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Firms as configurations:
Embracing causal complexity in the study of organizational performance

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Content

Abstract

The configurational perspective is an important theoretical approach to studying firms and their performance. Configurations scholars have established that firms, or organizations, are systems of tightly interdependent design choices, and that the degree to which all such choices are aligned, determines the level of a firm's effectiveness. This approach has been particularly popular among researchers in strategic management and entrepreneurship where firms' strategies, organizational design, and business models alongside external environment have received the most attention.

Studies taking the configurational approach have primarily used conventional methods such as regression and cluster analysis or deviation scores. Recent developments of novel analytical techniques have changed the way scholars now approach configurations. Specifically, the adoption of set-theoretic methods, in particular qualitative comparative analysis (QCA) and its fuzzy set variant (fsQCA), has led to a rapid increase of new scholarly applications across different management fields and to a whole new wave of studies using the configurational approach.

The purpose of this thesis is to explore this new perspective that some scholars have started to call "neo-configurational approach". In doing so, I focus on two aspects specifically, namely 1) understanding the approach, and 2) using it as a tool to study entrepreneurial phenomena. For the former, I seek to understand how this approach works and how it has been used in management research. As an output of this process, I develop a step-by-step guideline for how to apply fsQCA (chapter 2). For the latter, I conduct three empirical studies where I use fsQCA to answer different types of questions involving configurational characteristics (chapters 3-5).

In the first empirical study (chapter 3) I use the configurational approach to replicate and extend business model literature that relies on findings from regression analyses. These studies suggest that especially novel business models are positively associated with entrepreneurial firms' market value. I argue that using fsQCA allows for more insightful investigation of the role that novelty plays as part of a firm's business model. My results from analyses with two data sets indicate that the relationship between novel business models and firm performance may be less stable and more complex than previously thought.

In the second empirical study (chapter 4) I look into how configurations of top management team (TMT) characteristics relate to new ventures' initial public offering (IPO) performance. While I found that prior research has not been able to fully capture the combinative effects of TMT characteristics and try to address this gap, I am particularly interested in examining potential complements and substitutes within these configurations. By using a data set of 1,935 new ventures and fsQCA I am able to generate new insights regarding causal complexity germane to how TMTs relate to young ventures' performance outcomes.

In the last empirical study (chapter 5) I focus on family firms and three aspects of configurational inquiry, namely truth table analysis, sufficiency matrix, and standard fsQCA. To provide an alternative perspective regarding family firm influences on corporate social responsibility (CSR), I use a sample of 108 family firms from the S&P 500 to explore configurations of CSR dimensions. The findings suggest that family firms do not have to sacrifice financial gain to be socially responsible.

Overall, my work shows the versatility of the neo-configurational approach and provides guidance on how to use QCA. My findings from the empirical studies contribute to strategy and entrepreneurship literatures and demonstrate how embracing causal complexity helps to uncover novel insights.

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London, February 2020

List of tables

Abbreviations

CEO	Chief Executive Officer
csQCA	Crisp Set Qualitative Comparative Analysis
CSR	Corporate Social Responsibility
fsQCA	Fuzzy Set Qualitative Comparative Analysis
KLD	Kinder, Lydenberg, and Domini (database)
PRI	Proportional Reduction in Inconsistency
QCA	Qualitative Comparative Analysis
TMT	Top Management Team
U.S.	United States (of America)

1 INTRODUCTION

The configurational approach to studying organizations is central for strategy and entrepreneurship research (Mintzberg, 1979; Miller, 1996; Short, Payne & Ketchen, 2008). Scholars taking the configurational approach view firms as complex adaptive systems consisting of several elements, such as strategy, structure, and processes (Drazin & Van de Ven, 1985; Miles, Snow, Meyer & Coleman, 1978; Siggelkow, 2011; Venkatraman & Camillus, 1984). Accordingly, configurations have been defined as "*multidimensional constellations of conceptually distinct characteristics that commonly occur together*" (Meyer, Tsui & Hinings, 1993, p.1175), and more recent work has argued that they comprise core and peripheral elements that interact with each other (Siggelkow, 2002).

Configuration researchers have argued that firms need to exhibit a high level of fit among the different elements of their internal system to maximize their performance (Ketchen, Thomas & Snow, 1993; Miller, 1992; Venkatraman, 1989). Yet, at the same time this constellation of internal elements should be aligned with the external environment of the firm such that the internal system can function optimally towards its purpose (Burns & Stalker, 1961; Gresov, 1989; Porter, 1996). Hence, the goal of managers is to design organizations where highly interdependent internal elements complement each other (Milgrom & Roberts, 1995; Siggelkow, 2002) and match with the context the firm operates in (Lawrence & Lorsch, 1967; Porter & Siggelkow, 2007; Siggelkow, 2001).

The configurational approach has become a powerful tool in explaining implications of various types of organizing (Puranam, Alexy & Reitzig, 2014; Short et al., 2008). The approach roots back to the emergence of the modern organization theory and was originally an extension of the structural contingency theory (Burns & Stalker, 1961; Donaldson, 2001; Lawrence & Lorsch, 1967). While the merits of the original configurational approach remain strong and widely appreciated by scholars interested in organizational design and performance, a current trend seems to be moving towards a combination of the original and a more recent approach.

The more recent approach stems largely from methodological advancements. Studies taking the configurational approach have primarily focused on using conventional quantitative methods such as regression and cluster analysis or deviation scores (Short et al., 2008). Recent developments of novel analytical techniques, that stem mainly from political science and sociology, have changed the way management scholars approach configurations today (Misangyi, Greckhamer, Furnari, Fiss, Crilly & Aguilera, 2017). Specifically, the adoption of set-theoretic methods, in particular qualitative comparative analysis (QCA; Ragin, 1987; see also Fiss, 2007) and its fuzzy set variant (fsQCA; Ragin, 2000, 2008; see also Fiss, 2011), has led to a rapid increase of new scholarly applications across different management fields and to a whole new wave of studies using the configurational approach.

The purpose of this thesis is to explore this new perspective that some scholars have started to call "neo-configurational approach" (Misangyi et al., 2017). In doing so, I focus on two aspects specifically. ***First, I seek to understand how this approach works***. In chapter 2, *Configurations, causal complexity, and fuzzy set qualitative comparative analysis (fsQCA),* I elaborate on the past and the current state of configurations research in organizational studies. I argue that research in entrepreneurship is increasingly exploring how archetypes, taxonomies, typologies, and configurations can help scholars understand complex entrepreneurial phenomena. I also illustrate the potential for set-theoretic methods to inform this literature by offering best practices for how QCA can be used to explore research questions of interest to entrepreneurship scholars. Specifically, I discuss QCA and its tenets, in particular how it embraces causal complexity, I document how this approach has been used in management research, and provide step-by-step guidance to empower scholars to use this family of methods. I put a particular emphasis on the analytical procedures and offer solutions to dealing with potential pitfalls when using QCA-based methods and highlight opportunities for future entrepreneurship research. ***Second, I draw from the developed understanding and apply this approach*** to contribute to strategy and entrepreneurship literatures. For this part, I conduct three empirical studies by using fsQCA to answer novel questions each one involving different types of configurational characteristics (chapters 3, 4, 5).

In the first empirical study (chapter 3), *Replicating and extending quantitative research using configurational analysis*, I draw from the configurational approach to study how novel business models relate to firm performance. Recent studies on business models, in particular those taking the transaction design based view, have shown that novelty is positively associated with entrepreneurial firms' market value. However, our current knowledge is limited regarding how temporality and potential configurational effects of other sources of value and competitive strategies may affect this relationship. To examine these questions, I build on two manually collected data sets that I analyze in three steps. I attempt to reproduce the findings of two important quantitative studies (Zott & Amit, 2007, 2008) that have had a substantial impact on the field, and I do so by conducting (1) a narrow and (2) a quasi-replication to test whether the findings hold in different contexts. Then, (3) I use fsQCA to investigate how novelty combines effectively with other value elements and strategies. The results suggest that the relationship between novel business models and firm performance may be less stable and more complex than previously thought. I discuss the implications of my study for business model design theory and aspects that future research should take into account.

In the second empirical study (chapter 4), *Configurations as complements and substitutes*, I examine top management teams (TMT) and new ventures' initial public offering (IPO) performance. Prior research on the relationship between TMT composition and firm performance has not been able to fully capture the joint influence of simultaneously present TMT characteristics and different contexts. Researchers have claimed that the findings remain ambiguous mainly due to multiple interdependencies between the TMT characteristics as well as internal and external context, and have made numerous calls for TMT studies that would use configurational approaches and sophisticated methodologies. At the same time, while strategic management scholars have extensively applied the upper echelons perspective over the last three decades, it has only now started to gain more attention among entrepreneurship scholars. Recent efforts in investigations regarding performance implications of new ventures' TMT composition are characterized by similar issues as in the strategic management literature resulting in lack of understanding concerning successful TMTs. My study aims to fill this gap by analyzing the joint

necessity and sufficiency of several characteristics related to TMTs' heterogeneity and knowledge stock in 1,935 new ventures that went public on an American stock exchange between 1990 and 2010. Specifically, I seek to understand how these characteristics combine effectively and act as complements and substitutes to influence firms' IPO performance. By using fsQCA, I am able to generate new insights regarding causal complexity germane to how TMTs relate to young ventures' performance outcomes. The study contributes to upper echelons theory, new venture teams, and IPO literature.

In the third empirical study (chapter 5), *Gaining insights from a full configurational analysis*, I exploit three different aspects of the configurational analysis. To provide an alternative perspective regarding family firm influences on corporate social responsibility (CSR), I use a sample of 108 family firms from the S&P 500 and explore configurations of CSR dimensions through a truth table analysis. Then, drawing from theory on organizational identity, I utilize a sufficiency matrix and measures reflective of the family's close visible association to further understand how the family's relationship with the firm relates to CSR outcomes. Finally, I examine which CSR configurations are sufficient for high financial performance by using standard fsQCA. My findings suggest that family firms do not have to sacrifice financial gain to be socially responsible.

Finally, chapter 6 summarizes the thesis and provides concluding thoughts.

2 CONFIGURATIONS, CAUSAL COMPLEXITY, AND FUZZY SET QUALITATIVE COMPARATIVE ANALYSIS (FSQCA)[1][2]

This chapter was accepted for publication in the "*Research Methodology in Strategy and Management*" book series. Respecting the copyrights of Emerald Publishing Limited, a full version of the original article can be found in Appendix A. Here, I only provide the abstract.

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Abstract

Research in entrepreneurship is increasingly exploring how archetypes, taxonomies, typologies, and configurations can help scholars understand complex entrepreneurial phenomena. We illustrate the potential for set-theoretic methods to inform this literature by offering best practices regarding how qualitative comparative analysis (QCA) can be used to explore research questions of interest to entrepreneurship scholars. Specifically, we introduce QCA, document how this approach has been used in management research, and provide step-by-step guidance to empower scholars to use this family of methods. We put a particular emphasis on the analytical procedures and offer solutions to dealing with potential pitfalls when using QCA-based methods and highlight opportunities for future entrepreneurship research.

[1] This chapter was developed in collaboration with Aaron McKenny (University of Central Florida) and Jeremy Short (University of Oklahoma).

[2] This chapter has been presented and discussed at Strategic Management Society Annual Conference and the TUM-WHU Research Seminar.

3 REPLICATING AND EXTENDING QUANTITATIVE RESEARCH USING CONFIGURATIONAL ANALYSIS[3]

In this chapter, I use the configurational approach to replicate and extend business model literature that relies on findings from regression analyses. Prior work suggests that novel business models are positively associated with entrepreneurial firms' market value. I argue that using fsQCA allows for more insightful investigation of the role that novelty plays as part of a firm's business model. My results from analyses with two data sets indicate that the relationship between novel business models and firm performance may be less stable and more complex than previously thought.

INTRODUCTION

Business models are gaining increasing attention by strategic management and entrepreneurship researchers (Massa, Tucci & Afuah, 2017; Zott et al., 2011). The increasing popularity of this construct seems to derive from its universally accepted potential to explain firms' combined efforts of value creation and value capture (Chesbrough & Rosenbloom, 2002; Massa et al., 2017; Teece, 2010). A number of studies sees them as an organizational system of interrelated design elements representing a firm's architecture of translating an entrepreneurial opportunity into a viable business (Aversa, Furnari & Haefliger, 2015; Afuah, 2003; Andries, Debackere & van Looy, 2013; Baden-Fueller & Mangematin, 2013; Johnson, Christensen & Kagermann, 2008; Zott & Amit, 2010).

Based on this system level thinking, a transaction design based view has emerged as one of the dominant perspectives on business models. According to this approach, the value a firm creates and captures is seen as resulting from four different value drivers, or business model design themes – novelty,

[3] This chapter has been presented and discussed at Academy of Management Annual Meeting, Strategic Management Society Annual Conference, DRUID Annual Conference (one of three finalists for Steven Klepper Young Scholar Award), Strategy, Entrepreneurship, and Innovation Consortium, as well as research seminars at Technical University of Munich, Nanyang Technological University, and New York University.

efficiency, lock-in, and complementarity (Amit & Zott, 2001). Here, a business model design theme describes "…*any factor that enhances the total value created by an [e-]business*" (Amit & Zott, 2001 p.494). Subsequent work has highlighted that in particular novelty seems to matter for firm performance (Zott & Amit, 2007, 2008), and, in so doing, paved the way for the emergence on an entire literature stream on business model innovation (Foss & Saebi, 2017; Zott & Amit, 2011), centering on how firms can exploit new ideas, technologies, or ways to deliver products and services through business model redesign.

In sum, the transactional perspective on business models has added a considerable amount to our understanding of value creation and value capture. At the same time, given its ever-increasing importance for strategy research and practice, we need to ensure the validity of the empirical and conceptual foundations of this perspective, and in particular the foundational work of Amit and Zott (Amit & Zott, 2001; Zott & Amit, 2007, 2008), which have established it.

Here, first, empirically, it is noteworthy that this stream of literature builds on data drawn from a novel industry (electronic businesses) at a time of great environmental turmoil (the dotcom boom and bust). Accordingly, it is unclear whether these initial findings, that novelty is a near-universally beneficial business model design attribute, would generalize to the business models of more established firms and to contexts of more established industries, with research in other domains suggesting that precisely this may not be the case (e.g., Park & Mezias, 2005).

Second, conceptually, the transactional perspective currently does not fully capture the complementarities inherent in interrelated systems, that is, that the system has to be *more* than the sum of the overall value created (Argyres & Liebeskind, 1999; Ennen & Richter, 2010). Here, prior scholarship in the transactional perspective has mainly looked at pairwise interactions between novelty and other design dimensions, value drivers and business strategies (Porter, 1980, 1985; Zott & Amit, 2007, 2008). Yet, a full configurational perspective would need to incorporate these interdependencies *simultaneously* to capture the true, complete system of interactions. In turn, such a configurational analysis (Fiss, 2011) could not only better highlight the interdependence between different design dimensions, but also point

toward potential equifinality in business model design (Doty, Glick & Huber, 1993): whether it is really novelty as a singular design dimension that would predict a high-value business model or whether it is rather a series of different combinations (which may or may not include novelty), all of which may equally lead to high performance.

Accordingly, in this study, I propose to replicate and extend the original work by Zott and Amit to answer two questions, which should be integral to research on business models. First, is the effect of business model novelty *temporally stable*, that is, do its effects on firm performance also hold when an industry has become more mature? Second, is the effect of novelty *configurationally stable*, that is, when subjecting the same data to a full configurational analysis, does novelty emerge as a necessary or even sufficient condition for high performance?

To do so, (1), I will attempt to reproduce the original results of Zott and Amit (2007, 2008) through a narrow replication (Bettis, Helfat & Shaver, 2016) using their original sampling frame for the 1999-2000 period, then (2) quasi-replicate these studies, for the same industry (electronic business) but for more established firms in the 2014-2015 period, and (3) subject both prior analyses to a neo-configurational perspective (Misangyi et al., 2017) through fuzzy set qualitative comparative analysis (fsQCA).

Overall, I find mixed support for a dominant role of novelty as a driver of business model value. First, in the narrow replication, I am only able to reproduce some of the original findings, suggesting that the evaluation of business models (through, e.g., coders) themselves may not be temporally stable. Second, in the quasi-replication using a more recent data set, the original hypotheses are not supported. Third, while novelty clearly emerges as an important factor in the configurational analysis, it alone is not sufficient to explain high firm performance, but needs to be combined with other sources of value or a strong competitive strategy, typically differentiation. Finally, across both regression and configurational analysis, I find that novelty is less important for the firms in my second sample (years 2014-2015).

This study contributes to the role of novel value creation as part of the business model and transaction design, and its relationship with firm performance. I conclude by proposing that rather than

investigating single business model elements (including design themes) in isolation, irrespective of the definition used, the elements be considered in combinations to account for more real life complexity. In addition, I provide several recommendations to improve the empirical scrutiny of business model research using a transactional perspective.

THEORY

A company's business model describes a set of interconnected choices and mechanisms through which it pursues to create value for its stakeholders, and capture some of that value for itself (Casadesus-Masanell & Ricart, 2010; Chesbrough & Rosenbloom, 2002; Teece, 2010; Zott & Amit, 2010). While there is consensus on this relatively abstract view on business models, strategy and entrepreneurship researchers have introduced numerous approaches to studying business models and have not fully agreed on a unanimous definition (Massa et al., 2017). In this study, I focus on the transaction design based view and use the definition of business model provided by Amit & Zott (2001); according to them, business model is "*…content, structure, and governance of transactions designed so as to create and capture value through the exploitation of business opportunities*".

They (Amit & Zott, 2001) draw, among others, on transaction cost economics and theories of Schumpeterian innovation to identify four different sources of value creation—so-called 'design themes' of the business model: novelty, efficiency, lock-in, and complementarity. For example, companies establishing a novelty-oriented business model focus on product or service innovation and hope to win customers over by providing superior use value. Oppositely, efficiency-oriented companies build transaction-based, scalable business models to remove market imperfections. Across a series of studies, Amit and Zott then go on to show that novelty is the most crucial driver of value creation, captured by market capitalization, that companies should influence.

Both papers I try to replicate and extend in this study (Zott & Amit, 2007, 2008) build on Amit and Zott (2001) and focus on business model design and firm performance yet they take slightly differing

approaches. Whereas the first paper focuses on the main effects of novel and efficient business models, the second paper focuses on the interaction effects of the business model design and product market strategy. Accordingly, below I first elaborate on the role of novelty as a driver of value creation focusing on the first replicated study, and then on novelty as a configurational aspect of the business model design focusing on the second replicated study.

The role of novelty as a driver of business model value creation

Most crucially, in Zott and Amit (2007), the authors test how business model designs affect firm performance in environments characterized by high and low resource munificence. In what has become the most cited article in Organization Science published in 2007 (as of December 2019, 1,487 citations on Google Scholar), they draw from their own past work (Amit & Zott, 2001) on business model design themes to test the performance effects of novelty and efficiency under varying environmental munificence.[4] Drawing on a sample of 201 (final sample size 142-180) e-businesses that had recently gone public in one of the largest North American or European stock exchanges, they find that novelty is positively associated with firm performance, but only little support that the level of resource munificence in the environment would strengthen this effect. The authors found mixed results for efficiency-centered business models as there was a significant positive effect only when the environment was characterized by a low level of resource munificence. Given the effect of the interaction term of novelty and efficiency together was insignificant, overall, the findings suggest that business model designs, and mainly the level of novelty, may be of importance for firms' financial performance.

[4] Specifically, they hypothesized that the more novelty-centered (other variables constant) and the more efficiency-centered (other variables constant) the business model design of a firm is, the higher the firm performance will be, measured by the market capitalization. They also hypothesized that the positive effect of novelty-centered business models will be stronger in environments characterized by a high level of resource munificence than vice versa, and that the positive effect of efficiency-centered business models will be stronger in environments characterized by a low level of resource munificence than vice versa. Finally, they tested the performance effect of novelty and efficiency together.

Zott and Amit (2007) represents a paper that is instrumental to the transactional perspective on business model design. Yet, from the perspective of broadly generalizing from the empirical approach this paper draws on, several issues emerge. First, as the industry itself was still within a nascent stage, it is to be expected that firm behavior be evaluated differently compared to a situation in which the industry itself was more established, with clear evaluation criteria having been agreed upon by key stakeholders (Alexy & George, 2013). As such, it is not clear whether the same behavior, even if exhibited by the same type of (now, older) firms in the same (now, more established) industry would result in the same market performance. Second, the specific observation period, 1999-2000 (or, more broadly, the period of the dotcom boom and eventual bust), saw extremely volatile market evaluations. For example, a series of studies has shown how a simple name change to include ".com" in the firm name had substantial, yet time-variant effects on firms' market valuation (e.g., Cooper, Dimitrov & Rau, 2001; Lee, 2001). Similarly, the capital market showed clearly different reactions toward the announcement of alliance deals before and after the stock market crash (Park & Mezias, 2005). These results not only raise questions about whether some of the effects observed of Zott and Amit (2007) could not be explained by other factors, which only exist in this sampling frame (i.e., whether the effects are *temporally stable*), they may even cast doubt about the choice of dependent variable (as performance measures connected more strongly to stock market developments should see substantial variation that would have less to do with actual firm performance).

Accordingly, as a first step after reproducing Zott and Amit's original 2007 study for 1999 and 2000, I propose to compare the effects of the novelty design dimension from that sample to a sample drawn from 2014 and 2015.

Novelty as a configurational aspect of business model value creation

Amit and Zott (2001) highlight how the different design themes are neither mutually exclusive nor collectively exhaustive. Rather, the design dimensions themselves already reflect aggregate evaluations of several transactional elements of the business model (i.e., *overall*, is this business model novel?). In turn,

in some of their work – partly in Zott and Amit (2007), but in particular in Zott and Amit (2008) – the authors try to identify which combinations of value drivers may be particularly value-accretive.

Zott and Amit (2008) essentially builds on the previous work of the same authors (Amit & Zott, 2001; Zott & Amit, 2007), which by itself has had an even wider reach (Google Scholar: 1,670 citations as of December 2019). Hence, as in Zott and Amit (2007), in this paper, the authors also draw on a sample of relatively young e-businesses that had gone public between the years 1996 and 2000, with the observational period itself being the years 1999 and 2000. Specifically, Zott and Amit (2008) draw from the configurations literature to investigate how novelty- and efficiency-centered business model designs work together with product market strategies, i.e., differentiation and cost leadership, and early market entry to impact firm performance. Although the authors do not develop formal hypotheses, they draw on a formal model of fit between the business model designs and product market strategies. Their analysis revealed that novelty-centered business models coupled with differentiation, cost leadership, or early market entry can increase firm performance. They also run several tests to demonstrate that the business model design themes novelty and efficiency are distinct from the product market strategies, namely differentiation and cost leadership, and that they act as complements rather than substitutes.

Indeed, the logic of interdependence underlying the business model as a system is adequately captured by configuration theory. The configurational approach to studying the strategy-performance relationship has been increasingly prominent in strategic management research (Fiss, 2011; Ketchen, Thomas & Snow, 1993; Miller, 1996; Misangyi et al., 2017; Short, Payne & Ketchen, 2008). It assumes that organizations are systems of highly interdependent elements that need to be consistently aligned in order to create internal and external fit, which, in turn, leads to superior performance (Doty et al., 1993; Miller, 1992; Siggelkow, 2002), such as when scholars have explored configurations of strategy, structure, and the environment (e.g., Burns & Stalker, 1961; Chandler, 1962; Miles & Snow, 1978; Miller, 1986; Miller & Friesen, 1984; Mintzberg, 1979; Siggelkow, 2001).

From a configurational perspective, the question of business model design thus becomes one of identifying (1) a complementary internal configuration that (2) exhibits external fit (Siggelkow, 2002;

Venkatraman & Camillus, 1984). First, complementarity constitutes that choices across several dimensions of a configuration are interdependent, and that specific choices will exhibit different levels of positive and negative externalities, or synergy (Milgrom & Roberts, 1995). To increase firm performance, it is up to management to identify a configuration that maximizes synergies, which means that choosing an inferior solution to a specific problem dimension may sometimes be preferred from a systems perspective (Argyres & Liebeskind, 1999; Ennen & Richter, 2010). At the same time, many potential configurations that lead to the highest level of synergies may simultaneously exist (Gresov & Drazin, 1997). Second, the idea of 'external fit' (Drazin & Van de Ven, 1985; Miller, 1992; Siggelkow, 2001) captures whether the chosen configuration is right given the prevailing external environment. For example, while both the organic and mechanistic organizations are prototypically optimized internal configurations for innovating organizations, the organic organization should be applied in volatile environments, and the mechanistic organization in stable ones (Burns & Stalker, 1961).

From such a perspective, I propose that the initial insights from Zott and Amit's (2008) work should be extended to a full configurational analysis (see e.g., Aversa et al., 2015; Fiss, 2011; Grandori & Furnari, 2008 for similar arguments), to fully understand the contribution novelty makes as a value driver of business model performance. Specifically, to understand how novelty, as a part of an overall business model configuration, contributes to firm performance, I propose to explore how varying configurations of the different business model design themes are necessary or sufficient for firm performance in combination in light of crucial external contingencies. Here, past work – and also Zott and Amit's 2008 paper – points to the crucial importance of three environmental factors: first, firm strategy and the fit of strategy, structure, and action (Porter, 1985; Fiss, 2011). Assuming that firm strategy describes the general idea about how firms hope to extract value, a fitting business model would represent an implementation in line with that general direction; for example, a novelty-oriented business model seems more fitting to enact a differentiation strategy (Zott & Amit, 2008), yet, configurational analysis holds the potential to uncover equally valuable hybrid strategies (e.g., Campbell-Hunt, 2000; Hill, 1988; Porter, 1996; Thornhill & White, 2007).

Second, literature on the strategy-structure fit has often pointed in particular to firms' size, which seems crucial to firms' ability to acquire and exploit resources efficiently (e.g., Burns & Stalker, 1961; Donaldson, 1982; Miles & Snow, 1978; Pugh, Hickson, Hinings & Turner, 1968). In turn, we might expect that for example larger firms may in fact benefit more from configurations emphasizing efficiency-centered business models and cost leadership strategies, rather than focusing on novelty.

Third, strategy scholars have often highlighted how industry might have a significant impact on firm performance (Doz & Kosonen, 2010; Vanneste, 2017). Specifically, the degree of competition, or competitive threat, has frequently been included in studies focusing on the relationship between value creation and firm performance (e.g., Casadesus-Masanell & Zhu, 2012; Porter, 1980, 1985; Teece, 2010). For example, high levels of competition may result in lower overall value created by a business model and may hence, lead to lower firm performance (Zott & Amit, 2007, 2008).

Accordingly, as a second step, as above, I propose to replicate also Zott and Amit's original study (here: Zott & Amit, 2008), and then extend it to the 2014-2015 period. Subsequently, I will subject the resulting samples to a full configurational analysis to identify whether, in such a perspective, novelty emerges as a necessary or sufficient condition explaining high performing business models, and to explore which other configurations of business model design themes and strategy also lead to high firm performance.

DATA AND METHOD

Sampling

The goal of this is study is to investigate the temporal and configurational effects of novel business models on firm performance. I therefore set out to replicate two important studies by first taking a narrow replication approach, followed by a quasi-replication, and then using the same data in a configurational analysis. The data sets used in the original studies by Zott and Amit (2007, 2008) consist to a great extent of the same variables, which makes it ideal to use same data sets to replicate both studies. Hence, I

collected two sets of data to enable examination of novel business models, as in both of the original studies, at two different points in time.

For the narrow replications (Bettis et al., 2016) I collected a data set that is almost identical to those used in the replicated studies (Zott & Amit, 2007, 2008). Similar to the original studies, I looked for Internet-enabled firms that had gone public between April 1996 and May 2000 on the five largest stock exchanges in North America and Europe.[5] From the total of 384 firm I found, as Zott and Amit, I drew a random sample of 201 firms. The data on business models, strategies, competition, markets, and the firms' financials in this set are from the years 1999 and 2000.

The second data set, which is used for the quasi-replications (Bettis et al., 2016) is from 15 years later (2014-15) than the original data sets. Here, I started looking for Internet-enabled firms by applying the same sampling criteria as for the first sample. However, I could find only ~40 firms that had gone public on one of the five largest stock exchanges in North America and Europe between 2011-2015. Therefore, I considered public e-businesses regardless of the year they went public, after which I found more than 300 potential sample firms. The original purpose of this sampling criterion was to avoid firms with complex, multiple business models. Large firms typically have diversified businesses and the inclusion of such firms would potentially bias the results. Therefore, I carefully assessed the business models of all potential sample firms and chose only firms that generated a clear majority of their revenues by means of a principal business model. For example, although Google was involved in several businesses in 2014, it still yielded roughly 90% of its revenues via the search engine business – almost all other services such as Gmail and Hangouts were free of charge. Subsequently, after I had assessed the business models of the potentially eligible firms, the sample consisted of 173 e-businesses.

5 The original studies sampled firms "*…that had gone public in Europe or in the United States…*" (Zott & Amit, 2008 p.10), but it is unclear which stock exchanges exactly were used. In this study I used NASDAQ, NYSE, Euronext, London, and Frankfurt.

As most of the companies in this sample had been publicly traded for longer than four years, the average age and size of the firms is clearly higher than in my first sample and in those used in the original studies. Another difference between the second and the first data set is that the Internet and technology in general were more advanced in 2014-2015 compared to the years 1999-2000. Hence for this data set it was more difficult to distinguish between e-businesses and non-e-businesses as most firms nowadays have their own websites and online channels. This may also provide an interesting aspect for the quasi-replication.

Data collection

Zott and Amit (2007, 2008) developed scales for the business model design themes and product market strategies, and they used also further single-item variables, such as the importance of timing of entry, entry mode, product scope, and market scope. The items are listed in Appendix B. For novelty, efficiency, differentiation, cost leadership, timing of entry, entry mode, product scope, and market scope I followed Zott and Amit (2007, 2008), while the items on the business model design themes complementarity and lock-in were not published in those two papers, but in a working paper (Zott & Amit, 2002). Since also the four items on the degree of competition were not publicly available, I developed my own scale based on existing literature (e.g., Porter, 1980). The data were collected mostly from the firms' annual reports complemented by data from press releases, news articles, industry analyses, company websites (e.g., through Google Cache and Wayback Machine), and other SEC filings. Overall, I used eleven items to measure novelty, 13 for efficiency, eleven for lock-in, nine for complementarity, five for differentiation strategy, four for low cost strategy, and six for competition. Due to limited availability of data, or lack of access to them, I had to drop two out of the original 13 items measuring novelty of the business model. For the same reason, the final number of firms in my first sample decreased to 174, while the second sample size remained at 173.

A considerable proportion of the survey items is based on relatively subjective assessments, due to which, similarly to Zott and Amit (2007, 2008) and MacCormack, Verganti and Iansiti (2001), I

assigned students writing their final (scientific) thesis in the M.Sc. degree program under my supervision, to collect the same data for the sake of cross-validation. The students were trained for the data collection and provided with in-depth training as well as written guidance and instructions in order to ensure a required quality standard. All participating students used the data in their own final thesis, which motivated them to properly investigate the assigned firms' business models and strategies. The students and I collected the data independently, after which we compared our data sets and discussed all conflicting data points. Average inter-rater consistency in the first round was 0.71 for the 1999-2000 data and 0.79 for the 2014-2015 data, measured as Pearson correlation coefficient. After one to three rounds of discussion we derived a consensus thus reaching an agreement of 100% on all items.

I use the same items to measure the constructs as in the original studies, except for two novelty-items I had to drop due to lack of access to the data and limited availability thereof. I ran factor analysis and other tests to establish validity. During these tests I encountered issues regarding the unidimensionality of the business model design themes. I elaborate on these issues in the sections on limitations and future research suggestions. I also compared the Cronbach alphas of each construct used in this and the original studies. These are shown in Table 1.

Table 1: Cronbach alphas[a]

Construct	Zott & Amit (2007)	Zott & Amit (2008)	Narrow replication	Quasi-replication
Novelty	0.72	0.71	0.65	0.65
Efficiency	0.69	0.70	0.66	0.63
Lock-in	0.74	Not used	0.64	0.58
Complementarity	0.70	Not used	0.73	0.60
Differentiation	Not used	0.66	0.57	0.63
Cost leadership	Not used	0.76	0.74	0.69
Competition[b]	N/A	N/A	0.62	0.76

[a] I use the same items to measure the constructs as the authors in the original studies. I use a reduced set of items in my additional analysis to test whether improved internal consistency (higher Cronbach alphas) of the constructs affect the replication results. For more information, see the section on Robustness checks.
[b] Not reported in the original studies.

Configurational analysis: Fuzzy set qualitative comparative analysis (fsQCA)

The second aim of this study is to examine how novel business models combine effectively and ineffectively with other sources of value and strategies in different contexts. Hence, I draw from the neo-configurational approach (Misangyi et al., 2017) and use the fuzzy set qualitative comparative analysis (Fiss, 2011; Ragin, 2000, 2008) and the data sets that I also use for the narrow and quasi-replications. The fsQCA approach is appropriate for studying combinations of interdependent and complementary strategies that, depending on their consistency, may or may not lead to a desired outcome (Delbridge & Fiss, 2013; Greckhamer, Misangyi, Elms & Lacey, 2008).

After having been developed and used in particular in sociology and political science, fsQCA has become an established method also in management research. It has been both used across various fields in strategic management (e.g., Bell, Filatotchev & Aguilera, 2014; Crilly, Zollo & Hansen, 2012; García-Castro & Francoeur, 2016; Greckhamer, 2016; Misangyi & Acharya, 2014) as well as developed and tested as a method (e.g., Fiss, 2007, 2011; Fiss, Sharapov & Cronqvist, 2013; Greckhamer et al., 2008; Greckhamer, Misangyi & Fiss, 2013). For example, Greckhamer, Misangyi, Elms and Lacey (2008) concluded that QCA is a viable method in strategic management research and provides substantial benefits especially when examining potential interdependencies and complexity. Fiss (2011) showed that fsQCA demonstrates several potential advantages over correlational interaction methods, cluster analysis, and deviation scores, when studying configurations. For a full review of management studies using QCA, see Misangyi and colleagues (2017).

In this study I use fsQCA for several reasons. First, rather than estimating coefficients or bi-variate interactions on a correlational basis, I aim to detect effective (high performing) and ineffective (low performing) combinations of multiple conditions (Ragin & Fiss, 2008; Rihoux & Ragin, 2009) focusing on the role of novelty.

Second, I am interested in to what extent novelty is necessary and sufficient for different levels of performance. QCA allows for identifying necessary and sufficient conditions for desired outcomes (Ragin, 1987). For example, Misangyi and Acharya (2014) found that the presence of CEO stock options

is a necessary governance mechanism for firm high performance, because it was present in all consistently high performing configurations. In such a case the necessary condition may be excluded from further analysis and hence the overall model complexity reduced.

Third, identifying core and peripheral conditions and thus better understanding the strength of potential causal relationships between the conditions and the outcome is possible when using fsQCA. The concepts of causal core, causal periphery, and neutral permutations (i.e., changing peripheral elements around the core element(s) without influencing the overall effectiveness of that specific configuration) allow for generating deeper insights on equifinality (Fiss, 2011). It is important to investigate the role of novelty as a business model design from this perspective.

Prior to a fuzzy set analysis an important step is to calibrate thresholds for the set membership in each causal condition (Ragin, 2000). For the calibration of any variable the researcher is required to have theoretical or substantial knowledge of the cases for being able to define meaningful thresholds (Schneider & Wagemann, 2012). Often, such as here, there is little or no theoretical or substantial knowledge about meaningful thresholds that apply in socially complex phenomena. Hence, scales and other similar measurement instruments can provide practical help for calibration (Rihoux & Ragin, 2009; Schneider & Wagemann, 2012). Furthermore, scale-based calibration has become an established means for setting thresholds for set memberships (Misangyi et al., 2017). Hence, I calibrated all four business model design themes, the two competitive strategies, and competition in a similar way. Since all of the measures had more than three items of which each was assessed along a Likert scale ranging from 0 to 1 or 1 to 5, the minimum and maximum aggregated values of the single constructs rarely, if ever, reached close to the theoretical ends. Therefore, I set the thresholds at 0.75 and 4 (fully in), 0.50 and 3 (crossover point), and 0.25 and 2 (fully out). I calibrated firm size using employee-based thresholds and partly followed Fiss (2011) to set 1,000 as a threshold for firms being fully in the set of large companies, 250 as a crossover point, and 50 for fully out. Finally, calibration of the outcome variables (firm performance in different years) was based on percentiles of the population-level data obtained from Compustat (e.g., Fiss, 2011; Misangyi & Acharya, 2014). The calibration thresholds are shown in Table 2.

Table 2: Calibration thresholds

Variables	Fully out	Crossover point	Fully in	Explanation*
Market value 1999	22.517	88.506	483.218	Percentiles from population
Market value 2000	16.529	72.380	439.450	Percentiles from population
Tobin's Q 1999	0.220	0.631	2.010	Percentiles from population
Tobin's Q 2000	0.165	0.525	1.506	Percentiles from population
Market value 2014	29.803	181.572	1,264.109	Percentiles from population
Market value 2015	32.526	189.600	1,310.042	Percentiles from population
Tobin's Q 2014	0.279	0.830	1.955	Percentiles from population
Tobin's Q 2015	0.199	0.669	1.622	Percentiles from population
Novelty	0.25	0.50	0.75	Scale 0-1
Efficiency	0.25	0.50	0.75	Scale 0-1
Lock-in	0.25	0.50	0.75	Scale 0-1
Complementarity	0.25	0.50	0.75	Scale 0-1
Differentiation	2	3	4	Scale 1-5
Low cost	2	3	4	Scale 1-5
Competition	0.25	0.50	0.75	Scale 0-1
Large size (emp)	50	250	1000	EU size classes

*I used 25th, 50th, and 75th percentiles.

As explained in the second chapter of this thesis, the researcher then generates a truth table that displays all theoretically possible combinations of the causal conditions and how the studied cases distribute across these combinations (Ragin, 1987, 2000). Three thresholds need to be set at this point, namely consistency, proportional reduction in inconsistency (PRI), and frequency thresholds. While consistency refers to the degree to which a combination of causal conditions produces an outcome in question (e.g., high performance), frequency depicts simply the number of cases (sample firms) that follow a certain configuration. Consistency is recommended to set to at least 0.75 (Ragin, 2008a), however I followed Fiss (2011) and set it at 0.80 to avoid inconsistencies in the analysis. I also kept the proportional reduction in inconsistency (PRI) above 0.75 in all analyses. I set the frequency threshold at three cases per configuration and was thus able to always include at least the recommended 75% of the sample firms in the analysis (Ragin, 2017). In the third step, the researcher makes assumptions regarding the counterfactual analysis that results due to limited diversity (Soda & Furnari, 2012; Ragin, 2000) meaning that all theoretically possible configurations are not observed in the real world. I therefore assumed that the presence of each business model design theme contributes to firms' high performance.

In turn, for the other four conditions used in this study, differentiation, cost leadership, competition, and size, I assumed a contribution to firms' high performance neither through their presence nor absence.

REPLICATION RESULTS

Study 1: Zott and Amit (2007)

Table 3 shows the descriptive statistics (means and standard deviations) of the original study and both my replications.

Table 3: Descriptive statistics of Study 1 and the replications

	Zott & Amit (2007)		Narrow replication		Quasi-replication	
Variable	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Market value at close of Q4 1999 (2014)	1,506	3,184	1,420	3,698	6,362	20,317
Market value at close of Q4 2000 (2015)	387	1,101	395	894	8,261	31,991
Design efficiency	0.70	0.11	0.71	0.13	0.71	0.12
Design novelty	0.37	0.13	0.53	0.15	0.49	0.15
Complementarity	0.62	0.17	0.51	0.19	0.65	0.16
Lock-in	0.45	0.14	0.41	0.15	0.49	0.14
Age of firm	7.0	7.8	7.6	11.6	21.1	22.6
Ln number of employees	5.72	1.34	5.67	1.22	7.17	1.62
Country (1=United States, 0=Europe)	0.88	0.32	0.88	0.33	0.66	0.47
R&D expense US$ 00 (million)	2.7	6.4	6.6	15.7	176.3	819.4
Advertising expense US$ 00 (million)	4.7	9.3	8.6	17.6	137.0	426.2
Capital expense US$ 00 (million)	42.7	415.9	5.9	25.6	133.6	581.1
Book value of equity 99 (million) (2014)	164	417	98	212	1,602	7,221
Book value of equity 00 (million) (2015)	273	685	184	464	1,154	4,052
Sales net US$ 99 (million) (2014)	263	1,575	110	312	1,661	7,089
Sales net US$ 00 (million) (2015)	332	1,643	197	499	1,994	8,659
Number of employees	1,067	3,557	673	1,234	5,546	18,100
Market size US$ 00 (million)*	20,477	65,640	482,190	477,390	625,073	427,501

*The original studies obtained estimations of market size from Forrester Research and the U.S. Department of Commerce. In this study, I took the aggregated industry revenue from Compustat using 4-digit SIC codes. The robustness checks showed that the presence or absence of the variable in the regression models has only a very small effect (or no effect at all) on the results (see Section on Additional Analysis).

For the narrow replication, most variables seem to be in line with the original study, however, some variables have slight deviations. While novelty is somewhat lower in the original study than in the narrow replication, complementarity is slightly higher. Yet, the standard deviations of these variables are

almost identical. Further, R&D and advertising expenses are lower in the original study, but capital expenses are clearly higher than in the narrow replication. It is not clear where this difference comes from, but one likely explanation are outliers, as the relatively high standard deviation in the original study may indicate. Finally, market size is substantially higher in my data set due to the fact that I was not able to obtain market size estimates from Forrester Research and the U.S. Department of Commerce as the authors of the original study did, but took the aggregated industry sales from Compustat using a 4-digit SIC code. The business model design statistics of the quasi-replication are very similar to those of the original study, but as expected, the values of all monetary and size-related variables differ considerably due to the larger and older firms in the quasi-replication.

Zott and Amit (2007) hypothesized that efficiency- and novelty-centered business models are positively associated with firm performance (market value), and that the positive effect of efficiency is stronger when the level of resource munificence in the firms' environment is low (year 2000), and that the positive effect of novelty is stronger when the level of resource munificence is high (year 1999). In addition, they hypothesized that a high level of both efficiency and novelty may be positively or negatively associated with firm performance. The regression results of both the original studies and my replications are shown in Table 4-Table 6.

While Zott and Amit (2007) find support for efficiency being positively associated with firm performance in the year 2000 but not in 1999, my data do not support these findings, neither in the narrow nor in the quasi-replication. The original study found evidence regarding the positive effect of novelty, which I can partly confirm in the narrow replication. Interestingly, I find a positive effect of novelty when the level of resource munificence is high, but only in Models 1 and 3, which do not include control variables. I also find a positive effect of novelty when the level of resource munificence is low, but only in Models 2 and 4 in which control variables are present (though Model 4 includes novelty*efficiency interaction term). Moreover, similar to the original study, I did not find a statistically significant effect of the interaction of efficiency and novelty. Whereas in Zott and Amit (2007) the coefficient was clearly negative, the coefficient in the narrow replication is negative in the absence of control variables and

positive when the control variables are present, irrespective of the level of resource munificence. Finally, I did not find evidence for any of the hypothesized effects in the quasi-replication. A summary of the replication results is shown in Table 7.

Table 4: Replication results, Study 1 (Zott & Amit, 2007): High level of resource munificence

	Original study (Ln market value average Q4 1999)				**Narrow replication (Ln market value at end of Q4 1999)**			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	**19.75*** **	**17.25*** **	**19.78*** **	**17.51*** **	**5.99*** **	**1.36**	**5.98*** **	**1.29**
					(0.13)	(1.53)	(0.14)	(1.54)
Efficiency	**1.28**	**0.93**	**1.28**	**1.10**	**-0.27**	**1.37**	**-0.25**	**1.30**
	(1.09)	(0.9)	(1.09)	(0.9)	(0.99)	(1.25)	(1.07)	(1.27)
Novelty	**3.32*** **	**2.29** **	**3.21*** **	**2.17***	**2.07** **	**1.17**	**2.07** **	**1.21**
	(0.93)	(0.83)	(0.93)	(0.83)	(0.85)	(0.97)	(0.85)	(0.98)
Efficiency*Novelty			**-8.28**	**-9.16**			**0.44**	**-4.69**
			(7.63)	(6.09)			(5.5)	(7.1)
Complementarities		**-0.63**		**-0.59**		**-1.64** **		**-1.69** **
						(0.66)		(0.65)
Lock-in		**0.80**		**0.51**		**0.16**		**0.16**
						(1.09)		(1.09)
Competition		**0.05**		**-0.08**		**-0.65**		**-0.65**
						(0.66)		(0.66)
Ln market size		**-0.16***		**-0.16***		**0.16** **		**0.16** **
						(0.06)		(0.06)
Age		**-0.05*** **		**-0.05*** **		**-0.02**		**-0.02**
						(0.02)		(0.02)
Ln employees		**0.65*** **		**0.64*** **		**0.45*** **		**0.45*** **
						(0.15)		(0.15)
Country (1=United States, 0=Europe)		**0.12**		**0.20**		**1.392***		**1.49** **
						(0.75)		(0.74)
R&D expense US$ 00 (million)		**0.08*** **		**0.09*** **		**0.04** **		**0.04** **
						(0.02)		(0.02)
Advertising expense US$ 00 (million)		**0.03**		**0.03**		**0.00**		**0.00**
						(0.01)		(0.01)
Capital expense US$ 00 (million)		**0.00**		**0.00**		**-0.01**		**-0.01**
						(0.01)		(0.01)
R-squared	**0.10**	**0.52**	**0.11**	**0.53**	**0.04**	**0.39**	**0.04**	**0.39**
Adjusted R^2	**0.09**	**0.48**	**0.09**	**0.49**	**0.02**	**0.32**	**0.02**	**0.32**
Observations	**158**	**158**	**158**	**158**	**153**	**116**	**153**	**116**
F	**8.47*** **	**13.27*** **	**6.04*** **	**12.53*** **	**3.27** **	**9.55*** **	**2.21***	**9.23*** **
Robust standard errors in parentheses	†p<0.1, ∗<0.05, ∗∗p<0.01, ∗∗∗p<0.001				∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01			

Table 5: Replication results, Study 1 (Zott & Amit, 2007): Low level of resource munificence

	Original study (Ln market value average Q4 2000)				Narrow replication (Ln market value at end of Q4 2000)			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	**18.42*** **	**16.36*** **	**18.44*** **	**16.64*** **	**4.63*** **	**-1.63**	**4.37*** **	**-1.23**
					(0.89)	(2.21)	(0.15)	(1.98)
Efficiency	**2.21†**	**2.24***	**2.16†**	**2.51***	**-1.30**	**-0.73**	**-1.01**	**-1.06**
	(1.18)	(1.01)	(1.1)	(1.01)	(1.21)	(1.81)	(1.22)	(1.84)
Novelty	**1.72†**	**1.54†**	**1.70†**	**1.47**	**1.33**	**2.31***	**1.32**	**2.54****
	(1.01)	(0.93)	(1.01)	(0.93)	(0.95)	(1.24)	(0.97)	(1.22)
Efficiency*Novelty			**-8.24**	**-10.25**			**6.58**	**-16.65**
			(8.45)	(6.83)			(7.34)	(10.24)
Complementarities		**-0.71**		**-0.67**		**-0.30**		**-0.40**
						(1.04)		(1.01)
Lock-in		**-0.30**		**-0.57**		**-0.17**		**-0.18**
						(1.39)		(1.4)
Competition		**0.88†**		**-1.04***		**-0.49**		**-0.49**
						(0.97)		(0.97)
Ln market size		**0.04**		**0.04**		**0.04**		**0.04**
						(0.1)		(0.1)
Age		**-0.01**		**-0.01**		**0.01**		**0.01**
						(0.03)		(0.03)
Ln employees		**0.66*** **		**0.65*** **		**0.55*** **		**0.57*** **
						(0.19)		(0.19)
Country (1=United States, 0=Europe)		**-1.12****		**-1.01****		**2.37****		**2.67****
						(1.18)		(1.13)
R&D expense US$ 00 (million)		**0.05****		**0.05****		**0.02**		**0.02**
						(0.02)		(0.02)
Advertising expense US$ 00 (million)		**0.02**		**0.02**		**-0.04****		**-0.04****
						(0.02)		(0.02)
Capital expense US$ 00 (million)		**0.00**		**0.00**		**0.02***		**0.02****
						(0.01)		(0.01)
R-squared	**0.04**	**0.47**	**0.05**	**0.48**	**0.01**	**0.25**	**0.02**	**0.27**
Adjusted R^2	**0.03**	**0.44**	**0.03**	**0.44**	**0.00**	**0.17**	**0.00**	**0.18**
Observations	**180**	**180**	**180**	**180**	**161**	**118**	**161**	**118**
F	**3.84†**	**12.59*** **	**2.88***	**11.88*** **	**1.24**	**8.69*** **	**1.17**	**9.8*** **
Robust standard errors in parentheses	†p<0.1, ∗<0.05, ∗∗p<0.01, ∗∗∗p<0.001				∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01			

Table 6: Results of the quasi-replication, Study 1 (Zott & Amit, 2007)

	Quasi-replication (Ln market value at end of Q4 2014)				Quasi-replication (Ln market value at end of Q4 2015)			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	**5.92*** **	**-2.79***	**6.64*** **	**-3.21****	**5.90*** **	**-3.28***	**6.73*** **	**-3.78****
	(1.07)	(1.65)	(0.16)	(1.48)	(1.09)	(1.87)	(0.17)	(1.68)
Efficiency	**1.23**	**0.18**	**1.25**	**0.18**	**1.87**	**-0.08**	**1.84**	**-0.13**
	(1.39)	(0.91)	(1.39)	(0.93)	(1.43)	(0.95)	(1.41)	(0.94)
Novelty	**-0.13**	**-0.93**	**-0.07**	**-0.89**	**-0.73**	**-0.78**	**-0.69**	**-0.69**
	(1.1)	(0.74)	(1.09)	(0.76)	(1.23)	(0.81)	(1.2)	(0.78)
Efficiency*Novelty			**15.83**	**3.11**			**18.06***	**6.62**
			(10.28)	(5.12)			(10.39)	(5.01)
Complementarities		**-0.44**		**-0.42**		**-1.16**		**-1.11**
		(0.7)		(0.71)		(0.78)		(0.79)
Lock-in		**0.65**		**0.77**		**0.11**		**0.34**
		(1.05)		(1.1)		(1.12)		(1.16)
Competition		**-0.39**		**-0.40**		**0.26**		**0.27**
		(0.88)		(0.87)		(0.89)		(0.87)
Ln market size		**0.12**		**0.12**		**0.20**		**0.18**
		(0.1)		(0.1)		(0.12)		(0.12)
Age		**-0.02***		**-0.02***		**-0.02***		**-0.02***
		(0.01)		(0.01)		(0.01)		(0.01)
Ln employees		**1.09*** **		**1.10*** **		**1.18*** **		**1.19*** **
		(0.08)		(0.09)		(0.08)		(0.08)
Country (1=United States, 0=Europe)		**1.38*** **		**1.35*** **		**0.51***		**0.46**
		(0.29)		(0.29)		(0.28)		(0.28)
R&D expense US$ 00 (million)		**0.00**		**0.00**		**0.00**		**0.00**
		(0)		(0)		(0)		(0)
Advertising expense US$ 00 (million)		**0.00**		**0.00**		**0.00****		**0.00***
		(0)		(0)		(0)		(0)
Capital expense US$ 00 (million)		**-0.00*** **		**-0.00*** **		**0.00**		**0.00**
		(0)		(0)		(0)		(0)
R-squared	**0.00**	**0.70**	**0.03**	**0.70**	**0.00**	**0.70**	**0.00**	**0.70**
Adjusted R^2	**-0.01**	**0.67**	**0.01**	**0.67**	**0.00**	**0.70**	**0.00**	**0.70**
Observations	**173**	**114**	**173**	**114**	**172**	**113**	**172**	**113**
F	**0.40**	**25.7*** **	**1.00**	**23.79*** **	**0.97**	**39.85*** **	**1.49**	**39.64*** **
Robust standard errors in parentheses		∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01		

Table 7: Summary of replication results, Study 1 (Zott & Amit, 2007)[ab]

	DV = Ln Market Value		Narrow replication			Quasi-replication[c]		
H#	**Independent variable**	**Prediction**	**Same effect**	**No effect**	**Different effect**	**Same effect**	**No effect**	**Different effect**
1	Efficiency	Positive	0/4	4/4	0/4	0/4	4/4	0/4
2	Novelty	Positive	2/4	2/4	0/4	0/4	4/4	0/4
3	Novelty* High munificence	Positive (stronger)	1/2	1/2	0/2	n/a	n/a	n/a
4	Efficiency* Low munificence	Positive (stronger)	0/2	2/2	0/2	n/a	n/a	n/a
5-6	Novelty*Efficiency	Positive or Negative	0/4	4/4	0/4	0/4	4/4	0/4[d]

[a] The numbers in columns 4-9 refer to the number of relevant regressions (e.g., models that include an interaction term novelty*something, are not relevant when the main effect of novelty is examined).
[b] Hypotheses 1 (partly), 2, 3, and 4 were supported in the original studies. Hypotheses 5 and 6 had a negative coefficient yet statistically not significant.
[c] Since the years 2014 and 2015 do not differ considerably in their level of resource munificence (unlike years 1999 and 2000 do), the original hypotheses could not be tested in the quasi-replication.
[d] The interaction of novelty*efficiency is positive and statistically significant in the Model 3 of the quasi-replication (year 2015), however, the F-statistic of the overall model is not statistically significant.

Study 2: Zott and Amit (2008)

Table 8 shows the descriptive statistics of the original study and my replications. Similar to Study 1, the mean of novelty seems to be somewhat lower in the original study than in the narrow replication, but again, the standard deviations are almost the same. Moreover, competition is slightly lower and entry mode clearly higher in the original study, and like in Study 1, market size differs due to the different source of data collection. Finally, the descriptive statistics of the quasi-replication appear very close to those of the original study, except variables that relate to monetary values or firm size and age.

Table 8: Descriptive statistics of Study 2 and the replications

	Zott & Amit (2008)		Narrow replication		Quasi-replication	
Variable	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Novelty	0.38	0.14	0.54	0.15	0.49	0.15
Efficiency	0.74	0.12	0.73	0.13	0.72	0.12
Differentiation	3.60	0.80	3.39	0.72	3.08	0.73
Cost leadership	2.66	1.03	2.81	0.77	2.58	0.90
Timing of entry	2.15	1.59	3.24	0.90	2.39	1.14
Market value average Q4 2000 (2015)	517	1,491	641	1,438	8,323	31,624
Market value average 2000 (2015)	883	2,262	774	1,772	8,330	32,101
Competition	0.62	0.18	0.74	0.15	0.68	0.14
Market size*	22,410	69,111	482,190	477,390	625,073	427,501
Age of firm	7	7.9	8.14	11.43	21.1	22.6
Employees	1,145	3,749	673	1,234	5,548	18,100
Entry mode	3.97	1.28	2.26	1.93	3.34	1.41
Product scope	3.77	1.01	3.16	1.07	2.82	1.35
Market scope	1.87	1.05	2.48	1.02	2.98	1.40

*The original studies obtained estimations of market size from Forrester Research and the U.S. Department of Commerce. In this study, I took the aggregated industry revenue from Compustat using 4-digit SIC codes. The robustness checks showed that the presence or absence of the variable in the regression models has only a very small effect (practically no effect at all) on the results.

The original findings alongside my regression results are in Table 9 and Table 10. While Zott and Amit (2008) did not develop formal hypotheses but developed an econometric model for firm value creation, they focused on testing the fit between the business model design and product market strategy. Specifically, they examined how novelty and efficiency interact with differentiation, cost leadership, and timing of entry.

The authors of the original study found evidence that the interaction of novelty and differentiation has a positive effect on firm performance. Surprisingly, I find no evidence for this in either replication. Zott and Amit found that the fit between novelty and cost leadership may have a positive effect (statistically significant in Model 1 but not in Model 5), while I find the same is partly true in the quasi-replication but not in the narrow replication. Further, novelty and timing of entry are positively associated with firm performance in the original study, but neither replication provides same evidence. Finally, the original study, as well as both replications, did not find support for the effect of efficiency and cost leadership.

Table 9: Results of the narrow replication, Study 2 (Zott & Amit, 2008)

	Original study (Ln market value average Q4 2000)					Narrow replication (Ln market value at end of Q4 1999)					Narrow replication (Ln market value at end of Q4 2000)				
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant	**-0.19**	**-0.37**	**-0.39**	**-0.47**	**-0.29**	**1.10**	**1.19**	**1.38**	**1.35**	**0.83**	**1.57**	**1.05**	**1.51**	**1.65**	**1.52**
						(1.77)	(1.78)	(1.72)	(1.73)	(1.88)	(1.92)	(1.76)	(1.88)	(1.84)	(1.9)
Independent variables															
Novelty	**1.26†**	**1.45†**	**1.31†**	**1.67***	**0.93**	**1.77***	**1.65***	**1.12**	**1.77****	**2.25**	**1.42**	**1.63**	**2.35**	**1.30**	**-0.39**
	(0.93)	(0.92)	(0.98)	(0.96)		(0.9)	(0.85)	(2.9)	(0.89)	(3.4)	(1.25)	(1.27)	(4.28)	(1.28)	(4.25)
Efficiency	**0.95**	**0.63**	**0.84**	**0.76**	**1.34†**	**0.34**	**0.27**	**0.37**	**0.39**	**0.01**	**0.03**	**0.07**	**-0.06**	**0.31**	**0.60**
					(0.82)	(0.97)	(0.97)	(0.97)	(1.08)	(1.13)	(1.36)	(1.32)	(1.33)	(1.48)	(1.5)
Differentiation	**1.80*****	**1.92*****	**1.99*****	**2.02*****	**1.77*****	**0.54*****	**0.53*****	**0.52*****	**0.51*****	**0.53*****	**0.46***	**0.43***	**0.48***	**0.49***	**0.42***
	(0.5)	(0.53)	(0.53)	(0.55)	(0.52)	(0.17)	(0.18)	(0.17)	(0.18)	(0.19)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)
Cost leadership	**-0.44**	**-0.35**	**-0.43**	**-0.42**	**-0.47**	**-0.04**	**-0.08**	**-0.05**	**-0.04**	**-0.06**	**-0.03**	**0.00**	**-0.03**	**0.02**	**-0.04**
						(0.14)	(0.14)	(0.14)	(0.16)	(0.16)	(0.23)	(0.22)	(0.22)	(0.25)	(0.25)
Timing	**0.16**	**0.15**	**0.04**	**0.19**	**-0.01**	**-0.14**	**-0.14**	**-0.18**	**-0.16**	**-0.10**	**-0.29**	**-0.23**	**-0.31**	**-0.24**	**-0.24**
						(0.13)	(0.13)	(0.13)	(0.14)	(0.14)	(0.21)	(0.2)	(0.22)	(0.21)	(0.24)
Control variables															
Competition	**-0.48**	**-0.66**	**-0.25**	**-0.4**	**-0.12**	**0.16**	**0.10**	**0.17**	**0.15**	**0.18**	**-0.67**	**-0.71**	**-0.63**	**-1.00**	**-0.93**
						(0.75)	(0.76)	(0.77)	(0.74)	(0.78)	(0.95)	(0.94)	(0.96)	(1)	(1.01)
Ln market size	**0.07**	**0.08**	**0.06**	**0.08**	**0.07**	**0.17****	**0.17****	**0.17****	**0.17*****	**0.18****	**0.05**	**0.03**	**0.04**	**0.02**	**0.03**
						(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.09)	(0.09)	(0.09)	(0.09)	(0.1)
Age	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.02**	**-0.02**	**-0.02**	**-0.02**	**-0.02**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**
						(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Ln employees	**0.85*****	**0.87*****	**0.85*****	**0.87*****	**0.80*****	**0.55*****	**0.54*****	**0.54*****	**0.54*****	**0.55*****	**0.60*****	**0.60*****	**0.60*****	**0.59*****	**0.59*****
						(0.14)	(0.14)	(0.13)	(0.13)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Mode of entry	**-0.36**	**-0.31**	**-0.42**	**-0.34**	**-0.44**	**0.15****	**0.15****	**0.15****	**0.14***	**0.15****	**0.07**	**0.11**	**0.08**	**0.09**	**0.11**
						(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.1)	(0.1)	(0.1)	(0.1)	(0.11)
Product scope	**-0.02**	**0.02**	**-0.06**	**0.00**	**-0.04**	**0.08**	**0.08**	**0.07**	**0.08**	**0.09**	**0.29***	**0.28***	**0.26**	**0.30***	**0.31***
						(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.16)	(0.16)	(0.17)	(0.17)	(0.17)
Market scope	**-0.12**	**-0.06**	**0.13**	**-0.04**	**0.03**	**-0.15**	**-0.17**	**-0.16**	**-0.16**	**-0.16**	**-0.35****	**-0.25**	**-0.30***	**-0.31***	**-0.33***
						(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.17)	(0.16)	(0.17)	(0.16)	(0.18)
Interactions															
Novelty*Differentiation	**11.07***				**10.61***	**0.93**				**1.06**	**0.55**				**-0.84**
	(5.05)				(5.19)	(1.58)				(1.86)	(2.26)				(2.39)
(Novelty*Differentiation)^2	**-158.92**				**-122.8**	**-0.20**				**-0.71**	**-4.28**				**-3.47**
						(3.31)				(3.26)	(5.39)				(4.9)
Novelty*Cost leadership		**3.91†**			**3.17**		**1.09**			**1.48**		**-1.83**			**-2.51**
		(2.8)					(1.1)			(1.22)		(1.58)			(1.81)
(Novelty*Cost leadership)^2		**-13.81**			**-24.87**		**4.86**			**4.83**		**22.17****			**26.03****
							(6.79)			(9.02)		(10)			(12.48)
Novelty*Timing			**4.68***		**3.63***			**0.23**		**-0.19**			**-0.19**		**0.51**
			(2.24)		(2.49)			(0.92)		(1.07)			(1.3)		(1.29)
(Novelty*Timing)^2			**8.32**		**18.90**			**0.18**		**-0.14**			**0.23**		**-0.26**
								(0.5)		(0.6)			(0.58)		(0.63)
Efficiency*Cost leadership				**4.00**	**2.86**				**-0.17**	**-0.85**				**0.85**	**1.72**
									(1.28)	(1.4)				(1.75)	(1.65)
(Efficiency*Cost leadership)^2				**-16.97**	**-9.09**				**0.12**	**0.38**				**7.15**	**-1.92**
									(4.49)	(6)				(6.46)	(8.05)
R^2	**0.52**	**0.51**	**0.52**	**0.51**	**0.55**	**0.33**	**0.33**	**0.32**	**0.32**	**0.34**	**0.25**	**0.28**	**0.24**	**0.26**	**0.29**
Adjusted R^2	**0.47**	**0.46**	**0.48**	**0.46**	**0.48**	**0.24**	**0.25**	**0.24**	**0.24**	**0.21**	**0.16**	**0.19**	**0.15**	**0.17**	**0.16**
N	**161**	**161**	**161**	**161**	**161**	**128**	**128**	**128**	**128**	**128**	**129**	**129**	**129**	**129**	**129**
F	**11.18*****	**10.76*****	**11.39*****	**10.67*****	**8.40*****	**3.40*****	**3.5*****	**3.43*****	**3.48*****	**2.53*****	**2.98*****	**3.62*****	**2.93*****	**3.6*****	**3.01*****
Robust standard errors in parentheses	†p<0.1, *<0.05, **p<0.01, ***p<0.001					*p<0.1, **p<0.05, ***p<0.01					*p<0.1, **p<0.05, ***p<0.01				

Table 10: Results of the quasi-replication, Study 2 (Zott & Amit, 2008)

	Original study (Ln market value average Q4 2000)					Quasi-replication (Ln market value at end of Q4 2014)					Quasi-replication (Ln market value at end of Q4 2015)				
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant	**-0.19**	**-0.37**	**-0.39**	**-0.47**	**-0.29**	**-1.22**	**-0.59**	**-1.23**	**-1.28**	**-0.25**	**-2.19**	**-1.57**	**-2.07**	**-2.26**	**-1.26**
						(1.44)	(1.48)	(1.51)	(1.46)	(1.53)	(1.52)	(1.55)	(1.56)	(1.5)	(1.58)
Independent variables															
Novelty	**1.26†**	**1.45†**	**1.31†**	**1.67***	**0.93**	**0.15**	**0.71**	**1.38**	**0.28**	**2.16**	**-0.65**	**-0.23**	**-0.89**	**-0.56**	**-0.27**
	(0.93)	(0.92)	(0.98)	(0.96)		(0.67)	(0.73)	(1.5)	(0.71)	(1.58)	(0.64)	(0.65)	(1.48)	(0.62)	(1.51)
Efficiency	**0.95**	**0.63**	**0.84**	**0.76**	**1.34†**	**0.25**	**0.32**	**0.28**	**0.44**	**0.23**	**0.92**	**0.90**	**0.91**	**1.14**	**0.85**
					(0.82)	(0.86)	(0.88)	(0.85)	(0.94)	(0.95)	(0.83)	(0.83)	(0.82)	(0.86)	(0.87)
Differentiation	**1.80*****	**1.92*****	**1.99*****	**2.02*****	**1.77*****	**0.12**	**0.13**	**0.11**	**0.10**	**0.19**	**0.23**	**0.21**	**0.22**	**0.17**	**0.24**
	(0.5)	(0.53)	(0.53)	(0.55)	(0.52)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.15)	(0.15)	(0.15)	(0.15)	(0.16)
Cost leadership	**-0.44**	**-0.35**	**-0.43**	**-0.42**	**-0.47**	**-0.34*****	**-0.32*****	**-0.35*****	**-0.34*****	**-0.28*****	**-0.26****	**-0.24****	**-0.28*****	**-0.28*****	**-0.20***
						(0.1)	(0.1)	(0.1)	(0.1)	(0.11)	(0.1)	(0.11)	(0.1)	(0.09)	(0.11)
Timing	**0.16**	**0.15**	**0.04**	**0.19**	**-0.01**	**0.28*****	**0.27*****	**0.23***	**0.27****	**0.22***	**0.26*****	**0.26*****	**0.20***	**0.25****	**0.17**
						(0.1)	(0.1)	(0.12)	(0.11)	(0.13)	(0.1)	(0.09)	(0.11)	(0.1)	(0.12)
Control variables															
Competition	**-0.48**	**-0.66**	**-0.25**	**-0.4**	**-0.12**	**0.93**	**0.55**	**0.99**	**0.89**	**0.52**	**0.78**	**0.43**	**0.80**	**0.78**	**0.50**
						(0.82)	(0.81)	(0.81)	(0.83)	(0.83)	(0.72)	(0.68)	(0.7)	(0.72)	(0.7)
Ln market size	**0.07**	**0.08**	**0.06**	**0.08**	**0.07**	**-0.02**	**-0.05**	**-0.02**	**-0.02**	**-0.07**	**0.02**	**-0.01**	**0.02**	**0.02**	**-0.03**
						(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Age	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01***	**-0.01***	**-0.01***	**-0.01**	**-0.01***	**-0.01***
						(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Ln employees	**0.85*****	**0.87*****	**0.85*****	**0.87*****	**0.80*****	**1.06*****	**1.04*****	**1.05*****	**1.06*****	**1.06*****	**1.15*****	**1.14*****	**1.13*****	**1.15*****	**1.14*****
						(0.07)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Mode of entry	**-0.36**	**-0.31**	**-0.42**	**-0.34**	**-0.44**	**-0.10**	**-0.10**	**-0.11**	**-0.10**	**-0.12**	**-0.10**	**-0.11**	**-0.11**	**-0.10**	**-0.12**
						(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Product scope	**-0.02**	**0.02**	**-0.06**	**0.00**	**-0.04**	**0.00**	**0.04**	**0.02**	**0.01**	**0.05**	**0.00**	**0.04**	**0.01**	**0.01**	**0.04**
						(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Market scope	**-0.12**	**-0.06**	**0.13**	**-0.04**	**0.03**	**-0.04**	**-0.06**	**-0.04**	**-0.04**	**-0.06**	**0.00**	**-0.03**	**0.00**	**0.00**	**-0.02**
						(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.07)	(0.08)
Interactions															
Novelty*Differentiation	**11.07***				**10.61***	**0.30**				**-0.39**	**0.02**				**-0.64**
	(5.05)				(5.19)	(1.14)				(1.16)	(0.74)				(0.83)
(Novelty*Differentiation)^2	**-158.92**				**-122.8**	**-2.19**				**-5.31**	**-2.83**				**-4.82**
						(3.25)				(4.09)	(2.05)				(2.95)
Novelty*Cost leadership		**3.91†**			**3.17**		**0.58**			**0.46**		**1.14***			**0.70**
		(2.8)					(0.61)			(0.66)		(0.61)			(0.66)
(Novelty*Cost leadership)^2		**-13.81**			**-24.87**		**4.40****			**5.51****		**2.74**			**3.63**
							(1.84)			(2.22)		(1.75)			(2.21)
Novelty*Timing			**4.68***		**3.63***			**-0.46**		**-0.59**			**0.14**		**0.00**
			(2.24)		(2.49)			(0.58)		(0.6)			(0.55)		(0.55)
(Novelty*Timing)^2			**8.32**		**18.90**			**0.44**		**0.47**			**0.50**		**0.70**
								(0.47)		(0.61)			(0.4)		(0.53)
Efficiency*Cost leadership				**4.00**	**2.86**				**0.13**	**-0.41**				**1.30**	**0.67**
									(0.82)	(1.03)				(0.8)	(1.01)
(Efficiency*Cost leadership)^2				**-16.97**	**-9.09**				**1.89**	**0.71**				**0.05**	**-0.21**
									(2.63)	(2.99)				(2.84)	(3.21)
R^2	**0.52**	**0.51**	**0.52**	**0.51**	**0.55**	**0.65**	**0.66**	**0.65**	**0.65**	**0.66**	**0.71**	**0.72**	**0.71**	**0.71**	**0.73**
Adjusted R^2	**0.47**	**0.46**	**0.48**	**0.46**	**0.48**	**0.62**	**0.63**	**0.62**	**0.62**	**0.62**	**0.69**	**0.69**	**0.69**	**0.69**	**0.69**
N	**161**	**161**	**161**	**161**	**161**	**173**	**173**	**173**	**173**	**173**	**172**	**172**	**172**	**172**	**172**
F	**11.18*****	**10.76*****	**11.39*****	**10.67*****	**8.40*****	**22.16*****	**21.53*****	**21.92*****	**21.67*****	**16.03*****	**28.4*****	**28.75*****	**29.29*****	**29.79*****	**22.39*****
Robust standard errors in parentheses	†p<0.1, ∗<0.05, ∗∗p<0.01, ∗∗∗p<0.001					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				

Table 11: Summary of replication results, Study 2 (Zott & Amit, 2008)[ab]

	DV=Ln Market Value		Narrow replication			Quasi-replication		
H#	Independent variable(s)	Prediction	Same effect	No effect	Different effect	Same effect	No effect	Different effect
1	Novelty* Differentiation	Positive	0/2	2/2	0/2	0/2	2/2	0/2
2	Novelty* Cost leadership	Positive	0/2	2/2	0/2	1/2	1/2	0/2
3	Novelty* Timing of entry	Positive	0/2	2/2	0/2	0/2	2/2	0/2
4	Efficiency* Cost leadership	Positive	0/2	2/2	0/2	0/2	2/2	0/2

[a] The numbers in columns 4-9 refer to the number of regressions.
b Hypotheses 1, 2 (partly), and 3 were supported in the original studies, hypothesis 4 was not. Note that the original study did not contain formal, numbered hypotheses.

All five models include interactions implying that the main effects of the independent variables cannot be interpreted. To gain more insight into the effect of novelty, I ran a Model 0 without the interactions and found that novelty has a positive and statistically significant effect on firm performance when the dependent variable is market value in 1999. Although the model is slightly different from the model(s) in Study 1, which focused more on the main effect of novelty and efficiency, this provides evidence on the positive impact of novel business models. Yet, with the dependent variable from years 2000, 2014, and 2015, the effect is not significant. A summary of the results can be seen in Table 11.

RESULTS OF THE CONFIGURATIONAL ANALYSIS

First part: Years 1999 and 2000

I started out by first conducting a necessary condition analysis that reveals the degree of necessity of the causal conditions for the desired outcome (high performance in this case). The degree of necessity is expressed as a score between 0 and 1, and the higher it is, the stronger the evidence of necessity. A causal condition obtaining a score of 0.90 or higher can be considered necessary for the outcome of interest (Ragin, 2006). In my analysis, the necessity score of novelty is 0.64 in 1999 and 0.65 in 2000 implying that novelty is not a necessary condition for high market value. Yet, I find that both efficiency (0.91 in

both 1999 and 2000) and high level of competition (0.92 in 1999 and 0.93 in 2000) obtain a high necessity score. A high level of necessity of efficiency can be expected in this case as the sample consists of e-businesses, which are inherently more efficient than for example conventional manufacturing firms. In turn, I do not consider high level of competition a necessary condition for high firm performance. Although competition fosters firms' novelty and efficiency, markets with low levels of competition may be an implication of novel business models that lead to positive first mover advantages and hence high performance. Depending on the analysis, necessary conditions can sometimes be removed from further analysis as it is known that those conditions will be present in every configuration. However, as there are still 8-9% of the high performing sample firms that do not require efficient business models, and 7-8% of high performing firms that are not operating in highly competitive markets, I decided not to remove them from further analysis.

Table 12 shows the results of the standard configurational analysis from the years 1999 and 2000. I find five consistently high performing configurations in 1999 and six in 2000 implying first-order equifinality (configurations 1, 2, and 3 in both years). Further, configurations 1a and 1b as well as 2a and 2b in the year 1999, or 2a, 2b, and 2c in the year 2000 demonstrate how some configurations may have the same core elements (large characters) but different peripheral elements (small characters). This phenomenon is known as second-order equifinality, or neutral permutation (Fiss, 2011). The overall solution consistency scores are 0.88 in 1999 and 0.84 in 2000 implying that the presented configurations are high performing 88% and 84% of the time, respectively. The configurations displayed for 1999 cover 62% of all high performing configurations in the sample, while the same number is 67% for the year 2000.

Table 12: QCA results for high market value in years 1999 and 2000

	High level of resource munificence					Low level of resource munificence					
	High avg. market value in 1999					**High avg. market value in 2000**					
	1a	1b	2a	2b	3	1a	1b	2a	2b	2c	3
Business model											
Novelty	-	⊕	⊕	-	⊕	-	⊕	-	⊕	-	⊕
Efficiency	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Lock-in	-	-	-	-	⊕	-	-	-	-	-	⊕
Complementarity	❍	❍	-	⊕	-	-	⊕	-	-	⊕	⊕
Strategy											
Differentiation	-	⊕	⊕	⊕	⊕	⊕	⊕	-	⊕	⊕	⊕
Low cost	❍	-	-	⊕	⊕	❍	❍	❍	-	-	-
Contingencies											
Competition	⊕	⊕	⊕	⊕	⊕	⊕	-	⊕	⊕	⊕	⊕
Large size	-	-	⊕	⊕	-	-	❍	⊕	⊕	⊕	-
Consistency	0.89	0.91	0.94	0.92	0.91	0.86	0.84	0.92	0.93	0.92	0.89
Raw Coverage	0.37	0.31	0.35	0.26	0.23	0.47	0.25	0.40	0.37	0.36	0.29
Unique Coverage	0.12	0.02	0.04	0.02	0.03	0.07	0.01	0.06	0.02	0.02	0.02
Overall Solution Consistency			**0.88**					**0.84**			
Overall Solution Coverage			**0.62**					**0.67**			

⊕ indicates presence of a condition, ❍ indicates absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

Second part: Years 2014 and 2015

For the second part of the configurational analysis focusing on the years 2014 and 2015, I started again by examining potential necessary conditions for consistent high performance i.e., for market value. Novelty obtained a score of 0.56 in both years. This means that novelty is not a necessary condition for high performance, and that it is clearly less necessary than it was in the years 1999 and 2000 (0.64 and 0.65, respectively). Efficiency in turn, and again, seems to be a necessary condition with a score of 0.91 in 2014 and 0.92 in 2015. While high level of competition does not appear to be a necessary condition, unlike in 1999 and 2000, large size obtains a score of 0.96 in both 2014 and 2015 thus being close to 100% necessary for high market value. Yet, like in the case of efficiency, most firms in this sample are larger than 250 employees, which was set as the crossover point between rather small and rather large

companies. For the same reason as in the first part of the configurational analysis, I keep the almost-necessary conditions in for further analysis.

Table 13: QCA results for high market value in years 2014 and 2015

	High avg. market value in 2014			High avg. market value in 2015			
	1	2	3	1a	1b	2a	2b
Business model							
Novelty	-	❍	-	❍	❍	-	-
Efficiency	-	⊕	⊕	-	⊕	⊕	⊕
Lock-in	-	-	⊕	❍	❍	⊕	⊕
Complementarity	-	⊕	⊕	-	⊕	-	⊕
Strategy							
Differentiation	⊕	-	⊕	⊕	-	⊕	⊕
Low cost	❍	❍	-	❍	❍	❍	-
Contingencies							
Competition	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Large size	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Consistency	0.87	0.87	0.87	0.92	0.89	0.88	0.86
Raw Coverage	0.44	0.38	0.42	0.26	0.31	0.35	0.42
Unique Coverage	0.08	0.10	0.10	0.01	0.07	0.02	0.10
Overall Solution Consistency		**0.84**				**0.86**	
Overall Solution Coverage		**0.64**				**0.56**	

⊕ indicates presence of a condition, ❍ indicates absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

Table 13 displays the results from the second part of the standard configurational analysis. Again, the results from both years show first-order equifinality as there are three distinct configurations in 2014 and two in 2015. In addition, there is second-order equifinality in 2015 as configurations 1a and 1b as well as 2a and 2b imply neutral permutation. The overall consistency scores are 0.84 for 2014 and 0.86 for 2015, while the overall coverage scores are 0.64 in 2014 and 0.56 in 2015.

Elaboration on the configurational analysis

Since my goal is not to develop a typological theory but to explore and detect potential complementarities and interdependencies among the business model design themes and strategies, I do not elaborate explicitly on each configuration but focus on analyzing novelty, in particular.

Overall, the configurational results reveal five useful insights regarding the novelty of business models. First, novelty alone is not sufficient for high firm performance. It needs to be supported by other sources of value or a strong strategy to be effective. This finding is observable in all four analyses (years 1999, 2000, 2014, 2015).

Second, novelty seems to have a good fit with all other elements of the model, that is, the other sources of value, both differentiation and cost leadership strategy, as well as for both large and small firms in both highly competitive and less competitive environments. Consequently, novelty and efficiency seem to be complements rather than substitutes as they are both frequently simultaneously present in the consistently high performing configurations.

Third, novelty can sometimes backfire and prevent firms from being considered high performing. This can be seen in the analysis of 2014-15 where novelty must not be part of some of the high performing configurations. The coverage scores of those specific configurations indicate that such cases are not rare.

Fourth, novelty seems to be more important in certain time periods than in others. The data show that in 1999 and 2000 consistently high performing configurations are typically characterized by novel business models, or at least not by the absence of novel business models, but that in 2014 and 2015 novelty is not needed at all for consistent high performance. While dashes in the configuration tables indicate that the respective causal conditions can be present or absent and thus do not matter in those specific configurations, there is no configuration in 2014 or 2015 where novelty needs to be present for consistent high performance. In fact, in 1999 and 2000 the presence of novelty is sometimes even a core

condition whereas in 2014 and 2015 its absence is a core condition in some high performing configurations[6].

Fifth, the business model design does not have to correspond to the expected strategy. Novelty seems to have a good fit with both differentiation and cost leadership, and efficiency together with differentiation or cost leadership can also lead to consistent high performance.

Low performing configurations

As causal asymmetry implies that the configuration of causal conditions leading to the presence of an outcome (e.g., high performance) is not necessarily the inverse of the configuration that produces the absence of the same outcome (Misangyi et al., 2017; Ragin, 2000), I analyzed configurations leading to not high and low performance. The analysis is similar to the main analysis above, but here I use different outcome definitions. First, I took the negation of high performance and ran the analysis. Then, I re-calibrated the outcome variable to correspond to the 25th, 32,5th, and 50th percentiles of the lowest performing firms and ran the analysis. I did not identify any configurations that would consistently lead to not high or low performance. The consistency levels were much lower from the recommended 0.75. This indicates that there may be many ways to underperform and that the causal conditions used in this study cannot plausibly explain the sample firms' low performance.

[6] Core conditions are essential elements of a configuration while peripheral elements may be exchangeable (Fiss, 2011). Core elements are derived from a so called parsimonious solution that takes into account both easy and difficult counterfactuals, which are based on the researcher's assumptions and his/her theoretical knowledge.

ROBUSTNESS CHECKS

In addition to typical robustness checks, I run additional tests in order to gain further insights into the relationship of novel business models and firm performance. I first focus on the quantitative analysis and then on the configurational analysis.

Additional quantitative analysis

To examine whether more can be learnt with the data sets at hand, I conduct further analysis by 1) testing the effects using an alternative dependent variable, i.e., Tobin's Q, 2) using reduced sets of items that represent the business model design themes with a higher internal consistency (Cronbach alpha), and 3) using dummies for missing values of control variables to see whether a higher N affects the results. First, I re-run all regressions using Tobin's Q as the dependent variable (Brainard & Tobin, 1968; Tobin, 1969). Opposite to merely realized (such as RoA or EBIT%) or perceived (such as market value) performance measures, Tobin's Q, calculated as the ratio of a firm's market value and its total assets, combines these two (Ceggangoli, 2009; Visnjic, Weingarten & Neely, 2016). If Tobin's Q is greater than 1.0, the firm's market value is greater than the value of its assets, and vice versa. In other words, the higher the Tobin's Q, the higher a firm's performance.

The results of these tests are illustrated in Table 14-Table 17. Interestingly, I find that novelty is positively associated with Tobin's Q in each regression model in 1999 but in none in 2000. This finding supports Zott and Amit's (2007) hypothesis regarding novel business models' positive impact on firm performance, especially when the level of environmental resource munificence is high. Moreover, novelty has a positive influence also in two models in 2014, both of which include control variables, but it has no statistically significant effect in any of the models in 2015. With regard to the interaction effects in Study 2 (Zott & Amit, 2008), novel business models together with a cost leadership strategy seem to have a negative impact on Tobin's Q in the year 2000. Interestingly, this effect was positive in 2015 when firm

performance was measured by its market value. Similarly, the effect of novelty and timing (early entry) is negative in 2014, while it is positive in the original study (Zott and Amit, 2008).

Table 14: Tobin's Q as dependent variable: Narrow replication, Study 1 (Zott & Amit, 2007)

	Replication (Ln Tobin's Q at end of Q4 1999)				Replication (Ln Tobin's Q at end of Q4 2000)			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	**0.83***	**0.89**	**1.79*****	**1.70***	**0.881****	**0.76**	**0.63*****	**0.31**
	(0.46)	(0.94)	(0.09)	(0.94)	(0.34)	(0.66)	(0.06)	(0.66)
Efficiency	**-0.11**	**0.09**	**-0.06**	**0.15**	**-0.39**	**-0.77**	**-0.38**	**-0.78**
	(0.63)	(0.81)	(0.62)	(0.81)	(0.49)	(0.59)	(0.48)	(0.59)
Novelty	**1.99*****	**1.30***	**1.98*****	**1.26***	**0.07**	**0.20**	**0.05**	**0.21**
	(0.52)	(0.68)	(0.52)	(0.67)	(0.4)	(0.6)	(0.4)	(0.59)
Efficiency*Novelty			**3.72**	**3.88**			**2.08**	**-0.47**
			(3.94)	(4.55)			(2.84)	(2.98)
Complementarities		**-0.38**		**-0.35**		**0.36**		**0.36**
		(0.5)		(0.5)		(0.28)		(0.28)
Lock-in		**0.21**		**0.21**		**0.15**		**0.15**
		(0.76)		(0.76)		(0.44)		(0.44)
Competition		**-0.18**		**-0.18**		**0.36**		**0.36**
		(0.51)		(0.5)		(0.28)		(0.29)
Ln market size		**0.06**		**0.06**		**-0.01**		**-0.01**
		(0.06)		(0.06)		(0.04)		(0.04)
Age		**0.00**		**0.00**		**0.01**		**0.01**
		(0.01)		(0.01)		(0.01)		(0.01)
Ln employees		**-0.16***		**-0.16***		**-0.05**		**-0.05**
		(0.08)		(0.08)		(0.07)		(0.07)
Country (1=United States, 0=Europe)		**0.60***		**0.52**		**0.26**		**0.27**
		(0.31)		(0.33)		(0.3)		(0.31)
R&D expense US$ 00 (million)		**0.02**		**0.02**		**0.00**		**0.00**
		(0.02)		(0.02)		(0)		(0)
Advertising expense US$ 00 (million)		**0.00**		**0.00**		**-0.01**		**-0.01**
		(0)		(0)		(0.01)		(0.01)
Capital expense US$ 00 (million)		**0.00**		**-0.01**		**0.00**		**0.00**
		(0.01)		(0.01)		(0)		(0)
R-squared	**0.09**	**0.22**	**0.09**	**0.22**	**0.01**	**0.10**	**0.01**	**0.11**
Adjusted R^2	**0.07**	**0.13**	**0.07**	**0.12**	**-0.01**	**-0.03**	**-0.02**	**-0.04**
Observations	**127**	**115**	**127**	**115**	**99**	**93**	**99**	**93**
F	**7.54*****	**6.87*****	**5.3*****	**5.67*****	**0.33**	**1.31**	**0.33**	**1.19**
Robust standard errors in parentheses	∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01			

Table 15: Tobin's Q as dependent variable: Quasi-replication, Study 1 (Zott & Amit, 2007)

	Replication (Ln Tobin's Q at end of Q4 2014)				Replication (Ln Tobin's Q at end of Q4 2015)			
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	**1.16*** **	**-0.07**	**1.06*** **	**-0.32**	**1.25*** **	**-0.11**	**1.05*** **	**-0.47**
	(0.24)	(0.76)	(0.04)	(0.66)	(0.26)	(1.07)	(0.05)	(0.99)
Efficiency	**0.04**	**0.30**	**0.05**	**0.30**	**-0.14**	**-0.39**	**-0.15**	**-0.39**
	(0.33)	(0.46)	(0.33)	(0.46)	(0.35)	(0.52)	(0.35)	(0.53)
Novelty	**-0.22**	**-0.90** **	**-0.21**	**-0.88** **	**-0.15**	**-0.13**	**-0.12**	**-0.11**
	(0.28)	(0.37)	(0.27)	(0.38)	(0.31)	(0.45)	(0.31)	(0.46)
Efficiency*Novelty			**2.87***	**0.93**			**3.46***	**1.41**
			(1.63)	(1.94)			(1.98)	(2.48)
Complementarities		**0.01**		**0.02**		**-0.02**		**-0.02**
		(0.31)		(0.31)		(0.37)		(0.37)
Lock-in		**0.28**		**0.32**		**-0.47**		**-0.42**
		(0.44)		(0.45)		(0.52)		(0.52)
Competition		**0.31**		**0.31**		**0.15**		**0.16**
		(0.41)		(0.41)		(0.44)		(0.45)
Ln market size		**0.04**		**0.04**		**0.08**		**0.08**
		(0.05)		(0.05)		(0.07)		(0.07)
Age		**-0.00***		**-0.00***		**-0.00** **		**-0.00** **
		(0)		(0)		(0)		(0)
Ln employees		**0.03**		**0.03**		**0.08**		**0.08**
		(0.04)		(0.04)		(0.05)		(0.05)
Country (1=United States, 0=Europe)		**0.39*** **		**0.39*** **		**0.16**		**0.15**
		(0.13)		(0.13)		(0.15)		(0.16)
R&D expense US$ 00 (million)		**0.00**		**0.00**		**0.00**		**0.00**
		(0)		(0)		(0)		(0)
Advertising expense US$ 00 (million)		**0.00**		**0.00**		**0.00**		**0.00**
		(0)		(0)		(0)		(0)
Capital expense US$ 00 (million)		**-0.00***		**-0.00***		**0.00**		**0.00**
		(0)		(0)		(0)		(0)
R-squared	**0.00**	**0.23**	**0.02**	**0.23**	**0.00**	**0.12**	**0.03**	**0.13**
Adjusted R^2	**-0.01**	**0.13**	**0.00**	**0.13**	**-0.01**	**-0.01**	**0.00**	**-0.02**
Observations	**169**	**111**	**169**	**111**	**128**	**92**	**128**	**92**
F	**0.33**	**2.87*** **	**1.42**	**2.9*** **	**0.26**	**2.76*** **	**1.15**	**2.57*** **
Robust standard errors in parentheses		∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01		

Table 16: Tobin's Q as dependent variable in the narrow replication, Study 2 (Zott & Amit, 2007)

	Original study (Ln market value average Q4 2000)					Replication (Ln Tobin's Q at end of Q4 1999)					Replication (Ln Tobin's Q at end of Q4 2000)				
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant	**-0.19**	**-0.37**	**-0.39**	**-0.47**	**-0.29**	**1.53**	**1.70**	**1.89**	**1.71**	**1.33**	**0.94**	**0.68**	**0.80**	**0.78**	**1.06***
						(1.18)	(1.18)	(1.16)	(1.15)	(1.24)	(0.67)	(0.6)	(0.67)	(0.66)	(0.61)
Independent variables															
Novelty	**1.26†**	**1.45†**	**1.31†**	**1.67***	**0.93**	**1.74****	**1.74*****	**-0.01**	**1.87*****	**0.12**	**-0.42**	**-0.16**	**0.25**	**-0.26**	**-1.48**
	(0.93)	(0.92)	(0.98)	(0.96)		(0.67)	(0.66)	(1.86)	(0.67)	(2.37)	(0.52)	(0.47)	(1.47)	(0.53)	(1.19)
Efficiency	**0.95**	**0.63**	**0.84**	**0.76**	**1.34†**	**-0.55**	**-0.47**	**-0.51**	**-0.70**	**-0.79**	**-0.46**	**-0.40**	**-0.49**	**-0.49**	**-0.06**
					(0.82)	(0.68)	(0.68)	(0.69)	(0.69)	(0.76)	(0.44)	(0.48)	(0.45)	(0.5)	(0.51)
Differentiation	**1.80*****	**1.92*****	**1.99*****	**2.02*****	**1.77*****	**0.09**	**0.06**	**0.11**	**0.06**	**0.07**	**0.00**	**-0.03**	**0.03**	**0.03**	**-0.04**
	(0.5)	(0.53)	(0.53)	(0.55)	(0.52)	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)	(0.09)	(0.08)	(0.09)	(0.08)	(0.08)
Cost leadership	**-0.44**	**-0.35**	**-0.43**	**-0.42**	**-0.47**	**0.11**	**0.13**	**0.09**	**0.13**	**0.15**	**0.09**	**0.14***	**0.09**	**0.11**	**0.09**
						(0.09)	(0.09)	(0.09)	(0.1)	(0.1)	(0.08)	(0.07)	(0.08)	(0.09)	(0.09)
Timing	**0.16**	**0.15**	**0.04**	**0.19**	**-0.01**	**0.00**	**-0.01**	**-0.01**	**-0.01**	**0.03**	**-0.01**	**0.02**	**0.01**	**0.03**	**-0.01**
						(0.09)	(0.09)	(0.09)	(0.1)	(0.09)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
Control variables															
Competition	**-0.48**	**-0.66**	**-0.25**	**-0.4**	**-0.12**	**-0.09**	**-0.11**	**-0.12**	**0.00**	**-0.03**	**0.09**	**0.08**	**0.11**	**0.04**	**0.03**
						(0.51)	(0.5)	(0.52)	(0.51)	(0.52)	(0.29)	(0.27)	(0.29)	(0.28)	(0.29)
Ln market size	**0.07**	**0.08**	**0.06**	**0.08**	**0.07**	**0.07**	**0.07**	**0.06**	**0.07**	**0.07**	**-0.01**	**-0.02**	**-0.01**	**-0.02**	**-0.01**
						(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02***	**0.02***	**0.02**	**0.02**	**0.02****
						(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Ln employees	**0.85*****	**0.87*****	**0.85*****	**0.87*****	**0.80*****	**-0.13***	**-0.14***	**-0.15***	**-0.15***	**-0.13**	**-0.04**	**-0.04**	**-0.04**	**-0.04**	**-0.06**
						(0.08)	(0.07)	(0.08)	(0.08)	(0.08)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
Mode of entry	**-0.36**	**-0.31**	**-0.42**	**-0.34**	**-0.44**	**0.11***	**0.09**	**0.10***	**0.09**	**0.09***	**-0.02**	**-0.01**	**-0.02**	**-0.01**	**-0.01**
						(0.05)	(0.06)	(0.05)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Product scope	**-0.02**	**0.02**	**-0.06**	**0.00**	**-0.04**	**0.06**	**0.06**	**0.07**	**0.06**	**0.08**	**0.12***	**0.12****	**0.12***	**0.13***	**0.13*****
						(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)
Market scope	**-0.12**	**-0.06**	**0.13**	**-0.04**	**0.03**	**-0.08**	**-0.07**	**-0.11**	**-0.07**	**-0.09**	**-0.17*****	**-0.10***	**-0.13****	**-0.12****	**-0.17*****
						(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Interactions															
Novelty*Differentiation	**11.07***				**10.61***	**1.26**				**0.98**	**0.20**				**-0.88**
	(5.05)				(5.19)	(1.03)				(1.3)	(0.69)				(0.66)
(Novelty*Differentiation)^2	**-158.92**				**-122.8**	**-1.78**				**-1.28**	**-2.74***				**-1.34**
						(2.05)				(2.04)	(1.39)				(1.13)
Novelty*Cost leadership		**3.91†**			**3.17**		**-0.73**			**-0.64**		**-1.87*****			**-2.52*****
		(2.8)					(0.69)			(0.76)		(0.68)			(0.64)
(Novelty*Cost leadership)^2		**-13.81**			**-24.87**		**2.59**			**5.02**		**8.28*****			**13.38*****
							(4.04)			(5.32)		(3.06)			(3.27)
Novelty*Timing			**4.68***		**3.63***			**0.60**		**0.57**			**-0.15**		**0.39**
			(2.24)		(2.49)			(0.6)		(0.76)			(0.52)		(0.37)
(Novelty*Timing)^2			**8.32**		**18.90**			**-0.20**		**-0.45**			**-0.03**		**-0.26**
								(0.36)		(0.43)			(0.25)		(0.18)
Efficiency*Cost leadership				**4.00**	**2.86**				**-1.01**	**-0.79**				**-0.14**	**0.80**
									(0.9)	(0.94)				(0.7)	(0.62)
(Efficiency*Cost leadership)^2				**-16.97**	**-9.09**				**0.72**	**-0.97**				**2.37**	**-3.70**
									(3.08)	(3.59)				(2.23)	(2.6)
R^2	**0.52**	**0.51**	**0.52**	**0.51**	**0.55**	**0.21**	**0.21**	**0.21**	**0.21**	**0.23**	**0.18**	**0.27**	**0.14**	**0.15**	**0.35**
Adjusted R^2	**0.47**	**0.46**	**0.48**	**0.46**	**0.48**	**0.11**	**0.10**	**0.10**	**0.11**	**0.08**	**0.04**	**0.14**	**-0.01**	**0.01**	**0.18**
N	**161**	**161**	**161**	**161**	**161**	**125**	**125**	**125**	**125**	**125**	**98**	**98**	**98**	**98**	**98**
F	**11.18*****	**10.76*****	**11.39*****	**10.67*****	**8.40*****	**3.12*****	**3.55*****	**3.22*****	**3.35*****	**2.76*****	**1.97****	**1.9****	**1.11**	**1.21**	**3.18*****
Robust standard errors in parentheses	†p<0.1, ∗<0.05, ∗∗p<0.01, ∗∗∗p<0.001					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				

Table 17: Tobin's Q as dependent variable in the quasi-replication, Study 2 (Zott & Amit, 2007)

	Original study (Ln market value average Q4 2000)					Replication (Ln Tobin's Q at end of Q4 2014)					Replication (Ln Tobin's Q at end of Q4 2015)				
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant	**-0.19**	**-0.37**	**-0.39**	**-0.47**	**-0.29**	**0.05**	**0.16**	**0.00**	**-0.01**	**0.25**	**-0.62**	**-0.31**	**-0.68**	**-0.55**	**-0.41**
						(0.62)	(0.66)	(0.63)	(0.63)	(0.65)	(0.73)	(0.75)	(0.71)	(0.73)	(0.78)
Independent variables															
Novelty	**1.26†**	**1.45†**	**1.31†**	**1.67***	**0.93**	**-0.13**	**0.07**	**1.12***	**-0.08**	**1.26***	**0.00**	**0.16**	**0.72**	**-0.02**	**1.02**
	(0.93)	(0.92)	(0.98)	(0.96)		(0.32)	(0.32)	(0.65)	(0.32)	(0.69)	(0.38)	(0.4)	(0.7)	(0.38)	(0.76)
Efficiency	**0.95**	**0.63**	**0.84**	**0.76**	**1.34†**	**0.44**	**0.48**	**0.45**	**0.48**	**0.47**	**0.36**	**0.30**	**0.32**	**0.37**	**0.23**
					(0.82)	(0.35)	(0.35)	(0.35)	(0.38)	(0.37)	(0.42)	(0.42)	(0.39)	(0.45)	(0.46)
Differentiation	**1.80*****	**1.92*****	**1.99*****	**2.02*****	**1.77*****	**-0.04**	**-0.03**	**-0.04**	**-0.06**	**-0.02**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**
	(0.5)	(0.53)	(0.53)	(0.55)	(0.52)	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.08)	(0.08)
Cost leadership	**-0.44**	**-0.35**	**-0.43**	**-0.42**	**-0.47**	**-0.18*****	**-0.18*****	**-0.19*****	**-0.18*****	**-0.17*****	**-0.19*****	**-0.17*****	**-0.18*****	**-0.18*****	**-0.16*****
						(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)	(0.06)
Timing	**0.16**	**0.15**	**0.04**	**0.19**	**-0.01**	**0.05**	**0.05**	**0.03**	**0.05**	**0.02**	**0.07***	**0.07**	**0.04**	**0.07**	**0.04**
						(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Control variables															
Competition	**-0.48**	**-0.66**	**-0.25**	**-0.4**	**-0.12**	**0.71****	**0.64****	**0.78*****	**0.73****	**0.66****	**0.07**	**-0.04**	**0.17**	**0.08**	**0.10**
						(0.3)	(0.3)	(0.3)	(0.31)	(0.31)	(0.3)	(0.3)	(0.31)	(0.32)	(0.34)
Ln market size	**0.07**	**0.08**	**0.06**	**0.08**	**0.07**	**0.03**	**0.02**	**0.03**	**0.03**	**0.01**	**0.09***	**0.07**	**0.09****	**0.08***	**0.07**
						(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)
Age	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**-0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
						(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Ln employees	**0.85*****	**0.87*****	**0.85*****	**0.87*****	**0.80*****	**0.03**	**0.03**	**0.04**	**0.03**	**0.04**	**0.06**	**0.06**	**0.06***	**0.07***	**0.07***
						(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Mode of entry	**-0.36**	**-0.31**	**-0.42**	**-0.34**	**-0.44**	**-0.05***	**-0.05***	**-0.06****	**-0.05***	**-0.06****	**-0.04**	**-0.05**	**-0.06***	**-0.05**	**-0.06**
						(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Product scope	**-0.02**	**0.02**	**-0.06**	**0.00**	**-0.04**	**0.02**	**0.03**	**0.03**	**0.02**	**0.04**	**-0.03**	**-0.02**	**-0.02**	**-0.03**	**-0.01**
						(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Market scope	**-0.12**	**-0.06**	**0.13**	**-0.04**	**0.03**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.03**	**0.03**	**0.03**	**0.03**	**0.02**
						(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Interactions															
Novelty*Differentiation	**11.07***				**10.61***	**0.34**				**0.15**	**-0.09**				**-0.35**
	(5.05)				(5.19)	(0.37)				(0.39)	(0.46)				(0.48)
(Novelty*Differentiation)^2	**-158.92**				**-122.8**	**-1.08**				**-2.31***	**0.93**				**0.28**
						(1.07)				(1.31)	(1.47)				(1.73)
Novelty*Cost leadership		**3.91†**			**3.17**		**-0.09**			**-0.12**		**0.23**			**0.20**
		(2.8)					(0.29)			(0.31)		(0.37)			(0.45)
(Novelty*Cost leadership)^2		**-13.81**			**-24.87**		**1.49***			**1.603***		**1.16**			**1.33**
							(0.79)			(0.93)		(0.84)			(1.22)
Novelty*Timing			**4.68***		**3.63***			**-0.52****		**-0.51***			**-0.32**		**-0.36**
			(2.24)		(2.49)			(0.25)		(0.26)			(0.27)		(0.27)
(Novelty*Timing)^2			**8.32**		**18.90**			**0.25***		**0.27**			**0.38****		**0.36**
								(0.14)		(0.17)			(0.18)		(0.23)
Efficiency*Cost leadership				**4.00**	**2.86**				**0.28**	**0.16**				**0.25**	**0.28**
									(0.38)	(0.46)				(0.35)	(0.56)
(Efficiency*Cost leadership)^2				**-16.97**	**-9.09**				**0.11**	**-0.20**				**0.05**	**-0.84**
									(1.03)	(1.15)				(1.22)	(1.55)
R^2	**0.52**	**0.51**	**0.52**	**0.51**	**0.55**	**0.15**	**0.16**	**0.18**	**0.15**	**0.20**	**0.17**	**0.18**	**0.20**	**0.17**	**0.21**
Adjusted R^2	**0.47**	**0.46**	**0.48**	**0.46**	**0.48**	**0.08**	**0.08**	**0.10**	**0.07**	**0.09**	**0.07**	**0.08**	**0.10**	**0.07**	**0.07**
N	**161**	**161**	**161**	**161**	**161**	**169**	**169**	**169**	**169**	**169**	**128**	**128**	**128**	**128**	**128**
F	**11.18*****	**10.76*****	**11.39*****	**10.67*****	**8.40*****	**2.27*****	**2.43*****	**2.68*****	**2.49*****	**2.76*****	**2.47*****	**2.77*****	**2.84*****	**2.75*****	**2.65*****
Robust standard errors in parentheses	†p<0.1, ∗<0.05, ∗∗p<0.01, ∗∗∗p<0.001					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01					∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01				

As an additional check, I tried to address the fact that quite a few of the business model design themes showed poor internal consistency (Cronbach alphas in Table 1; survey items in Appendix B). I hence recoded the constructs to achieve the highest possible Cronbach alpha. I then re-ran all the regression models with both market value and Tobin's Q as dependent variables. Surprisingly, I did not observe any substantial changes in the statistical significance levels or the effect directions and sizes.

Since a few of the control variables (R&D expenses, advertising expenses, capital expenses, and market size) had 10-40 missing values, I used an additional dummy variable for each to indicate whether the value was missing or not. If it was missing, I assigned both the original and the dummy variable a value of zero. If it was not missing, I left the original variable as it was and assigned the dummy a value of 1. I then ran all regressions again and did not observe any significant changes in the results.

Finally, similar to Zott and Amit (2007), I ran robustness checks using slightly differing dependent variables for market value. These include average market value for the whole year (1999, 2000, 2014, 2015), average market value in the fourth quarter for all years, and the year closing value. I observed minimal changes in the coefficients, but nothing that challenges the patterns or interpretations from the main analyses. Further, since the variable market size was considerably higher in my data sets compared to the original studies, I tested whether its absence would make any difference for the results. I found that this does not affect the findings.

Additional configurational analysis

To gain further insights and to compare the results taking an alternative outcome variable to market value, I re-ran the same configurational analyses using Tobin's Q as a measure of firm performance. The results of this additional analysis can be seen in Table 18 and Table 19. Although the consistency and coverage scores are different from the main results when market value is used as a measure of firm performance, and the configurations are not all the same, the same patterns of novelty can be observed. It is not sufficient for high performance without other sources of value or a strong strategy; novelty can be

effective with any other business model design theme; too much novelty can sometimes backfire and negatively influence firm performance; novelty was more important in 1999 and 2000 than it was in 2014 and 2015, and; novelty has a good fit with both differentiation and cost leadership strategy, just like efficiency does.

Table 18: fsQCA results for high Tobin's Q in years 1999 and 2000

	High resource munificence							Low resource munificence		
	High Tobin's Q in 1999							**High Tobin's Q in 2000**		
	1	2	3	4	5	6	7	1a	1b	2
Business model										
Novelty	-	❍	⌖	⌖	⌖	-	⌖	❍	❍	⌖
Efficiency	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖
Lock-in	-	❍	❍	-	-	-	❍	-	-	⌖
Complementarity	-	❍	❍	⌖	-	⌖	-	⌖	⌖	⌖
Strategy										
Differentiation	⌖	-	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖
Low cost	❍	❍	-	-	⌖	⌖	-	❍	⌖	-
Contingencies										
Competition	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖	⌖
Large size	❍	-	-	-	⌖	⌖	❍	❍	⌖	⌖
Consistency	1.00	0.95	1.00	0.99	0.97	0.96	1.00	0.84	0.83	0.84
Raw Coverage	0.29	0.22	0.24	0.24	0.23	0.23	0.28	0.21	0.22	0.23
Unique Coverage	0.02	0.05	0.01	0.03	0.01	0.02	0.02	0.08	0.03	0.07
Overall Solution Consistency				**0.97**					**0.80**	
Overall Solution Coverage				**0.56**					**0.36**	

⌖ indicates presence of a condition, ❍ indicates its absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

Table 19: QCA results for high Tobin's Q in years 2014 and 2015

	High Tobin's Q in 2014				High Tobin's Q in 2015		
	1	2	3	4	1	2	3
Business model							
Novelty	-	-	⊕	❍	-	-	⊕
Efficiency	-	⊕	⊕	⊕	-	⊕	⊕
Lock-in	-	-	❍	⊕	-	-	-
Complementarity	-	⊕	⊕	⊕	-	⊕	⊕
Strategy							
Differentiation	⊕	❍	-	-	⊕	❍	-
Low cost	❍	-	-	-	❍	-	-
Contingencies							
Competition	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Large size	⊕	⊕	⊕	-	⊕	⊕	⊕
Consistency	0.9	0.84	0.87	0.86	0.91	0.93	0.88
Raw Coverage	0.44	0.40	0.32	0.33	0.45	0.39	0.48
Unique Coverage	0.12	0.06	0.02	0.01	0.11	0.07	0.09
Overall Solution Consistency			**0.84**			**0.87**	
Overall Solution Coverage			**0.65**			**0.71**	

⊕ indicates presence of a condition, ❍ indicates its absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

I ran fsQCA-specific analyses to ensure robust results (Skaaning, 2011). First, I ran the same analysis with different thresholds for the set memberships. I re-calibrated all causal conditions. For example, I altered the upper and lower thresholds from 0.75 and 0.25 to 0.80 and 0.20. The results remained relatively unchanged – mainly new neutral permutations took place and the number of sub-configurations changed (unsubstantially), but the same observed core elements and the interpretation of the solutions persisted. Second, I changed the consistency threshold from 0.80 to 0.75 and 0.90. Expected changes regarding the number of configurations in the final solution took place while the key findings remained same. Third, I changed the frequency threshold from three to two cases which resulted in more high performing configurations and a higher overall coverage score but also a more complex overall solution and less parsimony. Again, the same configurations and patterns could be observed, and the findings that had already been discovered did not change.

DISCUSSION

In this paper, I had set out to study whether novel business models are positively associated with firm performance, and if so, and whether this effect is stable over time and when subjected to actual configurational analysis. To do so, I replicated two key studies investigating the effects of and fit between business model design and strategy, namely Zott and Amit's work from 2007 and 2008. First, I reproduced these studies at two different points in time to scrutinize temporal stability. Second, I used fsQCA to analyze for configurational stability.

I am not able to fully replicate the results although I do find partial evidence for the positive effect of novel business models on firm performance. Yet, this effect occurs mainly when the level of environmental resource munificence is high. While I find little support for the interaction effects of novelty and strategy, my configurational analysis shows how novelty can be combined effectively with other business model designs and strategies. In addition, my results indicate that the importance of novelty was higher in the years 1999-2000 than 2014-2015. Overall, my results shed some light on why there are such mixed results in the business model innovation literature.

There can be many reasons for why I was not fully able to reproduce Zott and Amit's findings. First, sampling may be one cause of the inconsistent results both in the work of Zott and Amit (2007, 2008) as well as in the replications of this study. Although for my narrow replication I carefully followed the sampling criteria used in the original studies, it is possible that, for example, our definition of what exactly constitutes an e-business may be different. Zott and Amit (2007, 2008) state that they sampled *"…firms that derived all or part of their revenues from transactions conducted over the Internet...*" and "…*firms that went public in Europe or the United States between April 1996 and May 2000.*" While I considered five large stock exchanges in the Western countries, it is not clear whether the authors of the original studies included firms from other stock exchanges too. Furthermore, like Zott and Amit, I found more than 300 e-businesses that would fit the sampling criteria, but instead of collecting data on all of

them, we randomly sampled 201 firms. Short, Ketchen, and Palmer (2002) have shown that even relatively small differences in random samples can lead to dissimilar findings. Also, 56% of the sample firms in the original study had been delisted by June 2004 indicating that it was relatively easy to become a publicly traded company during the Internet boom and that there may be a potential issue of survival bias. Hence, the firms in our samples may be relatively heterogeneous. Finally, the sampling strategy of the quasi-replication followed the criteria of the original studies with the two exceptions that 1) the firms' business models, strategies, and performance were measured in 2014 and 2015 instead of 1999 and 2000, and 2) majority of the sample firms had gone public more than four years before 2014-15, which explains the larger size and higher age of the firms on average. This might also cause the differing results of the quasi-replications compared to the original studies.

Second, the measures of the four business model design themes, two strategies, and some of the control variables are based on one or more items that include relatively subjective assessments made by the researcher (or the person who collects the data) regarding what kind of a transaction design is novel, efficient, lock-in-effective, and offers strong complementarities, as well as whether a firm focuses on process innovation to decrease costs, whether they invest much in marketing and branding etc. While such assessments based on Likert scales give direction, and even if discussed and compared with another researcher who collected the same data independently after having been trained for it, one can question the accuracy of these assessments. While the descriptive statistics on the business model design themes and strategies in the original study and my replications are relatively close to each other, one might argue that more precise methods of data collection are needed.

A third possible reason for why I was only partly able to replicate the original results is the configurational nature of activity systems, such as business models and the sources of value, as well as their fit with firms' market strategies. Numerous strategic management scholars have studied business models by taking a configurational perspective and by using appropriate analytical methods to uncover multiple simultaneous interactions among the elements of the activity system and its environment (Aversa et al., 2015; Afuah, 2003; Andries et al., 2013; Baden-Fueller & Mangematin, 2013; Demil & Le Johnson

et al., 2008). In their study of how e-businesses create value, Amit and Zott (2001) elaborated abundantly on the potential complementary effects and configurational nature of the different business model design themes. Subsequently, they tested how novelty and efficiency interact to impact firm performance (Zott & Amit, 2007) and adopted a configurational approach in their next study (Zott & Amit, 2008) to investigate how novelty and efficiency interact with firms' market strategies. Yet, the authors do not capture 1) the two other sources of value, namely lock-in and complementarity, and 2) multiple simultaneous interactions, or combinations of the sources of value and strategies that may influence firms' outcomes as a system of multiple tightly connected design choices. While the findings and reasoning of Zott and Amit (2007, 2008) have been extremely useful for strategic management scholars interested in business models, we have lacked empirical evidence of how the combined effort of such design choices relate to firms' performance outcomes. Prior research has shown how scholars can discover additional, or even completely uncovered findings through configurational analysis (Ragin & Fiss, 2017). Therefore, I conducted a configurational analysis applying fsQCA and two different samples to investigate how novelty combines effectively and ineffectively with other elements in the activity system.

Overall, the results show that novelty may not have been as important for firm performance in 2014-2015 as in 1999 and 2000. In fact, the configurational analysis reveals that novelty is not necessarily always good for high firm performance, especially in the analysis of the years 2014-2015. This could indicate that the success or effectiveness of a novel business model may be contingent on timing, for example, for reasons related to liability of novelty and legitimacy of the business (Alexy & George, 2013). Prior research has shown that novelty can sometimes even backfire, if for example first-mover disadvantages are realized (Liebermann & Montgomery, 1998) or potential users show slow adoption of innovation (Rogers, 1962). Further, my additional empirical tests point to the possibility that the effect of novelty depends on the performance measure used. I examined the effects of different dependent variables and found that perceived (market value) and semi-perceived (Tobin's Q) measures of performance lead to different interpretations. Hence it is of utmost importance to be clear on the purpose of the performance measure used.

I uncover that novelty alone is neither sufficient nor necessary for firm performance. Although Zott and Amit (2007, 2008), as well as other scholars (see Foss & Saebi, 2017 for a systematic literature review), have found that novel business models have a positive effect on firm performance, novelty needs to be combined with at least one of the other sources of value, efficiency, lock-in, or complementarity, or with a strong differentiation strategy. Hence, my findings clearly highlight how, different to initial assumptions of their incompatibility (Zott & Amit, 2008), high-performing configurations exist that bring supposedly incommensurable dimensions – in particular novelty and efficiency – together. Yet, there may be a relatively simple explanation for the effectiveness of simultaneous value creation through novelty and efficiency. Based on the definition of novelty in terms of transaction-related value creation, and the survey items used to measure it, novel business models do not exclude any of the other design themes. In fact, a novel business model may be novel, because it involves a new, more efficient transaction design. Besides, e-businesses are inherently efficient as they deal with information rather than goods or services. Yet, this does not mean that they are also efficiently managed entities, such as mechanistic organizations (Burns & Stalker, 1961), because efficiency here (in the context of business models) refers to the content, structure, and governance of transactions (Amit & Zott, 2001). Moreover, e-businesses are a relatively new phenomenon, and the rapidly developing Internet-based technologies continuously enable new ways to create and capture value by means of novel designs of transactions. Therefore, novelty and efficiency can simply occur simultaneously, but similar to the argument of Miles and Snow (1978) and Porter (1985), I argue that the combination can be very effective, but that it is difficult to maintain over a longer period of time as it would require continuous innovations of the business model (see e.g., Amit & Zott, 2012; Casadesus-Masanell & Zhu, 2012).

Finally, I find that the activity systems embedded in business models are to be considered separately from business strategy. Partly in contrast to Fiss (2011), who finds consistency between the Miles and Snow typology (1978) and business strategy, I find no clear combinations between business strategies aimed at generating above-average performance and the activity systems chosen to enact those. In particular, I find combinations of differentiation strategies with or without novelty, or even with

efficiency orientation, which would be traditionally associated with a cost leadership focus (Porter, 1985; Zott & Amit, 2008). Thus, there seems to be equifinality even in how strategies can be enacted to achieve the same level of (high) performance.

Limitations

This study has at least three limitations. First, the sample size of both data sets used in this study may be acceptable but not ideal. The possibility, that the mixed results of the replications are subject to lack of statistical power, cannot be ruled out. A larger sample size would help identify outliers and provide more accurate mean values. However, novelty as well as most of the other variables, especially control variables, have at least partly the same effect direction and magnitude as in the original studies. Also, the F-statistic of all the regression models that include control variables are significant at $p<0.01$ level indicating adequacy of the sample size. Moreover, further tests showed that potential outliers are not a concern for this study.

Second, the descriptive statistics of the business model design themes and strategies in my data sets are largely similar to those in the original studies. The mean of novelty, however, is in both of my data sets somewhat higher than it is in the original studies. This could of course lead to different results and interpretations compared to the original studies. It is possible, that the replication results are different due to the deviating mean values of novelty. Yet, it is not likely as the standard deviations are almost the same as in the original studies, and the effect of novelty is positive and 50% of the time also statistically significant in the narrow replication (Study 1), indicating that the sample is relatively similar to that of the original study. Further, my analysis with an alternative dependent variable, Tobin's Q, shows, that novelty has a positive impact in all regression models of Study 1 in the year 1999.

Third, and possibly the cause of the previous limitation, the business model design constructs are not stable regarding their unidimensionality. Results of the factor analyses do not indicate strong construct validity, while the Cronbach alphas show partly sufficient, partly insufficient internal consistency (Nunnally, 1978). Since the factor analysis did not result in four clean design constructs, I

decided to replicate Zott and Amit's analyses using the same items as they do. After these analyses I reconstructed the design themes by reducing the number of items for each construct such that I used the highest possible Cronbach alphas to run all analyses with the new constructs. Surprisingly, this did not result in any substantial changes in the findings, as I elaborated in the section on Additional Analysis.

Future Research

The study raises questions that can be addressed by future research. For example, it would be useful to have theory-based guidelines or practical examples for deciding how to assess the individual survey items. Without such guidelines it can be difficult, for instance, to determine what is supposed to be considered novel on a scale of 1-5. Future studies could perhaps also consider other sources of data or other ways to collect them. For instance, they could try to conduct a survey with the sample firms' executives to obtain the data on business models and strategies directly from the managers. Another potential way to collect the data could be to use content analysis (Duriau, Reger & Pfarrer, 2007) and Computer-Aided Text Analysis (CATA; Short, Broberg, Cogliser & Brigham, 2010) using sources such as shareholder letters, annual reports, and mission statements. In this way, the data collection process could potentially be more efficient, accurate, and consistent, which would enable scholars to use a longitudinal research designs for studying the relationship between firms' business model design and performance over time. More efficient techniques of data collection would also allow for more large-scale data sets for the purpose of improving both reliability and validity of the business model design constructs.

It would also be interesting (and important) to gain further insight into whether the findings of this or prior studies hold in other contexts. For this, researchers could examine both potential linear as well as configurational effects of novelty and the other sources of value in emerging and more traditional industries or other geographical regions. This could be further investigated with new samples and also in different economic situations. Yet, the survey items developed by Zott and Amit (2007, 2008), also used in this study, were originally planned for studying electronic businesses and thus include statements

regarding information flows, user activities, and online-offline questions. Such items would possibly have to be excluded or redesigned for the purpose of studying non-e-businesses.

Finally, it would be further interesting to examine how novelty and the other sources of value combine, if at all, in the presence of other activity systems, such as organizational design. For example, new forms of organizing (see Puranam et al., 2014) in terms of task division and allocation, information flows, and incentives may require, or result in, certain types of combinations of value.

4 CONFIGURATIONS AS COMPLEMENTS AND SUBSTITUTES[7][8]

In this chapter, I look into how configurations of top management team (TMT) characteristics relate to new ventures' initial public offering (IPO) performance. While I found that prior research has not been able to fully capture the combinative effects of TMT characteristics and try to address this gap, I am particularly interested in examining potential complements and substitutes within these configurations. By using a data set of 1,935 new ventures and fsQCA I am able to generate new insights regarding causal complexity germane to how TMTs relate to young ventures' performance outcomes.

INTRODUCTION

In the last three decades, the study of organizations' top managers has played a central role in management research trying to understand firms' performance outcomes. To a great extent, scholars have built on the upper echelons perspective to explain how top management teams (TMTs) influence firms' performance and strategic choices through their cognitions, values, and perceptions (Hambrick & Mason, 1984). Indeed, a great number of studies shows that "*executives and their demographics matter*" (Carpenter, Geletkanycz & Sanders, 2004). Despite this consensus, evidence in the extant literature is characterized by inconsistencies. The most prominent discussion relates to the ongoing debate on the advantages of TMT heterogeneity, and many reviews conclude that the impact of heterogeneity on firm performance remains ambiguous (Harrison & Klein, 2007; Jackson, Joshi & Erhardt, 2003; Milliken & Martins, 1996; Williams & O'Reilly, 1998).

[7] This chapter was developed in collaboration with Ilona Stuhler (Microsoft).
[8] This chapter has been presented and discussed at Academy of Management Annual Meeting, East Coast Doctoral Consortium, and a research seminar at Technical University of Munich.

Given these ambiguous results in TMT research, scholars have started theorizing on why research on TMTs has produced equivocal results. TMT researchers have argued that these equivocal results stem mainly from the interdependencies between different TMT characteristics and the internal and external context (Carpenter, 2002; Joshi & Roh, 2009; Klotz, Hmieleski, Bradley & Busenitz, 2014). Based on this reasoning, numerous calls by scholars have been made to further advance theory while considering these interdependencies. For example, researchers have called for a more thorough investigation of how TMT characteristics combine effectively and influence firm performance as a configuration and have thus recommended applying sophisticated methodologies (Carpenter et al., 2004; Ferrier, 2001; Klotz et al., 2014; Kor, 2003).

In addition, while most research regarding upper echelons has focused on established firms, we lack insights into TMT composition's influence in new ventures (e.g., Beckman, Burton & O'Reilly, 2007; Certo, Holcomb & Holmes, 2009). Only recently work in strategic management and entrepreneurship research has integrated the upper echelons perspective into initial public offerings (IPOs) arguing that the composition and structure of top management teams (TMTs) play an important role at mastering new challenges occurring during the transition into a publicly traded company (Certo et al., 2009). These challenges include increased visibility, legal accountability, and additional demands from new stakeholders, such as investors and the government (Certo et al., 2009). Most of the empirical work that incorporated the upper echelon perspective has applied the "*more is better*" view and analyzed how aggregated TMT characteristics (for instance average experience) influence IPO performance (Cohen & Dean, 2005; Lester, Certo, Dalton, Dalton & Cannella, 2006). However, despite the extensive interest in TMT research in other areas and the initial work regarding TMTs and new venture performance, we still lack insight into how the TMTs' composition relates to IPO performance (Beckman et al., 2007; Zimmerman, 2008).

The purpose of this study is to answer these calls by examining how both TMT heterogeneity and their aggregated knowledge combine in different contexts to influence new ventures' IPO performance. We draw from prior research on TMTs and apply configurational logic (Misangyi et al., 2017) to study

how different TMT characteristics combine effectively and ineffectively, and how these characteristics may complement and substitute each other. We argue that past work has not been able to fully capture the simultaneous and combined effects of the different TMT characteristics and their potential equifinality in producing consistent performance outcomes especially in the new venture IPO context. Generating more insights on these topics advances our knowledge in three different ways. First, we aim to reconcile the inconsistent findings so far in the TMT literature by investigating how TMT characteristics operate in combinations and how they relate to firm performance simultaneously (Certo et al., 2009; Klotz et al., 2014). Second, by taking a novel methodological approach in this stream of research, we investigate which TMT characteristics act as complements and which as substitutes (see Misangyi & Acharya, 2014). This helps us gain more fine-grained insights into how the different TMT characteristics relate to each other and firm performance. Third, we aim to increase our understanding regarding which new ventures' TMT characteristics are necessary and sufficient, or if any, for high IPO performance and thus contribute to IPO and entrepreneurship literatures as well (Beckman et al., 2007; Zimmermann, 2008).

THEORY

The vast majority of research has applied the upper echelons perspective of organizations by Hambrick and Mason (1984) to investigate whether and how TMTs exert an influence on firm performance. In general, the core assumption of this theory is that organizations are a reflection of the cognitive skills and knowledge of their top executives (Hambrick, 2007; Hambrick & Mason, 1984). However, the two authors also acknowledged the great challenge that comes with measuring the psychological attributes of top managers: generally, psychometric data is unobservable and in the specific context of top management teams, obtaining a large sample of this data through qualitative research is difficult (Bantel & Jackson, 1989). Instead, they suggest to measure observable demographic indicators such as age, functional background or educations, assuming that they are related to the cognitive frames of the TMT (Carpenter et al., 2004). There has been an extensive amount of research suggesting that the members of

an organization's TMT indeed have an influence on firm performance. However, Carpenter and colleagues also note the ambiguity of findings across TMT literature, as the ongoing debate about the advantages of TMT heterogeneity shows.

Ambiguity of results in TMT heterogeneity research

Research on age diversity in TMTs has produced equivocal results. Some studies found no significant effects, such as the study by Chowdhury (2005) which suggests that age heterogeneity does not influence team effectiveness in new ventures. Another example is provided in the work by Tihanyi, Ellstrand, Daily, and Dalton (2000), who did not find significant effects related to the international diversification of firms. Moreover, Zheng (2012) and Zimmerman (2008) both report insignificant effects of age diversity on new venture performance and capital raised at IPO, respectively. Nevertheless, some scholars also stress the positive effects of age diversity. Foo (2011) suggests a positive relationship between member-rated team effectiveness in new ventures, and Kilduff, Angelmar, and Mehra (2000) report a positive association with team performance. The study by Amason, Shrader, and Tompson (2006) also entails interesting findings related to age, as heterogeneity therein seems to be beneficial in ventures without novel business ideas, but detrimental in highly novel ventures. However, there appears to be a growing consensus in literature that stresses the negative effects that are associated with age diversity (Milliken & Martins, 1996). For instance, Knight, Pearce, Smith, Olian, Sims, Smith & Flood (1999) report a negative influence on group processes (i.e., the level of agreement seeking within the team), which in turn are positively associated with strategic consensus in an association.

As with age diversity, literature is characterized by ambiguity when it comes to the advantages of gender heterogeneity. Again, some scholars report insignificant results (Chowdhury, 2005; Zheng, 2012), while others stress its positive influence (Welbourne & Andrews, 1996; Welbourne & Cyr, 1999). Yet, as Cohen and Broschak (2013) summarize, most of the underlying theoretical perspectives such as social categorization and similarity-attraction processes predict negative outcomes for teams exhibiting gender heterogeneity. However, results supporting this negative notion are somewhat limited, as gender

heterogeneity has not received as much attention from scholars as other TMT characteristics (Carpenter et al., 2004).

Research on experience heterogeneity in TMTs mostly reports positive relationships with firm outcomes. For instance, results by Eisenhardt and Schoonhoven (1990) suggest a positive association of heterogeneity in industry experience with sales growth. Additionally, Beckman and colleagues (2007) note positive associations with both the chance of receiving venture capital funding and the chance of going public. However, scholars also encountered negative effects. For example, Smith, Smith, Sims Jr., O'Bannon, Scully & Olian (1994) found a negative relationship between heterogeneity of experience and return on investments in high-tech companies.

Suggested reasons for ambiguous results

Scholars have identified several considerations to explain this ambiguity of results. The most prominent approach posits that the effect of TMT heterogeneity on firm performance depends on the context (Joshi & Roh, 2009; Klotz et al., 2014). The advocates of this approach have made numerous calls for a configurational perspective instead of measuring the effects in isolation (Carpenter et al., 2004; Ferrier, 2001; Hutzschenreuter & Horstkotte, 2013; Kor, 2003). Literature has identified different types of internal and external contexts that are supposed to have moderating effects on the relationship between TMT heterogeneity and firm performance.

Internal moderation of TMT diversity involves among others the work context (Joshi & Roh, 2009), organizational climate (Webber & Donahue, 2001) and leadership behavior (Hmieleski & Ensley, 2007). In addition, Carpenter et al. (2004) emphasize the importance of considering team size as a contextual factor when analyzing heterogeneity. Not only is team size positively associated with heterogeneity, but it can also influence conflict and information processing capabilities by itself (Haleblian & Finkelstein, 1993). Another stream of research puts forward the importance of behavioral integration, which in essence requires teams to overcome fragmentation in order to capitalize the benefits of heterogeneity (Buyl, Boone, Hendriks & Matthyssens, 2011). Moreover, research suggests that

leveraging the positive effects of heterogeneity is facilitated in short-tenured teams (Carpenter, 2002) that engage in debate (Simon, Pelled & Smith, 1999). Carpenter (2002) also suggests adversarial effects in the face of strategic complexity, as functional and tenure heterogeneity had a positive effect on financial performance at low levels of internationalization, whereas the relationship is reversed at high levels of internationalization. Finally, Bantel and Jackson (1989) posit that the advantages of heterogeneity depends on the type of tasks at hand, arguing that heterogeneous teams perform better at solving complex, non-routine problems.

The national context constitutes an example for external moderation effects on TMT heterogeneity. For instance, Wiersema and Bird (1993) highlight the differences between Japanese and U.S.-firms, as their results suggest that heterogeneity in Japan leads to larger turnover than in the U.S. Furthermore, research by Amason et al. (2006) reveals contingencies be-tween the novelty of a new venture and the advantages of heterogeneity. When the novelty of a new venture is low, the firm benefits from homogeneity, whereas highly novel ventures achieve better performances with heterogeneous teams. The most prominently studied external contexts are complexity of the industry and environmental uncertainty. A study by Keck (1997) suggests that heterogeneous teams are most effective in complex environments, whereas homogeneous teams are most effective in stable environments. Somewhat contrary to the previous finding, Carpenter and Fredrickson (2001) claim that tenure and functional heterogeneity involve negative effects in highly uncertain industries and positive effects in the face of low uncertainty. Some studies also combined internal and external contexts, shedding even more light on the complex contingencies in the field of TMT heterogeneity research. For instance, Hmieleski and Ensley (2007) studied the interaction effects between industry dynamism, leadership behavior and TMT heterogeneity. In dynamic industries, heterogeneous teams per-formed better with directive leadership and homogeneous teams performed better with an empowering leader. Interestingly, in stable industries, these contingencies were reversed, and heterogeneous teams performed better with empowering leadership, whereas homogeneous teams were better off with directive leaders.

New ventures are usually riskier and due to the lack of a long track record, investors face difficulties in assessing the quality, value and prospects of a young IPO firm (Megginson & Weiss, 1991; Ritter, 1984; Stuart, Hoang & Hybels, 1999). Moreover, older firms may have the advantage of having more time to obtain experience and resources and establish a better network of important stakeholders (Finkle, 1998). Nevertheless, these differences have not necessarily been an impediment for the success of young firms in the IPO market, and some investors might even value young firms more due to higher perceived growth prospects (Megginson & Weiss, 1991). Evidence in prior work does not support the benefits of a certain firm age, as most empirical work that related firm age to firm performance reports insignificant effects (Amason et al., 2006; Kor, 2003; Lester et al., 2006; Zimmerman, 2008). However, Brixy, Sternberg, and Stüber (2012) suggest that the importance of team characteristics depends on the development phase of the company.

Research by Kor and Misangyi (2008) suggests that especially in the context of young ventures, a high ratio of outside directors can offset the disadvantages usually associated with unexperienced TMTs. They coin the term "experience supplementing" to describe the situation when outside directors complement the available resources and knowledge of the TMT. Driven by agency theory considerations, many scholars, regulators and investors connote negative implications for firm performance when boards are dominated by insiders (Dalton, Daily, Ellstrand & Johnson, 1998; Harris & Raviv, 2006; Zahra & Pearce, 1989).

Uncertainty and complexity of the industry constitute an important contextual factor that should be considered in TMT research (Carpenter & Fredrickson, 2001; Keck, 1997). High-tech industries are confronted by higher levels of uncertainty and due to the application of sophisticated technologies a broad range of skills and knowledge are deemed more necessary (Jin, Madison, Kraiczy, Kellermanns, Crook & Xi, 2017). According to the information processing perspective, the complexity of such an environment could be compensated with higher levels of heterogeneity in the TMT (Haleblian & Finkelstein, 1993). This notion has already received support in empirical research (Eisenhardt & Schoonhoven, 1990; Hambrick, Cho & Chen, 1996; Keck, 1997). In contrast, managers in low-tech industries are possibly

faced with less complicated and risky decisions, which would reduce the needs for increased information processing capacities (Jin et al., 2017). Consequently, homogeneous teams might outperform heterogeneous teams in low-tech industries due to increased cohesion and collaboration. Research that compares TMT characteristics in high-tech and low-tech companies is limited, as most of the literature has focused on a certain industry. Scholars were predominantly interested in high-tech or technology-based industries and only sampled data from these firms (Bantel, 1998; Beckman et al., 2007; Eisenhardt & Schoonhoven, 1990; Ensley & Hmieleski, 2005; Knight et al., 1999; Smith et al., 1994; Tihanyi et al., 2000; Zimmerman, 2008). Among those that controlled for industry effects in broader samples, most reported insignificant effects when relating TMT characteristics to firm or team performance (Foo, 2011; Zheng, 2012). Results in studies that compared TMT characteristics in both industries are equivocal. Keck (1997) attributes benefits to heterogeneous teams in complex environments, results by Carpenter and Fredrickson (2001) suggest advantages of homogeneous teams in uncertain industries, and Jin and colleagues (2017) report insignificant differences between the composition of successful TMTs in high-tech and low-tech industries. These mixed findings show that further investigation of the TMT composition in different industrial contexts is necessary.

What unites most of the research in TMT literature is the assumption that the characteristics of a TMT influence the firm performance independently and cumulatively (Stewart, 2006). Although recent analysis of aggregated team characteristics supports this "*more is better*"-approach for human capital (Jin et al., 2017), this view fails to explain the equivocality in research findings as presented above. For example, the results of a study on the influence of managerial experience on sales growth of a new venture imply that different types of managerial experience (i.e., industry-specific experience, shared experience as a team) are not additive, but should be balanced due to reciprocal influences (Kor, 2003). Moreover, Buyl and colleagues (2011) propose interaction effects between members of the TMT. For example, results of their study indicate that having a generalist CEO could substitute a TMT with high functional diversity.

DATA AND METHOD

As in the other empirical studies of this thesis, we leverage fsQCA to investigate our research question (Fiss, 2011; Ragin, 2000). We are interested in the causal complexity regarding how TMT characteristics relate to new ventures' IPO performance. After having performed standard fsQCA, we examine potential complements and substitutes among the TMT characteristics.

Sample and setting

To study our research question, we use a sample of 2,295 new ventures that went public between 1990 and 2010 on an American stock exchange (Kenney & Patton, 2013). We define new ventures as those growth firms who are eight years or younger (McDougall, Robinson & DeNisi, 1992). In line with prior IPO research, the data include only emerging growth firms (e.g., Bell et al., 2014; Park, Borah & Kotha, 2016; Acharya & Pollock, 2013; Chen, Hambrick & Pollock, 2008). This refers to ventures that are not based on established firms by being a spinoff, subsidiary, or resulting from mergers and acquisitions. We combine this firm-level data set with data on 13,846 top executives (Kenney & Patton, 2017) and complement these with data from Bloomberg and Compustat. Due to missing data, especially on the performance variable, our final sample size is 1,935 new ventures and 11,858 top managers.

In defining what constitutes a top manager, we follow Jensen and Zajac's (2004) recommendation and disaggregate board members from the top managers. By applying the suggested definition of the TMT by Certo, Lester, Dalton & Dalton (2006), we classify managers as part of the TMT if they are among the top executives or next highest tier. Based on a list of keywords including director, CEO, and executive, we classify each person as a board member, TMT member and lower-level manager according to their current position as specified in the IPO prospectus (similar to Chen et al., 2008; Lester et al., 2006). Since dual (and even triple) roles are possible, the procedure results in an allocation with overlaps, but as long as an indication for being part of the TMT was present we included the person in the sample of TMT members.

The context of going public seems to be a particularly interesting setting for our analysis of TMT composition. During an IPO, a formerly privately held company transforms into a publicly traded company. Usually, this is a two-step process whereby the shares of a company are first sold to institutional investors who in turn offer the shares to the public market where they are freely traded (Certo et al., 2009). IPOs are thus an important part in the life cycle of a new venture. Companies can raise a substantial amount of equity capital that can be used to drive future growth or to settle financial liabilities (Nelson, 2003). Moreover, the creation of a public market provides existing shareholders, such as founders or venture capitalists, with the opportunity to convert some of their equity holdings into cash (Ritter & Welch, 2002). There are numerous other reasons why firms go public, including the facilitation of a future acquisition of the respective company, increased publicity, or lowering the cost of capital (Brau & Fawcett, 2006).

Conditions, measures, and calibrations

Outcome condition. We use price premium as an outcome condition to measure ventures' IPO performance (Bell et al., 2014). Price premium is calculated as (offer price–book value)/offer price. This is a useful measure as it represents investors' perceived value compared to the pre-IPO book value of the respective firm (Rasheed, Datta & Chinta, 1997). On the one hand, it removes the effect resulting from IPO firms' different sizes as large firms typically have much higher market capitalization. On the other hand, using profitability-based measures such as ROA and ROE would result in biased conclusions as young ventures need to invest in growth and take losses before becoming profitable at later stages. Hence, price premium can be considered somewhat more objective measure of young ventures' IPO performance. We calibrate our outcome condition by following Bell and colleagues (2014) and set the threshold for full membership at 95%, crossover point at 80.5%, and full non-membership at 66%.

TMT heterogeneity. We employ three TMT heterogeneity conditions. First, *age heterogeneity* has been widely used in TMT studies to capture whether differences in age among the TMT members influence performance. Data on the age of each manager was provided in the database by Kenney and

Patton (2013). Prior research has applied diverse measures, from using the standard deviation (Zheng, 2012) or coefficient of variation (Amason et al., 2006; Foo, 2011; Greening & Johnson, 1996; Knight et al., 1999; Smith et al., 1994; Tihanyi et al., 2000; Zimmerman, 2008) to the application of Blau's heterogeneity index (Blau, 1977; Chowdhury, 2005). In contrast to many other heterogeneity measures, the underlying attribute of age heterogeneity is continuous. Therefore, an assessment of heterogeneity based on ratios is not possible. Since the standard deviation of age is quite normally distributed, we calibrated the variable using anchor points close to the 25th, 50th and 75th percentiles. This results in a value of 7 for full membership, 4.999 for the crossover point and 3 for full non-membership.

Second, like age heterogeneity, *gender heterogeneity* in TMTs has been extensively studied. The database provided by Kenney and Patton (2013) did not include gender of the managers. Similar to Cohen and Broschak (2013), we coded the sex of the managers using their first names that we compared with a gender-name-database from the Social Security Administration which includes 100,000 names that were registered in the US from 1930 to 2015. To ensure correctness of the gender match, we ran through three steps by 1) using key words located in the manager description, such as "he" and "Mrs.", 2) manually inspecting the cases where the probability of correctness of gender match that was also provided by the name database was lower than 0.75, and 3) relying on international name databases including e.g. Chinese and Indian names.

Prior research has operationalized gender heterogeneity by various means. For instance, Zheng (2012) utilizes Blau's index, whereas Chowdhury (2005) calculates the percentage of the smaller gender representation. However, identical to age diversity, we captured gender heterogeneity with the concept of separation (Harrison & Klein, 2007) and calculated the standard deviation. The calculation of the standard deviation of gender results in a gender heterogeneity score ranging from 0 (completely homogeneous) to 0.5 (completely heterogeneous). Since perfect gender heterogeneity can only occur when there is an equal amount of men and women on the team, we set the upper threshold lower than 0.5 to accommodate for uneven team sizes and the perceived dominance of males in the United States (Milliken & Martins, 1996). We warranted full membership in the set of firms with high gender diversity to companies with a gender

ratio of 1:3, which equals a gender diversity score of 0.43. We set the crossover point at 0.23, because from that point on at least one person of the other gender is part in each team and a minimum amount of heterogeneity exists. A gender heterogeneity score of zero implies perfect homogeneity because all members of the team are of same gender, hence we set 0 as the lower threshold.

One of the most commonly examined heterogeneity variables is *functional expertise*. Following Amason and colleagues (2006), we used six functional categories, such as finance, operations, and information systems, to capture TMTs' heterogeneity in their functional background. We extracted this information from the IPO prospectuses' manager descriptions by using keywords related to the respective categories. Since experience in several categories is possible, we measured heterogeneity in each category separately by using Blau's index (Blau, 1977) and took the mean of all categories as a measure for overall functional heterogeneity. Although Blau's index is typically used such that mean is not necessary, our data did not allow us for determining the category in which the managers had the most experience. In such a case, mean can also be used (Harrison & Klein, 2007). Since in this case there are only two possible results, that are 1) yes, the manager has experience in this category, and 2) no, the manager does not have experience in this category, the maximum heterogeneity value is 0.5 in each category if half of the managers of a TMT are assigned to both groups, and the minimum value is 0, if all or none of the managers are assigned to any of the group. Subsequently, we calibrated functional heterogeneity by setting the upper threshold at 0.375, which is close to the heterogeneity of ratio 1:3, crossover point at 0.27, which is close to the heterogeneity ratio of 1:5 and lower threshold at 0.

TMT knowledge stock. We employ three conditions capturing the TMTs' knowledge stock. First, we include the TMTs' average university-level *education*. Education can be both a valuable source of knowledge and a signal for investors regarding their skills and aspirations. In line with most of the literature, we determined the individual education level by categorizing the managers into four distinct categories, based on the highest degree that was achieved: "no degree", "undergraduate degree", "graduate degree", or "doctoral degree" (Jackson, Brett, Sessa, Cooper, Julin & Peyronnin, 1991) for which we assigned a number of years typically needed to obtain that degree i.e., zero years for no degree,

four years for Bachelor, six years for MSc and MBA, and 10 years for PhD or equivalent. Since the manager database by Kenney and Patton (2013) did not include information on education, we scanned the description of each manager for keywords (e.g., "Bachelor" for undergraduate, "Master" for graduate or "Doctor" for doctoral degrees) to extract the highest level of education. To ensure a correct matching procedure, we gradually improved the keywords used for each category by taking several manager sub-samples randomly and checking if the correct degrees were assigned. We calibrated the condition by setting the full membership threshold at six years of average university-level education, crossover point at 2.95 years, and full non-membership threshold at 0.

Second, *founder experience* or entrepreneurial experience in general has often been used in studies dealing with new venture TMTs (e.g., Delmar & Shane, 2006; Kor, 2003). Similar to education, we use the IPO prospectuses' manager descriptions to collect data on whether or not the managers have prior experience in founding a new venture. Besides education or other type of experience, this may be important when managing a growing firm and dealing with a liability of newness (Brannon, Wiklund & Haynie, 2013). If a manager of a firm had founding experience, we coded this as 1 and if not, we coded it as 0. We operationalize founding experience by calculating the average number of TMT members with founding experience. Subsequently, we assign the sample firms a full membership in the set of strong founding experience if at least 50% of the managers had founded or co-founded a company on their own. We set the crossover point at 19.5% which translates to one out of five managers with founding experience, and full non-membership if none of the managers had this experience.

Third, similar to previous research, we captured each manager's *corporate experience* as previous senior management experience at prestigious companies and coded it as a binary variable (Acharya & Pollock, 2013; Beckman et al., 2007; Chen et al., 2008; Pollock, Chen, Jackson & Hambrick, 2010). This approach seemed particularly useful, as the transition to a public company poses unprecedented challenges to the IPO firm, hence they could benefit from the presence of managers that know how to manage a renowned public company. Consistent with Acharya and Pollock (2013), we retrieved a lagged-year list of S&P 500 firms for each year of the study from the Bloomberg database. For instance, we used

the companies in the S&P 500 index from the 31/12/1989 for all firms going public in 1990. For each manager, we compared their previous job roles and employers with the list of S&P 500 companies of the respective IPO year. If the manager had worked at one of these companies at a senior management level, we coded previous prestigious senior management experience as 1, if no indication was found, we coded it as 0. For the TMTs' average corporate management experience, we used the same calibration thresholds as for founding experience i.e., 50% for full membership, 19.5% as the crossover point, and 0% for full non-membership.

Firm level measures. We also employ two commonly used firm-specific conditions. First, *firm age* is calculated as the difference between the year of the IPO and the founding year. Since our data include only young ventures that are between 0-8 years old, we are interested in the differences within this group. We therefore use a set that consists of very young firms, while those firms that are not in this set, are still young ventures. Loughran and Ritter (2004) showed that the average firm age can be as low as two years – therefore we use this threshold for full membership for very young firms. These type of firms may suffer from extreme liability of newness resulting in lack of legitimacy and resources. However, at the same time they may enjoy a higher degree of independent decision making. We use 4.5 years as a crossover point (Bell et al., 2014) and 7 years for full non-membership.

Second, TMT and IPO studies generally have typically included *board independence* as a variable in their analysis. We classified board members using a commonly used distinction between inside and outside directors (Zahra & Pearce, 1989). Specifically, based on the information provided in the IPO prospectus, we coded directors as "insider" if they also held a position in the TMT or lower level management, and "outsider" if no such professional relationship with the firm was identified. We operationalized board independence by calculating each board's percentage of outside directors (Daily, Certo & Dalton, 2005; Judge & Zeithaml, 1992; Misangyi & Acharya, 2014; Tuggle, Sirmon, Reutzel & Bierman, 2010). We set the upper threshold at 70%, crossover point at 49,5%, and lower threshold at 30% (Bell et al., 2014).

External contingencies. Finally, we employ two external contingency conditions. First, similar to previous research, we based the industry classification on SIC codes (Beckman et al., 2007; Certo, Covin, Daily & Dalton, 2001; Helwege & Liang, 2004). We followed the recommendation of Kile and Phillips (2009) regarding which SIC codes to use when classifying *high-technology* firms, as the authors conducted an extensive analysis of which SIC codes result in the best match with their benchmark industry classification. The classification results in a 50%-50% split for high-tech and low-tech firms in our sample. Hence, we used a crisp set technique to assign IPO firms to the set of high-tech and low-tech firms based on their three-digit SIC code.

Second, a so-called *hot IPO timing* has been shown to affect firms' IPO performance (e.g., Helwege & Liang, 2004). Bell and colleagues (2014) found evidence that hot IPO market could even be a necessary condition for foreign IPO firms in achieving high IPO performance. Kenney and Patton's (2013) database included 3,939 IPOs on American stock exchanges during the period between 1990 and 2010. Based on the yearly number of IPOs, we used 400 as the upper threshold for the calibration, 250 as a crossover point, and 100 as the threshold for full non-membership. The descriptive statistics and all calibrations are shown in Table 20.

Table 20: Descriptive statistics and calibration thresholds

Condition	Obs	Mean	Std.Dev.	Min	Max	Fully in	Middle	Fully out
Price premium (outcome)	1,935	0.79	1.97	-81.66	6.33	0.95	0.805	0.66
Age heterog. (std.dev)	2,295	5.78	2.81	0	29.23	7	4.999	3
Gender heterog. (std.dev)	2,295	0.15	0.20	0	0.50	0.43	0.23	0
Functional exp. heterog.	2,295	0.31	0.09	0	0.48	0.375	0.27	0
Education in years (avg.)	2,295	3.41	2.88	0	10	6.10	2.95	0
Founding exp. in %	2,295	0.25	0.22	0	1	0.50	0.20	0
S&P 500 exp. in %	2,295	0.18	0.20	0	1	0.50	0.20	0
Very young firm (age)	2,295	4.57	2.15	0	8	2	4.5	7
Board independence in %	2,295	0.70	0.18	0	1	0.70	0.495	0.30
High-tech industry	2,295	0.52	0.50	0	1	1	-	0
Hot IPO year (# of IPOs)	2,295	297	135.72	10	530	400	250	100

FINDINGS

We began by running a necessity analysis where we found no indication of necessary conditions for any of the possible outcomes. In our sufficiency analysis, we follow Misangyi and Acharya (2014) by first focusing on identifying sufficient configurations of new venture TMT heterogeneity and knowledge stock as well as different internal and external contingencies (baseline solution). We then proceed to investigate which, if any, of these conditions combine as complements and/or substitutes. We use a consistency threshold of 0.80, frequency threshold of three (79 % of the cases included), and a PRI threshold of 0.70 in all analyses. Based on prior work in TMT research, we assume that the presence of functional expertise diversity, high average education, and hot IPO year contribute to high IPO performance, and code these accordingly in our analyses using the fsQCA 3.0 software.

In the first step, our findings show that seven combinations consistently lead to high IPO performance with an overall solution consistency of 0.84 and coverage score of 0.17. These results are illustrated in Table 21. While age and functional experience heterogeneity seem to be present in almost all combinations, the absence of gender heterogeneity appears in most of them. Further, high average education and S&P 500 experience do not seem important in these combinations, whereas high average founder experience is present in half of the high performing configurations. For the internal contextual part, most of the firms following these configurations are very young with independent boards. For the external contingencies, the consistently high performing firms include both high- and low-tech ventures. Similar to the findings of Bell and colleagues (2014), hot IPO year seems to be an important condition for IPO firms' performance.

Table 21: Configurations achieving high price premium

	1a	1b	2	3	4	5	6
TMT heterogeneity							
Age heterogeneity	⊕	⊕	⊕	-	⊕	⊕	❍
Gender heterogeneity	❍	❍	❍	❍	⊕	❍	❍
Functional experience heterogeneity	-	⊕	⊕	⊕	⊕	⊕	-
TMT knowledge stock							
High education	❍	❍	⊕	❍	❍	❍	-
Strong founding experience	⊕	⊕	-	❍	❍	⊕	❍
Strong S&P 500 experience	❍	❍	-	❍	❍	-	❍
Internal contingencies							
Very young firm	⊕	⊕	⊕	⊕	❍	⊕	❍
Board independence	-	⊕	⊕	⊕	⊕	❍	❍
External contingencies							
High-tech industry	❍	-	❍	⊕	⊕	❍	❍
Hot IPO year	⊕	⊕	⊕	⊕	⊕	⊕	❍
Consistency	0.81	0.83	0.83	0.87	0.85	0.84	0.87
Raw coverage	0.06	0.10	0.06	0.06	0.04	0.03	0.02
Unique coverage	0.01	0.01	0.03	0.01	0.01	0.00	0.01
Solution consistency				0.843			
Solution coverage				0.173			

⊕ indicates presence of a condition, ❍ indicates its absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

Configurations 1a and 1b are "neutral permutations", in that they share the same core conditions and only differ in their peripheral conditions (see Fiss (2011)).

The first two configurations (1a and 1b) share the same core conditions and represent thus second-order equifinality by differing only in their peripheral conditions (see Fiss, 2011). These high performing IPO firms are very young high- and low-tech ventures. While age and functional expertise heterogeneity are present in both configurations, gender heterogeneity is absent. The top managers of these firms have strong founding experience but lack both high education and corporate experience. Configuration 2 consists of very young low-tech firms with a strong board independence. Similar to configurations 1b and 5, age and functional expertise heterogeneity are present, while gender heterogeneity is absent. The presence of high average education is important, whereas the level of founding and corporate experience do not matter. Configuration 3 includes very young high-tech firms

with a high level of board independence. Age heterogeneity does not matter for these firms, but gender heterogeneity is absent and functional expertise heterogeneity is present. Interestingly, all three measures of TMT's knowledge stock are absent, implying that the TMTs' knowledge does not stem from high education, founding or corporate experience. Configuration 4 comprises high-tech ventures who are at least five years old and have a high level of board independence. Interestingly, all three TMT heterogeneity measures are present while all three TMT knowledge stock measures are absent. Configuration 5 is relatively similar with configurations 1a and 1b with the differences that these ventures are only low-tech firms where board independence is absent. The TMTs have high level of age and functional expertise heterogeneity but gender heterogeneity is absent. They have knowledge mainly through founding experience and to some extent also corporate experience (does not matter whether present or absent), while they do not have high average education. Finally, in configuration 6 the firms are at least five years old low-tech firms with low board independence. This is also the only consistently high performing configuration that does not take place in a hot IPO year. The only heterogeneity attribute that can be present, but does not have to be, is functional experience heterogeneity. Age and gender heterogeneity are absent. The TMTs have neither founding nor corporate experience, but they can have either high or low level average education.

Overall, age and gender heterogeneity are simultaneously present in only one configuration (4). Surprisingly, this is a configuration that comprises high-tech ventures that are at least five years old and where the TMT does not have high average education or founding and corporate experience. Furthermore, functional experience heterogeneity is mostly simultaneously present with age heterogeneity, but only once together with gender heterogeneity. The presence of high average education occurs only in low-tech industries and does not require the presence of founding or corporate experience. A higher level of board independence seems to be more important for high-tech than low-tech firms. For all high performing high-tech firms board independence is present, while the opposite is true to some extent.

Low and not-high performance

By applying the same thresholds for low and not-high performance, we did not identify any consistent combinations. Yet, we lowered the consistency thresholds (consistency=0.75; PRI=0.55) to get more potential insights and found indication for that some of the low performing configurations showed opposite patterns of the high performing configurations. For example, four out of the five low performing configurations were IPOs that took place in the "cold" IPO years. All of the five configurations are high-tech firms with a high level of board independence. Two configurations have firms who are not very young, while one of the configurations, where also hot IPO year is present, has very young firms. Interestingly, in all five low performing configurations the TMTs do not have much age heterogeneity, and in four of them, high average education is present. Moreover, in four configurations, the TMTs have strong experience in founding new firms, whereas functional expertise heterogeneity and corporate experience are present in three. Gender heterogeneity is present in two and absent in three configurations.

Analysis of complements and substitutes

Next we conducted the analysis of how the different conditions combine as complements and substitutes. For this we follow Misangyi and Acharya (2014) by creating so-called meta sets (Ragin, 2008a) that can be constructed by using the "fuzzy and" and "fuzzy or" functions in the fsQCA software. A meta set that uses the "fuzzy and" function acts as a reference to complements since it takes the lower calibrated value of the two sets included in the meta set. For example, if a firm has a membership score of 0.7 in the set of high age heterogeneity and 0.4 in high gender heterogeneity, the set membership of a firm in this meta set would be 0.4. Thus, both age and gender heterogeneity need to be present, and it is the lower of these two membership scores that determines the score of the meta set that would be called (age_and_gender). In turn, when a meta set is constructed using the "fuzzy or" function, the higher of the two membership scores would be considered, i.e., 0.7. This type of meta set refers to substitutes as only one of the conditions, the one with a higher score, needs to be present for the outcome of interest to occur. This type of meta set would be called (age_or_gender). When a meta set is included in the model that is being

analyzed, the interpretation of the results is guided by the change of the coverage score of the final solution. When it is higher than that of the baseline model, which was 0.17, and where all conditions are entered individually, there is a better model fit implying that the two conditions of the meta set are indeed complements or substitutes depending on whether the "fuzzy and" or "fuzzy or" function was used. If the coverage score is lower, the overall model fit is lower, meaning that the two conditions are not complements/substitutes. Two conditions can also be both complements and substitutes if the coverage score of both analyses is higher than that of the baseline model.

The results of this analysis can be seen in Table 22. We proceeded in four steps. First, we tested how the three heterogeneity attributes (age, gender, functional expertise) combine as complements and substitutes. For each pair we created two meta sets using the "fuzzy and" and fuzzy or" functions (i.e., six meta sets). We then entered them one at a time as a meta set in the baseline model and used the same thresholds as in the standard analysis (frequency=3; consistency=0.80; PRI=0.70). We found that all three pairs can act as complements and substitutes as their coverage exceeded that of the baseline model. It is worth mentioning that the scores for substitutes were always higher than those for complements.

Second, we constructed similar meta sets for the three TMT knowledge stock attributes (average education, average founding experience, average corporate experience) and ran the same analyses. The results showed that high average education acts as a substitute and not as a complement with both founding and corporate experience. In turn, founding and corporate experience were found to be both complements and substitutes the coverage for the substitute model being higher and that of the model where they were entered as complements.

Third, following the same method as in the previous steps, we created pairwise meta sets for all six conditions (age heterogeneity, gender heterogeneity, functional expertise heterogeneity, average education, average founding experience, average corporate experience) across the heterogeneity and TMT knowledge stock attributes and tested for their complementarity and substitutability. We found that education acts as a substitute with gender heterogeneity, as a complement with functional expertise

heterogeneity, and as neither complement nor substitute with age heterogeneity. All other pairs were found to be both complements and substitutes.

Table 22: Results of the analysis of complements and substitutes

Condition	Function	Condition	Coverage	Interpretation
Baseline model	-	Baseline model	0.173	-
age heterogeneity	and	gender heterogeneity	0.204	complements
age heterogeneity	or	gender heterogeneity	0.273	substitutes
age heterogeneity	and	func. exp. heterog.	0.212	complements
age heterogeneity	or	func. exp. heterog.	0.249	substitutes
gender heterogeneity	and	func. exp. heterog.	0.214	complements
gender heterogeneity	or	func. exp. heterog.	0.240	substitutes
education	and	founder experience	0.163	not complements
education	or	founder experience	0.191	substitutes
education	and	sp500 experience	0.099	not complements
education	or	sp500 experience	0.182	substitutes
founder experience	and	sp500 experience	0.185	complements
founder experience	or	sp500 experience	0.194	substitutes
age heterogeneity	and	education	0.136	not complements
age heterogeneity	or	education	0.156	not substitutes
age heterogeneity	and	founder experience	0.206	complements
age heterogeneity	or	founder experience	0.215	substitutes
age heterogeneity	and	sp500 experience	0.250	complements
age heterogeneity	or	sp500 experience	0.216	substitutes
gender heterogeneity	and	education	0.111	not complements
gender heterogeneity	or	education	0.179	substitutes
gender heterogeneity	and	founder experience	0.212	complements
gender heterogeneity	or	founder experience	0.226	substitutes
gender heterogeneity	and	sp500 experience	0.227	complements
gender heterogeneity	or	sp500 experience	0.205	substitutes
func. exp. heterog.	and	education	0.186	complements
func. exp. heterog.	or	education	0.172	not substitutes
func. exp. heterog.	and	founder experience	0.218	complements
func. exp. heterog.	or	founder experience	0.209	substitutes
func. exp. heterog.	and	sp500 experience	0.209	complements
func. exp. heterog.	or	sp500 experience	0.208	substitutes

Fourth, we now entered two or three meta sets simultaneously in the same model as we had entered only one meta set at a time in the model so far. In this way, we were able to enter some of the meta sets as complements and some as substitutes in the same model at the same time and hence to find the best-fitting solution (i.e., the solution with the highest coverage score). Our findings reveal that the model with the highest coverage included age and gender heterogeneity as substitutes as well as functional expertise heterogeneity and founding experience as complements. The coverage score of this solution is 0.28 implying that the best-fitting solution covers 28% of the high performing ventures in our sample. Table 23 shows the best-fitting solution.

Table 23: Best-fitting solution of configurations achieving high price premium

	1a	**1b**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TMT composition									
Age_or_Gender	⊕	⊕	⊕	⊕	⊕	⊕	❍	-	⊕
FunctionalExp_and_FoundingExp	-	⊕	-	-	❍	-	❍	❍	⊕
High education	-	-	⊕	-	❍	⊕	-	❍	❍
Strong S&P 500 experience	❍	-	❍	❍	❍	-	❍	❍	❍
Internal contingencies									
Very young firm	⊕	⊕	-	❍	-	⊕	❍	⊕	⊕
Board independence	❍	❍	❍	❍	-	⊕	❍	⊕	⊕
External contingencies									
High-tech industry	❍	❍	❍	⊕	⊕	❍	❍	⊕	-
Hot IPO year	⊕	⊕	⊕	⊕	⊕	⊕	❍	⊕	⊕
Consistency	0.80	0.84	0.81	0.82	0.84	0.80	0.85	0.85	0.83
Raw coverage	0.05	0.04	0.04	0.04	0.09	0.11	0.02	0.08	0.14
Unique coverage	0.01	0.00	0.01	0.01	0.02	0.06	0.01	0.01	0.03
Solution consistency					0.809				
Solution coverage					0.283				

⊕ indicates presence of a condition, ❍ indicates its absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

Configurations 1a and 1b are "neutral permutations", in that they share the same core conditions and only differ in their peripheral conditions (see Fiss (2011)).

To establish robustness of the results, we ran several sensitivity analyses according to Skaaning's (2011) recommendation. We slightly adapted the frequency and consistency thresholds, as well as the

calibration anchor points of all conditions including the outcome measure, and found that the results in the baseline model showed relatively little changes. The number of the configurations varied from four to nine, but these configurations were similar to the ones in the results we present above. Moreover, we observed slight changes in the solution coverage that varied between 0.10 and 0.20 as well as very little variations in the solution consistency.

DISCUSSION

Our goal was to answer the question of how TMT heterogeneity characteristics and knowledge stock combine effectively in different contexts to influence new ventures' IPO performance. We employed fsQCA to investigate 1,935 young ventures' configurations and measured their performance using price premium as the outcome condition. Finally, in addition to the standard fsQCA, we ran analyses regarding the causal conditions' pairwise complementarity and substitutability (Misangyi & Acharya, 2014). Our findings add to our understanding of how TMT characteristics work together to produce equifinal solutions towards various performance outcomes when firm-specific conditions and external contingencies are considered (Carpenter, 2002; Joshi & Roh, 2009; Klotz et al., 2014).

We find that age and gender heterogeneity might be substitutes. They appear simultaneously only in one of the consistently high performing configurations. This may underscore the notion that non-task-related heterogeneity might be detrimental for firm performance, or that at least too much of it leads to emotional conflicts in the TMT thus hindering information processing between the executives (Hutzschenreuter & Horstkotte, 2013; cf. Mathieu, Maynard, Rapp & Gilson, 2008; Webber & Donahue, 2001). Our finding that the presence of functional expertise heterogeneity contributes positively to firms' IPO performance is in line with prior work (e.g., Klotz et al., 2014). Yet, we also find that functional expertise heterogeneity acts as a complement with the average education of the TMT members, although they are both present in only one of the configurations (2). Interestingly, in configurations 1a and 6 they can even be simultaneously absent and still be related to high performance, with high and low level of

board independence and in both hot and cold IPO markets. However, these configurations are consistently high performing only in low-tech industries, which might be an important factor here. In low-tech environments information processing requirements may be lower than in high-tech environments and hence not needed for high performance (Eisenhardt & Schoonhoven, 1990; Haleblian & Finkelstein, 1993; Jin et al., 2017).

Interestingly, our findings show that it is possible to achieve high IPO performance without any of the investigated heterogeneity characteristics or knowledge stock attributes (configuration 6). Surprisingly, this configuration does not refer to very young high-tech firms, but to low-tech ventures without much board independence during a cold IPO year. A more careful inspection of the firms included in this configuration reveals that these firms went public in the early 1990's and are about five years old, small and mid-sized (15-876 employees) ventures with relatively small TMTs (3-5 managers). Further, firms in the configurations 3 and 4 have at least functional expertise heterogeneity but their attributes related to the TMT's knowledge stock are all absent (cf. Cohen & Dean, 2005; Lester et al., 2006). These firms are mid-sized high-tech ventures who went public during the hot IPO years in the late 1990's. The external conditions including the fact that these firms have independent boards, may explain these performance outcomes. Hence, with regard to high-tech industries, relatively young firm age, and board independence, our findings confirm conclusions of prior work that independent board members may complement relatively unexperienced TMTs of young high-tech ventures (Kor & Misangyi, 2008) and partly contradict Bell and colleagues' (2014) statement that older low-tech firms also require independent boards to achieve legitimacy.

Overall, our observations further strengthen the notion that the relationship between TMT heterogeneity, knowledge stock, the organizational context, and firm performance is indeed more complex than thought. Hence, these findings underscore the importance of the application of a holistic approach in future TMT research (Buyl et al., 2011; Carpenter et al., 2004; Kor, 2003). For future research it would be interesting to know whether boards with intensive knowledge stock and/or heterogeneity complement TMTs that lack heterogeneity and/or experience and high level of education,

or whether and if yes, when it is possible to achieve high performance with no heterogeneity and extensive knowledge stock in neither board nor TMT. We might also be missing important TMT characteristics such as TMT tenure, leadership styles, or firms' environmental characteristics. Future research should also compare short term and long term performance with longitudinal research designs in both strong and weak years of resource munificence (e.g., hot and cold IPO years).

5 GAINING INSIGHTS FROM A FULL CONFIGURATIONAL ANALYSIS[9]

In this chapter, I focus on family firms and three aspects of configurational inquiry, namely truth table analysis, sufficiency matrix, and standard fsQCA. To provide an alternative perspective regarding family firm influences on corporate social responsibility (CSR), I use a sample of 108 family firms from the S&P 500 to explore configurations of CSR dimensions. The findings suggest that family firms do not have to sacrifice financial gain to be socially responsible.

INTRODUCTION

Understanding why family firms often prioritize nonfinancial goals remains a foundational stream of inquiry in the family business literature (e.g., Chrisman, Chua, Pearson & Barnett, 2012; Holt, Pearson, Carr & Barnett, 2017). While nonfamily firms are generally more likely to prioritize maximizing financial performance, family firms may willingly sacrifice economic utility to preserve the affective endowment the family derives from their association with the firm (Berrone, Cruz & Gomez-Mejia, 2012). For example, scholars find that family firms are more likely than nonfamily firms to accept higher IPO underpricing (Kotlar, Signori, De Massis & Vismara, 2017) and tend to avoid sweeping cost-saving layoffs (Block, 2010).

To build knowledge surrounding the influence of family firms and social performance, family business scholars have generally used a dichotomous approach where the actions and outcomes of family firms are compared against those of nonfamily firms. While this approach is intuitively interesting and provided important insights in the early stages of this research stream, such comparisons are bounded by

[9] This chapter was developed in collaboration with Shane Reid (Louisiana State University) and Jeremy Short (University of Oklahoma).

the assumption that family firms are generally homogeneous in their motivations and behaviors. Further, this approach supposes that *all* family firms uniformly emphasize nonfinancial performance (Miller & LeBreton-Miller, 2014). However, scholars have recently suggested that family firms are quite heterogeneous with regard to nonfinancial goals given that family influence is often idiosyncratic with significant variation from firm to firm (Miller, Minichilli & Corbetta, 2013). As such, a growing number of calls within the family business research community have been extended to challenge scholars to explore the conditions and mechanisms that influence performance differences among family firms (Chua, Chrisman, Steier & Rau, 2012).

To begin addressing sources of nonfinancial performance heterogeneity, we examine a key nonfinancial goal within family firms: corporate social responsibility (CSR). Defined as the set of firm actions that advance some form of social good beyond what is required by law (Aguinis & Glavas, 2012), CSR allows family firms to express themselves as corporate entities with unique social identities (Dyer & Whetten, 2006; Zellweger, Nason, Nordqvist & Brush, 2013). In addition to the general limitation that much family business research is confined to a comparative analysis against nonfamily firms, additional limitations exist in investigations surrounding CSR. For example, most studies only consider either a single dimension of CSR (e.g., environment; Berrone, Cruz, Gomez-Mejia & Larraza-Kintana, 2010) or aggregate various CSR scores into a singular, overarching measure (e.g., Cruz, Larraza-Kintana, Garcés-Galdeano & Berrone, 2014). This approach is limited in that it creates overgeneralizations about how and why family firms are socially responsible (Carroll, Primo & Richter, 2016). Such shortcomings create a gap in what we know and what we need to know regarding family firm social responsibility (e.g., Marques, Presas & Simon, 2014).

We offer a novel approach to understand family firm CSR differences by applying a configurations perspective to explore unique patterns of family firm social responsibility engagement. Scholars have suggested that a configurations approach holds great potential to shed light on equivocal findings by providing a perspective that can more accurately capture the complexity of organizational phenomena (Short, Payne & Ketchen, 2008). Building on this premise, we look to identify what

configurations of key CSR dimensions – environment, community, employee relations, diversity, and product – exist in family firms. Most firms are typically not consistent across each dimension (Block & Wagner, 2014), instead focusing their efforts on specific social behaviors that align with either performance expectations, stakeholder demands, or image enhancement (Aguinis & Glavas, 2012). Thus, scholars suggest that identifying the types, or combinations, of specific socially responsible behaviors that emerge can provide an important step towards a broader understanding of organizational sense making and strategic priorities (Basu & Palazzo, 2008).

Perspectives on organizational identity provide a theoretical lens to inform configurations of CSR. Applied to family firms, research taking an identity perspective suggests that family firm actions are considered in light of how those actions might impact perceptions of the family (Whetten, Foreman & Dyer, 2014; Zellweger et al., 2013). Thus, firms where the family is closely identified with the firm are more likely to prioritize specific nonfinancial goals, such as CSR, as a means of satisfying nonfamily stakeholders and ensuring the image of the family remains protected (Brickson, 2007). What different CSR profiles emerge within family firms likely indicate how motivated the family is for firm actions to reflect well on the family (Zellweger et al., 2013).

Our work offers three contributions to the family business literature. First, we are the first empirical study to apply a configurations approach to explore dimensions of family firm social responsibility. Our analysis of CSR in 108 family firms drawn from the S&P 500 reveals that family firms emphasize multiple distinct, yet equally viable, CSR strategies. These results provide further empirical conformation regarding the heterogeneity of family firm performance supporting recent efforts to better understand how family firm differ (e.g., Daspit, Chrisman, Sharma, Pearson & Mahto, 2018; Marques et al., 2014). Second, we draw from organizational identity research that argues identity concerns related to the family's association with the firm affect strategic decision making (Whetten et al., 2014; Zellweger et al., 2013) to suggest that different CSR configurations emerge depending on how closely the family's identity overlaps with the firm's identity. We use three indicators of family-firm identity alignment – visibility of the family as the controlling coalition of the firm, the transgenerational

sustainability intentions of the family, and the capability of the business to provide family self-enhancement opportunities (Zellweger et al., 2013) – to demonstrate that the more identified the family is with the firm, the greater the likelihood certain CSR dimensions will be present. Consequently, our work adds empirical evidence to recent efforts exploring how identity might affect family firm behavior (e.g., Akhter, Sieger & Chirico, 2016; Cannella, Jones & Withers, 2015). Finally, we answer calls for more work examining how CSR might affect family firm financial performance (e.g., Niehm, Swinney & Miller, 2008; Singal & Gerde, 2015). Our results showing that many successful CSR configurations are related to high financial performance have important implications for prior assumptions regarding how family firms prioritize financial and nonfinancial goals (e.g., Chrisman et al., 2012; Holt et al., 2017).

THEORY

Social performance configurations in family firms

Organizations exist as complex systems characterized by an assemblage of highly interdependent elements whose outcomes cannot be fully understood if the effects of their constitutive parts are analyzed independently (Scott, 2012; Simon, 1996). As such, organizational performance is often best explained by exploring how independent organizational attributes such as strategies, goals, leadership, and structures, align or conflict with one another to shape organizational outcomes (Short et al., 2008). This configurational approach to causality is complex, characterized by three features: (1) *conjunction*, which suggests outcomes are not the result of a single cause but rather from the interdependence of multiple conditions, (2) *equifinality*, which suggests several possible paths to a given outcome, and (3) *asymmetry*, which suggests causal relationships between attributes in one configuration may not exist in others (Meyer et al., 1993; Misangyi et al., 2017). Understanding what configurations exist within a set of firms can therefore be useful for explaining differences in managerial actions and performance outcomes (Short et al., 2008).

Family business scholars have recently adopted a configurations perspective to better delineate distinct 'types' of family firms and explain performance heterogeneity. For example, Chirico, Sirmon, Sciascia, and Mazzola (2011) find that a configuration between entrepreneurial orientation, generational involvement, and participative strategy offers family firms a pathway to optimal financial performance. Looking at family firm decision making, Basco and Perez Rodriquez (2011) show that unique combinations of family and business orientations can lead to successful decision outcomes. Finally, Nordqvist, Sharma, and Chirico (2014) demonstrate how configurations of family involvement in ownership and management determine the governance mechanisms appropriate for desired performance outcomes. Viewing family firms through a configurations lens provides a more holistic understanding of family firm performance by considering the influence of organizational and structural characteristics as a whole, rather than separate elements (Basco & Perez Rodriquez, 2011; Nordqvist et al., 2014).

Applying a configurational approach to family firm CSR offers similar opportunities to unlock key insights regarding family firm behavior and outcomes. Family firms are often more socially responsible than nonfamily firms, indicating that social performance represents an integral component of a family firm's strategic goals (Cruz et al., 2014; Dyer & Whetten, 2006; Niehm et al., 2008). Yet, most current research exploring family firm CSR and its related implications regarding family firm decision making fails to account for both the distinct types of family firms that exist and how family involvement and influence can vary substantially from firm to firm (Chua et al., 2012; Daspit et al., 2018). Such an approach oversimplifies why controlling families might prioritize CSR. Further, the common research practice of aggregating various CSR dimensions into a singular, overarching measure overlooks the distinctive CSR actions that may exist within family firms (Capelle-Blancard & Petit, 2017). Such practices can potentially overstate a firm's social performance, or sometimes understate it, limiting what conclusions can be drawn (Carroll et al., 2016). Given such shortcomings, it is not surprising that what is known regarding family firm CSR and, more importantly, how and why family firms vary in social performance remains inconclusive (Marques et al., 2014).

To better answer lingering questions regarding what family firm social performance suggests about overall family firm behavior, we seek to first identify what specific CSR-related activities exist within family firms. Social responsibility is fundamentally a multi-dimensional construct and what encompasses CSR can take many forms depending the social issues being addressed. For instance, firms might adopt eco-friendly initiatives (e.g., Berrone et al., 2010; Flammer, 2013), participate in charitable giving and corporate philanthropy (e.g., Gautier & Pache, 2015), develop ethical corporate governance policies (Singal & Gerde, 2015), or promote diversity hiring initiatives (Mun & Jung, 2017). Understanding what specific CSR actions firms take can provide important insights into the firm's broader strategic priorities and motivations (de Jong & van der Meer, 2017). As such, scholars have suggested that identifying what CSR combinations or profiles that emerge within a set of firms can lead to a richer understanding of why firms act and behave the ways they do (Short et al., 2008). Thus, we seek to answer the following question:

Research Question 1: What configurations of the CSR dimensions are emphasized by family firms?

Organizational identity and social performance

Why different CSR configurations exist in family firms is likely related to what motivates family firms to pursue stakeholder-oriented goals (Block & Wagner, 2014). Controlling families vary substantially in their involvement and association with the firm (Miller et al., 2013). As such, it is likely that a family's motives for pursuing specific goals similarly vary. Building off the concept that family firms are heterogeneous with regard to their pursuit of strategic goals, Zellweger and colleagues (2013) employ an organizational identity perspective to suggest that the identity fit between the family and the firm influences why and the extent to which family firms prioritize nonfinancial goals including CSR. Family and firm identities are often highly intertwined in family firms, each providing context for how the other is shaped and perceived. This close identity fit suggests that controlling families will be acutely aware of how actions taken by the firm affect the firm's identity and image as related outcomes would also affect

how the family, and others, views itself (Cannella et al., 2015; Zellweger et al., 2013). Therefore, families are more likely to utilize their influence within the firm to pursue actions that best meet the needs of nonfamily stakeholders. Such actions ensure that nonfamily perceptions of the family remain positive (Zellweger et al., 2013). As such, the extent to which these identity concerns manifest and drive family decision making can impact family firm choices regarding CSR.

How much family and firm identities overlap can be observed through three firm-level characteristics reflective of a close identity alignment. First are the transgenerational sustainability intentions of the controlling family which refer to the family's expressed desire to pass firm control and leadership from one family generation to the next (Zellweger, Nason & Nordqvist, 2012). These intentions create a sense of continuity that assures the family's legacy will continue and signals to others that the family will remain an enduring element of the firm (Zellweger et al., 2013).

Second is the capability of the firm to provide the family self-enhancement opportunities. Because families possess a strong need for positive self-affirmation, families will look to strengthen their association with firms capable of creating or enhancing a positive image for the family (Zellweger et al., 2013). Similarly, families will look to distance themselves from firms whose actions might negatively affect perceptions of the family (Zellweger et al., 2013).

Third is the visibility of the family within the firm, defined by the involvement of family members in management and corporate governance (Zellweger et al., 2013). Because individuals who are visibly affiliated with an organization likely contribute to its perceived identity, family members holding public organizational roles and key management positions, such as the CEO, serve as visible reminders of the family's association with the firm (Dutton, Dukerich & Harquail, 1994). Taken together, controlling families are likely closely associated with family firms who possess these characteristics. Consequently, these families are more likely to utilize their influence within the firm to pursue actions, such as specific CSR behaviors, aimed at protecting the family's image and identity.

Therefore, we explore if heighted identity concerns related to close family-firm identity alignment can help explain why family firms might emphasize different CSR configurations. Accordingly, we pose the following research question:

Research Question 2: Do configurations of family firm CSR differ based on how closely associated the family is with the firm?

CSR configurations and financial performance

How CSR affects financial performance remains a point of contention for scholars that is characterized by differing assumptions and inconsistent findings (Aguinis & Glavas, 2012; Orlitzky, Schmidt & Rynes, 2003). Recent evidence suggests a positive, but small, correlation between CSR and financial performance (Margolis, Elfenbein & Walsh, 2009). How CSR specifically influences financial performance may differ based on various CSR dimensions. For example, environmental performance can actually hurt a firm's stock return (McPeak, Devirian & Seaman, 2010) while employee-related CSR might improve firm total value (Faleye & Trahan, 2011; Jiao, 2010). Such work is consistent with the notion of CSR being an inherently multi-dimensional construct whose complexity should be reflected in its measurement (Mitnick, 2000).

That CSR might be positively related to financial performance has important potential implications for family firms. A fundamental assumption of family business research is that family firms prioritize nonfinancial goals, such as CSR, that potentially sacrifice economic gain if such actions meet the affective needs of the family (Berrone et al., 2012; Chrisman et al., 2012). Strategic behaviors and objectives are therefore measured by how outcomes might affect the family's personal goals or standing within the firm rather that if profit or shareholder value is maximized (Berrone et al., 2010; Leitterstorf & Rau, 2014). Not surprisingly, family business scholars have cited this perspective to explain why family firms might emphasize social performance (Berrone et al., 2010; Cruz et al., 2014). Yet, if CSR leads to

positive financial performance, it is possible that family firms might be more pragmatic, rather than self-serving, as it relates to key strategic decisions and nonfinancial goals.

Therefore, we seek to understand how CSR affects financial performance in family firms. Because various CSR dimensions can have differing impacts on financial performance (Mattingly, 2017), our exploration of CSR configurations has the potential to better inform the CSR-financial performance relationship in family firms. Rather than attempting to understand the relative independent contribution of each of the various CSR dimensions on financial performance, a configurations approach allows us to examine what combinations of different CSR-related activities are necessary for high or low financial performance (Misangyi et al., 2017). Further, incorporating the identity alignment measures with the various CSR configurations can offer fresh perspectives regarding how family affective needs relate, or do not relate, to financial performance expectations. If CSR is truly a prioritized nonfinancial goal of the family, we would expect the configurations not to be related to financial performance. Consequently, linking specific CSR configurations to financial performance, and how family identity concerns might affect that relationship, therefore represents an important step towards understanding how and why families might prioritize nonfinancial goals. Accordingly, we ask:

Research Question 3: How do different configurations of CSR dimensions and family identity indicators influence family firm financial performance?

DATA AND METHOD

We use data from the S&P 500 collected from 2005 to create a sample of family firms where a substantial variation exists in how visibly associated the family is with the firm and social responsibility. S&P 500 firms have served as an important sampling frame in the family business literature, particularly in examining CSR (Bingham et al., 2011; Dyer & Whetten, 2006) as well as a number of other phenomena such as entrepreneurial orientation (Short et al., 2010), ambidexterity (Allison, McKenny & Short, 2014), and market orientation (Zachary, McKenny, Shor, Davis & Wu, 2011). For our efforts, the S&P 500 is

particularly attractive given that publicly traded firms have a vested interest in sharing information regarding their values, governance structures, and decision-making processes in a variety of documents made available to the public (e.g., annual reports, shareholder letters). Moreover, publicly traded firms must disclose key financial information which can be combined with other publicly available documents to triangulate firm-level attitudes and behaviors as well as their related outcomes (e.g., Short et al., 2010). Thus, given the potential data availability issues to capture the measures of CSR, family-firm identity alignment, and financial performance that inform our work, we limit our sample of S&P 500 family firms.

To ensure we capture data truly reflective of family firms, we follow previous work in *Family Business Review* and classify firms where a family member, or members, are a principal shareholder(s) (representing a 10% or more ownership stake) and where at least one of whom was either an executive member of the top management team and/or a board member (Brigham, Lumpkin, Payne & Zachary, 2014). Indeed, this classification "represents a conservative measure of family business status that is more likely to identify companies that truly capture the essence of family business" (Brigham et al., 2014, p.79). Following these requirements, and based on data availability, our final sample included 108 family firms with data captured for the 2005 fiscal year.

Procedure

We leverage qualitative comparative analysis and its fuzzy set variant (fsQCA; Fiss, 2011; Ragin, 2008a) to investigate our research questions. Management scholars have increasingly applied QCA to help better understand complex organizational phenomena (Misangyi et al., 2017). For example, McKenny, Short, Ketchen, Payne, and Moss (2018) explored how different configurations of entrepreneurial orientation relate to high and low firm performance. Based on their analysis of 399 entrepreneurial firms, they identify a set of patterns that were consistently related to high firm performance. Similarly, Vergne and Depeyre (2016) explored how firms adapt to environmental changes based on the level of managerial cognition and dynamic capabilities within the firms. An analysis of 17 U.S. defense firms revealed that neither superior cognition nor dynamic capabilities are necessary for firms to take adaptive actions.

Recently, family business scholars have likewise utilized QCA to explore how family firm performance differs based on family involvement levels (Gonzalez-Cruz & Cruz-Ros, 2016) and optimal configurations of external resources needed for internationalization (Kraus et al., 2016).

Calibration is an important component of fsQCA and reflects the process of defining set membership thresholds and transforming the original measures into set membership scores (Ragin, 2008b). After the calibration, each case (the unit of observation – a family firm in this study) obtains a calibrated set membership score for each set included in the analysis. These scores range from 0, meaning the firm is fully out of a given set, and 1, meaning that the firm is fully in the set. Because calibration directly affects the assignment of set memberships, it is important to use thresholds that are theoretically grounded and/or based on substantive knowledge regarding the phenomenon (Ragin, 2008b; Schneider & Wagemann, 2012). We calibrate our measures using three different thresholds, or cutoff points that were derived from prior research and empirical observations. Table 1 shows the calibration thresholds of all conditions.

Table 24: Calibrations

	Fully out (low)	**Crossover point (middle)**	**Fully in (high)**
Tobin's Q*	-0.4646418	-0.2621115	0.0137110
Environment	-1	0.1	1
Community	-1	0.1	1
Employee relations	-1	0.1	1
Diversity	-1	0.1	1
Product	-1	0.1	1
Transgenerational sustainability	59.525	61.80	63.80
Family self-enhancement	73	80.6825	92.05
Family visibility	0	0.095	0.2

Based on Compustat and KLD databases
* 95% winsorization and industry-adjustment

Outcome condition. A key goal of QCA is to investigate how theoretically relevant causal conditions relate to an outcome condition of interest (Ragin, 1987). Our outcome condition is high financial performance, measured using Tobin's Q calculated using the ratio of a firm's market value to its total assets captured from Compustat (Richard, Devinney, Yip & Johnson, 2009). To enable better

comparison of firm performance across industries, we standardized Tobin's Q at the two-digit SIC level based on the data from both family and nonfamily firms by subtracting the industry mean from the original Tobin's Q of a given firm and dividing the result by the standard deviation of the same industry (Misangyi & Acharya, 2014). Because outliers can affect the mean Tobin's Q values, we winsorized the Tobin's Q in each industry before calculating the standardized values. Winsorization is a common procedure in organization studies that transforms outlier values to a specific percentile defined by the researcher (Aguinis, Gottfredson & Joo, 2013). After identifying outliers in the different industries, we decided to use a winsorization of 95th percentile meaning that all values above the 97.5th percentile in each industry were set at the same value as the observation at the 97.5th percentile and all values below the 2.5th percentile in each industry were similarly transformed to the value at the 2.5th percentile (Kokic & Bell, 1994). Following this approach, we were able to eliminate the threat of outliers to affect the standardization of Tobin's Q. Finally, we use a one-year lagged performance measure from 2006 to determine the relationship various configurations of CSR dimensions and family identity has with subsequent financial performance.

The distinction of high and low financial performance, as well as that of high and very high financial performance (or low and very low), is difficult to determine. As such, we calibrated our outcome condition following common thresholds used in prior research (e.g., Fiss, 2011; García-Castro & Francoeur, 2016; Misangyi & Acharya, 2014). Accordingly, we calibrated our outcome measure using percentiles of the standardized Tobin's Q at the population level based on all data available in Compustat. We chose the median as a point of maximum ambiguity regarding whether a firm is high or low performing implying that 50% of the firms in that population are high performing and 50% are low performing. We use the 25th and 75th percentiles to define full non-membership and full membership implying that one fourth of the firms in that population is fully out and one fourth is fully in the set of high performing firms.

Corporate Social Responsibility. CSR is measured using data captured by the Kinder, Lydenberg, and Domini (KLD) database. KLD data contain time series aggregations of several indicators

of a firm's CSR across several broad categories (e.g., Perrault & Quinn, 2016). Firms are rated annually on a variety of strengths that are proactive actions taken by the firm and concerns that indicate a lack of action or poor policies related to social behavior. Strengths and concerns are scored in binary terms. To derive our *Overall CSR* measure for each dimension, we subtracted the number of concerns from the number of strengths across the five primary CSR dimensions: environment, community, employee relations, diversity, and product (Tang, Qian, Chen & Shen, 2015; Wang & Choi, 2013). We chose this approach for two reasons. First, it allows us to clearly distinguish between firms that are socially responsible and firms that are not. Second, due to a potential complexity issue resulting from including too many causal conditions in a QCA model (Marx & Dusa, 2011), we aimed to keep the number of causal conditions as low as possible and therefore only included the five most prominent CSR dimensions (Block & Wagner, 2014). Next, we calibrated the measures using three thresholds: (-1) for full non-membership, (0.1) as a crossover point indicating maximal ambiguity regarding whether a firm is a member or a non-member in this set, and (1) for full membership. For example, a firm with a positive measure for the diversity dimension would obtain a calibrated set membership score higher than 0.5 while a negative measure would obtain a set membership score lower than 0.5.

Because KLD data are not normally distributed but rather highly concentrated in the middle, the resulting distribution of the calibrated values was positively-skewed. If any cases are the same value as the crossover point, that case lies in the point of maximum ambiguity implying it will not be included in the analysis (Ragin, 2008b). Consequently, we required a threshold that would be above 0 but less than 1 and would not have the same value as any potential case. Because we wanted to assign a set membership to firms with any positive CSR score, we set the crossover point close to 0 at 0.1.

Family firm identity alignment. We capture identity concerns using measures rooted in Zellweger and colleague's (2013) theoretical conceptualization of observable family-firm identity alignment. Specifically, we measure transgenerational sustainability, family self-enhancement, and family visibility using validated measures created by Anglin, Reid, Short, Zachary, and Rutherford (2017). Computer-aided text analysis (CATA) and the CATA software program DICTION was used to measure

transgenerational sustainability and family self-enhancement. To calculate our *Transgenerational Sustainability* variable, we summed scores of the Past Concern, Present Concern and Commonality dictionaries from DICTION. The combination of these three dictionaries resulted in a measure designed to capture language consistent with the temporal continuity (Past Concern + Present Concern) and maintenance of the central values (Commonality) that corresponds with the conceptualization of transgenerational sustainability (Anglin et al., 2017; Zellweger et al., 2013). To calculate the *Family Self-Enhancement* variable, we created a composite measure of the Accomplishment, Human Interest, Collectives, and Praise dictionary scores from DICTION. The combination of these four dictionaries resulted in a measure designed to capture language consistent with the family firm's promotion of its accomplishments and community involvement (Anglin et al., 2017). We apply both measures to annual shareholder letters from our sample of 108 family firms. Both *Transgenerational Sustainability* and *Family Self-Enhancement* were calibrated using the same 25^{th}, 50^{th}, and 75^{th} percentiles used to calibrate financial performance.

Family visibility reflects the number of family members serving as board members and/or in top management (Zellweger et al., 2013). Data were triangulated from three sources (Lexis Nexus, BoardEx, and firm web sites) to assess the ratio of family members serving either on the board of directors or in top executive management roles. For example, if a board had 3 family members, the family board members variable was coded as "3". The same logic was used for coding the variable for family managers. In both cases, the values were then divided by the total number of board members or executives respectively. Due to the high correlation between the two variables, the ratios were combined into an overall *Family Visibility* variable. To calibrate this measure, we set the threshold for full non-membership at 0, crossover point at 0.095, and full membership threshold at 0.2. This implies that firms with less than 9.5% of family members in the top management team and board of directors obtained a calibrated value lower than 0.5, while firms with a family visibility ratio higher than 9.5% obtained a calibrated value between 0.5 and 1.

RESULTS

Table 25 shows the descriptive statistics of the calibrated values.

Table 25*:* Descriptive statistics of the calibrated values

	Observation	Mean	Std.Dev.	Min	Max
Tobin's Q*	108	0.65	0.35	0	1
Environment	108	0.43	0.25	0	1
Community	108	0.54	0.27	0.05	1
Employee relations	108	0.45	0.39	0	1
Diversity	108	0.72	0.35	0.05	1
Product	108	0.33	0.26	0	1
Transgenerational sustainability	108	0.50	0.41	0	1
Family self-enhancement	108	0.50	0.40	0	1
Family visibility	108	0.37	0.32	0.05	1

* 95% winsorization and industry-adjustment

First, we investigated the necessity of the presence and absence of the individual CSR and family influence dimensions for different performance outcomes. Necessity indicates the extent to which the individual presence or absence of the individual CSR dimensions and family influence conditions is necessary for high or low financial performance (Ragin, 2008a). We find that none of the causal conditions, individually, are necessary for any of the performance outcomes. Consequently, a family firm can be high or low performing without needing the presence or absence of the individual CSR dimensions or family identity indicators. Next, we explore which CSR configurations exist within family firms. We then look at how family identity in firms might be related to the occurrence of the individual CSR elements. Finally, we proceed with a standard analysis of sufficiency by exploring whether any combinations of the CSR dimensions and family influence are sufficient or necessary for high or low firm performance.

Occurrence of CSR strategies in family firms

To answer our research question 1, we constructed a truth table using only the CSR dimensions to determine what combinations are common and uncommon in family firms. A truth table displays all

possible combinations of the causal conditions, the number of observed firms in each combination, and how consistently each configuration produces the outcome of interest. Table 26 shows the distribution of these CSR configurations. Since research question 1 is only concerned with the possible CSR configurations that exist, financial performance was not included in this analysis.

Several observations are noteworthy. First, 17 out of the 32 possible CSR configurations occur in our data. The remaining 15 configurations may be rare in family firms or close to impossible to implement. Second, though there are clear differences regarding how family firms engage in CSR, 44% of our sample firms have one of the first two configurations and 75% of the firms one of the first five configurations. Such results suggest that while family firms do differ in their CSR approach, there exists some base level of consistency in their overall social responsibility engagement. Third, the most common configurations lack an emphasis on environment and product-related social actions. Conversely, community, diversity, and employee relations are more often present than absent. More surprisingly, only two of the observed 17 configurations have four CSR dimensions present suggesting that family firms are strategically targeted in their CSR. Finally, a configuration including the presence of all five CSR dimensions was not observed.

Table 26: CSR truth table – observed CSR configurations in family firms (n=108)*

Environment	Community	Employee Relations	Diversity	Product	Observations
No	No	No	No	No	26
No	No	No	Yes	No	22
No	No	Yes	Yes	No	13
No	Yes	No	Yes	No	11
No	No	Yes	No	No	9
No	Yes	Yes	Yes	No	7
Yes	No	No	Yes	No	5
Yes	Yes	Yes	Yes	No	3
No	No	Yes	Yes	Yes	3
Yes	Yes	No	Yes	No	2
Yes	No	No	No	No	1
No	Yes	No	No	No	1
No	No	No	No	Yes	1
Yes	Yes	No	No	Yes	1
No	Yes	Yes	No	Yes	1
No	Yes	No	Yes	Yes	1
Yes	Yes	No	Yes	Yes	1
Yes	Yes	No	No	No	0
Yes	No	Yes	No	No	0
No	Yes	Yes	No	No	0
Yes	Yes	Yes	No	No	0
Yes	No	Yes	Yes	No	0
Yes	No	No	No	Yes	0
No	Yes	No	No	Yes	0
No	No	Yes	No	Yes	0
Yes	No	Yes	No	Yes	0
Yes	Yes	Yes	No	Yes	0
No	No	No	Yes	Yes	0
Yes	No	No	Yes	Yes	0
Yes	No	Yes	Yes	Yes	0
No	Yes	Yes	Yes	Yes	0
Yes	Yes	Yes	Yes	Yes	0

* "Yes" indicates the presence of a condition and "No" its absence.

Influence of family identity

To answer our research question 2, we seek to understand how different levels of family identity might affect the CSR configurations within family firms. We do so by conducting a sufficiency analysis using the subset/superset analysis that provides a formal way to explore how different sets are related to each other (Ragin, 2017). A subset is a smaller part of another larger set, the superset. For example, the set of

family firms is a subset of the superset of S&P 500 firms. Similarly, the set of high performing family firms is a subset of family firms. The extent to which a set is a subset or superset to another set is indicated by coverage and consistency scores. Coverage is a metric that provides information on to what extent a set membership (or non-membership) in one set is necessary for a membership (or non-membership) in another set. Since we are not seeking to understand to what extent the presence or absence of the family identity conditions are necessary for the presence of the CSR conditions, we focus only on the consistency. Consistency score measures sufficiency which is a QCA-specific metric that indicates how often the presence of a family influence condition, or a combination of conditions, leads to the presence of a particular CSR dimension. A value of 1 means full sufficiency, implying that if the family identity condition was present, the CSR dimension would also always be present.

Table 27 reports the sufficiency score when the family influence conditions are present (before the slash). The second score refers to the sufficiency when the family identity conditions are absent (after the slash). Across the CSR dimensions, we find that the presence of the family identity conditions has a higher sufficiency for the presence of a particular CSR dimension than when the family influence conditions are absent. In other words, it seems that the presence of family identity leads more consistently to the presence of a specific CSR dimension than its absence does. This is particularly true for transgenerational sustainability and family visibility. When either are individually present in a family firm, each CSR dimension individually is more likely to be present compared to a situation where transgenerational sustainability and family visibility are absent. In particular, diversity, employee relations, and community seem to be most strongly influenced by transgenerational sustainability, while family visibility appears to influence firms' CSR regarding employee relations and product. Conversely, the presence of family self-enhancement may decrease the likelihood that the conditions environment, community, and employee relations are present.

Table 27: Sufficiency of family influence for the presence of CSR dimensions*

	Environment	Community	Employee Relations	Diversity	Product
	Sufficiency when family identity present / Sufficiency when family identity absent				
Transgeneration and Enhancement and Visibility	0.75 / 0.68	0.84 / 0.73	0.68 / 0.57	0.88 / 0.74	0.65 / 0.49
Transgeneration and Visibility	0.68 / 0.62	0.80 / 0.68	0.64 / 0.48	0.86 / 0.70	0.58 / 0.44
Enhancement and Visibility	0.70 / 0.64	0.77 / 0.75	0.65 / 0.58	0.85 / 0.77	0.60 / 0.46
Transgeneration and Enhancement	0.58 / 0.60	0.70 / 0.67	0.56 / 0.57	0.86 / 0.72	0.48 / 0.45
Transgeneration	0.52 / 0.50	0.67 / 0.58	0.55 / 0.45	0.84 / 0.68	0.42 / 0.38
Enhancement	0.52 / 0.54	0.61 / 0.65	0.47 / 0.54	0.78 / 0.75	0.42 / 0.40
Visibility	0.58 / 0.57	0.70 / 0.67	0.61 / 0.50	0.82 / 0.76	0.52 / 0.41

* Sufficiency indicates to what extent the presence of an individual family influence condition or their combination is sufficient for the CSR dimensions to occur. A value of 1 indicates that the family influence condition or their combination is always sufficient for the CSR dimension to occur.

Standard fsQCA: Analysis of sufficiency for high and low performance

To answer our research question 3, we include all five CSR measures and three family identity measures as causal conditions to explore their sufficiency for financial performance. To be included in our final analysis, the configurations first must pass three thresholds. A frequency threshold was set to represent the minimum number of the times a given configuration had to be observed. Following García-Castro and Francouer (2016), we set a threshold of two empirical cases to ensure 75% percent of the cases be retained for further analysis. Next, a minimum consistency threshold was set to identify the minimum percentage of similar cases leading to the outcome of interest when measuring sufficiency (Ragin, 2006). The higher the consistency threshold, the more sufficient a given configuration must be in producing the outcome of interest. Following Fiss (2011), we set the consistency threshold at 0.80, after which 27 observed configurations remained. Finally, to avoid situations where the conditions or their combinations may be consistently linked to both high and low financial performance, we set a minimum threshold for the proportional reduction in inconsistency (PRI), a consistency measure that excludes cases predicting both outcomes. Following the recommendation of Ragin (2017), we set this threshold at 0.75. After

removing configurations that failed to clear the three thresholds, the final number of configurations included in the analysis was 12.

The fsQCA software then compares these included configurations pairwise and creates the most parsimonious combination. For instance, if two configurations both lead to high performance but differ only on whether the firm was high or not high on employee relations, the two configurations would be merged and the employee relations dimension would be identified as being unimportant to the configuration with respect to its effect on high performance outcomes (Ragin, 1987). This process continues until the simplest set of configurations that consistently lead to high performance is determined. The final configurations include two types of causal conditions. First, core conditions which are the most important conditions for the occurrence of the outcome of interest (high performance) and represent configurational equifinality across types. Second, peripheral conditions which are complementary to the core conditions and represent configurational equifinality within types (Fiss, 2011).

Table 28 shows the five types of configurations based on the core conditions and eight configurations overall that consistently lead to high financial performance. We also report the consistency and coverage scores of the overall solution as well as of the individual configurations. Consistency scores correspond to sufficiency, which indicates the extent to which the configuration of CSR dimensions and family influence conditions is sufficient to lead to high financial performance (Ragin, 2006). A value of 1 indicates full sufficiency while 0 indicates full insufficiency. Coverage score is a measure of empirical relevance and tells how large a proportion of the high performing firms in the sample use a given configuration. A value of 1 indicates that a given configuration is the only one that is used by the high performing firms and a value of 0 reports the opposite. These scores apply similarly to both the individual causal conditions and any combination of the conditions.

Table 28: High performing configurations of CSR and family identity

	1	2a	2b	2c	3a	3b	4	5
CSR dimensions								
Environment	❍	❍	❍	❍	❍	⊕	❍	❍
Community	❍	❍	-	❍	❍	⊕	⊕	❍
Employee relations	❍	⊕	⊕	⊕	⊕	⊕	○	❍
Diversity	-	⊕	⊕	⊕	❍	⊕	⊕	○
Product	❍	❍	❍	⊕	❍	❍	❍	❍
Family firm identity								
Transgenerational sustainability	○	⊕	⊕	❍	○	○	⊕	⊕
Family self-enhancement	⊕	-	⊕	❍	❍	❍	○	❍
Family visibility	-	⊕	⊕	⊕	○	○	○	⊕
Consistency	0.88	0.88	0.89	0.92	0.86	0.91	0.93	0.91
Raw Coverage	0.18	0.13	0.12	0.09	0.07	0.11	0.09	0.05
Unique Coverage	0.11	0.02	0.01	0.02	0.02	0.04	0.03	0.02
Overall Solution Consistency	0.87							
Overall Solution Coverage	0.45							
Consistency cutoff	0.8							
Frequency cutoff	2							
Rows included	12							
Configurations observed	53/256							
High performing firms	74							
N	108							

⊕ indicates presence of a condition, ○ indicates its absence. Large characters indicate core conditions, small characters peripheral conditions. Dashes indicate "does not matter".

The first consistently high performing configuration (configuration 1) shows a minor or even nonexistent focus on CSR. Four of the CSR dimensions are absent while the emphasis on diversity did not influence the financial performance of firms in this configuration. The configuration has no CSR dimensions as core conditions and only the absence of transgenerational sustainability and the presence of family self-enhancement are core conditions. This configuration leads to high performance 88% of the time and is employed by 18% of the high performing family firms in our sample. The comparably high coverage scores can be explained by the fact that diversity and family visibility are marked by a dash which means they can be either present or absent without influencing the effectiveness of the configuration.

The second high performing type includes three configurations that differ in the peripheral conditions while retaining the same core conditions. The core conditions that comprise this type are the presence of two CSR dimensions, employee relations and diversity, and the presence of family visibility. The other CSR dimensions do not differ substantially, but an interesting finding here is that configuration 2c is the only consistently high performing configuration where the CSR element product is present. The three configurations also differ in the family influence conditions such that in configuration 2c, transgenerational sustainability and family self-enhancement are absent whereas in the other two configurations they are present (in 2a family self-enhancement can also be absent). The consistency levels of these three configurations vary between 88% and 92% while they represent between 9% and 13% of the high performing firms in our sample.

The third consistently high performing type also has two sub-configurations. Notably, the combinations of the CSR dimensions are relatively different from each other such that in the first configuration, four CSR conditions are absent while in the second configuration four are present. The differences are in environment, community, and diversity. The conditions on family influence are all absent in both sub-configurations. This shows that family firms differ in their CSR strategies considerably even if they have similar family identity levels and that the different social responsibility strategies can still be just as effective. Here, the presence of the CSR condition employee relations is a core condition together with the absence of the family influence conditions transgenerational sustainability and family visibility. The consistency scores are between 86% and 91% while the configurations cover between 7% and 11% of the high performing firms in our sample, respectively.

The fourth consistently high performing configuration is characterized by the presence of community and diversity, while the other three CSR dimensions are absent. Transgenerational sustainability is present but the other two family influence conditions are absent. However, all three conditions and the absence of the employee relations CSR dimension are core conditions of this configuration. The consistency score of the configuration is 93% and it covers 9% of the high performing family firms in our sample.

The fifth high performing type has a low level of CSR in all five dimensions. Family self-enhancement is also absent, but transgenerational sustainability and family visibility are present. The latter two and the CSR element diversity are derived from the parsimonious solution and thus core conditions of this configuration. The consistency score of this configuration is 91% and it covers 5% of the high performing firms in our sample.

Overall, the consistency of the final solution is 0.87, implying that firms taking any of these five configurational types will also have high financial performance 87% of the time. The overall solution coverage of 0.45 means that the five configurational types in our final solution are implemented by 45% of the high performing firms in our sample. Consequently, the remaining 55% of the high performing firms have a configuration that was observed only once or that does not consistently lead to high performance. While our consistency score is well above the minimum recommended 0.75 threshold (Ragin, 2008a), there is no standard for coverage. However, our coverage score is substantially higher than previous studies applying fsQCA to a large sample (e.g., Fiss, 2011; García-Castro & Francoeur, 2016; Misangyi & Acharya, 2014).

Robustness tests

When using fsQCA, scholars typically include a series of robustness checks to examine the reliability of their findings (e.g., Fiss, 2011, García-Castro & Francouer, 2016). QCA can be relatively sensitive to parameter changes. However, if the configurations that appeared in the final solution, as well as their consistency and coverage scores, stay relatively stable, the methodological choices made are unlikely to represent a substantial threat to the robustness of the findings (Schneider & Wagemann, 2012).

We performed several QCA-specific robustness tests to check reliability of our results (Skaaning, 2011). First, we changed the calibration thresholds of our outcome condition, high financial performance, such that the 50th percentile from the population level data was the cutoff point for full non-membership, 62.5th percentile the crossover point distinguishing between high and low performance, and 75th percentile for full membership. This resulted in similar but fewer configurations in the final solution indicating

expected effects of changing the calibration of the outcome condition (Fiss, 2011). Second, we changed the frequency threshold from two to three and reran the analysis. However, this violated commonly accepted QCA standards where at least 75% of the cases should be included in the analysis when choosing the frequency threshold (Ragin, 2017). When the threshold was set at two cases, 75% of the empirical instances were included. When we set it at three cases, only 50% of the observations were included. Nevertheless, only minor changes were observed, and mainly the number of configurations in the final solution decreased slightly as configurations observed only twice in the empirical data were not included in the analysis. Third, we changed the consistency threshold from 0.80 to 0.75 and 0.90 and reran the analysis. The results held when the threshold was 0.75 and 0.80 but changed when at the 0.90 threshold. Here, similar but fewer configurations were derived from the solution and overall they had a little bit higher consistency score but a slightly lower coverage score, which further supports the robustness of our results.

DISCUSSION

Our work's primary contribution is our treatment of family firm CSR from a configurations perspective revealing not all CSR dimensions are prioritized equally, or even exist, across family firms. As the first family business empirical study to apply a configurations perspective to family firm CSR, our approach represents a stark departure from the current family business literature that either focuses solely on a singular dimension of social performance or uses a simplified, aggregated measure of CSR (Berrone et al., 2010; Cruz et al., 2014). Instead, we demonstrate that social responsibility is a nuanced, multi-faceted aspect of family firm behavior. In finding family firms successfully engage in multiple, distinct CSR strategies, our work adds needed empirical texture to the growing research examining sources of family firm performance heterogeneity (Marques et al., 2014; Nordqvist et al., 2014). Consequently, our results showing that there is not a 'one size fits all' approach to CSR holds important implications for family business research.

By showing family firms differ in their CSR approach, we provide further empirical conformation that family firms are heterogeneous with regard to nonfinancial goals (e.g., Zellweger et al., 2013). Most family research suggests that family firm prioritization of nonfinancial goals, including CSR, is a key differentiator between family and nonfamily firms (e.g., Chrisman et al., 2012; Williams, Pieper, Kellermanns & Astrachan, 2018). Such perspectives suggest family firms are relatively consistent in their priorities and decision making. However, that family firms engage in multiple CSR strategies indicates that family firms are not constant in their goals nor in what they expect to personally gain from firm outcomes. Because the different CSR dimensions can be linked to the underlying strategic priorities and needs of an organization (Basu & Palazzo, 2008; Tang, Hull & Rothenberg, 2012), the existence of different configurations of CSR dimensions reveals a greater complexity to family firm motives and behaviors than has been previously conceptualized. Moving forward, future conclusions regarding family firm behavior should consider what different family firm characteristics, beyond just the singular presence of the family making it a family firm, influence these performance and outcome variances.

While our findings clearly suggest that family firms differ in their social responsibility, it is important to note that many of the most commonly occurring CSR configurations that emerge within family firms are more likely than not to include diversity and employee relations (see Table 26). Because such actions are among those most likely to directly benefit nonfamily firm stakeholders (Jayasinghe, 2016; Richard, Roh & Pieper, 2013; Singal & Gerde, 2015), this finding suggests that family firms place a priority on meeting stakeholder needs through their actions (Bingham et al., 2011). Though our work confirms family firm performance heterogeneity exists, many family firms likely share to some degree similar motives regarding their goals and behaviors.

Our findings linking levels of family-firm identity alignment to specific CSR configurations provides further insight into why family firms differ in their CSR choices. Specifically, we demonstrate that what CSR-related activities might emerge in family firms is related, in part, to how closely associated the family is with the firm. In particular, measures indicating high levels of transgenerational sustainability intentions and family visibility are consequential to what CSR dimensions, or

configurations, are most likely to be present. Family firms where the family is closely identified with the firm are most likely to prioritize social actions related to diversity, employee relations, and community. These results add empirical credence to the notion controlling families are acutely aware of how treatment of nonfamily members might affect perceptions of the family. Thus, families are more likely to influence the firm to take actions aimed at protecting the family's image and identity it draws from the firm (Whetten et al., 2014; Zellweger et al., 2013). Consequently, we add to the growing stream of research that suggests identity is a key source of heterogeneity in family firm behaviors and outcomes (e.g., Cannella et al., 2015; Whetten et al., 2014). We recommend scholars similarly adopt an identity perspective when exploring family firm outcomes given its ability to provide a clearer delineation of why families might differ in priorities, influence, and motivations across family firms. For example, future research might consider how identity perspectives affect family firm entrepreneurial orientation and risk taking (Naldi, Nordqvist, Sjoberg & Wickland, 2007), ethical climates (e.g., Kidwell, Kellermans & Eddleston, 2012), and procedural justice (De Massis, 2012).

Finally, our results showing that many of the CSR configurations within family firms are sufficient for high financial performance challenges prior assumptions that family firms sacrifice financial gain to pursue goals related to the family's affective needs (Berrone et al., 2012; Holt et al., 2017). We find that the most successful CSR strategies within family firms relate to high levels of financial performance, suggesting that families likely consider the financial impact of their decisions. Controlling families may view social initiatives as a way to appease nonfamily stakeholders whose priorities might differ from those of the family (Brickson, 2007), yet are likely aware that costly CSR decisions made on behalf of the self-interests of the family that negatively impacts shareholder value might have long-term negative repercussions for how the family is perceived (Hillman & Keim, 2001). However, because strong financial performance represents a key nonfamily stakeholder expectation (Barnett, 2007), engaging in activities that result in improved financial performance can also enhance perceptions of the family. Therefore, emphasizing CSR allows family firms to simultaneously pursue financial and nonfinancial goals. As such, our configurational approach exploring how various CSR dimensions and

family identity indicators affect financial performance levels answers prior calls to incorporate nonfinancial and financial goals within a configurations model (Nordqvist et al., 2014). Further, our results add fresh perspectives to growing research examining how different CSR dimensions affect financial performance outcomes (Mattingly, 2017).

Limitations and future research opportunities

The findings of our study reflect limitations that create opportunities for future research. First, our sample of family firms from the S&P 500 constrains the scope of our study and creates potential generalizability issues. Firms included in the S&P 500 are characterized by their large market share that might provide the resources to invest in CSR that smaller family firms might not have access to. Though availability issues of data required for the measures our study used limited our sample to S&P 500 family firms, subsequent research should consider alternate measures of social performance and family-firm identity fit that would allow for an expanded sample to include small-to-middle market or non-publicly traded family firms. For instance, more localized family firms might have a more involved relationship with their local communities that might affect the types of CSR-related activities they engage in compared to larger, more national family firms. Further, it would be interesting to see how the direct relationships family members in smaller family firms might affect how identity concerns change the types of CSR that emerge.

Our use of fsQCA is limitation due to the number of causal conditions the model can handle (Marx & Dusa, 2011). To explore the relationship between family firm CSR and financial performance, we included only the five most commonly investigated CSR dimensions (Block & Wagner, 2014; Mattingly, 2017) and three family influence conditions that have been developed in recent studies (Anglin et al., 2017; Zellweger et al., 2013). Because adding one new causal condition increases the overall complexity of a QCA model considerably (one condition doubles the number of possible configurations; Ragin, 2008a), we decided not to include any contingencies, such as firm size, age, or industry. However, we standardized our performance measure Tobin's Q at a two-digit SIC level to account for between industry differences in performance (Misangyi & Acharya, 2014). In addition, our sample consists of

firms listed in S&P 500, implying a certain degree of similarity in terms of size and age, or the general organizational processes resulting from the similar market valuation.

Another potential limitation is our use of an *Overall CSR* measure to distinguish between socially responsible and irresponsible firms. We calculated the measure separately for each CSR dimension by subtracting the number of concerns from the number of strengths (Tang et al., 2015; Wang & Choi, 2013). This approach allowed us to have a reasonable degree of overall complexity in our fsQCA model. Yet, the number of strengths and concerns are constructed such that a firm can be both responsible and irresponsible at the same time, even on the same dimension. This may lead to different kinds of implications regarding how family firms approach CSR. Future research should examine configurations of CSR strengths and weaknesses separately to where either fsQCA or other analytical approaches might provide new insights. Other studies might also consider alternative measures of CSR from the ones used here to further explore how and why family firms might be socially responsible. For example, the scale developed by Turker (2009) that measures social responsibility using stakeholder assignment might provide insights when applied to family firms where family and nonfamily perceptions of the firm's CSR are likely to differ.

Our configurations-based approach to family firm CSR is the first exploring how various CSR dimensions combine and exist within family firms and, to our knowledge, the first such study within the broader strategic management field. While our study explored the set relationships between CSR dimensions, family-firm identity indicators, and financial performance, we encourage future research to extend our work to continue exploring how various CSR configurations might affect various firm outcomes. For example, the link between CSR and corporate reputation is well established (e.g., Lin-Hi & Blumberg, 2016). However, it would be interesting to see how various CSR configurations might lead to lower or higher reputation scores. Further, our identity measures can be included in such a model as an extension of Deephouse and Jaskiewicz's (2013) look at how the family association with the firm affects firm reputation. Future research might also look at how configurations of other family firm characteristics, such as entrepreneurial orientation (e.g., Short et al., 2009), organizational ambidexterity

(e.g., Allison et al., 2014) or family influence (e.g., F-PEC; Klein, Astrachan & Smyrnios, 2005), affect financial performance.

Future research might also consider social responsibility as an outcome condition and explore how various family firm characteristics lead to CSR performance. For instance, it would be interesting to see how various configurations of family identity indicators influence low or high CSR performance. Other studies might consider how configurations of other measures representing family influence might affect CSR outcomes to determine if controlling families truly prioritize social performance.

6 CONCLUSIONS

The purpose of this thesis was to explore a novel theoretical and methodological approach; the so-called "neo-configurational perspective". I had set out to 1) understand how it works, and 2) apply it empirically to phenomena that are relevant for strategy and entrepreneurship researchers.

I started by exploring the new approach in chapter 2. I first briefly discussed how the configurational approach has evolved and why a neo-configurational perspective has emerged recently. This development has mainly been facilitated by new methodological advancements. Specifically, QCA and fsQCA, developed by social scientist Charles Ragin, paved the way for scholars interested in embracing causal complexity in terms of causal conjunction, equifinality, and causal asymmetry. After Peer Fiss introduced it to the management field, the configurational approach experienced a renaissance and a new wave of studies that were using fsQCA. This fast development has offered a number of opportunities for new research directions, but also a need for more precise and advanced resources for educational purposes to avoid applications below our general standards. Hence, I develop a stepwise approach to applying fsQCA and elaborate on potential pitfalls and best practices in each step. I provide guidance to others who are interested in studying their topics from this perspective and provide a number of potential future research questions for entrepreneurship scholars.

Chapter 3, the first empirical study of this thesis, set out to use fsQCA in addition to regression analysis to replicate and extend two important studies on business model design and firm performance. I use two data sets, one for a narrow and one for a quasi-replication. To a large extent, I am not able to reproduce the original findings, in particular with regard to the interaction effects studied by the authors of the original paper. Although the results of my additional tests and further examination regarding the positive impact of novelty on firm performance get close to those of the original findings, my results also indicate that the effect of novel business models on firm performance may not be stable over time, or that it may not hold at different times, especially when an industry has become more established. After the quantitative analysis, I investigate the same data sets by taking a fundamentally different methodological

approach applying fsQCA and offer alternative and complementary explanations on the role of novelty. I manage to gain important additional insights from the configurational analysis that would be difficult to uncover by using only conventional correlation-based methods. Therefore, I propose that rather than investigating single business model elements (including design themes) in isolation the elements be considered in combinations to account for more real life complexity.

Chapter 4, the second empirical study, deals with investigating complements and substitutes within configurations of TMT characteristics. The purpose of the study was to examine how TMT heterogeneity and their aggregated knowledge combine in different contexts to influence new ventures' IPO performance. I draw from prior research on TMTs and apply configurational logic and fsQCA to a data set of 1,935 new ventures that went public between the in 1990-2010. After having established a baseline model of high performing TMT configurations, I focused on potential complements and substitutes. I find a number of instances of such pairwise relationships. Most importantly, the results suggest that age and gender heterogeneity are substitutes, and that high functional experience heterogeneity and education are complements. I then use this pairs as meta sets in standard fsQCA and find a best-fitting solution for different configurations of TMT characteristics.

Chapter 5, the last empirical study, aimed to utilize several aspects of a configurational analysis. A configurations approach for measuring family firm social responsibility presents a promising path forward towards a more dynamic understanding of family firm behavior. By investigating family firm social performance as combinations of CSR dimensions, we overcome many shortcomings in the current literature and shift towards a comparative analysis regarding family firm CSR heterogeneity that can further uncover how and why family firms differ. For scholars, our results show that family firms can successfully engage in several distinct, yet equally viable, strategies for pursuing nonfinancial goals such as CSR. For family firm owners and managers, our findings suggest that there is not a 'one size fits all' approach to successfully being socially responsible and that pursuing socially responsible behaviors does not have to be at the expense of financial performance.

Overall, the neo-configurational perspective seems to be a useful approach for strategy and entrepreneurship research. My empirical studies show how the approach, and especially fsQCA, can be used to investigate a multitude of interesting and relevant phenomena. It can be combined with another method and used to generate more insights that are difficult to reveal when using other approaches.

I suggest two specific future research opportunities that would improve the value of the neo-configurational approach. First, while researchers can make causal arguments by referring to QCA-specific causal recipes and the notions of sufficiency (consistency) and necessity (coverage), the method does not provide a way to deal with endogeneity. This would be extremely important so that results gained from fsQCA can be even stronger and more robust. Now the researcher can deal with endogeneity mainly at the conceptual level when building the model. Though it is also possible to change the model and try different causal conditions and then evaluate their effect compared to the previous findings, but this can be somewhat arbitrary. Hence, a standard tool or process to deal with endogeneity is necessary for future research. Second, combining QCA with methods stemming from recent advancements in machine learning could be useful for making further configurational contributions to management research. Specifically, random forest and decision trees may provide researchers additional precision, power, and options to explore important phenomena. Promising studies using machine learning in combination with more conventional methods have already been presented at major management conferences (e.g., Tidhar & Eisenhardt, 2019).

Appendices

Appendix A: Published manuscript (chapter 2)

Leppänen, P. T., McKenny, A. F. & Short, J. C. 2019. Qualitative Comparative Analysis in Entrepreneurship: Exploring the Approach and Noting Opportunities for the Future, in Brian Boyd, T. Russell Crook, Jane K. Lê, Anne D. Smith (ed.) Standing on the Shoulders of Giants (Research Methodology in Strategy and Management, Volume 11) Emerald Publishing Limited, pp.155-177. https://doi.org/10.1108/S1479-838720190000011010.

INTRODUCTION

Research in entrepreneurship is increasingly drawing from knowledge surrounding archetypes, taxonomies, typologies, and configurations to help scholars understand entrepreneurial phenomena (Short, Payne & Ketchen, 2008). For instance, Miles, Snow, Meyer, and Coleman's (1978) early elaboration of the Miles and Snow typology has now garnered over 13,000 citations on Google Scholar, contributing to the Miles and Snow typology becoming one of the most widely-used classification schemes in management (Shortell & Zajac, 1990). Based on variables capturing internal organizational features, such as technology, processes, and structure, three types of adaptation strategies were identified: prospectors, analyzers, and defenders. Entrepreneurship scholars have drawn from these configurational strategies, indicating that these strategies may influence ventures' approach to opportunity recognition and exploitation (Jennings & Seaman, 1990; Kickul & Walters, 2002). In addition to drawing from configurations research in the broader management literature, entrepreneurship research is also increasingly examining new configurations of entrepreneurs, their ventures, and their environments. For instance, Khelil (2016) considered individual, venture, and situational characteristics to identify a taxonomy of five types of failing entrepreneurs. Seeking to understand how multiple internal and external factors work together to present a coherent gestalt is at the core of organizational configurations research.

Despite the development of a considerable literature regarding organizational configurations, research in this area has been limited by challenges associated with empirically examining these

configurations (e.g., Barney & Hoskisson, 1990; Thomas & Venkataraman, 1988). For instance, cluster analysis, one of the most prevalent techniques for examining organizational configurations, involves considerable researcher judgment regarding how the technique is applied and how cluster solutions are identified (Ketchen & Shook, 1996). As a result, some scholars view clustering algorithms with skepticism in regards to their value in configurations research.

Recently, qualitative comparative analysis (QCA) has emerged as a valuable alternative to cluster analysis for examining organizational configurations (Fiss, 2007; Misangyi, Greckhamer, Furnari, Fiss, Crilly & Aguilera, 2017; McKenny, Short, Ketchen, Payne & Moss, 2018). In contrast to techniques that treat each dimension as an equal contributor to group identification (e.g., cluster analysis), QCA-based investigations are able to identify whether each dimension is a core or peripheral part of the configuration, or if it is part of the configuration at all (e.g., Fiss, 2011). Further, the algorithm for cluster analysis attempts to maximize between-cluster heterogeneity and within-cluster homogeneity. This generally guarantees the identification of clusters regardless of whether meaningful groups exist in the data (Fiss, 2007). By contrast, QCA methods will return null findings if there are no configurations that consistently lead to the desired outcome[10]. As a result, management scholars have increasingly embraced QCA for examining organizational configurations and their sufficiency and necessity in producing various outcomes (Greckhamer, Misangyi & Fiss, 2013; Misangyi et al., 2017).

Despite increasing recognition of QCA's value to configurations research, there is still confusion regarding its use to examine myriad questions germane to research in entrepreneurship and management phenomena (Greckhamer, Furnari, Fiss & Aquilera, 2018). While several works explain the rationale behind and use of QCA (e.g., Berg-Schlosser et al., 2009; Fiss, 2007, 2011; Greckhamer, Misangyi, Elms & Lacey, 2008; Ragin, 1987, 2000, 2008; Schneider & Wagemann, 2012), entrepreneurship researchers

[10] QCA-based research typically involves assumptions about causality i.e., how different configurations lead to an outcome of interest, but it is also possible to use QCA for descriptive purposes (e.g., Berg-Schlosser, De Meur, Rihoux & Ragin, 2009).

seeking practical guidance regarding why, when, and how to use QCA-based methods would currently need to consult several of these references to understand the key decisions that must be made.

To encourage the use of this valuable approach in entrepreneurship research, this chapter provides a systematic examination of QCA with regards to its use in this literature. In particular, we provide step-by-step guidance to researchers taking this approach regarding each decision to be made and its implications (e.g., Ketchen & Shook, 1996). We believe our tutorial approach is an important step for advancing our understanding of QCA and thus encourages the further development and testing of configurational theories (Delbridge & Fiss, 2013; Snow & Ketchen, 2014).

THE LOGIC OF QUALITATIVE COMPARATIVE ANALYSIS

Qualitative comparative analysis (QCA) is a methodological approach developed by social scientist Charles Ragin to examine how configurations of independent variables (causal conditions, in QCA parlance) influence a dependent variable (outcome condition; Ragin, 1987, 2000, 2008). QCA accomplishes this task by analyzing the independent and joint necessity and sufficiency of the causal conditions to obtain the outcome (Fiss, 2007; see also García-Castro & Francoeur, 2016). Necessity suggests that a condition or conditions *must* be present in all cases for the outcome of interest to occur. For instance, posting a campaign for investors to see is a necessary condition for receiving investments through crowdfunding. However, necessity of a condition does not suggest that the condition, on its own, will cause the desired outcome. For the outcome to take place, the condition(s) must also be sufficient. Sufficiency suggests that the condition(s) on their own are enough for the outcome to occur. In this case, having a crowdfunding campaign posted is not sufficient for crowdfunding success on its own. However, the combination of posting a campaign and potential investors' assessment of the feasibility and desirability of the business idea might be jointly sufficient to cause investors to contribute (e.g., Short, Ketchen, McKenny, Allison & Ireland, 2017).

QCA uses 'set theory' to model and examine relationships. Relying on set theory introduces some fundamental differences in how relationships are conceived using QCA in contrast to clustering techniques historically used in entrepreneurship. For instance, QCA creates 'sets' of ventures for each of the causal conditions and outcome conditions. The researcher then identifies the extent to which ventures are members of each set. Thus, whereas cluster analysis might include an independent variable *years of experience* which tracks the number of years of relevant working experience the venture founder has, QCA would construct a set of ventures having an *experienced founder* (e.g., Fiss, 2011). Venture configurations are then identified based on patterns of set membership – that is, ventures that have the same pattern of causal condition set memberships (e.g., experienced founder, novel product, family firm) are considered part of the same configuration. In contrast, cluster analysis calculates a 'distance' between each venture and the other ventures in the sample based on the clustering variables (e.g., years of experience, extent of product novelty, family influence) and are iteratively grouped together based on these distances (Ketchen & Shook, 1996). While there are guidelines for identifying when to stop grouping ventures in cluster analysis, there is considerable researcher judgment in the selection and application of a stopping rule. As a result, a common critique in cluster analysis is the subjectivity of the number of clusters identified in a sample. Thus, the reliance on set theory helps QCA researchers overcome this critique by systematizing the identification of configuration membership.

QCA's reliance on set membership also provides an intuitive link between set membership and tests for necessity and sufficiency, potentially facilitating the assessment of causality in research using this approach. If all members of the outcome set are also members of one of the causal sets, that causal condition is necessary for the outcome condition. For example, if all ventures in the successful fundraising set were also in the set of ventures with experienced founders, QCA would suggest that having an experienced founder was a necessary condition for successful fundraising. Further, if all members of a causal set are also members of the outcome set, that causal condition is said to be sufficient for the outcome condition. For example, if all ventures in the experienced founders set were also in the

successful fundraising set, QCA would suggest that having an experienced founder was sufficient for successful fundraising.

Table 29: Truth table: Product novelty is necessary and sufficient

Causal conditions		Outcome condition
Novel product	**Experienced founder**	**Crowdfunding success**
True (1)	True (1)	True (1)
True (1)	False (0)	True (1)
False (0)	True (1)	False (0)
False (0)	False (0)	False (0)

Using set membership to assess necessity and sufficiency is modeled in QCA using truth tables. A simple example truth table is presented in Table 29. In this example the researcher might ask, "Which combinations of founder experience and product novelty lead to success in crowdfunding?" In the table we outline the condition that having a novel product is necessary and sufficient for crowdfunding success. Having a novel product is necessary for crowdfunding success because all rows where crowdfunding success is true, novel product is also true – suggesting that there is no recipe for crowdfunding success that does not include having a novel product. Product novelty is sufficient for crowdfunding success because all rows where novel product is true, crowdfunding success is also true – suggesting that no other causal conditions are needed in conjunction with novel product to cause crowdfunding success.

The procedure by which QCA reduces this truth table to the insight that having a novel product, on its own, is necessary and sufficient for crowdfunding success is through Boolean algebra. Boolean algebra uses logical operators such as 'and' and 'or' to express relationships between sets. Boolean algebra also has its own notation system for modeling these relationships. In particular, it uses an asterisk (*) to denote 'and' (e.g., Novel*Experienced, meaning the venture must be in both sets of ventures with novel products and with experienced founders) and a plus sign (+) to denote 'or' (e.g., Novel+Experienced, meaning the venture must either be a member of the set of ventures with novel products or with experienced founders). It uses an arrow (→) to express the causal link between the

condition(s) and the outcome (e.g., Novel*Experienced→FundingSuccess would suggest the ventures must both have novel products and experienced founders to be successful in crowdfunding). Finally, a tilde (~) is used to note the absence of a condition (e.g., ~Novel, meaning the venture must not be in the set of ventures with novel products).

Boolean algebra can be used to ascertain necessary and sufficient conditions for a simple truth table relatively easily. First, all cases where the outcome condition is false are removed because these cases cannot contribute to either the necessity or sufficiency for the presence of the outcome condition. In Table 29 this would remove the bottom two rows, leaving only the top two rows remaining. Next, Boolean algebra enables the combination of rows where the configuration differs on only one of the causal conditions. For instance, the two remaining rows in Table 29 are Novel*Experienced→FundingSuccess (i.e., having a novel product and experienced founder leads to crowdfunding success) and Novel*~Experienced→FundingSuccess (i.e., having a novel product but not having an experienced founder leads to crowdfunding success). The two rows differ only on whether the venture needs to be in the set of ventures with experienced founders to be successful in crowdfunding. As a result, the condition "Experienced" can be dropped and the two rows combined, resulting in Novel→FundingSuccess (i.e., having a novel product leads to crowdfunding success).

While Table 29 provides a relatively easy-to-interpret truth table linking causal conditions to an outcome of interest to entrepreneurship scholars, the simplicity of this table does not reflect a realistic view of the complexity of the configurational relationships investigated by many scholars. Consider a more complex model where the researcher identifies a number of different factors that may influence crowdfunding success. Research suggests that founders' education, prior founding experience, network ties, dedication, and business idea novelty all influence whether or not they obtain resources from external investors (e.g., Carter, Gartner & Reynolds, 1996; Macmillan, Siegel & Subba Narasimha, 1985; Mollick, 2014; Shane & Cable, 2002). A truth table for these variables would contain 2^5=32 rows, reflecting each combination of the five causal conditions.

The reduction of Table 29 into the relationship between one causal condition and the outcome condition also oversimplifies the relationships generally found in configurations research. In particular, configurations research frequently uncovers causal complexity in terms of causal conjunction and equifinality (Misangyi et al., 2017; Schneider & Wagemann, 2012). Causal conjunction suggests that two or more causal conditions work together to produce the outcome condition (Ragin, 1987, 2000). If having a novel product and a dedicated entrepreneur must both be present to be successful in crowdfunding (i.e., Novelty*Dedication→FundingSuccess), this relationship would be reflective of conjunctural causality because both conditions need to be present. Equifinality suggests that there may be more than one configuration that produces the same outcome (Doty et al., 1993; Ragin, 2008a). For instance, while having a novel product and a dedicated entrepreneur might be one way to obtain crowdfunding success, it could be that the combination of founders' dedication and prior experience may also lead to crowdfunding success among investors that bet on the founding team rather than the quality of the idea (e.g., Macmillan et al., 1985). In QCA, this more realistic model demonstrating both conjunctural causality and equifinality would be expressed as Novelty*Dedication+Dedication*Experience→FundingSuccess.

Configurations research is also frequently interested in causal asymmetry, which suggests that the opposite of combinations leading to the presence of an outcome may not necessarily lead to the absence of the outcome (Meyer, Tsui & Hinings, 1993; Ragin, 2008a). For instance, having a novel product and a dedicated entrepreneur may lead to success in crowdfunding (Novelty*Dedication→FundingSuccess); however, the negation of this combination may not necessarily lead to crowdfunding failure (~Novelty*~Dedication→~FundingSuccess). This stands in stark contrast to traditional methods where a positive correlation between an interaction of dedication and novelty and funding requires both that increases in the interaction term are accompanied by increases in funding and decreases in the interaction term are accompanied by decreases in funding.

QCA-based methods facilitate the examination of causal asymmetry without requiring it to actually occur, providing researchers with additional flexibility not afforded by correlational techniques.

For instance, researchers using QCA-based methods could examine research questions where there is no hypothesized effect of the causal conditions on the outcome below a certain threshold, but where above this threshold the causal conditions do influence the outcome. In contrast, correlation-based techniques assume a fixed linear interaction effect for all values of the independent variables.

Research questions where QCA is most valuable relative to traditional methods examine how the configurations of multiple factors, internal and external, influence an outcome of interest. Bell and colleagues (2014) used QCA to investigate whether "*different bundles of governance mechanisms in foreign IPO firms lead to the same perceived valuation outcomes*," and "*how… differences between a foreign IPO firm's home and host country institutional contexts affect this process of gaining legitimacy through governance mechanisms?*" Here the authors are interested in how patterns of multiple governance and institutional conditions work together to influence IPO valuation. Similarly, Greckhamer (2016) asked "*how do institutional differences across countries shape the typical compensation received by a country's CEOs and workers as well as the resulting pay differentials or pay dispersion between CEOs and workers?*" To answer this research question, Greckhamer examines how the interaction among a number of institutional-level phenomena influence compensation outcomes.

While many of the questions asked of QCA in extant management studies could be addressed using traditional configurations research methods, QCA opens the door to new research questions that would be more difficult to ask using these methods. For instance, QCA's ability to parse out the necessity and sufficiency of a condition in causing an outcome opens the door to more nuanced research questions regarding entrepreneurship phenomena. Similarly, QCA's ability to consider complex causal relationships characterized by equifinality, nonlinearity, and asymmetry makes it particularly well-suited to research questions examining these relationships. Table 30 highlights a number of potential research questions that would be more difficult to test using methods familiar to configurations research (e.g., cluster analysis, interaction terms in regression). For instance, research has identified a number of characteristics of entrepreneurially oriented firms (i.e., autonomy, competitive aggressiveness, innovativeness, proactiveness, and risk taking; Lumpkin & Dess 1996). This research also indicates that entrepreneurial

firms need not be high on all dimensions and that environmental factors may influence the patterns of entrepreneurial orientation that lead to high performance (McKenny et al., 2018). Future research could extend this insight to ask whether elements of a firm's organizational structure influence the outcomes of various entrepreneurial orientation patterns.

QCA is also flexible regarding the mode of reasoning in the research question (Berg-Schlosser et al., 2009). Whereas qualitative research is typically inductive and quantitative research deductive, QCA enables the researcher to examine research questions from either approach. For example, Aversa, Furnari, and Haefliger (2015) used QCA to study high and low performing business model configurations of the Formula One Racing teams. Similarly, Misangyi and Acharya (2014) conducted an exploratory study seeking answers to the question "*How do corporate governance mechanisms work together effectively?*" Both of these studies take an inductive approach, but while the goal of Aversa and colleagues (2015) is theory building on the mechanisms underlying the configurations, Misangyi and Acharya (2014) focus more on theory elaboration. By contrast, García-Castro and Francouer (2016) used QCA in a deductive mode to test *a priori* hypothesized relationships between firms' engagement levels in various stakeholder groups and firm performance. Consequently, the authors were able to conclude that high performing firms need at least a minimum investment in all primary stakeholder groups, and that not doing so is sufficient for low performance.

Table 30: Potential QCA-enabled research questions

Research stream	Research questions
Entrepreneurial Strategy	• Do elements of a firm's organizational structure influence the patterns of entrepreneurial orientation that lead to high performance? • What environmental or organizational characteristics are necessary for firms to be successful in shifting the balance between exploration and exploitation in cyclical ambidexterity? • How do characteristics of leaders and organizational culture interact to influence the success of entrepreneurial ventures?
Family Business	• What environmental or organizational characteristics are necessary for firms to maintain high performance when implementing family governance practices such as family boards? • What combinations of family statuses (i.e., ownership, control, influence, involvement) lead family firms to consistently outperform non-family firms? What combinations do not? • What configurations of the long-term orientation construct dimensions characterize successful family firms?
Social Entrepreneurship	• How do environmental, founder, and opportunity characteristics lead founders to launch for-profit vs. non-profit ventures? • What factors work together to influence the successful management of multiple stakeholder constituencies in social ventures? • How might firm- and network-level factors help social ventures overcome lack of institutional resources for addressing the needs of beneficiaries?
Entrepreneurial Finance	• What combinations of rewards lead to crowdfunding success in rewards-based crowdfunding? • What configurations of non-financial resources are most effective when launching a firm using bootstrapping? • How do institutional, governance, and CEO factors combine to influence performance in foreign IPOs?
Opportunity Recognition and Exploitation	• How do the resources available in an entrepreneur's former employer influence the likelihood of identifying and exploiting an entrepreneurial opportunity? • What environmental and state-like individual characteristics prime an individual to be most alert to entrepreneurial opportunities? • When a current opportunity is underperforming, what combinations of conditions influence entrepreneurs' decision to pivot to a new entrepreneurial opportunity? To persist with the current opportunity?

There are two QCA variants that warrant further explanation because they are finding increasing use in management research: crisp set QCA (csQCA) and fuzzy set QCA (fsQCA). The difference between these techniques concerns how variables are configured into sets. With crisp sets, ventures are

either fully-in or fully-out of the sets for both the causal conditions and the outcome of interest, there can be no partial membership in any set (Ragin, 1987). For instance, entrepreneurship research interested in configurations of industry membership, social mission, and whether the founder of the venture participated in a university entrepreneurship program on the decision to form as a non-profit or charitable for-profit entity would be usefully modeled as a crisp set because each of the conditions are appropriately modeled as dichotomous (e.g., the venture either has a social mission or it does not). With fuzzy sets, ventures can have degrees of membership in a set (Fiss, 2011; Ragin, 2000, 2008). For example, the conditions used in Table 29 (i.e., product novelty and experienced founder) are not easily dichotomized and considerable variability would be lost by modeling these as crisp sets. Accordingly, in a fuzzy set model, ventures that have slightly less novel products than the threshold for having a "novel product" might be given a set membership score of close to fully-in the novel product set to indicate that they have a meaningfully more novel product than those ventures that are fully-out of the novel product set. Whenever supported by theory, researchers should use fuzzy sets as this technique allows for more fine-grained analysis (Schneider & Wagemann, 2012, p. 317). Yet, crisp and fuzzy sets can also be used in a same model, such that some of the causal conditions are dichotomous while others are polychotomous. The calibration of variables into set membership, whether dichotomously in crisp sets or in terms of degree in fuzzy sets, differentiates QCA-based methods from cluster analytic measurement where best practice is to standardize measures using *z*-scores to put all clustering variables on the same scale (e.g., Greckhamer et al., 2018; Ketchen & Shook, 1996).

CONDUCTING QCA

In this section we provide a step-by-step guide to conducting a QCA in entrepreneurship research, documenting potential pitfalls that may arise both before and during the analysis, and how to address them. Table 31 lists each step, provides critical questions to ask in each step, and suggests possible actions for dealing with potential pitfalls. Although these steps are largely similar across software

packages, our discussion draws from fsQCA 3.0 (Ragin & Davey, 2017). While also other programs, such as the QCA packages in R (Thiem, 2016) and Stata (Longest & Vaisey, 2008) can be used, most management scholars have used the fsQCA software (e.g., Fiss, 2011; Misangyi & Acharya, 2014; Vergne & Depeyre, 2016).

Table 31: QCA steps

QCA step	Critical questions	Recommended actions
Step 1 Model development	How to choose from many possible conditions? How are the conditions linked to each other and to the outcome? Do the conditions show enough variance?	Use theoretical guidance to reduce the number of conditions, choose conditions that vary across cases, and state explicitly the expectation of their relationship to the outcome.
Step 2 Case selection (and subsequent data collection)	Are there cases with both positive and negative outcome? Are the cases similar but different enough? Is it appropriate to use a small sample (i.e., ~10-40 cases) or is a larger sample needed?	Determine the outcome of interest before defining the sample and provide detailed explanation of selected and non-selected cases. Choose cases that vary both in causal conditions and outcome. Add cases during and after the analysis if needed.
Step 3 Calibration	Is the calibration based on existing theory and logic or substantial knowledge (data) or both? How are the case data distributed? Can the thresholds be justified?	Make sure the thresholds are adequately justified by using existing theoretical, logical, or substantial knowledge. Avoid setting a threshold at a point where observed cases have the same value as that would lead to their removal from the analysis.
Step 4 Analysis of necessary conditions	Are some of the conditions necessary for the outcome to occur? To what extent are the conditions necessary? Do they make sense theoretically and practically? Can they be excluded from further analyses?	Run necessity analysis before sufficiency analysis. Evaluate potential necessary conditions both theoretically and practically and by assessing their consistency and coverage scores.
Step 5 Truth table analysis	Does the distribution of cases make sense? Are there observable patterns? Are there many logical remainders and how should they be treated? What frequency and consistency levels are appropriate?	Evaluate the table by sorting the rows according to the number of empirical instances and consistency scores. Examine empty rows and possible reasons why they were not observed. Set frequency threshold as high as possible, but so that at least 75% of the cases are included. Set consistency threshold at at least 0.75, but test also 0.80 and 0.90.
Step 6 Standard analysis	How many rows are included in the standard analysis? Are there logically redundant prime implicants and can they be excluded from the minimization?	Let software run the logical minimization procedure to avoid mistakes. Observe how many rows are included in the final analysis. Use

		existing knowledge to determine prime implicants if applicable.
Step 7 Counterfactual analysis	How much limited diversity is observed (how many empty rows)? Can any counterfactuals be integrated into the logical minimization process?	Use existing knowledge to integrate counterfactuals and justify your choices explicitly.
Step 8 Interpretation of results	Do the derived configurations make sense theoretically and practically? Are the final solutions empirically and theoretically relevant? What is the role of equifinality in the solution?	Compare the solutions with existing theory. Evaluate sufficiency and empirical relevance by considering consistency and coverage scores. Examine first- and second-order equifinality.
Step 9 Robustness checks	Which robustness checks make sense? Do the results change significantly if the parameters are changed?	Test robustness in more than one way. Observe possible changes in subset relations, consistency, and coverage. Integrate econometric analysis if applicable and needed.

Step 1: Model development. The first step in our approach to conducting QCA is model development. There are often challenges associated with using traditional methods to test models developed using configurations reasoning. For instance, examining organizational configurations using correlation-based analyses often involves entering interaction terms between two or more variables in regression (e.g., Dess, Lumpkin & Covin 1997). However, as the number of components of the configuration increase beyond two, interpretation of this interaction term becomes difficult (Fiss, 2007). Cluster analysis alleviates some of this concern by grouping ventures based on their similarities among a constellation of variables before entering the groups into the analytical model. However, by aggregating ventures into group membership variables, it is not possible to identify whether all of the variables used in the cluster analyses played a meaningful role in producing the outcome of interest, once again making interpretation of findings difficult. As a result, while the research questions addressed by configurations scholars using QCA often overlap considerably with what is possible using traditional configurations techniques, QCA enables researchers to uncover more nuanced insights regarding the models developed from these research questions.

The selection of causal and outcome conditions requires interplay of prior theoretical knowledge and empirical insights from ongoing investigations (Berg-Schlosser et al., 2009). Whereas a benefit of

QCA is the ability to include a number of causal conditions while maintaining interpretability, researchers should avoid haphazardly adding causal conditions to the model. QCA may be able to process a higher number of dimensions, but complex solutions may be more difficult to interpret with respect to the theory linking the pattern to the outcome of interest. Further, having a large number of causal conditions may lead to findings where the performance of one or few idiosyncratic cases influence the findings due to the few number of cases reflecting individual configurations (Schneider & Wagemann, 2012). For example, if eight conditions are used, there will be 2^8=256 possible combinations of those conditions. However, if only 50 cases are observed, there will be no empirical evidence for at least 206 combinations and potentially more if two or more ventures are classified into the same configuration. As a result, findings from this analysis would potentially result in findings that are idiosyncratic to the sample and may not have occurred if there were observations for a greater proportion of the possible combinations.

There are no clear rules for the upper limits of model complexity. However, some scholars have made recommendations. For example, Berg-Schlosser and De Meur (2009) suggest that studies with small sample sizes (i.e., those with 10-40 cases) should limit models to seven causal conditions. Marx and Dusa (2011) provide probabilities for QCA finding consistent solutions based on simulations of different sample sizes and number of conditions. Scholars have also proposed different ways to reduce the number of causal conditions in a QCA model and thus overall complexity by creating higher-order constructs or so called 'macro conditions' (Ragin, 2000; Grandori & Furnari, 2008), running QCA separately for certain groups (e.g., different industries), and developing a configurational theory first and starting to build the model from a few core conditions (Amenta & Poulsen, 1994).

Step 2: Case selection (and subsequent data collection). QCA research refers to observations of individuals, ventures, or industries as 'cases' (Ragin, 1987). While elements of sampling methods used in traditional covariance-based techniques are also applicable to QCA case selection, QCA also shares some similarities to qualitative research where cases are selected purposively based on their potential to shed complementary insight in the analysis (e.g., theoretical sampling).

QCA operates by examining how differences in the causal conditions influence the outcome of interest. If there is little variability in the cases with respect to the causal conditions, QCA is limited in its ability to uncover configurations. Accordingly, researchers should attempt to maximize heterogeneity of the cases analyzed with respect to both the causal conditions and the outcome (Berg-Schlosser & De Meur, 2009). Researchers should also attempt to capture multiple cases with the same configuration, enabling QCA to better estimate how consistently the configuration leads to the outcome of interest. Studies using small sample sizes should select samples based on theory and the characteristics of the cases to ensure that there is satisfactory variability across conditions (Ragin, 2008a). Studies using large sample sizes where variability should be less of an issue should adopt a more traditional sampling strategy, using random or purposive sampling (e.g., S&P 1500, KLD; e.g., García-Castro & Francoeur, 2016; Misangyi & Acharya, 2014).

In some instances, researchers using QCA may be justified in adding cases to their sample after the initial case selection (Ragin, 2000). In particular, if the researcher finds that some configurations are not represented in the data, she might be justified in selecting additional cases where these configurations are represented (Schneider & Wagemann, 2012). For example, consider a situation where the combination of experience and education is observed to consistently lead to securing external funding (i.e., Experience*Education→FundingSuccess), but where there were no observed cases where the entrepreneur had experience but no education or where they had education but no experience. In this scenario, it cannot be known whether the presence of either condition on its own would have been sufficient for successful crowdfunding or whether both experience and education are necessary. In this situation, researchers might purposively sample additional cases where the entrepreneur has either education or experience, but not both, to create a more complete understanding of the underlying causal relationships.

***Step 3: Calibration*.** Once data has been collected for each case, the researcher must decide how to assign membership of the cases in the investigated sets (Ragin, 2008b). Membership in QCA ranges from 0 (fully out of the set) to 1 (fully in the set). In crisp sets, only 0 and 1 are used. For dichotomous

data (e.g., CEO duality, possession of a patent) calibration into a crisp set is a one-to-one mapping. However, for polychotomous or continuous data, calibration into a crisp set is often done through the specification of a threshold where a case switches from being classified as fully out to fully in (e.g., family firm status).

Fuzzy sets use points between 0 and 1 (inclusive) to indicate varying levels of membership in the set. Here researchers often use multiple thresholds to capture these varying levels (e.g., mostly in: 0.8; more/less in: 0.6; more/less out: 0.4; mostly out: 0.2; Ragin, 2008b). The 0.5 point is particularly meaningful in fuzzy sets, this is the point of maximum ambiguity (Ragin, 2008a). This point indicates that it is unclear whether the case should be classified as closer to being a member of the set or not a member of the set. For example, Fiss (2011) calibrated firms with 50 employees as being at this point of maximum ambiguity with respect to the set of large EU firms. Researchers should be cautious when assigning a value of 0.5 to cases as these cases will not be included in the next steps of the analysis, reducing the final sample size (Schneider & Wagemann, 2012).

Unlike variable measurement in preparation for traditional methods, the selection of calibration thresholds in QCA requires theoretical or substantial knowledge of the causal and outcome conditions and the distribution of the data at the population level. The sets created by the researcher are intended to represent theoretically meaningful conditions in the population of interest. Thus, the threshold of what constitutes a novel product should be based on what theory suggests a novel product would be in the population. In this way, ventures are not classified having a novel product (or not) based on characteristics of the sample, but by what theory suggests about the population. This is particularly important because QCA analyzes data in terms of sets rather than in terms of variable covariance, accordingly, assigning cases to sets without well-justified thresholds may lead to wrong conclusions (Ragin, 2008a).

Using input from more than one source to establish calibration thresholds helps ensure the validity of the set membership (Schneider & Wagemann, 2012). In addition to using existing knowledge regarding the theory and population, it may also be valuable to consult with experts in the area (e.g.,

investors or industry analysts) to identify reasonable thresholds (Misangyi et al., 2017). Further, several existing QCA studies have gathered statistics regarding the population of interest to identify thresholds for calibration (e.g., Fiss, 2011; García-Castro & Francoeur, 2016; Misangyi & Acharya, 2014).

Set membership may be calibrated by hand; however, a particularly valuable tool for automating the calibration of continuous or interval data into fuzzy set membership scores is fsQCA's Calibrate function. The Calibrate function takes three inputs: the fully-in threshold, the point of maximum ambiguity, and the fully-out threshold, and rescales cases into the (0,1) range. Cases greater than the fully-in threshold receive a membership score very close to 1. Cases between the fully-in threshold and the point of maximum ambiguity are rescaled to fall between 1 and 0.5. Cases between the point of maximum ambiguity and the fully-out threshold are rescaled to fall between 0.5 and 0. Cases below the fully-out threshold receive a membership score very close to 0.

Step 4: Analysis of necessary conditions. After calibrating the conditions but before conducting the standard QCA analysis, the researcher should investigate whether any of the causal conditions is individually necessary for the outcome of interest to occur (Fiss, 2011). If the consistency score for a causal condition falls in the range [0.90-1.00] this suggests that ventures must generally be a member of this set for the outcome to occur (Ragin, 2006). Understanding the necessity of individual causal conditions is helpful in several ways. First, this potentially provides theoretically and practically relevant insights indicating the salience of that condition. Further, any conditions that were individually necessary can be excluded from further analysis because understanding that the condition is individually necessary indicates that the condition would occur in all configurations leading to the outcome of interest, making its inclusion in further analyses redundant (e.g., Greckhamer, 2016; Vergne & Depeyre, 2016).

Removing a condition from further analysis due to its individual necessity is generally appropriate. However, QCA may at times identify a condition as necessary when the condition is not actually necessary. For instance, if the causal condition does not vary much in the sample, QCA may mistakenly identify it as necessary for the outcome condition. Accordingly, researchers should assess whether the necessity of the condition is reasonable theoretically before eliminating it. Further, it is

important to distinguish between an independent necessity test and the prevalence of the condition based on the findings from the main QCA analysis. When a condition appears in each of the final configurations it may appear to be necessary, but one cannot infer individual necessity from these findings (Bol & Luppi, 2013).

***Step 5: Truth table analysis*.** Truth tables (e.g., Table 29) display all possible combinations of the causal conditions and link these configurations to the outcome of interest (Ragin, 1987). When observed data is incorporated into the truth table, fsQCA shows the researcher how the observed cases are distributed among the different configurations. If the cases are all clustered in a small number of truth table rows, collecting additional cases may be necessary to provide sufficient variability to test the researcher's hypotheses. The initial truth table also provides the researcher with an opportunity to visually assess the extent to which configurations of the causal conditions consistently produce the outcome of interest before reducing the configurations using an algorithm based on Boolean algebra (Schneider & Wagemann, 2012).

While inspecting the initial truth table provides a preliminary assessment of the configurations leading to the outcome of interest, not all rows identified as leading to the outcome will be included in the QCA analysis. In particular, each row must meet three criteria to be included. The first inclusion criterion is that each row must contain a minimum threshold of cases set by the researcher (Ragin, 2008a). In Table 29, if the researcher set this threshold to two and only one venture was in both the novel product and experienced founder sets, this row would not be used in the standard analysis (even though that venture was also a member of the crowdfunding success set). When a configuration has too few cases associated with it, it is difficult to identify whether the link to the outcome condition is driven by the configuration of causal conditions or idiosyncrasies of the case(s). There may be situations where the researcher opts to include rows that do not meet the higher threshold. For example, the configuration might be rare in practice such that only one or few cases in the population are likely to reflect the configuration. In such cases researchers might consider the benefits of having greater variety reflected in the cases greater than the cost of potentially including case-level idiosyncrasies.

The heuristics for selecting a minimum frequency threshold attempt to balance the desire to eliminate configurations where the findings are likely to be idiosyncratic to the sample with the desire to include enough observed configurations to enable the analysis. In studies with small sample sizes (e.g., 10-40 cases), researchers may consider thresholds of one or two cases per row because with configurations of even modest complexity the number of cases per configuration will rapidly decrease such that a higher threshold may eliminate many rows. On balance, studies with larger samples should consider higher minimum frequency thresholds. However, here too, researchers should also consider the complexity of the configurations when making this decision. Generally, researchers should set the highest threshold that their sample will bear, but not so high that the threshold eliminates more than 20-25% of the rows with cases in them (Ragin, 2017).

The second inclusion criterion is a minimum consistency threshold with regards to the outcome condition. Specifically, for inclusion in the standard analysis each row must consistently lead to the outcome condition. Consistency indicates how often the cases in the row led to the outcome of interest and is expressed as a percentage (Ragin, 2006)[11]. For instance, a consistency score of 0.83 for a truth table row would suggest that the cases reflected in that row were members of the outcome set (e.g., crowdfunding success) 83% of the time. The rationale for using a high consistency threshold is that this provides a guard against alternative explanations for the relationship. If a configuration only infrequently leads to the outcome of interest, it is difficult to rule out uncaptured condition(s) or random chance as alternative explanations for the outcome. By contrast, if the presence of a configuration leads to the outcome with high consistency, we can be more confident that the configuration plays an important role in causing the outcome condition.

The choice of a minimum consistency threshold should be driven by several factors, such as the sample size, research purpose, and nature of the knowledge and theory at hand (Schneider & Wagemann,

[11] This simple definition refers to consistency in crisp sets. For fuzzy sets the principle is the same, but the formula for calculating it is slightly different.

2012). If the theoretical arguments to be made require close to full consistency of the configurations with regard to the outcome, then a threshold close to 1 should be chosen. If the sample size is relatively large (e.g., >100) and the researcher takes a fuzzy set approach, it might be justified to use a lower threshold because large samples typically contain configurations with cases that lead either to the outcome of interest or its absence. Moreover, consistency levels in fuzzy sets are based on the fuzzy membership scores meaning that they also include cases that have e.g. a membership score of 0.60 in the outcome set. This implies that a consistency score of 1 is extremely rare in fuzzy set QCA (Ragin, 2008a). The generally-accepted norm for QCA research is that minimum consistency threshold should be no lower than 0.75 (Ragin, 2006, 2008). This threshold would retain all rows where at least 75% of cases with the same combination of causal conditions lead to the outcome of interest. However, many recent studies have applied a cutoff of 0.80 to increase the overall 'reliability' of the results (e.g., Bell et al., 2014; Misangyi & Acharya, 2014).

The third inclusion criterion applies only to fuzzy set analyses and concerns the 'proportional reduction in inconsistency' for each observed configuration. A challenge associated with QCA that would not occur in traditional configuration methods is that some causal conditions could predict both the presence and absence of the outcome condition with a high level of consistency. For example, if there is minimal variability in one or more of the causal conditions (e.g., experienced founder), then that causal condition would appear to be a predictor for both the outcome condition (e.g., crowdfunding success) and absence of the outcome condition (e.g., not successful in crowdfunding) simply because there was minimal variability in the sample. Proportional reduction in inconsistency is a metric that attempts to address this issue by calculating how consistent the configuration would be for the outcome after eliminating cases that are consistent for both the presence and absence of the outcome (Misangyi & Acharya, 2014; Schneider & Wagemann, 2012). In other words, this metric provides a consistency score of a given configuration relative to the outcome of interest without it also being sufficient for the opposite outcome.

Best practice suggests that the proportional reduction in inconsistency metric be kept above 0.75 to avoid retaining configurations that predict both the presence and absence of the outcome (Ragin, 2017). In the current version of the fsQCA software, researchers cannot automate the process of eliminating rows with PRI scores below the minimum threshold. However, if the outcome condition is manually recoded to '0' instead of '1' for these rows, the fsQCA software will eliminate these rows from consideration in the standard analysis.

Step 6: Standard analysis. After the rows meeting the three criteria for analysis have been retained, QCA proceeds by applying Boolean algebra to reduce the truth table to a smaller number of simpler configurations that lead to the outcome of interest through a process called logical minimization (Ragin, 2000). In the fsQCA 3.0 software this is called "truth table algorithm" and it makes use of the Quine-McCluskey algorithm. To illustrate the process of logical minimization, we offer the following example. The initial truth table uncovers four configurations consistently leading to the crowdfunding success: (1) Novel product, dedicated and experienced entrepreneur; (2) novel product, dedicated, but not experienced entrepreneur; (3) not a novel product, but a dedicated and experienced entrepreneur; and (4) not a novel product, not a dedicated but experienced entrepreneur.

Logical minimization proceeds by combining rows that both lead to the outcome of interest, but differ only on the presence/absence of one causal condition (Ragin, 1987). Using this logic, in the first step of logical minimization the QCA algorithm would combine rows 1 and 2. These two rows both lead to success in crowdfunding and differ only on whether the entrepreneur was experienced. If experience can be either present or absent and the remaining configuration conditions still consistently lead to crowdfunding success then experience must not be an important part of the configuration. The combination of rows 1 and 2 would result in a new combined configuration: novel product and dedicated entrepreneur.

The process of logical minimization iterates until no further simplifications can be made. After combining rows 1 and 2, QCA would also find that rows 1 and 3 differ only on whether the product was novel. Because product novelty was not important between these two rows, novelty would be eliminated

and the new combined configuration would reflect only a dedicated and experienced entrepreneur. In the next iteration QCA would identify that rows 3 and 4 differ only on the entrepreneur's dedication, and would combine them into a new row reflecting an experienced entrepreneur with a product that is not novel. At this point all remaining rows contain at least two differences so no further combinations can be made. Thus, QCA would provide these three configurations as leading to success in external fundraising. In Boolean terms this would be expressed as Novelty*Dedication+Dedication*Experience+~Novelty*Experience→FundingSuccess. Table 32 summarizes this minimization procedure.

Table 32: Prime implicants and the boolean minimization

Row	Primitive Boolean expressions of consistent configurations	Prime implicants (minimized expressions)	Final solution for receiving funding
1	Novelty*Dedication*Experience	Novelty*Dedication Dedication*Experience ~Novelty*Experience	Novelty*Dedication ~Novelty*Experience
2	Novelty*Dedication*~Experience		
3	~Novelty*Dedication*Experience		
4	~Novelty*~Dedication*Experience		

Sometimes the logical minimization process can result in the identification of redundant configurations that make the resulting configurations more complicated without adding new insight into the relationship between the causal and outcome conditions. Consider the funding example from Table 32. The four configurations in the initial truth table before logical minimization are referred to as primitive Boolean expressions. After logical minimization there are three simplified configurations, called prime implicants. However, there is a logical redundancy in these prime implicants: one or more of the prime implicants is not actually needed to explain the relationships between all of the primitive expressions and the outcome of interest. In this example, we see that Novelty*Dedication explains the first two primitive expressions, Dedication*Experience explains the first and third primitive expressions, and ~Novelty*Experience explains the third and fourth. From this, we can identify that the

Dedication*Experience prime implicant is logically redundant because the two other prime implicants together explain all four of the original primitive expressions.

When there are redundancies in prime implicants, the researcher's input is required to determine which configurations to retain and which configurations are redundant (Ragin, 1987). Elimination of logically redundant prime implicants typically results in more parsimonious findings. However, the decision to remove redundant prime implicants should be based on existing knowledge of the theory or phenomena rather than being a purely methodological consideration (Ragin, 2017).

Step 7: Counterfactual analysis. Not all possible combinations of the causal conditions of interest will always be observed in the sampled cases. This may occur due to small sample size, rarity of the configuration, or because they are impossible[12] (Schneider & Wagemann, 2012). This phenomenon is known as limited diversity and results in truth table rows with no observations. These rows without observations are called logical remainders and can, in some cases, be used to further simplify the solutions uncovered from the main analysis even though there were no observations for the row.

This step, in which the researcher can integrate logical remainders into the analysis, is referred to as the counterfactual analysis (Ragin, 2008a; Soda & Furnari, 2012). Counterfactuals are classified as either being 'easy' or 'difficult' (Ragin, 2008a). Easy counterfactuals are configurations where, despite no cases being present, existing theory or empirics indicate that the presence of an additional causal condition would still lead to the outcome of interest (Fiss, 2011). For example, suppose we had data showing that Novelty*Dedication*~Experience→FundingSuccess, but no data regarding the Novelty*Dedication*Experience configuration. Without counterfactual analysis, QCA would indicate that a recipe for crowdfunding success is to have a novel business idea and be dedicated, but not to be experienced. This is not a satisfying configuration as theory suggests that having entrepreneurial experience should, in general, help solicit funding. Accordingly, counterfactual analysis enables us to tell

[12] For example, it is impossible for a venture to be a non-family firm and have third-generation family ownership.

fsQCA that even though the configuration where experience is present was not observed, if it were present, it would have led to fundraising success. Thus, following counterfactual analysis, QCA would identify the solution to be Novelty*Dedication→FundingSuccess because we have reason to believe that the absence or presence of experience does not change the outcome of this configuration.

Whereas easy counterfactuals examine what theory or empirics suggest would have happened if a causal condition were present, difficult counterfactuals examine what would have happened if the causal condition were absent (Fiss, 2011). A parallel to our previous example would be that we have data showing that Novelty*Dedication*Experience→FundingSuccess, but no data regarding Novelty*Dedication*~Experience. This counterfactual is more difficult to resolve than the first one because the combination of novelty and dedication might not have led to crowdfunding success without the entrepreneur having experience.

In fsQCA, researchers provide input into the counterfactual analysis by indicating whether, in general, the presence or absence of the individual conditions are thought to contribute to the outcome of interest. After the researcher has indicated whether a condition is expected to be present or absent for the outcome to occur, the software conducts the analyses and provides the final solution. If existing theory/research do not provide sufficient insight regarding the relationship to merit use in a counterfactual analysis, the researcher can also indicate that the condition can be either present or absent. Indicating that the condition can be either present or absent tells the software that this condition should not be used for counterfactual analysis. If all conditions are coded in this way, the final QCA results will be based only on the observed cases (Ragin, 2017).

Step 8: Interpreting the results. After running the analyses, the fsQCA software provides three types of results, namely the complex, parsimonious, and intermediate solutions (Ragin, 2000, 2008). The complex solution is based solely on the empirical data and thus does not contain any logical minimizations from the counterfactual analysis. Hence, the complex solution typically contains more configurations that lead to the outcome and each configuration tends to contain more causal conditions than the two other solutions. The parsimonious solution presents the results with both easy and difficult

counterfactuals. As a result, parsimonious solutions tend to have fewer configurations that lead to the outcome and each configuration tends to contain fewer causal conditions. The intermediate solution takes into account only easy counterfactuals.

A common way for interpreting the results of the QCA analysis is to use the intermediate solution to identify the number of configurations that lead to the outcome of interest and the components of these configurations (Fiss, 2011). The results of the parsimonious solution can then be used to identify which of the conditions presented in the intermediate solutions are most important to their respective configurations (Fiss, 2011; Misangyi et al., 2017). The causal conditions derived from the parsimonious solution are referred to as *core* (e.g., Fiss, 2011) or *central* (e.g., Misangyi & Acharya, 2014) conditions of a given configuration, because the parsimonious result includes only those conditions that could not be removed in the logical minimization process even when assuming difficult counterfactuals. Hence, they are in the core of a given configuration. The remaining conditions that appear in the intermediate solution but not the parsimonious solution are referred to as *peripheral* (e.g., Fiss, 2011), *contributing* (e.g., Misangyi & Acharya, 2014), or *complementary* (e.g., Greckhamer, 2016) conditions.

In some cases, researchers may find that two or more parsimonious solutions map onto one configuration in the intermediate solution. For example, the parsimonious solution might be: ~Novelty*Dedication*Experience+~Novelty*Dedication*StrongNetworkTies→FundingSuccess, and the intermediate solution might be: ~Novelty*Dedication*Experience*StrongNetworkTies→FundingSuccess. In this situation, all of the conditions that appear in at least one of the parsimonious solutions that are consistent with the intermediate solution should be identified as a core component even though they are sourced from multiple configurations in the parsimonious solution set (P. Fiss, personal communication, May 11, 2017).

The results often include configurations that differ either in both core and peripheral, or only in peripheral conditions. When configurations differ in both the core and peripheral components, this suggests that there is between-type variation with respect to configurations that lead to the outcome of interest. When configurations differ only in the peripheral components, this suggests that there is within-

type variation with respect to configurations that lead to the outcome of interest. Such a distinction provides more fine-grained insight into how different configurations lead to the same outcome in terms of first- and second-order equifinality. Prior work on QCA has referred to second-order equifinality as *neutral permutation* (Fiss, 2011).

In the results provided to the researcher, fsQCA indicates both how consistently a solution leads to the outcome of interest and a coverage score. Coverage refers to the proportion of cases that exhibit a configuration to all cases where the outcome is obtained, and is expressed as a percentage (Ragin, 2006)[13]. For example, if Novelty*Dedication→FundingSuccess had a coverage score of 0.37, this would suggest that 37% of ventures that were successful in crowdfunding were categorized as having novel products with a dedicated entrepreneur. Although there is no minimum threshold for coverage, a low coverage score indicates that the given solution may not be very common. Yet, such configurations may still provide theoretically relevant insights (e.g., niche fundraising strategies employed by a small number of ventures, but successful for those that do use it). The overall solution coverage scores (the extent to which the minimized solutions together cover all cases with the outcome) in recent work using QCA have ranged from relatively high (0.54 in Bell et al., 2014; 0.74 in Vergne & Depeyre, 2016) to relatively low (0.05 in García-Castro & Francoeur, 2016; 0.10 in Misangyi & Acharya, 2014).

Step 9: Robustness checks. As with any method, QCA is sensitive to the methodological decisions of the research design. As a result, researchers using QCA should examine the robustness of their results to the decisions made in their research process. If robustness checks identify relatively stable causal configurations leading to the desired outcome and consistency/coverage scores, researchers can be confident that these methodological artifacts are unlikely to pose a significant threat to the validity of the findings (Schneider & Wagemann, 2012). If the robustness checks result in considerable variability in findings, researchers should try to identify the source of the discrepancies. Examining the truth table is

[13] This simple definition refers to coverage in crisp sets. For fuzzy sets the principle is the same, but the formula for calculating it is slightly different.

often useful for understanding how the case distribution, logical remainders, and consistencies influenced the final QCA results.

There are several categories of robustness checks that QCA scholars attend to. First, the results of QCA studies can be sensitive to the parameters used to conduct the analysis, such as calibration, frequency threshold, and consistency threshold (Ragin, 2008a). Accordingly, researchers should replicate their analyses with variations on these different parameters to assess the reliability of the resulting solutions (e.g., Skaaning, 2011). Second, researchers should examine the sensitivity of analyses to exceptions made to common QCA heuristics. For instance, researchers may have decided to include one or more configurations where the number of cases fell below their minimum frequency threshold. In addition to providing justification for doing so, researchers should also run the analysis multiple times, once with the below-threshold cases included and once with them excluded to examine the effect of these cases on the results. Finally, considering multiple operationalizations of the constructs examined and lags between the causal and outcome conditions might also shed complementary light on the solutions found in the main analysis (e.g., García-Castro & Francouer, 2016).

CONCLUSION

The purpose of this chapter is to shed light on the benefits of using QCA, its analytical procedures, and various ways for how to deal with potential pitfalls. We review some of the past work that used QCA and provide a step-by-step approach to conducting QCA. While we have sought to be prescriptive in this manuscript, these guidelines should not be applied mechanistically. Rather researchers should keep in mind the research question and the research design of the study at hand and apply these guidelines in a manner that aligns theory with method in that study. With our work we hope to offer entrepreneurship scholars guidance regarding how the approach might be applied in this field and look forward to reading more QCA studies in the future.

Appendix B: Survey items

Item	Statement	Scale	Original study2007	This study (both samples)	Original study2008	This study (both samples)
efficiency1	Inventory costs for participants in the business model are reduced	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency2	Transactions are simple from the user's point of view	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency3	The business model enables a low number of errors in the execution of transactions	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency4	Costs other than those already mentioned for participants in the business model are reduced (e.g., marketing and sales, transaction processing, communication costs)	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency5	The business model is scalable (e.g., can handle small as well as large number of transactions)	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency6	The business model enables participants to make informed decisions	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency7	Transactions are transparent: flows and use of information, services, goods can be verified	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency8	As part of transactions, information is provided to participants to reduce the asymmetric degree of knowledge among them regarding the quality and nature of the goods being exchanged	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency9	As part of transactions, information is provided to participants about each other	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency10	Access to a large range of products, services and information, and other participants is provided	1; 0.75; 0.25; 0	yes	yes	no	no
efficiency11	The business model enables demand aggregation		yes	yes	no	no
efficiency12	The business model enables fast transactions	1; 0.75; 0.25; 0	yes	yes	yes	yes
efficiency13	The business model, overall, offers high transaction efficiency	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty1	The business model offers new combinations of products services and information	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty2	The business model brings together new participants	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty3	Incentives offered to participants in transactions are novel	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty4	The business model gives access to an unprecedented variety and number of participants and/or goods	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty5	The business model links participants to transactions in novel ways	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty6	The richness (i.e., quality and depth) of some of the links between participants is novel	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty7	Number of patents that the focal firm has been awarded for aspects of its business model	1; 0.66; 0.33; 0	yes	no	yes	no
novelty8	Extent to which the business model relies on trade secrets and/or copyrights	1; 0.66; 0.33; 0	yes	yes	yes	yes
novelty9	Does the focal firm claim to be a pioneer with its business model?	1; 0	yes	yes	yes	yes
novelty10	The focal firm has continuously introduced innovations in its business model	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty11	There are competing business models with the potential to leapfrog the firm’s business model	1; 0.75; 0.25; 0	yes	yes	yes	yes
novelty12	There are other important aspects of the business model that make it novel	1; 0.75; 0.25; 0	yes	no	yes	no
novelty13	Overall the company's business model is novel	1; 0.75; 0.25; 0	yes	yes	yes	yes
lockin1	The incentives offered to participants by loyalty programs to engage in repeat transactions are strong	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin2	Business model participants can customize products, services, or information to their needs	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin3	State the methods used by the e-commerce company to personalize goods (check box)	n/a	n/a	no	no	no

lockin4	This personalization is effective in attracting and maintaining participants	n/a	n/a	no	no	no
lockin5	The business model promotes transaction safety and reliability	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin6	Methods adopted that promote trust by giving customers control over the use of personal information (check box)	n/a	n/a	no	no	no
lockin7	Other methods adopted that promote trust (check box)	n/a	n/a	no	no	no
lockin8	The focal firm has a dominant design (i.e., a proprietary standard that it developed for its business model)	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin9	The concept of "virtual community" plays an important role in the business model	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin10	Affiliate Programs, which are designed to enable transactions originating from the company's partners, play an important role	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin11	The business model exhibits important direct network externalities; participants benefit from increasing numbers of similar participants	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin12	The business model exhibits important indirect network externalities: participants from one group benefit from increasing numbers of participants from another group	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin13	Site users must make considerable site-specific investments of time and effort in order to learn how to use the site	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin14	Site users must have specialized assets (like customized software) in place in order to use the site	1; 0.75; 0.25; 0	n/a	yes	no	no
lockin15	Overall, the business model succeeds in creating lock-in	1; 0.75; 0.25; 0	n/a	yes	no	no
complement1	There are complementarities between online and offline elements of the transaction in the business model	1; 0.75; 0.25; 0	n/a	yes	no	no
complement2	The business model enables complementarities among activities of participants (e.g., supply chain integration)	1; 0.75; 0.25; 0	n/a	yes	no	no
complement3	The business model enables complementarities between the company's technologies and technologies provided by others	1; 0.75; 0.25; 0	n/a	yes	no	no
complement4	The business model offers customers a wide range of complementary services and products from various participants to the business model	1; 0.75; 0.25; 0	n/a	yes	no	no
complement5	The business model offers customers a wide range of complementary services and products from the firm whose business model is discussed itself	1; 0.75; 0.25; 0	n/a	yes	no	no
complement6	Cross-selling of products/services is important to the business model	1; 0.75; 0.25; 0	n/a	yes	no	no
complement7	There are strong vertical complementarities in terms of product/service offerings (e.g., after sales service)	1; 0.75; 0.25; 0	n/a	yes	no	no
complement8	There are strong horizontal complementarities in terms of product/service offerings (e.g., hardware and software, one stop shopping)	1; 0.75; 0.25; 0	n/a	yes	no	no
complement9	Overall, the bundling of complementary products/services are important to the business model	1; 0.75; 0.25; 0	n/a	yes	no	no
lowcost1	Offering products/services at low prices/prices lower than competition	5; 4; 3; 2; 1	no	no	yes	yes
lowcost2	Minimizing product-related expenditures, in particular through process innovation	5; 4; 3; 2; 1	no	no	yes	yes
lowcost3	Emphasizing economies of scale and scope with products and services	5; 4; 3; 2; 1	no	no	yes	yes
lowcost4	Low-cost strategy	5; 4; 3; 2; 1	no	no	yes	yes
differ1	Importance and use of product–service-related patents	5; 4; 3; 2; 1	no	no	yes	yes

differ2	Importance of new product development, innovation and R&D activity	5; 4; 3; 2; 1	no	no	no	no
differ3	Emphasis on growth by acquiring, or merging with R&D/technology intensive firms	5; 4; 3; 2; 1	no	no	no	no
differ4	Branding and advertising as part of firm's marketing strategy/approach	5; 4; 3; 2; 1	no	no	yes	yes
differ5	Differentiation strategy	5; 4; 3; 2; 1	no	no	yes	yes
timing	Timing of market entry (being the first to enter a market, and/or first to introduce products or services in a market, or realizing first mover advantage in another way)	5; 4; 3; 2; 1	no	no	yes	yes
entrymode	Mode of market entry (relying on strategic partnerships, and joint ventures in order to develop, produce, distribute, or market products/services)	5; 4; 3; 2; 1	no	no	yes	yes
productscope	Breadth of product offering (pursuing a narrow, focused product scope)	5; 4; 3; 2; 1	no	no	yes	yes
marketscope	Breadth of targeted market segments (pursuing a narrow, focused market scope)	5; 4; 3; 2; 1	no	no	yes	yes
comp1	The company competes with several direct competitors	1; 0.75; 0.25; 0	n/a	yes	n/a	yes
comp2	The company competes with several indirect competitors	1; 0.75; 0.25; 0	n/a	yes	n/a	yes
comp3	The competition in the company's industry is intense	1; 0.75; 0.25; 0	n/a	yes	n/a	yes
comp4	The company's industry is very innovative compared to other industries	1; 0.75; 0.25; 0	n/a	yes	n/a	yes
comp5	The company's industry is easy to enter (and it is easy to become an established player)	1; 0.75; 0.25; 0	n/a	yes	n/a	yes
comp6	The company's customers can easily change their provider	1; 0.75; 0.25; 0	n/a	yes	n/a	yes

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