. Without proper consideration, such differences in language, culture, political system, level of education and industrial development may cause detriments to internationalization process and overseas operations (Harris & Morran, 1999). These observations of double-edged effects further reinforce the configurational thinking that with the same organizational characteristics, the performance depends on how firms leverage these characteristics and combine them with the selection of strategic positioning in certain environmental context.

Furthermore, given configurations of the same strategic actions and organizational characteristics, the presence/absence of environmental conditions may also lead to different outcomes. This lends support to the notion that industry does matter (McGahan & Porter, 1997). Nonetheless, the fact that environmental attributes are not the core elements in all configurations except one (N1.1) might imply that industry changes alone could not have a much powerful impact on firm performance. Therefore, configurational thinking is still valid: the combination of industry and other factors such as organization structure and strategic choices that matters.

Taken as a whole, those above recipes explain why earlier research in finding out what leads to effective performance has produced somewhat mixed and diverse results. It is clear that there is no single formula or formula with a sin-

gle strategy to success. There exist multiple core conditions even in one recipe. Thus, there is still hope even in bad times if appropriate recipes are applied. The implications for managers will be discussed in the next section.

7 CONCLUSIONS

This study set out to construct and test a different model of theorizing the complex causal relationships between organizational performance outcome and the environmental factors, organizational level characteristics, and strategic positioning. Subsequently, the study proposes a series of recipes for success and non-success. It was achieved by employing the configurational approach, fs/QCA on a unique dataset collected from over 200 firms in the global pulp and paper industry, accounting for approximately 1,400 cases over a range of 27 years (1989-2015). Conventionally, such topics in the competitive dynamics literature are addressed by the variance approach. This research therefore contributes to the literature of competitive strategy an alternative to realistically evaluate the combinational effects of various factors on firm performance besides correlation-related and variance decomposition approaches. The study also advances the application of fsQCA by taking into account the temporal changes, which indicates different sets of recipes in different periods. The findings further reinforce configurational thinking, the notion of core and peripheral conditions, and neutral permutations. Moreover, departing from the literature of dynamic capability (resource configuration as firm strategic capabilities) in combination with competitive dynamics, organizational learning and adaptation literature, the study allowed for an extension of strategic actions to include not only exploration and exploitation, but also other acts of acquiring external resources (e.g., merger & acquisition, collaboration) and shedding resources (e.g., divestment, consolidation, reorganization). Furthermore, such model may be generalized for predict the causal recipes in other industries: how and why industry dynamics and firm actions are linked.

In term of the practical implications, it can be interpreted from the study's findings that there are several recipes that firms could avoid or apply to make it through the environmental turbulence. Whether it is in good or bad times, winning organizations are the ones who are flexible and ready to change. First of all, in order to anticipate and quickly react to changing conditions, being

strong in balance sheet is key, i.e. being large does matter. Being well-diversified is also important to ride on the business cycles. However, established organizations should be aware of the negative effects of structural inertia against change and cultural difference in internationalization. Second, the industry winners would be those who are ready on hands with multiple strategies focusing on both long-term and short-term goals. Taking ambidexterity (the Regenerator) as an example, employing exploitation strategies (enhancing efficiency, managing cost) ensures short-term cashflow for survival in downturns. However, firms should have plan for preparing to come out ahead, perhaps by incubating innovations in collaboration with other stakeholders. It is because collaborative business models may help to reduce risk. Or according to another recipe (the Conqueror), large players leveraged on their financial strength to acquire market shares of other small and medium ones, and then use them adjust the market's overcapacity. Sometimes, shedding resources or selling part of the businesses at the profitable point is also considered as another realistic strategy to ensure survival for other operations. In short, a robust recipe for effective performance means preparation of several scenarios including different strategic options and application in a correct-timing manner. As demonstrated in the above recipes, sometimes the same strategic actions being applied in different environmental contexts results in different outcomes.

Naturally, the current study has several limitations. In term of data collection and preparation, the recording of actions was taken from only published newswires although the collection of which was from a centralized source, Innventia. Second, due to a large number of newswires, actions were auto-coded by a software, ATLAS.ti. Perhaps, further study should include a validity check of such computerized coding, by taking random sub-sample and coding manually. Third, the data of market and product diversification was taken as of only 2015 while it should have been tracked annually during the study period or at least once at the end of each sub-period. Moreover, as noted above, even though the study was made at the global scale, it was just about one industry. Hence, result generalization should be made with caution. For example,

size was one of the core elements as economy of scales is imperative in the P&P business, but it might be not the case in others, such as Information and Communication Technology (ICT) industry. In addition, the periodization was made based on the macro indicator. Perhaps, other ways of periodization could have been considered and sensitivity analysis could be made. Furthermore, it would be more beneficial to come back and forth between the fuzzy set analyses and the relevant cases (that were included in the configuration results) so that more insights could be revealed.

Indeed, for future research, it might be interesting to run analysis on shorter sub-periods (i.e., several shorter intervals) to see whether the patterns of configurations change. Furthermore, as inspired by Misangyi et al. (2017), the current data can be used to track even the movement of fuzzy set scores of a certain causal condition in relation to the outcome, which is towards a more case-oriented approach. Moreover, since the coverage indices in this study's results were relatively low, there exist other possible causal conditions, for instance the speed of taking actions. The study might also be conducted based on geographical differences to see whether the configurations change and what are the patterns. The reason is that market conditions practically were different in different parts of the world, which demands for different recipes.

In conclusion, the findings further reinforce causal complexity as an important methodological approach to study complex organizational phenomena. At the same time, I hope that the current study, through the application of the set-theoretic approach, sheds some lights on the "recipes for success" and paths to non-success: what firms did in good and bad times, what were relatively more important (core) and their consequences. Deeper understanding of such phenomenon might enhance managers and business owners' capability to profitably ride their organizations through various cycles.

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APPENDICES

APPENDIX 1: Summary of selected literature review

		Types of Competitive Actions	Competitive Behaviour	Organizational Performance
1	Environmental Context			Industry effects account importantly for variation in performance outcome (Schmalensee, 1985; Rumelt, 1991).
1.1	Industry munificence	In growing industries, firms are more reluctant to explore changes or search for alternatives (Barr, Stimpert & Huff, 1992). Slower or declining industry	In growing industries, competition tends to be more relaxed (Porter, 1980).	Profitability is theorized to be generally higher in growing industries (Porter, 1980).

		demand is more likely to push firms to search for new less competed market arenas (Harrigan & Porter, 1983).		
1.2	Intensity of rivalry	D'Aveni (1994)'s hypercompetitive arenas corresponding to different types of actions: exploitation in cost and quality, exploration in timing and know-how, and competitive-cooperation in deep pockets.		There is a negative relationship between industry rivalry and firm performance (Schomburg, Grimm, & Smith, 1994; Smith, Grimm, & Gannon, 1992; Young <i>et al.</i> , 1996).
2	Organizational Characteristics			
2.1	Size	Size & Age attributes in Miles and Snow	- Large firms are likely to carry out more total competitive actions in a giv-	

		<p>(1978, 2003)'s typology.</p> <ul style="list-style-type: none"> - Large and established firms tend to focus on stability and hence pursue cost leadership (i.e., exploitation) rather than 	<p>en time period (Young <i>et al.</i>, 1996). They are also more likely to respond to competitors' competitive challenges.</p> <ul style="list-style-type: none"> - Smaller organizations tend to initiate more attacks and be speedier and stealth in executing such activities (Chen & Hambrick, 1995, MacMillan, 1980; Smith <i>et al.</i>, 2001). 	
2.2	Age	<p>differentiation (i.e., exploration) strategy. Vice versa for small and young firms.</p>	<ul style="list-style-type: none"> - Changes are challenging for old organizations due to inertial pressures (Aldrich & Auster, 1986). Old firms tend to repeat successful-proven strategies, and form routines toward internal consistency and specialization (Miller & Chen, 1995). - Younger firms are motivated to continually scan for any opportunities that may arise (Smith <i>et al.</i>, 2001). They tend to undertake a more complex competitive repertoire to avoid competitive 	

			simplicity (Miller & Chen, 1996).	
2.3 & 2.4	Market diversity (product and geography)		<ul style="list-style-type: none"> - Multiple point competition may lead to mutual forbearance against competition (Edwards, 1955; Karnani and Wernerfelt, 1985). - Firms of less market diversity are theorized to be more aggressive with competitive actions in those few markets that they are in. 	Firms with multimarket contacts tend to achieve higher profits and survive longer (Scott, 1991; Baum and Korn, 1999; Pilloff, 1999; Haveman and Nonnemaker, 2000; Gimeno, 2002).

APPENDIX 2: Code List

Market trend	MKTTREND : =market trend company's finance company's profile statistics case study conference update claim top 100 casestudy annual report statistical case studies market report market update
Merger	MERGER : =merge merged merging merges MERGER
Acquisition	ACQUISITION : =acquisition acquire acquiring acquired acquires takeover take-over takes over taking over took over taken over
Collaboration	COLLABORATION : =JOINT VENTURE JOINT-VENTURE PARTNERSHIP CO-OPERATE CO-OPERATING CO-OPERATED CO-OPER-ATES COOPERATE COOPERATING COOPERATED COOPERATES COLLABORATE COLLABORATING COLLABORATED COLLABORATES PARTNER PARTNERING
Consolidation/Reorganization/Divestment	CONSOREORG : =closure closed closing closes shutdown shut shutting down downtime down time reorganize reorganized reorganizing reorganizes divest divestment divesting divested divests consolidated consolidating consolidate consolidates restructure restructuring restructured restructures eliminate eliminated eliminating elimiates capacity close downsize downsizing downsized laid off new business structure
Exploratory internal development	EXPLORINDEV : =NEW TECHNOLOGY NEW TECHNOLOGIES NEW PRODUCT NEW PATENT NEW MATERIAL NEW PACK NEW CONCEPT INNOVATION PACK INNOVATION TECHNOLOGY INNOVATION SALE PROTOTYPE INNOVATION MARKETING INNOVATION MATERIAL INNOVATION PRODUCT DEVELOPMENT MATERIAL DEVELOPING DEVELOPED DEVELOPS DEVELOP DEVELOPMENT PACK NEW PRODUCT TECHNOLOGY PATENT PRODUCT PATENT MATERIAL DEVELOPING PROD-

	UCT DEVELOPED PRODUCT DEVELOP PRODUCT NEW TECHNOLOGY MATERIAL INNOVATION SERVICE PATENT PACK NEW TECHNIQUE PATENTED PATENT
Exploratory sensing	EXPLOSENSE:= RESEARCH RESEARCH INSTITUTE PRODUCT DEVELOPMENT RESEARCH PROGRAMME UNIVERSIT RESEARCH LABORATOR LABORATORY EXPERIMENT RESEARCH AND DEVELOPMENT EXPERIMENT RESEARCH RESEARCH PROGRAM EXPERIMENTAL EXPERIMENT PRODUCT R&D RESEARCH & DEVELOPMENT R & D
Incremental investments	INCREINVEST:= REBUILD REBUILT NEW PLANT NEW MILL NEW INSTALLATION NEW EQUIPMENT PAPER MACHINE INVESTMENT MODERNISATION MODERNIZATION INSTALLATION MODIFICATION MODIFY MODIFIE MILL INVESTMENT MACHINERY INVESTMENT DRYER INVESTMENT PRESS INVESTMENT MACHINE REBUILD MACHINE REBUILT MODERNISE MODERNIZE NEW PAPER MACHINE NEW PAPERMAKER NEW PRESS UPGRAD NEW PRINT INVESTMENT PLANT NEW MACHINERY NEW PRINTER PRINTER INVESTMENT PRINT INVESTMENT PAPERMAKER INVESTMENT NEW DRYER NEW LINE MILL EXPANSION NEW MACHINE INSTALL INVESTMENT LINE PLANT EXPANSION EXPAND INVESTMENT MACHINE UPGRADING MILL NEW PAPER MACHINE
Incremental improvement (Process improvements)	INCREIMPRO:= AUTOMATION AUTOMATED AUTOMATING AUTOMATES NEW PROCESS NEW SOFTWARE NEW APPLICATION INTEGRATE INTERGRATING INTERGRATED INTERGRATES PATENT PROCESS PATENT SYSTEM INNOVATION SYSTEM NEW SYSTEM INNOVATION PROCESS PROCESS IMPROVEMENT IMPROVING IMPROVED IMPROVES IMPROVE

APPENDIX 3: Raw outputs of fuzzy set analyses for option 3

Recipes of Success:

Sub-period 1989-1999

*** ERROR(Quine-McCluskey): The 1 Matrix Contains All Configurations. ***

Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---

frequency cutoff: 5
consistency cutoff: 0.83192

TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/1989 1999.csv

Model: profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivef)

Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---

frequency cutoff: 5
consistency cutoff: 0.83192

Assumptions:

	raw coverage	unique coverage	consistency
	-----	-----	-----
sizef*agef*geodivf*prodivf*explorationf*exploitationf*~macollaf*~mktf*~competitivef	0.107402	0.0184775	0.836116
sizef*agef*geodivf*prodivf*explorationf*~exploitationf*macollaf*~consoreorgf*~mktf*~competitivef	0.0936575	0.0475862	0.882654
sizef*agef*geodivf*prodivf*explorationf*~exploitationf*~macollaf*consoreorgf*mktf*~competitivef	0.100596	0.0322403	0.8624
sizef*agef*geodivf*prodivf*explorationf*exploitationf*~macollaf*~consoreorgf*mktf*competitivef	0.0955646	0.0119992	0.856342
solution coverage: 0.21137			
solution consistency: 0.838183			

Sub-period 2000-2010

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2000 2010.csv
 Model: profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
 frequency cutoff: 5
 consistency cutoff: 0.810943

	raw coverage	unique coverage	consistency
~consoreorgf*~mktf	0.392512	0.0287355	0.530083
~macollaf*~mktf	0.389388	0.0308595	0.44179
~prodivf*~competitivf	0.366021	0.0293123	0.507432
~prodivf*~mktf	0.380132	0.00949687	0.527335
explorationf*~competitivf	0.376892	0.0509154	0.543565
explorationf*~mktf	0.353102	0.00124955	0.537454
solution coverage:	0.690066		
solution consistency:	0.426174		

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2000 2010.csv
 Model: profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
 frequency cutoff: 5
 consistency cutoff: 0.810943
 Assumptions:

consistency	raw coverage	unique coverage	
-----	-----	-----	
sizef*agef*geodivf*~prodivf*explorationf*~exploitationf*~macollaf*~consoreorgf*~mktf	0.110727	0.0594033	0.801217
sizef*agef*geodivf*~prodivf*explorationf*~exploitationf*~macollaf*consoreorgf*mktf*~competitivf	0.0866873	0.0353633	0.810943
solution coverage:	0.146091		
solution consistency:	0.782824		

Sub-period 2011-2015

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2011 2015.csv
 Model: profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
 frequency cutoff: 1
 consistency cutoff: 0.806781

	raw coverage	unique coverage	consistency
sizef*prodivf*~explorationf*exploitationf*macollaf*~consoreorgf	0.148349	0.148349	0.800634
solution coverage: 0.148349			
solution consistency: 0.800634			

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2011 2015.csv
 Model: profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
 frequency cutoff: 1
 consistency cutoff: 0.806781
 Assumptions:

	raw coverage	unique coverage	consistency
sizef*~geodivf*prodivf*~explorationf*exploitationf*macollaf*~consoreorgf*~mktf*competitivf	0.107285	0.0332276	0.808482
sizef*agef*geodivf*prodivf*~explorationf*exploitationf*macollaf*~consoreorgf*~mktf*~competitivf	0.10725	0.0331924	0.814781
solution coverage: 0.140477			
solution consistency: 0.79813			

Paths to Non-Success:

Sub-period 1989-1999

TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/1989 1999.csv
Model: ~profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf)
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 4
consistency cutoff: 0.830894

	raw coverage	unique coverage	consistency
~exploitationf*consoreorgf*~mktf	0.226276	0.0586304	0.740225
macollaf*consoreorgf*~mktf	0.140818	0.0117106	0.792269
agef*~explorationf*~exploitationf*~mktf	0.168014	0.00941208	0.718098
prodivf*~explorationf*~exploitationf*~mktf	0.182647	0.00795066	0.698847
solution coverage: 0.295248			
solution consistency: 0.713543			

TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/1989 1999.csv
Model: ~profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 4
consistency cutoff: 0.830894
Assumptions:

	raw coverage	unique coverage	consistency
sizef*agef*geodivf*prodivf*~explorationf*~exploitationf*macollaf*consoreorgf*~mktf	0.0750158	0.0750158	0.830894
solution coverage: 0.0750158			
solution consistency: 0.830894			

Sub-period 2000-2010

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2000 2010.csv
 Model: ~profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
 frequency cutoff: 5
 consistency cutoff: 0.822452

	raw coverage	unique coverage	consistency
prodivf	0.648864	0.391276	0.714823
consoreorgf*competitivf	0.346793	0.0892053	0.752149
solution coverage:	0.738069		
solution consistency:	0.710764		

11111-0111
 1111-10111
 sizef*agef*geodivf*prodivf*~explorationf*~exploitationf*macollaf*consoreorgf+
 sizef*agef*prodivf*explorationf*~exploitationf*~macollaf*~consoreorgf*mktf*competitivf+
 sizef*agef*geodivf*prodivf*~explorationf*explorationf*~macollaf*consoreorgf*mktf+
 sizef*agef*geodivf*explorationf*~exploitationf*~macollaf*consoreorgf*mktf*competitivf+
 sizef*~agef*geodivf*prodivf*~explorationf*~exploitationf*macollaf*~consoreorgf*mktf*competitivf+
 sizef*~agef*geodivf*~prodivf*~explorationf*explorationf*~macollaf*consoreorgf*mktf*competitivf

 TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2000 2010.csv
 Model: ~profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)
 Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
 frequency cutoff: 5
 consistency cutoff: 0.822452
 Assumptions:

	raw coverage	unique coverage	consistency
sizef*agef*geodivf*prodivf*~explorationf*~exploitationf*macollaf*consoreorgf	0.103096	0.0564493	0.903469
sizef*agef*prodivf*explorationf*~exploitationf*~macollaf*~consoreorgf*mktf*competitivf	0.067494	0.0265662	0.829563
sizef*agef*geodivf*prodivf*~explorationf*explorationf*~macollaf*consoreorgf*mktf	0.0586653	0.0126459	0.889992
sizef*agef*geodivf*explorationf*~exploitationf*~macollaf*consoreorgf*mktf*competitivf	0.0730669	0.0105949	0.830702
sizef*~agef*geodivf*prodivf*~explorationf*~exploitationf*~macollaf*~consoreorgf*mktf*competitivf	0.053252	0.0183891	0.932287
sizef*~agef*geodivf*~prodivf*~explorationf*explorationf*~macollaf*consoreorgf*mktf*competitivf	0.0334132	0.0082382	0.926396
sizef*agef*geodivf*prodivf*explorationf*~macollaf*consoreorgf*mktf*competitivf	0.0710027	0.00250311	0.853107
solution coverage:	0.221326		
solution consistency:	0.858994		

Sub-period 2011-2015

*** ERROR(Quine-McCluskey): The 1 Matrix Contains All Configurations. ***

Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---

frequency cutoff: 5
consistency cutoff: 0.917526

TRUTH TABLE ANALYSIS

File: C:/Users/khnguyen/Desktop/09 Mar 2017/2011 2015.csv

Model: ~profit3f = f(sizef, agef, geodivf, prodivf, explorationf, exploitationf, macollaf, consoreorgf, mktf, competitivf)

Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---

frequency cutoff: 5
consistency cutoff: 0.917526

Assumptions:

	raw coverage	unique coverage	consistency
	-----	-----	-----
sizef*agef*geodivf*explorationf*~exploitationf*~consoreorgf*~mktf*competitivf	0.170136	0.0445347	0.912743
sizef*geodivf*prodivf*explorationf*~exploitationf*macollaf*~consoreorgf*~mktf*competitivf	0.116495	0.00463083	0.956214
sizef*agef*geodivf*prodivf*~exploitationf*~macollaf*consoreorgf*~mktf*competitivf	0.131244	0.0389932	0.964864
sizef*geodivf*prodivf*~explorationf*~exploitationf*macollaf*consoreorgf*~mktf*competitivf	0.0990895	0.0261088	0.956181
solution coverage: 0.261448			
solution consistency: 0.909625			