A Longitudinal Perspective on Organizational Ambidexterity

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List of Abbreviations

2SLS	Two-Stage Least Squares
AR	autocorrelation
β	correlation coefficient
B	Balancing Loop
CEO	Chief Executive Officer
CI	Contextual Integration
CORE	Center for Organizational Excellence, University of St. Gallen
Ed./Eds.	Editor/Editors
e.g.	for example, for instance (Latin *example grandi*)
et al.	and other people (Latin *et alii/alia*)
etc.	et cetera
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
H	hypothesis
i.e.	that is (Latin *id est*)
LED	Light Emitting Diode
log	logarithm
l.t.	long term
M&A	Mergers & Acquisitions
min.	minimum
max.	maximum
N	Number
n.a.	not applicable
No.	number
obs	observations
OLS	Ordinary Least Square
p	level of significance
Ph.D.	Doctor of Philosophy (Latin *philosophiae doctor*)
Prob	Probability
R	Reinforcing Loop
R^2	squared multiple correlation coefficient
R&D	research and development
RoA	Return on Assets
RoE	Return on Equity

RoNPW	Return on Net Premiums Written
SD	Structural Differentiation
SE	Standard Error
SIC	Standard Industrial Classification
s.t.	short term
TD	Temporal Differentiation
TMT	Top Management Team
TSR	Total Shareholder Return
U.S.	United States
VIF	Variance Inflation Factor
vs.	versus

Summary

Organizational ambidexterity has recently been named a "hot topic" in strategy research (Birkinshaw and Gupta, 2014: 2). It is defined as a firm's ability to simultaneously pursue exploration and exploitation (Gupta, Smith, and Shalley, 2006), and has emerged as a "new research paradigm in organization theory" (Raisch, Birkinshaw, Probst, and Tushman, 2009: 685). Over the last two decades, scholars have studied ambidexterity from many different theoretical perspectives, mostly adopting cross-sectional research designs (Raisch and Birkinshaw, 2008).

Contributing to this cross-sectional work, this dissertation takes a longitudinal perspective on ambidexterity, focusing on the role of time in the exploration-exploitation dilemma. Time has an important function in understanding organizational ambidexterity: The outcomes of exploration and exploitation differ with regard to time (March, 1991), and time can be a solution to balance both conflicting tasks (Boumgarden, Nickerson, and Zenger, 2012). In summary, "the adoption of time as an important research lens (…) allows for a deeper exploration of the dynamic processes underlying the emergence of organizational ambidexterity" (Raisch *et al.*, 2009: 689).

This dissertation consists of five papers, each of which stresses time's role in organizational ambidexterity from a different perspective. For example, Paper 1 investigates how firms' exploration-exploitation balance changes over time, whereas Paper 4 draws a comparison between the simultaneous and sequential pursuit of exploration and exploitation. The papers adopt different levels (firm, project, and individual-level) of analysis and apply distinct methodologies (qualitative and quantitative).

This dissertation contributes to theory and practice. First, by introducing the novel concept of dynamic ambidexterity, it provides a longitudinal perspective on how firms adjust their simultaneous exploration-exploitation balance over time. Second, it provides insights into how and why firms often end up with unbalanced allocations, that is, over-exploration or exploitation. Finally, this dissertation introduces several mechanisms that allow firms to achieve exploration-exploitation balance over time. These mechanisms comprise the analysis of firm resources (Paper 4), the composition of firms' organizational models (Paper 5), or the use of acquisitions as a firm-external mechanism to pursue exploration and exploitation (Paper 3).

Zusammenfassung

Organizational ambidexterity wurde kürzlich als „heisses Thema“ innerhalb der Strategieforschung bezeichnet (Birkinshaw and Gupta, 2014: 2). Es definiert sich als die Fähigkeit einer Firma gleichzeitig *exploration* und *exploitation* durchzuführen (Gupta *et al.*, 2006) und hat sich als „neues Forschungsparadigma innerhalb der Organisationstheorie entwickelt“ (Raisch *et al.*, 2009: 685). Innerhalb der letzten beiden Jahrzehnte haben Wissenschaftler *ambidexterity* aus verschiedensten Theorieperspektiven untersucht und dabei vor allem Querschnittsstudien durchgeführt (Raisch and Birkinshaw, 2008).

Die vorliegende Dissertation trägt zu diesen Querschnittsstudien bei und nimmt eine longitudinale Sichtweise auf *ambidexterity* ein, indem sie sich auf die Rolle von Zeit in dem *exploration-exloitation* Dilemma fokussiert. Die Betrachtung von Zeit hat eine wichtige Funktion für das Verständnis von *organizaitonal ambidexterity*. Der Ausgang von *exploration* und *exploitation* unterscheidet sich im Hinblick auf Zeit (March, 1991) und Zeit ist ebenso ein Möglichkeit beide gegensätzlichen Tätigkeiten zu balancieren. Zusammenfassend „ermöglicht die Betrachtung von Zeit als wichtige Forschungsperspektive ein tiefgreifendes Verständnis auf die dynamischen Prozesse hinter dem Entstehen von *organizational ambidexterity*“ (Raisch *et al.*, 2009: 689).

Diese Dissertation besteht aus fünf Studien. Jede Studie betont die Rolle von Zeit auf *organizational ambidexterity* aus unterschiedlichen Perspektiven. Die erste Studie untersucht beispielsweise wie Firmen die Balance aus *exploration* und *exploitation* über die Zeit verändern, wohingegen die vierte Studie die gleichzeitige und sequenzielle Verfolgung beider Tätigkeiten vergleicht. Alle Studien verwenden verschiedene Analyseebenen (Firmen-, Projekt- und Individualebene) und wenden verschiedene Methoden (qualitative und quantitative) an.

Diese Dissertation hat Implikationen für die Wissenschaft und Unternehmenspraxis. Erstens wird durch die Einführung des neuartigen *dynamic ambidexterity* Konzeptes eine longitudinale Betrachtung auf die gleichzeitige Verfolgung von *exploration* und *exploitation* über die Zeit ermöglicht. Zweitens liefert sie Einblicke weshalb Firmen in eine unausgewogene Verteilung, d.h. ein Übermass an *exploration* oder *exploitation*, abgleiten. Schlussendlich stellt diese Dissertation mehrere Mechanismen vor, die es Firmen ermöglichen, eine ausgeglichene Balance zwischen beiden Tätigkeiten über die

Zeit beizubehalten. Diese Mechanismen umfassen die Analyse von Firmenressourcen (Studie 4), die Zusammensetzung von Organisationsmodellen (Studie 5) oder die Verwendung von Akquisitionen als Firmen-externen Mechanismus um *exploration* und *exploitation* zu verfolgen (Studie 3).

1 Introduction

1.1 Organizational Ambidexterity: Balancing Exploration and Exploitation

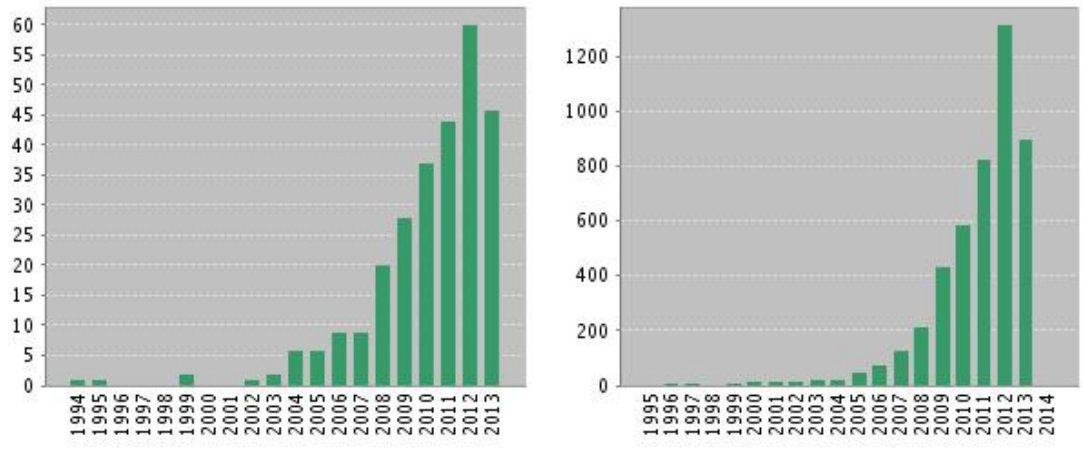
One of the most prevalent themes in organization science is firms' ability to exploit their current capabilities while simultaneously exploring fundamentally new competencies (Hill and Birkinshaw, 2012; Levinthal and March, 1993; March, 1991; Stettner and Lavie, 2014). Both exploration and exploitation are required to ensure organizations' long-term prosperity (Raisch and Birkinshaw, 2008). Nevertheless, they exhibit quite opposing characteristics. Exploration involves searching for, differentiating between, experimenting with, and developing new competencies, and is associated with uncertain and distant returns. Exploitation involves the refinement, efficiency, and execution of the firm's current abilities, and is associated with certain and short-term returns (March, 1991: 71). While firms need the complementary returns from both activities, they have to make certain trade-offs associated with the execution of both, a situation referred to as the exploration-exploitation paradox. Firms that are able to make these trade-offs and actually benefit from their simultaneous pursuit are often referred to as ambidextrous organizations (Tushman and O'Reilly, 1996).

In order to overcome the conflicting requirements of exploration and exploitation, scholars have adopted different levels of analysis and have researched many mechanisms that enable ambidexterity (see O'Reilly and Tushman, 2013 for a recent review). Most of these scholars have researched ambidexterity from a firm-level perspective (Jansen, Tempelaar, van den Bosch, and Volberda, 2009; Stettner and Lavie, 2014). As such, the implementation of dual structures (Duncan, 1976), cross-functional interfaces (Jansen et al., 2009), or a collective organizational context (Gibson and Birkinshaw, 2004) have been regarded to enable ambidexterity on a company-wide level. Attempting to gain a better understanding of ambidexterity, scholars have also investigated it from a business-unit, venture, or project-level perspective and have have questioned how exploration and exploitation are effectively accomplished within organizational subunits (e.g., Hill and Birkinshaw, 2012; Jansen, Simsek, and Cao, 2012b). This perspective was found to be especially useful for researching ambidexterity in the context of new product development (NPD) projects, where both exploration and exploitation are required to ensure the success of product

development and subsequent commercialization (Sheremata, 2000; Tiwana, 2008; Westerman, McFarlan, and Iansiti, 2006). Finally, several studies have focused on the individual level, investigating whether individual managers' skills or characteristics can actually contribute to achieving ambidexterity (Laureiro-Martinez, Brusoni, and Zollo, 2010; Mom, van den Bosch, and Volberda, 2009; Smith and Tushman, 2005). Managers' capacity to handle contradictions (Smith and Tushman, 2005), take on multiple roles (Gibson and Birkinshaw, 2004), and refine and renew knowledge, skills, and expertise (Floyd and Lane, 2000) was found to support ambidexterity.

Organizational ambidexterity's importance has been stressed in both academic research and managerial practice. Figure 1 illustrates the increase in literary references to and publications on organizational ambidexterity over the last few years. Birkinshaw and Gupta refer to this mounted attention in a recent article entitled "The meteoric rise of ambidexterity research" (2014: 3). However, despite the surge in publications, several fundamental issues remain unresolved. In their recent literature review, Lavie and colleagues (2010: 147) conclude: "Still, while our understanding of the determinants and effects of exploration and exploitation has improved, more research is needed to sort out and refine the fundamental terms and concepts associated with these activities."

Figure 1: ISI Citations and Publications "Organizational Ambidexterity"



Published items per year ***Citations per year***

(Source: ISI Web of Knowledge, Downloaded in 31 October 2013)

However, ambidexterity not only has academic significance; ensuring firms' effective execution of exploration and exploitation is still one of the most important and challenging tasks in managerial practice. Neslté's chair and long-time CEO Peter Brabeck stated: "We have to deploy past experiences while staying focused on the current execution and, at the same time, pursue new ideas to shape the future. The greatest challenge for top managers is to enable the organization to achieve the right balance between these objectives." Furthermore, several case studies have given examples of firms that are able to simultaneously achieve breakthrough innovations and improve the existing business, and of firms that are unable to do so (e.g., Raisch, 2008; Tushman and O'Reilly, 1996). IBM is one of the most prominent examples to undergo the remarkable transformation from a struggling seller of hardware to a highly profitable broad range solutions provider (O'Reilly, Harreld, and Tushman, 2009). In contrast, Polaroid and other firms in the photography industry that were once highly profitable, could not manage the shift from analog to digital cameras and, hence, disappeared from the market (Tushman, Smith, Wood, Westerman, and O'Reilly, 2010).

1.2 Theoretical Motivation: Time in Organizational Ambidexterity

As described in the previous paragraph, organizational ambidexterity is highly relevant to academic research and managerial practice. Previous studies have adopted many different levels (firm, project, and individual levels) of analysis, but have, as of yet, almost exclusively focused on a cross-sectional research design and have mostly neglected time in their conceptualization (e.g., Raisch and Birkinshaw, 2008; Simsek, Heavey, Veiga, and Souder, 2009).

Time, however, plays an important role in understanding organizational ambidexterity (e.g., Gupta *et al.*, 2006; Raisch and Birkinshaw, 2008). There are three major reasons to consider time in the context of exploration and exploitation. First, it has an important function in determining the outcomes of exploration and exploitation. While exploration is linked to temporally distant returns, exploitation is associated with short-term profitability (March, 1991). Especially since the outcomes of the two conflicting tasks are intertwined – that is, the outcomes of exploration are often transferred to exploitation (Gilsing and Nooteboom, 2006) – the omission of time may cause erroneous conclusions (Venkatraman, Lee, and Iyer, 2007: 24).

Second, time plays an important role in identifying ways to balance exploration and exploitation (O'Reilly and Tushman, 2013). Other than balancing both conflicting tasks simultaneously, notions like vacillation (Boumgarden *et al.*, 2012), temporal separation (Lavie *et al.*, 2010), or cycling (Raisch and Birkinshaw, 2008) describe "cycles of exploration and exploitation, during which an organization focuses only on one dominant activity and later shifts to the other" (Lavie *et al.*, 2010: 133). Time reveals different ways to balance exploration and exploitation.

Finally, time plays an important role in organizations' environmental contexts, which, in turn, have a major influence on firms' exploration-exploitation allocation (Jansen, Van den Bosch, and Volberda, 2005). As environments are not usually stable over time (Porter, 1980), it seems unlikely that a given exploration-exploitation balance will lead to optimal long-term performance outcomes. For example, Jansen, Van den Bosch, and Volberda (2006) find that highly dynamic environments require an emphasis on exploration rather than exploitation, while less dynamic environments require the opposite orientation. Sound empirical evidence has shown that the level of environmental dynamism shifts as industries evolve (Cannella, Park, and Lee, 2008; Castrogiovanni, 2002). Companies that maintain a given exploration-exploitation balance thus risk repeated misalignments with their environments, which can affect their performance negatively (Miller, 1992; Venkatraman and Prescott, 1990). We thus need to investigate how ambidextrous firms adapt their exploration-exploitation balance to varying environmental conditions over time.

1.3 Dissertation Overview

This dissertation focuses on the role of time in organizational ambidexterity. It consists of five papers that question how the inclusion of time can enhance our understanding of firms' ability to handle the exploration-exploitation paradox from a longitudinal perspective. The five papers adopt different levels (i.e. firm, project, and individual levels) of analysis, apply different research methodologies (i.e. qualitative and quantitative), and include empirical studies as well as one conceptual study (see Table 1 for an overview). The following two sub-chapters present a short outline of each of the five papers and an overview of the different methodologies used.

1.3.1 Outline of Dissertation Studies

The first paper introduces a new, longitudinal concept for simultaneously balancing exploration and exploitation. The concept, which is referred to as *dynamic ambidexterity,* captures firms' ability to adapt their exploration-exploitation balance over time. Building on strategy-environment coalignment and paradox theory perspectives, this paper argues that dynamic ambidexterity leads to higher firm performance than the more static forms of ambidexterity described in previous studies. Furthermore, the concept of dynamic ambidexterity highlights a novel paradox in ambidextrous firms. It is shown that static ambidexterity (i.e. the concept used in previous work on ambidexterity) has a self-reinforcing effect: while firms become increasingly adept at balancing exploration and exploitation over time, their ability to adapt this balance to changing environmental conditions declines. Ultimately, static ambidexterity crowds out dynamic ambidexterity, which harms firm performance. Based on a longitudinal sample of the global insurance industry, this study finds empirical support for the arguments. It contributes to organizational theory by developing a more dynamic understanding of ambidexterity and reveals how some of the previously described practices to promote ambidexterity can trap firms in downward spirals rather than preventing them from doing so. Moreover, this paper's findings suggest that coalignment and paradox theory perspectives are complementary and that their integration may be necessary to provide comprehensive theoretical models of dynamic concepts, such as organizational ambidexterity.

The second paper adopts an individual-level perspective and focuses on managerial ambidexterity; that is, managers' intrinsic ability to balance exploration and exploitation in their decision making (i.e., managerial ambidexterity). Accounting for the different temporal feedback effects of exploration and exploitation, this paper investigates how managerial ambidexterity interacts with extrinsic organizational policies, how it addresses restrictions on developing organizational ambidexterity and how it contributes to securing superior long-term profitability. Using system dynamics modeling, this paper simulates these interactions and the underlying feedback processes under different environmental conditions. The simulation experiments suggest that managerial ambidexterity may only lead to organizational ambidexterity under moderate environmental conditions. Counter-intuitively, this paper proposes that, in stable (or dynamic) environments, managers who are biased toward exploration (or exploitation) may be more effective in securing organizational

ambidexterity and long-term profits than those who are not. Among other theoretical insights, this allows us to argue that managers need to solve two paradoxical sub-challenges (adaptation and balancing) when developing organizational ambidexterity under different environmental conditions.

The third paper investigates how firms can implement organizational ambidexterity through a series of acquisitions . In recent years, researchers have become increasingly interested in serial acquirers and the performance implications of their different acquisition sequences. While prior research has focused mainly on the externally observable structural characteristics of these sequences, this paper makes a finer-grained distinction between explorative and exploitative acquisitions and examines how their timing affects acquirer performance. Based on a sample of 21.264 acquisitions of the US's 172 largest public firms over 21 years (1990 – 2010), the paper finds that the temporal separation between explorative and exploitative acquisitions has a positive effect on acquirer performance. Moreover, it establishes that engaging in different types of acquisitions simultaneously has an inverted U-shaped effect on acquirer performance. The paper contributes to the literature by putting forward a novel concept, namely the strategic content design of acquisition streams, and by providing new empirical evidence on the performance of acquisition streams.

Following March (1991), the fourth paper focuses on the resource allocation decisions firms make during exploration-exploitation trade-offs. It moreover investigates firms' simultaneous and sequential pursuit of the two conflicting tasks from a resource perspective. In this paper, intra and inter-temporal economies of scope (Helfat & Eisnehardt, 2004) were applied to the exploration-exploitation paradox. Specifically, this study investigates three major input resources (human resources (HR), financial resources, and operational resources) in the global insurance industry and finds that they have disparate efficiency effects on the simultaneous and sequential pursuit of exploration and exploitation. For example, balancing both conflicting tasks simultaneously benefits from relatively lower financial and operating-costs, whereas it suffers from relatively higher HR-costs. This paper contributes to the literature by investigating the costs of ambidexterity, comparing the simultaneous and sequential balancing modes, and clarifying the nature of the exploration-exploitation paradox.

Finally, the fifth paper takes a practitioner perspective on organizational ambidexterity and investigates how firms' technological innovations (i.e. exploration) are effectively integrated into their current, more exploit-oriented organizational structure. Firms face many challenges in their pursuit to effectively implement and manage such explorative technological innovations. This study investigates the dilemma of organizational separation and integration when implementing technological innovation from an organization theory perspective. Studying ten innovation projects at a global technology firm, two organizational models for the effective implementation of technological innovation are identified and compared to one another. Four innovation strategies are described and matched with the two organizational models.

1.3.2 Outline of Data and Methodology Used

This dissertation includes four empirical (Papers 1, 3, 4, and 5) and one conceptual paper (Paper 2). The conceptual paper applies a simulation methodology. Specifically, it relies on system dynamics modeling, a specific simulation methodology that accounts for feedback mechanisms (Sterman, 2000), which was found to be especially suitable for modeling organizational decision making processes (e.g., Carroll, Sterman, and Markus, 1994; Levine, Leholm, and Vlasin, 2001). Given the various feedback processes of firms' resource allocation decisions among exploration and exploitation (for further explanations, see Chapter 3.3), system dynamics seems to be a suitable simulation methodology for modeling the trade-offs involved in firms' exploration-exploitation decision making.

The four empirical papers are based on three different data sets. The first one focuses on the global insurance industry over a period of nine years (1999 – 2007). In addition to firm accounting data obtained from COMPUSTAT and DATASTREAM, data on exploration-exploitation were derived from a content analysis of 14,666 press releases. All involved firms are publicly listed and are included in the Dow Jones Stoxx insurance index. They are required to publicly announce any of their strategic activities by issuing press releases. Following Uotila and colleagues' (2009) method, the analyses of such strategic activities enabled the construction of a continuous exploration-exploitation measure.

The second data set comprises the largest 200 Global Fortune 500 firms' exploitation and exploration acquisitions over a period of 21 years (1990 – 2010). Accounting data were obtained from COMPUSTAT, whereas acquisition data were obtained from SDC PLATINUM and GSI ONLINE. A total of 21,264 acquisitions, which the involved firms carried out during the period of observation, were analyzed. Each of these acquisitions was rated on the exploration-exploitation continuum based on a nine-item scale developed by Stettner and Lavie (2014). The scale required additional data, which was obtained from the World Bank and the Hofstede composite index (for further explanations, see Chapter 4.4.2).

The last data set was derived from ten technological innovation projects at TechCorp, a leading global technology firm. Data on these innovation projects was obtained from 32 semi-structured interviews with project-CEOs, technology managers, or project consultants, as well as from the company's internal (e.g., technology memoranda, board presentations, consultant reports, etc.) and external archival documents (e.g., segment reporting, press releases, etc.) (for further explanations, see Chapter 6.5).

The four data sets were analyzed using a variety of quantitative and qualitative research methods. In the case of a qualitative research design, the ten innovation projects included successful (six cases) as well as unsuccessful (four cases) projects. Following Faems and colleagues (2008), the presence of "polar cases" allowed for conducting a comparative case study analysis, based on a grounded theory approach (see Chapter 6.5 for further details).

With regard to the three papers that adopted a quantitative research design, a number of different estimation procedures were used in accordance with the specific characteristics of the data set as well as the underlying theoretical reasoning. A detailed justification of each estimation procedure is presented in the respective papers (see Chapters 2.5.3, 4.4.4, and 5.4.3). Specifically, two-stage least squares (2SLS) instrumental variable regressions, generalized methods of moments (GMM) estimators, and longitudinal fixed effects ordinary least squares (OLS) estimators were used as estimation procedures (see Table 1 for an overview).

Table 1: Overview of Dissertation

		Chapter 2 / Paper 1	Chapter 3 / Paper 2	Chapter 4 / Paper 3	Chapter 5 / Paper 4	Chapter 6 / Paper 5
Main Theory / Specific Theory		**Organizational Ambidexterity**				
		Contingency Theory	**Managerial Ambidexterity**	**Organizational Learning/Acquisitions**	**Economies of Scope**	**Organizational Design**
Main Research Question		▪ How do ambidextrous firms adapt their exploration-exploitation allocation over time?	▪ How does managerial ambidexterity relate to organizational ambidexterity and long-term firm performance?	▪ How does the content design (i.e. exploration-exploitation orientation) of acquisition streams impact long-term firm performance	▪ Do intra and inter-temporal economies of scope reduce the cost of firms' simultanoues and sequential pursuit of exploration & exploitation?	▪ How can firms simultaneously create organizational integration and separation to successfully implement technological innovation?
Methodology	**Level of Analysis**	**Firm-Level**	**Individual-Level**	**Firm-Level**	**Firm-Level**	**Project-Level**
	Empirical Context	▪ Global insurance industry (Dow Jones Stoxx insurance index)	▪ N.A. (Simulation data generated)	▪ Large multinational corporations (Global Fortune 500)	▪ Global insurance industry (Dow Jones Stoxx insurance index)	▪ Large diversified technology firm
	Sample & Data Sources	▪ 56 Global insurance firms (1999 – 2007) ▪ Compustat, Datastream, A.M. BEST	▪ N.A. (Simulation data generated)	▪ 200 largest GF500 firms (1990 - 2010) ▪ Compustat, Datastrea, SDC Platinum	▪ 56 Global insurance firms (1999 – 2007) ▪ Compustat, Datastream	▪ 10 Case studies ▪ Interviews, archival documents (partially confidential)
	Methodology Applied	**Quantitative Methodology**				**Qualitative Methodology**
		▪ Two-Stage Least Squares (2SLS) instrumental variable regression	▪ Systems Dynamics Modeling (SDM)	▪ Generalized Methods of Moments (GMM) estimator	▪ Longitudinal fixed effects Ordinary Least Squares (OLS) estimator	▪ Multiple case study design
Major Findings		▪ Introduction of a longitudinal perspective on org. ambidexterity ▪ Identification of a novel paradox between static and dynamic ambidexterity	▪ Managerial ambidexterity leads to org. ambidex-terity only under moderate env. conditions ▪ Counterintuitively, exploration-biased managers prevail under dynamic env. conditions and vice versa	▪ Temporal separation of exploratory and exploitative transactions in acquisition streams has a positive effect on firm performance. ▪ Structural separation and contextual integration have disparate effects on firm performance	▪ Firm resources (i.e. human , financial , and operational resources) have disparate relative cost effects on firms' simultaneous and sequential balancing of exploration and exploitation	▪ The interaction of different organizational features (i.e. organization structure and leadership models) enable to overcome the separation-integration dilemma in organizing technological innovation

1.4 Publication Strategy

The papers used in this dissertation have been presented at multiple international conferences as well as at various universities (for an overview, see the list displayed below). The author would like to thank all the discussants for their valuable suggestions during these presentations. Additionally, he extends his thanks to Justin Jansen (Erasmus University Rotterdam), Tomi Laamanen (University of St. Gallen), Dovev Lavie (Technion, Israel Institute of Technology), Ian MacMillan (Wharton School, University of Pennsylvania), Hart Posen (University of Wisconsin), Sebastian Raisch (HEC, University of Geneva), and Harbir Singh (Wharton School, University of Pennsylvania) for willingly providing in-depth feedback, in the form of friendly reviews, on the various papers included in this dissertation.

- ***Paper 1***: Academy of Management Annual Meeting 2013 (Orlando); CORE Research Workshop 2012 (University of St. Gallen); Strategic Management Society International Conference 2012 (Prague), Winner of the best conference PhD paper prize, Finalist for the best conference paper price for practice implication, Nominated for best conference paper prize

- ***Paper 2:*** Academy of Management Annual Meeting 2011 (San Antonio); Strategic Management Society International Conference 2010 (Rome); CORE Research Workshop 2010 (University of Geneva)

- ***Paper 3:*** Strategic Management Society International Conference 2012 (Prague); CORE Research Workshops 2011 & 2012 (University of Geneva); Academy of Management Annual Meeting 2013 (Orlando); Strategy Research Colloquium 2013 (Aalto University); Global Junior Faculty Development Program 2013 (Wharton School, University of Pennsylvania)

- ***Paper 4:*** Sol C. Snider Research Colloquium 2013 (Wharton School, University of Pennsylvania); Research Colloquium 2013 (Paul Merage School of Business, University of California, Irvine)

- ***Paper 5:*** Strategic Management Society International Conference 2011 (Miami); CORE Research Workshop 2011 (University of St. Gallen)

The author and his coauthors plan to publish the five papers in major national and international management journals. As of October 2013, "The Paradox of Static and Dynamic Ambidexterity" (Paper 1) received a revise and resubmit at *Academy of Management Journal*; "The Dynamics of Ambidextrous Decision Making" (Paper 2) received a revise and resubmit at *Organization Science*; "Content Design of Acquisition Streams: Balancing Exploration and Exploitation" (Paper 3) is currently being prepared for submission to the *Strategic Management Journal*; "Benefits of Conflicting Activities: Intra and Inter-temporal economies of scope in balancing exploration and exploitation" (Paper 4) is being prepared for submission to *Academy of Management Journal*; and, finally, the German version of "Application: Organizing for the Implementation of New Technology: The Dilemma of Organizational Separation and Integration" (Paper 5) received a revise and resubmit at *Zeitschrift für Führung + Organisation*.

2 The Paradox of Static and Dynamic Ambidexterity[1]

Abstract

This paper introduces the concept of dynamic ambidexterity, which captures a firm's ability to adapt its exploration-exploitation balance over time. Building on strategy-environment coalignment and paradox theory perspectives, we argue that dynamic ambidexterity leads to higher firm performance than the more static forms of ambidexterity described in previous studies. Further, the concept of dynamic ambidexterity enables us to highlight a novel paradox in ambidextrous firms. We show that static ambidexterity has a self-reinforcing effect: while firms become increasingly adept at balancing exploration and exploitation over time, their ability to adapt this balance to changing environmental conditions declines. Ultimately, static ambidexterity crowds out dynamic ambidexterity, which harms firm performance. Based on a longitudinal sample of the global insurance industry, we find empirical support for our arguments. We contribute to organizational theory by developing a more dynamic understanding of ambidexterity and reveal how some of the previously described practices to promote ambidexterity can trap firms in downward spirals rather than preventing them. Further, based on our findings, we argue that coalignment and paradox theory perspectives may be complementary and their integration required to provide comprehensive theoretical models of dynamic concepts such as organizational ambidexterity.

Keywords: Exploitation; Exploration; Organizational Ambidexterity; Organizational Paradox; Organizational Routines; Time

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2.1 Introduction

A prominent argument in organization theory claims that a firm's ability to balance its exploration and exploitation activities is associated with superior long-term firm performance (e.g., Gibson and Birkinshaw, 2004; O'Reilly and Tushman, 2008a). Exploration, which scholars describe with terms like radical innovation (Tushman and O'Reilly, 1996) and experimentation (Baum, Li, and Usher, 2000), enables firms to respond to discontinuities. Exploitation, which scholars characterize with notions like incremental innovation (Tushman and O'Reilly, 1996) and refinement (Baum *et al.*, 2000), allows firms to increase the efficiency of their daily operations. The eternal challenge behind the idea of ambidexterity is that firms have to reconcile these paradoxical demands in their task environments (March, 1991).

While the ambidexterity perspective has led to important insights for research and practice (see Raisch & Birkinshaw, 2008 for an overview), a particular issue causes concern: given that most firms operate in changing environments (Porter, 1980), it seems unlikely that a static balance between exploration and exploitation will lead to optimal performance outcomes. For example, Jansen, Van den Bosch, and Volberda (2006) found that dynamic environments require a higher emphasis on exploration than on exploitation. Sound empirical evidence has shown that the level of environmental dynamism shifts as industries evolve (Cannella *et al.*, 2008; Castrogiovanni, 2002). Companies that maintain a relatively static exploration-exploitation balance thus risk repeated misalignments with their environments, which can affect their performance negatively (Miller, 1992; Venkatraman and Prescott, 1990). We need a more dynamic understanding of ambidexterity that allows us to explore how companies adapt their exploration and exploitation activities over time (Raisch *et al.*, 2009).

In this paper, we develop the concept of *dynamic ambidexterity*, which captures the firm's ability to adapt its exploration-exploitation balance over time. Drawing on the strategy-environment coalignment literature (Miller, 1992; Venkatraman and Prescott, 1990), we argue that dynamic ambidexterity enables firms to realign their relative exploration-exploitation attention with the changing environmental demands. Integrating the ambidexterity literature's paradox perspective (O'Reilly and Tushman, 2008a; Smith and Lewis, 2011), we further argue that dynamic ambidexterity allows for adaptations that constantly maintain both exploration and exploitation. Dynamic

ambidexterity thus differs from the temporal separation concept (Siggelkow and Levinthal, 2003), which refers to shifts between discrete periods of either exploration or exploitation. It is also distinct from previous accounts of structural (Tushman and O'Reilly, 1996) and contextual (Gibson and Birkinshaw, 2004) ambidexterity. We refer to this work as *static ambidexterity* since it captures firms' ability to strive for and operate at a given intermediate point on the exploration-exploitation continuum (Lavie *et al.*, 2010), rather than exploring how they adapt this balance over time (Boumgarden *et al.*, 2012: 588).

We tested the performance effects of dynamic ambidexterity by using cross-sectional time series analyses based on a longitudinal sample of global insurance companies between 1999 and 2007. Our findings confirm our theoretical arguments that dynamic ambidexterity is associated with higher long-term firm performance than static ambidexterity is. Further, we show that the static and dynamic ambidexterity concepts are inherently contradictory. Our analyses reveal that firms' pursuit of static ambidexterity has a self-reinforcing effect: while these firms become increasingly adept at balancing exploration and exploitation, their ability to adapt this balance to changing external conditions declines over time. Ultimately, static ambidexterity displaces dynamic ambidexterity, which is harmful to long-term firm performance.

Based on our findings, we make several contributions to the organizational literature. First, we introduce the concept of dynamic ambidexterity. While prior ambidexterity concepts (e.g., Gibson and Birkinshaw, 2004; Tushman and O'Reilly, 1996) explain how firms become ambidextrous, we provide new theory on the important question of how they can sustain and reinforce this ability (Raisch *et al.*, 2009). Second, this paper highlights a novel paradox in ambidexterity research, which shows that even the simultaneous pursuit of exploration and exploitation fails to protect firms from becoming locked-in. While prior work argued that one-sided exploration and one-sided exploitation can have self-reinforcing effects (Gupta *et al.*, 2006), we find that the balance of the two can also trap firms in downward spirals. Finally, we contribute to the broader debate on the interplay between coalignment and paradox theory perspectives (Smith and Lewis, 2011). Extending previous work, we argue that the two perspectives may be complementary and their integration required to provide comprehensive theoretical models of dynamic concepts such as organizational ambidexterity.

2.2 Theoretical Background

March (1991: 71) conceptualized exploration and exploitation as fundamentally opposed learning activities. In his original definition, March describes exploration as "search, variation, risk taking, and experimentation" contrasting it with exploitation, which he describes as "refinement, choice, production, and efficiency." In recent years, scholars extended the discussion of the exploration-exploitation duality to the technological innovation, organization design, strategic management, and organizational adaptation literatures (Raisch and Birkinshaw, 2008), delineating it as an emerging research paradigm in organization theory (Farjoun, 2010; Lavie *et al.*, 2010).

A fundamental challenge when managing exploration and exploitation stems from the two activities' self-reinforcing effects (Gupta *et al.*, 2006). Described in terms of a 'success-trap,' exploitation often leads to short-term success, which in turn reinforces similar behavior, while effectively reducing exploration (Ahuja and Lampert, 2001). Conversely, the 'failure-trap' postulates that "failure leads to search and change which leads to failure which leads to more search, and so on" (Levinthal and March, 1993: 105). In short, the outcomes of exploration and exploitation are likely to cause self-reinforcing effects, which allow exploration and exploitation – in turn – to drive out its counterpart (Simsek *et al.*, 2009). Ambidexterity, or the ability to simultaneously balance exploration and exploitation (Raisch and Birkinshaw, 2008), is believed to prevent firms from being caught in the downward spirals of one-sided attention. While the simultaneous pursuit of exploration and exploitation is anything but trivial (Lavie *et al.*, 2010), scholars have proposed that the adoption of appropriate structural (Tushman and O'Reilly, 1996) contextual (Gibson and Birkinshaw, 2004), and leadership (Smith and Tushman, 2005) solutions enables firms to foster and strengthen the exploration-exploitation balance.

Ambidexterity scholars have controversially discussed the exact nature of the exploration-exploitation balance. Some describe ambidexterity in terms of an orthogonal connection (e.g. Jansen *et al.*, 2009; Lubatkin, Simsek, Ling, and Veiga, 2006), which implies that the two activities are separate and do not compete for the same resources (Gupta *et al.*, 2006). Conversely, others conceptualize ambidexterity on a continuum between exploration and exploitation (e.g., Lavie, Kang, and Rosenkopf, 2011; Uotila *et al.*, 2009), which assumes an inherent trade-off between

the two activities (Cao, Gedajlovic, and Zhang, 2009). Gupta et al. (2006) compare these approaches and argue that the orthogonal approach is preferable for examining exploration and exploitation across domains, while the continuum approach better reflects the tradeoffs at the organizational level. In this study, we are concerned with the relative allocation of scarce managerial and financial resources to exploration and exploitation at the organizational level. We thus follow prior recommendations (Gupta *et al.*, 2006; Lavie *et al.*, 2010; Simsek *et al.*, 2009) and apply the continuum approach.

Scholars using a continuum approach to study ambidexterity define balance as an intermediate point on the exploration-exploitation continuum (Lavie *et al.*, 2010; March, 1991). While some refer to the mid-point explicitly (e.g., He and Wong, 2004), most scholars allow for greater latitude in terms of the balance's relative distance to the two ends of the continuum. For example, Levinthal and March (1993: 105) argue that the "precise mix of exploitation and exploration that is optimal is hard to specify." Moreover, scholars state that the appropriate balance could vary across firms depending on contingencies such the organization's dominant logic (Miles and Snow, 1978) and industry characteristics (Jansen *et al.*, 2006). Many authors thus define balance broadly as operating on any intermediate point on the exploration-exploitation continuum, regardless of the specific level or position of that point (Lavie *et al.*, 2010).

In recent years, multiple studies have investigated how firms strive towards an intermediate point (Andriopoulos and Lewis, 2009), as well as to maintain this intermediate point (Benner and Tushman, 2003), rather than orienting themselves towards one of the extremes. In this study, we summarize this work under the notion 'static ambidexterity.' In this view of ambidexterity, an organization operating on the exploration-exploitation continuum "strives to reach the intermediate point on that continuum that corresponds to its natural balance" (Lavie *et al.*, 2010: 127). As Boumgarden et al. (2012: 591) conclude, "successfully pursuing balance between exploration and exploitation in essence implies the ability to maintain a more or less static equilibrium."

Scholars investigating static ambidexterity refer to three main arguments to explain its positive long-term performance effects. First, they refer to exploration and exploitation's complementary effects on firm performance (Levinthal and March, 1993; March, 1991). While exploration leads to returns that are more variable and

distant in time, exploitation ensures returns that are more certain and closer in time (March, 1991). Consequently, firms that balance the two activities should be able to optimize their overall performance. Second, scholars claim that the ability to combine exploration and exploitation is in itself a valuable resource that contributes to firm performance (Farjoun, 2010; Simsek *et al.*, 2009). For example, Yang and Atuahene-Gima (2007: 5) argue that "the interaction of exploitation and exploration enhances firm performance because it generates an ambiguous resource, the value of which only exists in their relationship." Finally, scholars argue that combining the two activities helps firms reconcile the paradoxical demands in their task environments (O'Reilly and Tushman, 2008a).

Besides the advantages of a simultaneous pursuit of exploration and exploitation, the two tasks' conflicting nature may also lead to costs and challenges. Managing these conflicting demands simultaneously may overstrain operative managers' cognitive abilities (O'Reilly and Tushman, 2008a), trigger substantial coordination and monitoring costs (Gibson and Birkinshaw, 2004), and, ultimately, cause the firm to lose focus and fail on both accounts (Gupta *et al.*, 2006). Despite these challenges, scholars generally conclude that the benefits of static ambidexterity outweigh its costs (Raisch *et al.*, 2009) and empirical studies provide strong support in favor of static ambidexterity's positive association with long-term firm performance (e.g. Gibson and Birkinshaw, 2004; He and Wong, 2004; Lubatkin *et al.*, 2006).

2.3 The Concept of Dynamic Ambidexterity

In recent years, several scholars have criticized the ambidexterity literature for its static perspective (e.g., Farjoun, 2010; Simsek *et al.*, 2009). For example, Raisch et al. (2009: 686) state that the "majority of organizational ambidexterity research presents (…) a static view of organizational behavior." They conclude that future research should take a temporal perspective, which "allows for a deeper exploration of the dynamic processes underlying the emergence of organizational ambidexterity." One argument is that exploration and exploitation are transitive forces, which means that one may evolve into the other (Gilsing and Nooteboom, 2006; Westerman *et al.*, 2006). Another argument for a dynamic perspective relies on contingency theory arguments (Ketchen, Thomas, and Snow, 1993) that alignment is a dynamic process, which forces organizations to continuously reconfigure their activities to meet changing environmental demands. In this perspective, a firm's exploration-exploitation

allocation is a continuous process of recurring adaptations (Boumgarden *et al.*, 2012; Siggelkow, 2002). We thus need a more dynamic understanding of ambidexterity that allows us to explore how companies change their exploration and exploitation activities over time (Raisch *et al.*, 2009).

In this paper, we combine the previous ambidexterity literature's insights with arguments from the coalignment literature (Andrews, 1980; Miles and Snow, 1978) to develop a more dynamic conception of ambidexterity. In the coalignment perspective, firms need to maintain the fit between their internal strategic orientation and their external environments (Miller, 1992; Venkatraman and Prescott, 1990). Consequently, the coalignment literature suggests that only firms with the ability to respond to environmental changes by constantly co-aligning their internal processes achieve superior firm performance (Burns and Stalker, 1961; Lawrence and Lorsch, 1967b; Thompson, 1967). Firms need to actively work on their adaptive abilities to be prepared to respond to environmental change (Feldman and Pentland, 2003). They develop change routines (Adler, Goldoftas, and Levine, 1999; Nelson and Winter, 1982) – procedures for changing routines, or creating new routines, that are applicable across multiple change events (Levitt and March, 1988). To routinize the process of change, senior managers have to gain experience in modifying routines by repeatedly initiating changes. For example, Amburgey, Kelly, and Barnett (1993: 54) argue that "organizations learn to change by changing. The more an organization changes its operating routines, the more likely it is to develop the modification routines needed to make further, similar changes." With reference to these concepts, we now argue that firms operating in changing environments may have to constantly adapt their exploration-exploitation balance.

Prior ambidexterity studies suggest that the optimal balance between exploration and exploitation "may be contingent upon the environment an organization faces" (Uotila *et al.*, 2009: 221). Several studies claim that dynamic environments require a higher emphasis on exploratory rather than exploitative innovation (e.g., Jansen *et al.*, 2006; Wang and Li, 2008). Environmental dynamism, defined by the extent of unpredictable change in an organization's environment (Dess and Beard, 1984), leads to an abundance of opportunities that increases the potential benefit from exploration (Zahra, 1996), but constrains the firm's ability to exploit (Sorensen and Stuart, 2000). There is sound empirical evidence that the level of environmental dynamism shifts constantly as industries evolve (Cannella *et al.*, 2008; Castrogiovanni, 2002).

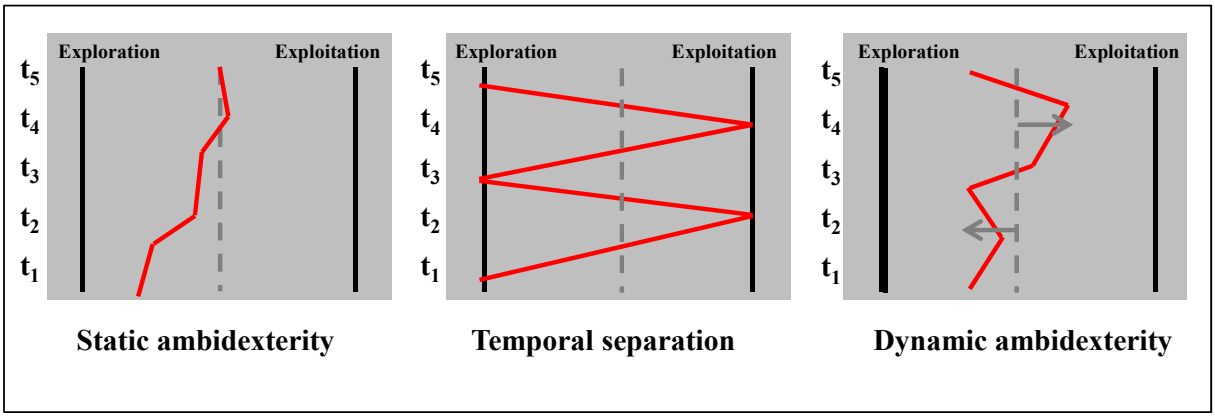
Companies that maintain a relatively static exploration-exploitation balance thus risk repeated misalignments with their environments, which can affect their performance negatively (Miller, 1992; Venkatraman and Prescott, 1990). Given that most firms operate in changing environments (Porter, 1980), a static exploration-exploitation balance is unlikely to lead to optimal long-term performance. Since retaining the firm's ability to align this balance may depend on specific change routines (Feldman and Pentland, 2003), which are built and maintained through continuous change of a similar kind (Amburgey *et al.*, 1993), the firm may be forced to continuously shift its exploration-exploitation balance – even during periods of relative environmental stability.

The idea that companies shift between exploration and exploitation over time is not entirely new to organization theory scholars. Described by notions such as "temporal separation" (Puranam, Singh, and Zollo, 2006: 275), "cycling" (Nickerson and Zenger, 2002: 458), and "vacillation" (Boumgarden *et al.*, 2012), scholars argue that firms may allocate sequential attention to exploration and exploitation. However, while ambidexterity scholars analyze the firm's *simultaneous* attention to exploration and exploitation, these *sequential* approaches assume that firms engage in either exploration or exploitation at a specific time (Raisch and Birkinshaw, 2008). The sequential approach thus fails to capture the synergistic qualities of exploration and exploitation (Farjoun, 2010; Smith and Lewis, 2011) and does not consider the paradoxical tensions that arise from their simultaneous management (Lavie *et al.*, 2010).

We introduce the concept of *dynamic ambidexterity*, which describes the firm's ability to adapt its exploration-exploitation balance over time. The value of dynamic ambidexterity arises from the firm's ability to align its exploration-exploitation balance with the environment's shifting demands, while constantly maintaining the two activities. While static ambidexterity is focused on operating at a given intermediate point on the exploration-exploitation continuum, dynamic ambidexterity enables the firm to adjust this point in response to changing environmental requirements. Contrary to static ambidexterity, dynamic ambidexterity requires also alignment moves directed away from an intermediate point. Contrary to sequential approaches, which imply strong alignment moves towards the extremes, dynamic ambidexterity favors more prudent moves that increase the relative attention to one pole, while maintaining some degree of the other. Firms engaged in dynamic

ambidexterity thus operate within an intermediate range: they shift their relative balance with changing environmental demands, but they change direction before spiraling out of balance towards the extremes. Please refer to Figure 2 for a graphical illustration of the concepts of static ambidexterity, temporal separation, and dynamic ambidexterity.

Figure 2: Comparison of Different Balancing Modes



We argue that dynamic ambidexterity might be positively related to long-term firm performance for three reasons: First, the firm's ability to remain adaptive in respect of its exploration-exploitation allocation leads to benefits. As argued above, firms need to ensure that their strategies and processes are aligned with their external environments (Miller, 1992; Venkatraman and Prescott, 1990). In changing environments, firms thus need the ability to constantly adapt their internal activities to their external environments' requirements (Burns and Stalker, 1961; Lawrence and Lorsch, 1967b; Thompson, 1967). For example, firms can benefit from exploratory opportunities in times of environmental dynamism, while they may enjoy higher returns from exploitative activities under more stable conditions (Jansen *et al.*, 2006; Siggelkow and Levinthal, 2003). With every alignment move, firms build and reinforce their change routines, which is likely to increase their ability to respond more timely and appropriately to future environmental change (Amburgey *et al.*, 1993). While these adaptations can create additional costs, we follow the coalignment literature's arguments (Venkatraman and Prescott, 1990) and assume that the benefits from these small adaptations exceed their respective costs.

Second, benefits arise from the firm's ability to retain some degree of exploration and exploitation at all times. The ambidextrous orientation provides these firms with the three previously described effects of complimentary performance (March, 1991), the generation of a valuable synergistic resource (Yang and Atuahene-Gima, 2007), and the reconciliation of paradoxical task requirements (O'Reilly and Tushman, 2008a). Since simultaneous exploration and exploitation is maintained at all times, firms also enhance their ability to manage the paradoxical tensions between the two activities over time (O'Reilly and Tushman, 2008a). While combining exploration and exploitation has its costs (Gibson and Birkinshaw, 2004), we follow the ambidexterity literature's previous arguments (Benner and Tushman, 2003) and assume ambidexterity's benefits outweigh the costs that arise from its management.

Finally, besides the benefits arising from a firm's ability to remain aligned with its environment and its ability to simultaneously explore and exploit, the combination of the two can be beneficial. Previous work argues that firms are particularly prone to overreactions when they have failed to align themselves with environmental change in a timely manner (Volberda, 1996). This effect is reinforced if these organizations fall short of performance expectations, which prior studies related to a tendency to overly focus on either exploration or exploitation (O'Reilly and Tushman, 2008a; Wang and Li, 2008). As both one-sided orientations have been related to self-reinforcing effects (Gupta *et al.*, 2006), they represent a major threat to firms' ability to return to ambidexterity. The ability to gradually adapt the levels of exploration and exploitation while maintaining some degree of both may thus be essential to avoid excesses in either direction.

Summarizing our argumentation, we claim that dynamic ambidexterity has a positive effect on firm performance for three reasons. First, we agree with the previous ambidexterity literature's paradox perspective, which assumes that simultaneous exploration and exploitation has positive performance effects. Second, in line with the coalignment literature, we argue that a firm's ability to adapt its exploration-exploitation balance to fit changing environmental demands may enhance this performance effect. Finally, we claim that the interaction between the two effects – simultaneously balancing the two and adapting this balance – may prevent firms from oversteering in their alignment moves, which has positive performance effects.

H1: Dynamic ambidexterity is positively associated with firm performance.

Comparing the concepts of static and dynamic ambidexterity, we assume that the latter is more positively related to firm performance than the former because dynamic ambidexterity has an additional valuable feature that static ambidexterity does not have. Static ambidexterity is merely focused on a firm's internal ability to align its structures (Tushman and O'Reilly, 1996), contexts (Gibson and Birkinshaw, 2004), and leadership (Smith and Tushman, 2005). However, to host the paradoxical requirements of exploration and exploitation, dynamic ambidexterity combines this ability with the firm's capacity to scan its external environments and to gradually adapt the exploration-exploitation balance to these environments' shifting requirements. Therefore, dynamic ambidexterity entails some of the qualities of static ambidexterity, but also complements a firm's internal alignment with an external perspective. We thus assume that dynamic ambidexterity goes well beyond the abilities and qualities related to static ambidexterity.

H2: Dynamic ambidexterity is associated with higher performance than static ambidexterity is.

2.4 The Paradox of Static and Dynamic Ambidexterity

We introduced and defined the concept of dynamic ambidexterity and argued for its superiority compared to static ambidexterity. Based upon these ideas, we continue to argue that those firms that excel in static ambidexterity will paradoxically struggle most with dynamic ambidexterity because static ambidexterity has a self-reinforcing effect that effectively prevents firms from engaging in dynamic ambidexterity.

Why is static ambidexterity self-reinforcing? First of all, the simultaneous pursuit of exploration and exploitation is not a trivial task (Lavie *et al.*, 2010). Scholars have argued that to enable ambidexterity firms need to install complex structures (Tushman and O'Reilly, 1996), foster a specific organizational context (Gibson and Birkinshaw, 2004), appoint senior management with specific characteristics and capabilities (Mom *et al.*, 2009), design appropriate incentive systems (O'Reilly and Tushman, 2004), install suitable control systems (McCarthy and Gordon, 2011), and create an overarching strategic intent and vision (O'Reilly and Tushman, 2004). This requires a conscious managerial decision for ambidexterity and the commitment of substantial resources for its implementation. Moreover, this commitment has to be maintained over time. Engaging with ambidexterity is a time-consuming process and none of its

features can be implemented swiftly or easily (e.g., O'Reilly and Tushman, 2004). For example, Gibson and Birkinshaw (2004: 214) admit that installing ambidextrous contexts is a time-consuming process and that "the development of this sort of capacity takes many years."

If static ambidexterity is a valuable capability that is developed over years (O'Reilly and Tushman, 2008a) and requires the fundamental, comprehensive, and long-term-oriented alignment of a firm's organization and strategy (Raisch and Birkinshaw, 2008), we presume that it will also give rise to the formation of organizational routines. Routines arise from collective behaviors and actions (Nelson and Winter, 1982) and are defined as "recurring patterns of behavior of multiple organizational members involved in performing organizational tasks" (Feldman and Rafaeli, 2002: 311). Routines may guide organizational members towards ambidextrous behavior and actions. While building such routines may be aligned with the strategic intent of firms striving for ambidexterity, routines can also become sources of inertia (Hannan and Freeman, 1984) and inflexibility (Gersick and Hackman, 1990; Weiss and Ilgen, 1985). Organizations that once decided to amend their structures, contexts, and leadership to pursue ambidexterity, may be stuck with this decision for considerable time to protect prior investments and reap the benefits of their returns. During this time, they develop routines that further reinforce their ambidextrous orientation.

The self-reinforcing effect may be amplified by static ambidexterity's positive performance effect (e.g., He and Wong, 2004). It is a widely established argument in the organizational literature that success leads to the repetition of the behavior that first generated this success (Bettis and Prahalad, 1995). Described by the 'dominant logic' notion (Prahalad and Bettis, 1986), it was argued that when top managers perform a task, its economic success reinforces them positively. As the benefits of static ambidexterity should become increasingly visible in performance outcomes over time, we presume that managers who opt for static ambidexterity reinforce their ambidextrous orientation further. Static ambidexterity can thus be understood as a constant process of striving towards an intermediate point as opposed to seeking to reach one of the extremes (Lavie *et al.*, 2010). While moves towards the intermediate point are encouraged, moves away from this point are sanctioned as they contradict the firm's vision, strategy, and structure.

H3: Static ambidexterity has a self-reinforcing effect: the degree of ambidexterity in one period is positively associated with its degree in the following period.

Above, we presented the self-reinforcing effects of static ambidexterity. Prior inertia theory (Sydow, Schreyogg, and Koch, 2009) teaches us that such effects evolve in three development phases. In the preformation phase, firms can select their actions from a broad set of options. Subsequently, initial choices give rise to a dominant action pattern. In the final lock-in phase, the dominant action pattern becomes fixed. With regard to ambidexterity, we argue that firms initially experiment with different exploration-exploitation allocations. For example, senior teams may move resources between explorative and exploitative businesses as shifting needs demand (O'Reilly and Tushman, 2011). During this phase, firms that over-explore "suffer the cost of experimentation," whereas firms that over-exploit feel the "risk of obsolescence" (Cao *et al.*, 2009: 783). Based on these experiences, ambidextrous firms define a strategic intent that intellectually justifies and imposes an exploration-exploitation balance (O'Reilly and Tushman, 2008a).

The emerging senior team consensus on the importance of this balance – reflected in their behavioral integration (Lubatkin *et al.*, 2006) – should motivate these firms to reinforce their balanced orientation. Senior teams in ambidextrous organizations are heavily incentivized to maintain the exploration-exploitation tension (O'Reilly and Tushman, 2011) and to defend this balance against short-term pressures from the environment (Tushman, Smith, and Binns, 2011). The closer the organization moves to its targeted intermediate point, the less it is motivated to further change its balance (Lavie *et al.*, 2010). Moves away from the intermediate point – towards greater attention to either exploration or exploitation – are in conflict with the dominant logic, which makes such moves increasingly less likely over time. We thus presume that static ambidexterity is increasingly replicated and the resource allocation patterns (Giddens, 1984) are increasingly focused on maintaining the firm's "natural balance" (Lavie *et al.*, 2010: 127).

Based on these arguments, we presume that organizations focused on static ambidexterity tend to defend and reinforce their balanced orientation, even in the face of short-term environmental change. The more they maintain this balance, the more they lose the ability to gradually shift between exploration and exploitation over time. We thus assume that while static ambidexterity may reinforce itself, it has a negative effect on dynamic ambidexterity.

H4: Static ambidexterity in one period has a negative effect on dynamic ambidexterity in the subsequent period.

2.5 Methodology

To test our hypotheses, we composed a sample from the global insurance industry, which seems suitable to our study for several reasons: First, the insurance industry encompasses a high number of firms of considerable size, but is not yet consolidated to a level that would hinder our research. Second, insurance companies are usually focused on the financial service sector, which allowed us to avoid sample heterogeneity, while ensuring the comparability of different firms within the industry. Third, the insurance sector was exposed to deregulations, capital market volatility, demographic change, and two major environmental shockwaves (terror attacks in 2001 and hurricane Katrina in 2005), all of which are conducive to test our hypotheses on dynamic ambidexterity. Finally, recent studies have found the sector useful to study both ambidexterity (e.g., Jansen *et al.*, 2012b) and coalignment moves (e.g., Klarner and Raisch, 2012).

We derived our sample from the Dow Jones Stoxx Insurance Index (81 firms) for the period 1999 to 2007. We relied on the Index's initial configuration to avoid survivor bias (Mitchell, 1991). Owing to the composition of the index and data availability, we had to discard several firms. We excluded 11 broker firms, which are solely focused on the retailing of financial products, and nine firms with insufficient data availability. Our final sample thus consists of 61 insurance firms and 1,952 firm-quarter observations.

2.5.1 Main Variables

According to theoretical arguments, exploration and exploitation have performance effects with regard to different time horizons (March, 1991). In line with previous research (Lavie *et al.*, 2011), we thus included two performance measures in our analysis to capture both exploitation's short-term and exploration's long-term effects. We used the Return on Equity (RoE) as a short-term (e.g., Jansen *et al.*, 2006; Venkatraman *et al.*, 2007) and the Total Shareholder Return (TSR) as a long-term performance measure (e.g., Miller and Bromiley, 1990; Morgan and Rego, 2006). We calculated the TSR as the firm's stock price at the end of each period minus the stock price at the beginning of the period, plus its respective share of the annual dividend (Hayward, 2003). We derived performance data from COMPUSTAT and DATASTREAM.

Exploration-exploitation: In accordance with Uotila et al. (2009), we measured the quarterly relative amount of a firm's explorative orientation by means of content analysis. We collected textual data in the form of press releases available on the firms' corporate websites (Duriau, Reger, and Ndofor, 2000). Since the industry's high disclosure standards require firms to release corporate decisions fully and in a timely manner, we considered press releases superior to periodicals or other third party articles (Boyd and Bresser, 2008; Chen and Hambrick, 1995). We applied a stepwise process to make the press releases accessible, to identify their announcement dates, and analyze their content by means of regular expressions and structured content analysis (Schimmer, 2012; Shapiro and Markoff, 1997).

Specifically, we downloaded the firms' press release archives with an open source download manager (Maier, Parodi, and Verna, 2008). We analyzed each document with the word list provided by March (1991), measuring the number of specific words within each press release. This procedure is particularly useful when studying bipolar scales such as exploration and exploitation. The collection process resulted in 14,666 analyzed press releases, each assigned to a specific firm quarter. After excluding firm-quarters with no relevant press releases, we assessed a firm's quarterly exploitation-exploration orientation on the basis of an average of 14 releases. An insurance company's explorative activity includes, for example, the launch of a new product line or expansion into a new geographical area, whereas exploitation describes activities such as the extension of an existing product line or the launch of a corporate efficiency program.

To crosscheck the validity of our exploration-exploitation measure, we correlated this variable with insurance industry proxies indicating a firm's explorative orientation (the increase in the degrees of diversification and internationalization) and exploitative orientation (the decrease in the underwriting expense ratio). We found the expected correlations between our textual measures and the industry-specific proxy variables for exploration and exploitation.

Static ambidexterity is operationalized and measured as the interaction between $\text{exploration}_{i,t}$ and $\text{exploitation}_{i,t}$ in period t (e.g., Gibson and Birkinshaw, 2004; He and Wong, 2004; Katila and Ahuja, 2002). The measure takes a minimum value of 0 (firms with a one-sided focus on either exploration or exploitation) and a maximum value of .25 (firms that operate at an intermediate point on the exploration-exploitation

continuum). While previous studies have used similar ambidexterity measures, we use the term 'static ambidexterity' to better distinguish this concept from 'dynamic ambidexterity.' Static refers to the position or "static equilibrium" (Boumgarden *et al.*, 2012: 591) that a firm held on the exploration-exploitation continuum in a given period.

Dynamic ambidexterity is operationalized through two interdependent components. The first component measures the absolute change in the exploration-exploitation balance over time, taking a minimum value of 0 (firms that keep their exploration-exploitation balance stable) and a maximum value of 1 (firms that move from pure exploration to pure exploitation or vice versa). The second component measures a firm's ability to maintain a relative balance while changing its exploration-exploitation allocation (as opposed to slipping off towards the extremes). This measure is calculated by the arithmetic average of the exploration-exploitation interaction in the focal (t) and the preceding (t-1) period, taking a minimum value of 0 (firms that move in a range close to the exploration or exploitation extremes) and a maximum value of 0.25 (firms that move in a mid-range between the exploration and exploitation extremes).

After both the components were standardized, dynamic ambidexterity was measured as the interaction between the two components. Firms that adapt their exploitation-exploration balance while maintaining some degree of both activities show high dynamic ambidexterity values. For example, firms that switch from a relative exploration-exploitation balance of 0.3 in one period to a balance of 0.7 in the subsequent period have a relatively high dynamic ambidexterity value of 0.34 (0.40 for the first component; 0.84 for the second component). Conversely, firms that either switch between extremes or do not (or very little) adapt their exploration-exploitation balance show low dynamic ambidexterity values. For example, firms that switch radically from a relative exploration-exploitation balance of 0.05 in one period to a balance of 0.95 in the subsequent period have a relatively low dynamic ambidexterity value of 0.17 (0.90 * 0.19). Similarly, firms whose balance remains highly stable, barely moving from an intermediate point of 0.5 in one period to 0.6 in the subsequent period, have a low dynamic ambidexterity value of 0.10 (0.10 * 0.98). In the extreme, firms that did not change their exploration-exploitation allocation (first component equals 0), or that operated with a pure exploration or exploitation allocation (second component equals 0) showed no dynamic ambidexterity at all.

2.5.2 Control Variables

As we conducted a single-industry study, we were able to limit our control variables to firm-level variations. In detail, we included prior firm performance, firm size, firm slack, firm diversification, and firm internationalization in our analysis. First, as firm performance might be consistent over time (e.g. Goddard, Tavakoli, and Wilson, 2005), we controlled for *prior firm performance* in our analysis. To avoid the problem of correlation between the dependent variable and the error term (Arrelano, 2003), we incorporated lagged accounting performance (the RoE) in models that estimated market performance (the TSR) and vice versa. *Firm size* was measured by a firm's sales in the focal period. Size was selected because it has been identified as an important antecedent to firm performance. As in previous studies (Bromiley, 1991), we used a firm's debt-to-equity ratio to calculate *firm slack.* Further, a firm's degree of *diversification* has been associated with firm performance (Amit and Livnat, 1988). Jacquemin and Berry's (1979) entropy measure of diversification was used to quantify the extent of diversity in a firm's lines of business. The measure was calculated on the basis of sales in each of the ten four-digit SIC business segments reported by COMPUSTAT. Similar to the composition of this measure, we calculated a firm's level of *internationalization* as the entropy measure of a firm's foreign sales.

2.5.3 Data Analysis

Since dynamic ambidexterity captures change to a firm's exploration-exploitation balance over time, we opted for a longitudinal data analysis approach. We ran fixed-effects OLS regressions, as dynamic ambidexterity is a continuous, normally distributed variable, and the Hausman (1978) test rejected the consistency of random effects ($p < 0.001$). To test our hypotheses, we compiled models with four dependent variables: static ambidexterity and dynamic ambidexterity (see Table 4), as well as short-term and long-term firm performance (see Table 3). As firm performance may not only be an outcome of dynamic ambidexterity, but may also influence a firm's exploration-exploitation balance (March, 1991), we first tested a two-stage regression analysis (2SLS) to handle potential endogeneity (Lavie *et al.*, 2011). In our first-stage models, we predicted dynamic ambidexterity values based on the following equation:

$$\textit{Dynamic ambidexterity}_{t,i} = \textit{static ambidexterity}_{t-1,i} + \textit{environmental dynamism}_{t-1,i} + \textit{firm age}_{t-1,i} + \textit{firm leverage}_{t-1,i}$$

Similar to the overall model, our first-stage models were estimated by running fixed-effects OLS regressions. Our analysis revealed static ambidexterity and firm age as the most reliable predictors of dynamic ambidexterity. The first-stage F-statistic indicated the relevance of the chosen instruments (Stock and Yogo, 2004), whereas the Hansen J-statistic indicated that our chosen instruments were exogenous to dynamic ambidexterity (Hansen, 1982). After assessing the accuracy of our first-stage model, the predicted dynamic ambidexterity values were included as dependent variables in the second-stage models. In these models, long- (the TSR) and short-term (the RoE) performance served as independent variables. Based on a Hausman (1978) test, we compared the different estimates from the OLS and the two-stage models. The p-values indicated the consistency of the OLS (Wooldridge, 2010).

Following the endogeneity test, we conducted a Wooldridge (2010) test to examine the potential autocorrelation. The p-values of both the models rejected the null hypothesis that there is no first-order autocorrelation (*TSR: $p < 0.02$; RoE: $p < 0.001$*). Additionally, we tested for heteroscedasticity (Breusch and Pagen, 1979) and found that the variance of our residuals is dependent on the values of our independent variables. As both tests indicated the need to account for autocorrelation and heteroscedasticity, we used the Huber White Sandwich Estimator to calculate robust, clustered standard errors (Anderson and Reeb, 2003). Further, we included time-fixed effects (Hayward, 2003) to account for unsystematic time-specific events (e.g., industry shocks such as those caused by hurricane Katrina). Finally, we checked for multicollinearity by computing the Variance Inflation Factors (VIF). As indicated in Tables 3 and 4, the maximum VIF for variables in our models was 2.07, which is below the rule-of-thumb cutoff value of 10 for multiple regression models (Neter, Wasserman, and Kutner, 1985).

Overall, our analyses include 61 insurance companies over a period of 32 quarters. The maximum number of 1,952 firm-quarter observations had to be reduced due to three constraints: First, our sample had to be shortened due to takeovers (e.g., American General Corp.) or bankruptcies (e.g., Conseco) that took place during the period of observation. Second, the inclusion of dynamic ambidexterity, as well as the lagged performance variables reduced the maximum time span available to estimate our models. Finally, several companies reported semi-annual rather than quarterly data during the early years of our observation period, thus further reducing the number of firm-quarter observations.

2.6 Results

Table 2 depicts the descriptive statistics and correlations of all the variables, pooled over the period of observation. Tables 3 and 4 report the results of our fixed-effects panel regression models. First, we estimated two models (Models 3 and Model 7; see Table 3) to test Hypothesis 1 regarding dynamic ambidexterity's performance effects. With regard to short-term (Model 7; $\beta = 0.0726$; $p < 0.05$) and long-term performance (Model 3; $\beta = 0.0918$; $p < 0.05$), we found empirical support for Hypothesis 1. As indicated by an increase in R2 ($0.45 < 0.50$ for long-term performance; $0.19 < 0.25$ for short-term performance), the inclusion of dynamic ambidexterity resulted in a higher model fit compared to the control models (Models 1 and 5). The results remain significant when including the effects of static ambidexterity (Model 4: $\beta = 0.104$; $p < 0.01$; Model 8: $\beta = 0.0836$; $p < 0.01$). Hypothesis 1 is thus supported.

Hypothesis 2 suggests that dynamic ambidexterity's performance effect is higher than static ambidexterity's performance effect. Models 4 and 8 compare the performance effects of dynamic and static ambidexterity. While the difference in standardized beta-coefficients in Model 4 provides initial evidence for Hypothesis 2, we conducted a Wald test to examine whether this difference is significantly different form zero (Wald, 1943). The Wald test indicated a significant difference, and we therefore conclude that dynamic ambidexterity has a higher long-term performance effect than static ambidexterity. In Model 8, the short-term performance effect of dynamic ambidexterity is significant and positive ($\beta = 0.0778 > \beta = 0.0252$), while static ambidexterity's has an insignificant effect. Hypothesis 2 is thus supported.

Hypothesis 3 argued for a self-reinforcing effect of static ambidexterity. As displayed in Model 2 (see Table 4), we found empirical support for this hypothesis ($\beta = 0.111$; $p < 0.05$). Finally, our last hypothesis argued that static ambidexterity displaces dynamic ambidexterity. As indicated by Model 4, we found empirical support for Hypothesis 4 ($\beta = - 0.165$; $p < 0.05$).

Table 2: Descriptive Statistics and Correlation Matrix

	Variables	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Firm Performance (RoE)	0.033	0.045	1								
(2)	Firm Performance (TSR)	7.417	35.979	0.30***	1							
(3)	Static Ambidexterity	0.165	0.087	0.14**	0.08*	1						
(4)	Dynamic Ambidexterity	0.221	0.116	0.12***	0.12***	-0.14***	1					
(5)	Static Ambidexterity (t-1)	0.165	0.087	0.04	0.03	0.39***	-0.15***	1				
(6)	Firm size	8.217	1.213	0.05	-0.09*	0.05	0.04	0.01	1			
(7)	Firm slack	5.128	6.113	0.13***	0.12***	0.09*	-0.12***	0.14***	-0.36***	1		
(8)	Diversification	0.524	0.382	0.13***	0.03	-0.03	-0.05	0.02	0.00	0.19***	1	
(9)	Internationalization	0.453	0.570	0.12***	0.04	-0.01	0.012***	0.02	-0.22***	0.17***	0.04	1

N=790 *** p<0.001, ** p<0.01, * p<0.05. + p<0.1

Table 3: Regression Analysis for Hypothesis 1 and 2

Dependent variable	Long-term firm performance (TSR)				Short-term firm performance (RoE)			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Dynamic ambidexterity			0.0918*	0.104**			0.0726*	0.0836**
			(9.768)	(9.343)			(0.00946)	(0.00868)
Static ambidexterity		0.0422		0.0773+		0.0339		0.0695
		(11.65)		(17.11)		(0.0197)		(0.0252)
Prior firm performance (RoE)	0.198***	0.228***	0.229***	0.220***				
	(28.19)	(23.98)	(24.97)	(24.25)				
Prior firm performance (TSR)					0.104*	0.0856+	0.0594	0.0587
					(5.13e-05)	(5.55e-05)	(6.39e-05)	(6.26e-05)
Firm size	-0.159*	-0.136	-0.141	-0.154+	-0.155	0.0631	0.0406	0.0292
	(1.601)	(2.082)	(2.225)	(2.214)	(0.00477)	(0.00599)	(0.00673)	(0.00657)
Firm slack	0.0470	-0.0201	-0.00486	-0.0125	0.106+	0.0796	0.0980	0.0956
	(0.265)	(0.591)	(0.561)	(0.554)	(0.000576)	(0.000727)	(0.000714)	(0.000700)
Diversification	0.0195	0.00229	-0.0228	-0.0167	0.0590	0.0500	0.0495	0.0469
	(3.546)	(4.775)	(5.954)	(5.732)	(0.00975)	(0.0137)	(0.0141)	(0.0143)
Internationalization	0.0783	0.0845	0.139+	0.151+	0.0173	-0.0746	-0.0704	-0.0569
	(4.857)	(5.583)	(6.215)	(6.578)	(0.00765)	(0.00645)	(0.00696)	(0.00713)
Constant	14.23	61.26**	51.59*	46.36*	0.0462	-0.00392	-0.00125	-0.00556
	(14.45)	(22.74)	(20.31)	(20.32)	(0.0396)	(0.0507)	(0.0565)	(0.0579)
Firm fixed effects & year dummies	Included	Included	Included	Included	Included	Included	Included	Included
Observations	1,303	918	790	790	1,125	807	712	712
R-squared	0.45	0.50	0.50	0.50	0.19	0.23	0.25	0.26
Number of companynr	61	60	58	58	58	55	54	54
VIF	1.66	1.74	1.74	1.77	1.76	1.93	2.06	2.07

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 4: Regression Analysis for Hypothesis 3 and 4

Dependent variable	Static ambidexterity		Dynamic ambidexterity	
	Model 1	Model 2	Model 3	Model 4
Static ambidexterity (t-1)		0.111*		-0.165*
		(0.0527)		(0.104)
Firm performance (RoE)	0.0817	0.101+	0.129**	0.123**
	(0.109)	(0.111)	(0.131)	(0.133)
Firm size	0.135	0.162+	0.0208	0.0379
	(0.00631)	(0.00599)	(0.00918)	(0.00963)
Firm slack	0.0612	0.0462	-0.110	-0.0980
	(0.00124)	(0.00127)	(0.00357)	(0.00348)
Diversification	-0.0757	-0.0359	-0.0656	-0.0783
	(0.0157)	(0.0170)	(0.0330)	(0.0325)
Internationalization	-0.120+	-0.155*	-0.0406	-0.0391
	(0.0147)	(0.0149)	(0.0189)	(0.0183)
Constant	0.128**	0.116*	0.267**	0.302**
	(0.0473)	(0.0534)	(0.0958)	(0.0981)
Frim fixed effects & year dummies	Included	Included	Included	Included
Observations	963	886	817	817
R-squared	0.071	0.080	0.091	0.113
Number of companynr	60	59	58	58
VIF	1.62	1.66	1.65	1.68

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Robustness Tests

We conducted a series of robustness tests and supplementary analyses to challenge our findings. First, we considered alternative operationalizations of short-term and long-term performance. Return on Net Premiums Written (RoNPW) was used as a substitute for short-term performance, whereas Tobin's Q was considered as an alternative for long-term performance. For Hypothesis 1, we found a positive and significant relationship between dynamic ambidexterity and RoNPW ($\beta = 0.0345; p < 0.1$) with regard to Hypothesis 1, whereas the relationship between dynamic

ambidexterity and Tobin's Q was positive but insignificant ($\beta = 0.0012;\ p < 0.15$). Owing to this constraint, we tested Hypothesis 2 solely for short-term performance. When comparing the standardized coefficients of static and dynamic ambidexterity, we found additional support for Hypothesis 2 ($\beta = 0.0345 > \beta = 0.0214$). Overall, the results of the alternative performance measure tests confirm our findings.

Second, we created models with different time lags (one to three periods) between (static or dynamic) ambidexterity and (short-term or long-term) performance. Overall, the use of different lags confirmed our initial findings. However, we found that our original models produced superior fit statistics, thus reconfirming our model specifications. Third, we changed the time-intervals of our analyses from quarterly to half-year and annual observations. We were specifically able to reproduce the initial findings for long-term performance (e.g., for Model 3 - quarterly: $\beta = 0.0918;\ p < 0.05$ vs. half-year: $\beta = 0.0731;\ p < 0.1$ *vs.* annual: $\beta = 0.0918;\ p < 0.05$). In respect of short-term performance, the decrease in the number of available observations reduced the significance levels of the half-year and annual observations, but reproduced the positive main effect. Regarding Hypotheses 3 and 4, we were able to find significant effects for all three time intervals. The results of these additional sensitivity tests support our initial findings.

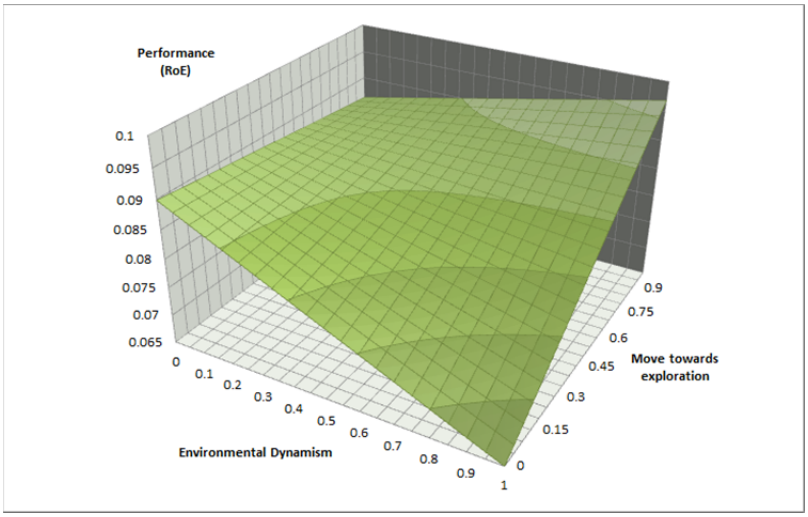
Fourth, we substituted our fixed-effects OLS estimator with a linear Generalized Method of Moments (GMM) estimator (Arellano and Bond, 1991). The GMM estimator has been recommended for dynamic models that include lagged dependent variables and has the added benefit of correcting endogeneity (Bascle, 2008). We did not apply the GMM estimator in our main analyses due to the structure of our data sample. Since our sample combines a relative large number of periodical observations (36 quarters) with a limited number of firm observations (61), the number of available moment conditions is high. Under such conditions, previous studies have advised against the use of the GMM estimator as it may cause potential overidentification problems (Roodman, 2008a). In order to provide complete analyses, we used the GMM estimator in a sensitivity check, which generated results that are consistent with our OLS estimations.

Fifth, we included alternative control variables in our models. For example, as a substitute for *firm size*, we included *total assets* or *number of employees*, which did not change our findings. The inclusion of additional control variables, such as *firm age* did

not significantly improve the fit of our models. Moreover, the inclusion of variables that assess environmental conditions – such as *environmental dynamism* or *environmental munificence* (Keats and Hitt, 1988) – led to multicollinearity in our year dummies. We thus replaced the year dummies with the environmental dynamism (and environmental munificence) variables. While this substitution led to increased significance levels in our main effects, it lowered the overall fit of our models (reduced R^2).

Finally, we conducted an ad-hoc analysis to test our underlying theoretical assumptions on the interrelation between environmental dynamism, a firm's adaptation moves, and the association with firm performance. We ran additional regression models that allowed us to test the interaction effect of environmental dynamism and a firm's move towards exploration. A move towards exploration was indicated by a dummy variable that takes a value of 1 if a firm increases its relative exploration-exploitation allocation. In line with prior ambidexterity research (Jansen *et al.*, 2006), we find that both main effects have a negative impact on subsequent firm performance (environmental dynamism: $\beta = -0.025;\ p < 0.001;$ move towards exploration $\beta = -0.004;\ p < 0.1$). Conversely, the moderation variable shows a significant and positive association with performance ($\beta = 0.036;\ p < 0.001$). These findings support our underlying theoretical arguments that the alignment of firms' exploration-exploitation balance with changing environmental conditions has a positive performance association. Please see Figure 3 for a graphical representation of the performance landscape of firms' alignment moves to changing environmental dynamism.

Figure 3: Moderation Effect of Environmental Dynamism



2.7 Discussion

This study provides a longitudinal perspective of a firm's simultaneous pursuit of exploration and exploitation. Drawing upon our findings, we discuss our paper's most important contributions to the ambidexterity literature and the broader debate in the organizational literature on coalignment and paradox theory perspectives. We conclude by highlighting avenues for future research and discuss this study's relevance for managerial practice.

2.7.1 The Concept of Dynamic Ambidexterity

Previous ambidexterity studies (Gibson and Birkinshaw, 2004; Tushman and O'Reilly, 1996) focus on investigating how firms strive to and operate at a given intermediate point on the exploration-exploitation continuum (Lavie *et al.*, 2010). While these approaches provide excellent explanations of how firms become ambidextrous, we build theory on how they can maintain and sustain their ambidextrous orientation. Since the ambidexterity literature explicitly strives to identify the sources of long-term firm survival and prosperity (March, 1991; O'Reilly and Tushman, 2008a), we provide a much needed longitudinal perspective to complement the extant approaches to organizational ambidexterity (Raisch and Birkinshaw, 2008; Simsek *et al.*, 2009).

Our findings indicate that, compared to static ambidexterity, dynamic ambidexterity is related to superior long-term firm performance. While dynamic ambidexterity relies upon ambidexterity theory's core argument that organizations "need to balance their exploration and exploitation activities to achieve optimal performance" (Uotila *et al.*, 2009: 221), it differs from static ambidexterity in two, potentially beneficial, ways. First, while previous ambidexterity approaches "balance exploration and exploitation attempting to achieve a static equilibrium" (Boumgarden *et al.*, 2012: 588), dynamic ambidexterity allows organizations to adapt this balance to changing environmental conditions. This enables them to better match their resource allocations with external opportunities (Jansen *et al.*, 2006). Second, while an emphasis on "static balance in exploration and exploitation compromises the levels of each that are attained" (Boumgarden *et al.*, 2012: 592), dynamic ambidexterity has the benefit that the paradox is partly nested in time (Farjoun, 2010). Organizations can temporarily focus their primary attention on either the one or the other task, which reduces the extent to which they experience the tensions between them.

The dynamic ambidexterity concept draws upon and integrates arguments from the related debate on temporal solutions to the exploration-exploitation paradox (e.g., Puranam *et al.*, 2006; Siggelkow and Levinthal, 2003). However, dynamic ambidexterity differs from temporal separation in three, potentially valuable, ways. First, while temporal separation targets either exploration or exploitation at a time (Boumgarden *et al.*, 2012), dynamic ambidexterity maintains the synergistic fusion between the two forces at all times. This enables organizations to benefit fully from exploration and exploitation's mutually enabling qualities (Smith and Lewis, 2011), whereas temporal separation fails to produce more than "brief periods of dual capability" (Boumgarden *et al.*, 2012: 590). Second, while previous studies tend to ignore or downplay the cost of temporal separation (Boumgarden *et al.*, 2012; Nickerson and Zenger, 2002), it is safe to assume that radical shifts between explorative and exploitative orientations disrupt operations and create substantial restructuring costs (Lavie *et al.*, 2010). Conversely, in its quest to maintain balance over time, dynamic ambidexterity involves gradual transitions (e.g., Lavie and Rosenkopf, 2006) rather than more costly and disruptive radical shifts. Finally, compared to temporal separation, dynamic ambidexterity is much less exposed to the reinforcing path dependence felt in one-sided exploration or exploitation (Gupta *et al.*, 2006), which "may delay subsequent transitions and make them costly to implement" (Lavie *et al.*, 2010: 133).

Further, our findings provide first insights into the drivers of dynamic ambidexterity. In line with previous studies (Jansen *et al.*, 2006; Uotila *et al.*, 2009), we argue that a different exploration-exploitation balance might be optimal for environments characterized by different levels of environmental dynamism. Scholars have also related other environmental conditions, such as exogenous shocks (Meyer, Brooks, and Goes, 1990) and changes in competitive intensity (Barnett, 1997), to varying needs for exploration and exploitation (Levinthal and March, 1993). We can thus assume that organizations face opposing external forces that simultaneously call for exploration and exploitation (Lavie *et al.*, 2010). Dynamic ambidexterity could be the solution to gradually adapt a firm's resource allocation to the exact mix or balance that is appropriate under current environmental conditions. Besides external drivers, there may also be internal drivers of dynamic ambidexterity. In this study, we argued that firms have to constantly adapt their exploration-exploitation balance to establish and maintain change routines (Adler *et al.*, 1999). Moreover, previous studies have argued that in their relentless pursuit of knowledge acquisition, development, and

application, organizations have a natural tendency to constantly transition from exploration to exploitation and vice versa (Lavie *et al.*, 2010; Rothaermel and Deeds, 2004). Dynamic ambidexterity may thus be better aligned with an organization's natural needs and abilities than the more static forms of ambidexterity that have been previously described.

Finally, while our study's focus is on dynamic ambidexterity's outcomes, we can provide first insights into its antecedents. Firms that wish to sustain their ability to combine exploration and exploitation need two, closely intertwined, abilities: the ability to transition between different exploration-exploitation allocations (Lavie *et al.*, 2010) and the ability to manage exploration-exploitation tensions (O'Reilly and Tushman, 2008a). Dynamic ambidexterity forces organizations to simultaneously have external and internal competencies. An organization's ability to proactively adapt its exploration-exploitation balance to changing environmental conditions is associated with its absorptive capacity (Lavie and Rosenkopf, 2006); that is, the ability to assess the value of external knowledge, internalize it, and apply it (Cohen and Levinthal, 1990). Organizations should identify "early warning signs" that signal that "the time for a course correction has come" (Probst and Raisch, 2005: 100). Conversely, an organization's ability to maintain the tension between exploitation and exploration is related to its capacity to manage contradictions (Smith and Tushman, 2005). A firm that manages to combine the two abilities creates a dynamic capability that is difficult to imitate and could thus be an important source of long-term prosperity.

2.7.2 The Paradox of Static and Dynamic Ambidexterity

Prior studies discussed the self-reinforcing effects of either exploration or exploitation (Gupta *et al.*, 2006) and hailed the ambidexterity concept's virtues in overcoming these tendencies by simultaneously balancing the two activities (Lavie *et al.*, 2010; Tushman and O'Reilly, 1996). In this study, we find evidence that even maintaining a balance between exploration and exploitation fails to effectively protect firms from becoming locked-in. Since ambidexterity is particularly time-consuming (Gibson and Birkinshaw, 2004) and firms have to align their structures, processes, and systems to enable ambidexterity (O'Reilly and Tushman, 2008a), they may develop path dependencies (Boumgarden *et al.*, 2012). Maintaining a stable balance for longer periods can thus trap firms in downward spirals since static ambidexterity is negatively

associated with dynamic ambidexterity, which has superior long-term performance outcomes.

These insights contribute to an emerging debate in the ambidexterity literature (Andriopoulos and Lewis, 2009; Farjoun, 2010; Smith and Lewis, 2011). These scholars rely upon paradox theory to discuss whether contradictory tensions – such as those between exploration and exploitation – should be resolved through synthesis or temporal separation (Lavie *et al.*, 2010). In an earlier study, Poole and Van de Ven (1989) mention that paradox resolution through synthesis or temporal separation exhibits distinct means, yet could be combined in business practice. In this study, we provide the first evidence that only the combination of the two means to handle paradox may provide a sustainable solution. Drawing upon Smith and Lewis (2011), we propose a "dynamic equilibrium" model to sustain ambidexterity through constant motion around an intermediate point on the exploration-exploitation continuum. Organizations have to protect themselves against the inertial forces that loom large at both extremes, but also at the center of the continuum. While temporal separation implies the momentum required to break inertia, synthesis in turn contributes the synergistic qualities that arise from the two opposing elements' integration.

2.7.3 The Interplay between Coalignment and Paradox Perspectives

Building upon these insights, we make a final contribution to the larger debate on coalignment and paradox perspectives in the organizational literature. Research on organizational tensions has long been dominated by coalignment or contingency theory approaches. These approaches explore the conditions that drive organizational alignment with opposing alternatives (Lawrence and Lorsch, 1967a), such as exploration and exploitation (e.g., Tushman and Romanelli, 1985). Recently, Smith and Lewis (2011) positioned a paradox perspective as a timely and promising alternative to coalignment theory. While the authors acknowledge the possibility of combining both theoretical perspectives, they go to great lengths to position them as alternatives and argue in favor of one approach (the paradox perspective) over the other (the coalignment perspective).

Our findings indicate that the two perspectives are complementary rather than competing. Elements of both perspectives have to be integrated to capture the full complexity of managing exploration-exploitation tensions. Coalignment theory allows

for investigating alignment moves and exploring the conditions that drive such moves (Donaldson, 1987). This focus leads to important insights, since it clarifies potential long-term gains from alignment and allows for analyzing dynamic behavior. Paradox theory is not particularly strong in explaining any of these aspects, but provides additional insights that coalignment theory fails to provide. By examining the tensions and the practices for managing them, a paradox perspective clarifies the short-term benefits from combining opposing elements and allows for analyzing the drivers behind escalating commitments and ways to preventing them.

In isolation, coalignment and paradox theory approaches thus fail to explain the full variance in long-term firm performance. Rather, the combination of the two is required to consider both the long-term returns from alignment (made visible by a coalignment theory lens) and the short-term gains from combination (as illuminated by a paradox theory perspective). As argued by Poole and Van de Ven (1989), juxtaposing opposing theories can inspire novel insights and richer theory building. The triangulation across multiple paradigms allows researchers to grapple with theoretical contradictions, which should enable them "to build theory more attuned to the intricacy and paradoxes of organizational life" (Lewis and Grimes, 1999: 686).

2.7.4 Future Research: Balancing Modes and Dynamic Ambidexterity

The extant ambidexterity literature has explored different modes that allow organizations to balance exploration and exploitation (Lavie *et al.*, 2010; Raisch and Birkinshaw, 2008). More specifically, the literature has discussed leadership (e.g., Lubatkin *et al.*, 2006), as well as the structural (e.g., Tushman and O'Reilly, 1996) and contextual (e.g., Gibson and Birkinshaw, 2004) antecedents of ambidexterity. While these are rich foundations to draw upon, we propose avenues for future research that are concerned with identifying the differences between dynamic ambidexterity and the more static ambidexterity approaches, as well as with discussing further antecedents that may be required to foster dynamic ambidexterity within organizations.

With regard to leadership antecedents, Beckman (2006) found that top management teams (TMT) are ambidextrous if they maintain a balanced mix of diverse and common team affiliations. From a dynamic ambidexterity perspective, the quest for a balanced mix can be beneficial, but it implies the risk of TMTs being trapped in a given exploration-exploitation allocation. This is particularly true, as previous studies

show that a firm's current TMT demographics tend to mirror its past senior teams' demographics (Beckman and Burton, 2008). Moreover, prior research has stressed the importance of TMT behavioral integration for ambidexterity (Jansen *et al.*, 2009; Lubatkin *et al.*, 2006). However, behavioral integration may be a double-edged sword with regard to dynamic ambidexterity: while it fosters the ability to reconcile conflicting matters (Jansen *et al.*, 2009), it also reinforces path-dependent decisions (Granovetter, 1985), which reduce the firm's ability to adapt its exploration-exploitation balance. Future research may thus provide a more dynamic perspective on leadership antecedents and examine how dynamic ambidexterity may be facilitated. In particular, TMT change could be an important means to alter TMT demographics and processes, thus stimulating adaptations to the exploration-exploitation balance.

With regard to its structural antecedents, dynamic ambidexterity requires the allocation of top management attention and financial resources to the differentiated, loosely coupled subunits. While previous structural ambidexterity studies take a rather static perspective (Taylor and Helfat, 2009), dynamic ambidexterity would benefit from a more longitudinal perspective. For example, dynamic ambidexterity could be fostered by shifting charters between subunits (Galunic and Eisenhardt, 1996), as well as through active portfolio management at the top, which enable adaptations to the exploration-exploitation balance. Future research should thus explore the emergence, development, and divesture of explorative and exploitative businesses over time.

Finally, contextual ambidexterity is particularly promising for dynamic ambidexterity, since the ambidextrous contexts are inherently "dynamic and flexible" (Gibson and Birkinshaw, 2004: 211) and employees are free to individually decide how to divide their time between explorative and exploitative activities. However, we would need deeper insights into whether, and to what extent, human beings' personalities and cognitive abilities are biased towards exploration or exploitation (Bryant, 2009; Higgins, 1998; Mom *et al.*, 2009). The more biased they are, the more the composition or demography of organizational members within a given unit will determine and sustain the unit's "natural" exploration-exploitation balance. In this case, external "corrective" influences, such as shifting leadership styles (Jansen, George, van den Bosch, and Volberda, 2008) or changes in team composition, may be required to support dynamic ambidexterity.

2.7.5 Practical Implications

While we principally advise managers to promote ambidexterity, we also caution them to stay adaptive and continue to adjust their firm's exploration-exploitation balance. Dynamic ambidexterity is particularly challenging as it forces managers to simultaneously address multiple challenges: First, they need to host and harmonize the conflicting exploration and exploitation requirements. Second, they need to withstand the temptation to continue their current, successful paths in favor of more risky adaptations. Third, they need to maintain the exploration-exploitation balance while aligning themselves with new environmental requirements.

This leads to the essential question of how managers can master the challenge of dynamic ambidexterity. As discussed above, the existing solutions to ambidexterity are a starting point for discussing the antecedents of dynamic ambidexterity at various levels of analysis. Individuals may not only need the ability to deal with conflicting elements in their task environments (Mom *et al.*, 2009), but also the ability to screen their external environments to proactively adapt their exploration and exploitation activities. At the team level, considerations of team composition, demographics, and processes (Ling, Simsek, Lubatkin, and Veiga, 2008) may have to be expanded to dynamic aspects, such as the strategic use of team member changes, rotational role assignments, and team boundary-spanning behavior, to shift a given exploration-exploitation balance. Finally, at the organizational level, top management teams may have to develop the ability to shift their attention and resource allocation patterns in a timely manner, while maintaining the checks and balances that avoid an excessive alignment with either of the extremes.

2.8 Conclusion

We have merely sketched an outline of a dynamic ambidexterity approach. Theoretical arguments and empirical evidence show that dynamic ambidexterity is an important capability that affects long-term firm performance positively. Further, our findings indicate that dynamic ambidexterity may be less prone to path dependencies and inertia than the more static approaches previously described. However, further theoretical work is required to tighten the concept of dynamic ambidexterity, and additional empirical research is critical to help us understand how firms become ambidextrous, how they sometimes stay that way, why and how some become better at managing it, and why others sometime lose their ability to effectively balance

exploration and exploitation. Organization theory researchers need to join forces with scholars in the fields of change management, innovation, human behavior, and strategy to unlock the riddles that lie behind the firm's long-term survival and prosperity. There could hardly be a more ambitious research agenda in the management domain today.

3 The Dynamics of Ambidextrous Decision Making[2]

Abstract:

Managers' ability and willingness to reconcile the opposing forces of exploitation and exploration (i.e., managerial ambidexterity) has gained increased attention in recent research. However, prior studies have failed to provide conclusive theoretical insights into how managers' intrinsic abilities and preferences interact with extrinsic organizational policies and restrictions in developing organizational ambidexterity and securing superior long-term profitability. Using system dynamics modeling, we simulate this interaction and the underlying feedback processes under different environmental conditions. The simulation experiments suggest that managerial ambidexterity may only lead to organizational ambidexterity under moderate environmental conditions. Counter-intuitively, we propose that, under stable (or dynamic) environments, managers biased towards exploration (or exploitation) may be more effective in securing organizational ambidexterity and accumulated long-term profits. Amongst other theoretical insights, this allows us to argue that managers need to solve two paradoxical sub-challenges (adaptation and balancing) when developing organizational ambidexterity under varying environmental conditions.

Keywords: Organizational Ambidexterity, Managerial Ambidexterity, Profit Gap, Path Dependency, System Dynamics

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3.1 Introduction

Over the past ten years, organizational ambidexterity, i.e., a firm's ability to reunite exploitative and explorative activities, has become a central research theme in organization studies (e.g., Raisch and Birkinshaw, 2008; Raisch *et al.*, 2009). While structural and contextual solutions to achieve ambidexterity dominated earlier research (e.g., Gibson and Birkinshaw, 2004), scholars have recently emphasized the pivotal role of individual managers in firms' efforts to become ambidextrous (Mom, Van den Bosch, and Volberda, 2007; Simsek, 2009; Smith and Tushman, 2005).

Most research on managerial ambidexterity focuses on the cognitive characteristics of ambidextrous managers, which result in an intrinsic behavioral inclination and willingness to simultaneously combine exploitation and exploration (e.g., Smith and Tushman, 2005). Studies on the outcomes of such managerial ambidexterity remain scarce. Still, it is largely assumed that managers' ambidexterity leads to organizational ambidexterity and, ultimately, to superior long-term profitability (e.g., Simsek, 2009).

Managers drive organizational ambidexterity through their decision-making processes, particularly their resource allocation decisions (e.g., March, 1991). However, the allocation of resources not only relies on managers' intrinsic inclination, but also on extrinsic (i.e., organizational-level) performance feedback (i.e., feedback based on the gap between the profit objectives and the actual profits) and path dependency (Lavie *et al.*, 2010). While there has been research on these two extrinsic factors, prior studies have mostly focused on either one or the other to explain ambidextrous decision making (e.g., Garcia, Calantone, and Levine, 2003; March, 1991; Sull, 1999).

The purpose of this study is to shed light on the longitudinal effects of managers' intrinsic inclination (towards exploration, exploitation, or both) on organizational ambidexterity and long-term profitability. We were guided by the theoretical argument that managerial inclination, performance feedback, and path dependency interact to determine a firm's resource allocation decisions regarding exploitative and explorative activities (Lavie *et al.*, 2010). Furthermore, we believe that the extrinsic decision-making antecedents (performance feedback and path dependency) change over time, as they are closely linked to the organizational activities that result from prior resource allocation decisions. We therefore study how the interaction of intrinsic and extrinsic

antecedents regarding resource allocation evolves over time and how it relates to organizational ambidexterity and accumulated long-term profit under different environmental conditions. We rely on system dynamics modeling, which has been found useful to simulate the feedback processes underlying the evolution of ambidextrous patterns (e.g., Garcia *et al.*, 2003).

During our simulation experiments, we discerned the assumed positive relationship between managerial ambidexterity, organizational ambidexterity, and long-term profit, but solely under moderate environmental conditions. Conversely, our simulation experiments indicate that, in the long run, managers intrinsically biased towards exploration succeed under stable environmental conditions, while managers biased towards exploitation are more successful under dynamic environmental conditions. This is particularly surprising, as prior organizational ambidexterity research has provided evidence that a bias towards exploitation yields higher returns under stable environmental conditions and that an exploration bias is beneficial under dynamic environmental conditions (Jansen *et al.*, 2005; Sorensen and Stuart, 2000). Behind these counterintuitive results, we identify the logic that the extrinsic performance feedback and path dependency tend to induce over-exploitation or over-exploration under non-moderate environmental conditions. Under such circumstances, managers have to counteract the extrinsic organizational tendency to overreact in order to stabilize the ambidextrous balance between exploitation and exploration on the organizational level.

Through this study, we contribute several new theoretical insights to managerial and organizational ambidexterity research. First, our simulation experiments indicate that environmental dynamism not only influences the organizational ambidexterity-performance relationship, as suggested by prior research, but has an additional effect on the interplay of intrinsic and extrinsic antecedents to resource allocation decisions that contribute to organizational ambidexterity. The intrinsic and extrinsic factors that guide ambidextrous decision making only reinforce one another under moderate environmental conditions, but need to act as opposing forces under stable and dynamic environmental conditions. Second, we describe and explain the potential differences between the short-term and long-term effects of managerial ambidexterity. As intrinsic and extrinsic antecedents to resource allocation decisions appear to become effective at different points in time, long-term success might, in some cases, require managerial choices that appear counterintuitive at first. Finally, our study

contributes an important insight for the broader theory on organizational ambidexterity. It allows us proposing that managers need to deal with two paradoxical sub-challenges when developing organizational ambidexterity under varying environmental conditions. Previous research has described the challenge to adapt the mix of exploitation and exploration to the environmental dynamism. We refer to this as the *adaptation challenge*. However, solving this challenge does not prevent firms from over-exploitation or over-exploration in the long run. Accordingly, we argue that managers need to solve an additional *balancing challenge* by acting themselves into the opposite direction to return to a balanced state of organizational ambidexterity (e.g., exploitation-biased managers need to operate in exploration-biased organizations that are adapted to dynamic environmental conditions).

This study is organized as follows: In the next section, we first summarize key theoretical insights from prior ambidexterity research. Subsequently, we introduce our methodological approach before developing the theoretical model of resource allocation decisions. Thereafter, we simulate different configurations of managerial inclinations towards exploitation and/or exploration under varying environmental conditions. These experiments allow us to develop propositions on how different managerial inclinations towards exploitation and/or exploration relate to organizational ambidexterity and accumulated long-term profit in stable, moderate, and dynamic environments. We conclude our study with a discussion of our contribution to theory and practice and by referring to the limitations of this research.

3.2 Theoretical Background

In his seminal article, March (1991) argued that organizations need to divide their attention and resources to either exploit old certainties or explore new possibilities. However, subsequent research showed that a focus on either exploitation or exploration may burden firm growth (He and Wong, 2004), firm profitability (Lavie *et al.*, 2011), and business unit profitability (Gibson and Birkinshaw, 2004). Instead, ambidextrous organizations that develop the ability to simultaneously pursue exploitative and explorative activities are assumed to deliver superior profitability (e.g., Raisch *et al.*, 2009; Simsek, 2009; Tushman and O'Reilly, 1996). The ambidexterity concept was adopted in various literature streams, such as organizational learning, technological innovation, organizational adaptation, strategic management, and organizational design (Raisch and Birkinshaw, 2008).

In this study, we apply the technological innovation perspective, which suggests that firms need to simultaneously engage in exploitative innovation – small improvements in mature products – and explorative innovation – fundamental changes leading to a switch from existing products to new ones (Jansen *et al.*, 2006; Lavie and Rosenkopf, 2006; Tushman and Smith, 2002). Balancing exploitative and explorative innovation is believed to be beneficial for a firm's accumulated long-term profit (Benner and Tushman, 2003). Environmental dynamism influences the right balance between exploitative and explorative innovation (Jansen *et al.*, 2006). Firms facing moderate environmental conditions benefit from relatively equal attention to exploitation and exploration. Dynamic environments quickly render current products and technologies obsolete and require increased attention to explorative innovation for firms to remain profitable. Conversely, stable environments allow firms to retain their existing products and technologies in the market, favoring increased attention to exploitative innovation (Jansen *et al.*, 2005; Sorensen and Stuart, 2000).

Prior research have provided inconclusive evidence regarding whether firms can simultaneously increase their exploitation and exploration (e.g., Katila and Ahuja, 2002), or if these are the opposite ends of a continuum (March, 1991). From a technological innovation perspective, researchers usually assume that managers have a pre-determined R&D budget that they can allocate to either exploitative or explorative innovation (Garcia *et al.*, 2003). Prior studies have described two extrinsic organizational policies and restrictions that guide these resource allocation decisions: profit feedback and path dependency.

3.2.1 Extrinsic Organizational Antecedents of Resource Allocation

First, managers compare their actual achievements with the organization’s profit targets (Levinthal and March, 1981). If, for example, a certain product or technology no longer meets its profit objectives, dissatisfaction with the current activities will induce an extrinsic performance feedback that encourages managers to search for new alternatives, thus increasing the allocation of resources to explorative innovation (Garcia *et al.*, 2003; March, 1991; Sull, 1999). Conversely, if the actual profitability exceeds the targets, managers are incentivized to allocate more resources to exploitative innovation aimed at extending the lifecycle of the firm's existing products or technologies (Levinthal and March, 1981). These assumptions are in line with prior studies, which argue that managers take fewer risks when profitability exceeds their

goals, and that high organizational risk taking is associated with low profitability relative to the aspirations (Greve, 1998; Kahneman and Tversky, 1979; March, 1988; March and Shapira, 1992). The profit gap can be reassessed at any time period, which implies that the resource allocation in one time period influences the resource allocation in the next time period indirectly through the changes in profitability resulting from the decision.

Second, when deciding to allocate resources, managers are guided by the organization's path dependency (Levinthal and March, 1993). If, for example, managers currently allocate resources to explorative innovation, it will be difficult to shift the allocation of resources entirely to exploitative innovation in the following time periods. Accordingly, prior research has argued that organizational-level rigidities and structural inertia imprint managers' future decision-making behavior (Beckman, 2006; Beckman and Burton, 2008; Leonard-Barton, 1992). Path dependency is thus another circular relationship underlying managers' resource allocation decisions. The current allocation of resources at any time period is influenced by the preceding allocation and influences the upcoming allocation.

3.2.2 Intrinsic Managerial Antecedents of Resource Allocation

Prior research has pointed out that extrinsic factors alone cannot sufficiently explain why exploitative and explorative activities occur. Instead, scholars recognize the pivotal role of senior executives' intrinsic inclination regarding driving organizations towards ambidexterity (e.g., Gibson and Birkinshaw, 2004; Mom *et al.*, 2007; O'Reilly and Tushman, 2004; Simsek, 2009; Smith and Tushman, 2005). Managers' inclination towards exploit, explore, or to undertake both is rooted in their cognition, which defines how they understand a situation, seek information, and finally reach decisions (Walsh, 1995). Ambidextrous managers have a paradoxical cognition, which results in an intrinsic behavioral inclination and willingness to simultaneously combine exploitation and exploration (Smith and Tushman, 2005). Conversely, managers without such a paradoxical cognition, are generally biased towards one or the other.

Prior studies have to date provided theoretical and empirical insights into the antecedents of managerial ambidexterity. In order to be ambidextrous, managers need various characteristics, such as the ability to accommodate contradictions (Smith and Tushman, 2005), to fulfill multiple roles (Gibson and Birkinshaw, 2004), and to refine

and renew their knowledge, skills, and expertise (Floyd and Lane, 2000). Most of these previous studies have implicitly assumed that managerial ambidexterity leads to resource allocation decisions that promote organizational ambidexterity and, thus, fosters firm profitability (e.g., Simsek, 2009).

A recent literature review suggests that ambidextrous decision making is guided by both intrinsic and extrinsic factors (Lavie *et al.*, 2010). Accordingly, we may assume that managers' inclination towards exploitation or exploration interacts with performance feedback and path dependency to determine resource allocation decisions. As theory still lacks insights into how these factors relate to one another, the purpose of this study is to understand how different types of intrinsic managerial inclinations (exploitation-orientation, exploration-orientation, ambidextrous orientation) interact with extrinsic factors over time to build organizational ambidexterity and foster accumulated long-term profits under different environmental scenarios.

3.3 Methodology

To study the longitudinal interaction of intrinsic and extrinsic antecedents to determine resource allocation decisions, we used simulation modeling, as this research method has been found to be effective to cope with multiple, interrelated feedback processes and their behavior over time (e.g., Davis, Eisenhardt, and Bingham, 2007; Lomi, Larsen, and Wezel, 2010; Sterman, 2000). Simulations were used in studies on organizational decision-making processes (Carroll *et al.*, 1994; Levine *et al.*, 2001; Morecroft and Sterman, 1994; Rudolph, Morrison, and Carroll, 2009; Sastry, 1997; Walrave, van Oorschot, and Romme, 2011), and organizational ambidexterity (Lin, Yang, and Demirkan, 2007; Rivkin and Siggelkow, 2003; Siggelkow and Levinthal, 2003). Specifically, we relied on the simulation methodology of system dynamics, which enabled us to capture the structural assumptions of managerial resource allocation decisions, as well as to analyze their interactions and consequences over time. System dynamics combines information feedback theory and behavioral decision theory to map organizations' operating policies, information flows, and decision-making processes (Forrester, 1961, 1968; Morecroft, 1985; Sterman, 1987). The methodology accounts for time delays and nonlinearities and can thus create insights from a process perspective (Morecroft, 2007; Sterman, 2000; Warren, 2008).

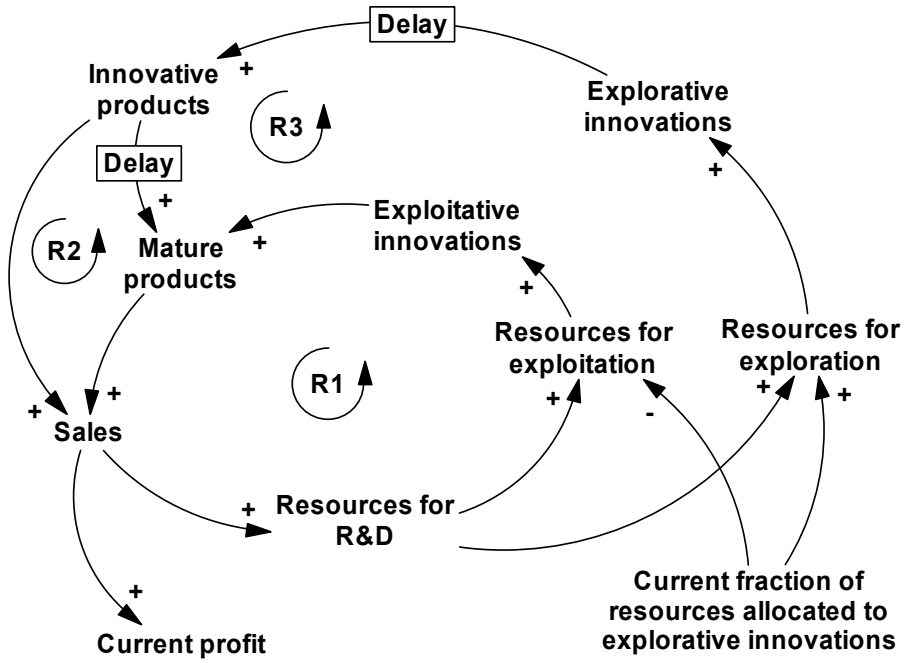
In the paper, we use causal loop diagrams to represent the causal relationships between the variables in our simulation model. In general, the relationships between two variables can either be positive (+), indicating that the outcome variable moves in the same direction when a change occurs in a cause variable; or negative (-), indicating that the outcome variable moves in the opposite direction when a change occurs in a cause variable. A feedback loop is a logically closed causal chain where an initial change in a variable is fed back to its origin. Each feedback loop has a polarity which describes the loop's dynamic characteristic. If a feedback effect amplifies the original change in a variable, the loop is described as reinforcing (R). If the feedback effect reduces the original change in a variable, the loop is described as balancing (B).

We developed the simulation model of the dynamics of managerial resource allocation decisions and organizational ambidexterity in four steps. First, we used established constructs and variables as well as causal relationships from the literature on organizational ambidexterity to conceptualize the interaction of exploitative and explorative innovation, environmental dynamism, and firm profits. This constitutes the core of our basic model (Figure 4). Second, based on this basic model, we developed a differential equation model. The model is fully documented in the online appendix. We thus follow system dynamics' highest documentation practices (Martinez-Moyano, 2012; Rahmandad and Sterman, 2012). To evaluate the accuracy of the simulation model, we conducted simulations to assess the model's ability to reproduce established theory in the area of organizational ambidexterity (Figure 5). In addition, we ascertained the validity of the model by means of extensive structural and behavioral testing, for example, the consistency of the units of measure, the robustness under extreme conditions, as well as the sensitivity of the structural formulations and the parameter changes (Groesser and Schwaninger, 2012; Schwaninger and Grosser, 2008; Sterman, 2000). Third, we introduced the three antecedents of managerial resource allocation decisions by adding managers' individual inclination, profit feedback, and path dependency to the model (Figure 6). Finally, we performed simulation experiments with different parameter configurations representing different managerial inclinations under different environmental scenarios. Based on these results, we derive our propositions.

3.4 Theoretical Model

As a first step, we modeled the premises of organizational ambidexterity theory in a technological innovation context (see Table 5 in the Appendix for an overview of selected variables and Table 6 for additional equations that are not described in detail in this section). The relevant dynamic mechanisms are three reinforcing feedback loops (see Figure 4).

Figure 4: Basic Causal Loop Diagram



The first reinforcing feedback loop, R1, allocates a certain fraction of the firm's R&D resources to exploitative innovation, which induce the refinement of a firm's mature products (Levinthal and March, 1981; Winter, 1971). This refinement allows the firm to retain more of its products in the market, which increases the firm's sales from mature products (Macmillan, Hambrick, and Day, 1982). As most firms were found to define their R&D budget as a portion of sales, the increase in sales adds to the firm's R&D resources for the next time period (Hambrick and Macmillan, 1985).

The second reinforcing feedback loop, R2, allocates the remaining share of the firm's R&D resources to explorative innovation (March, 1991). Resources allocated to

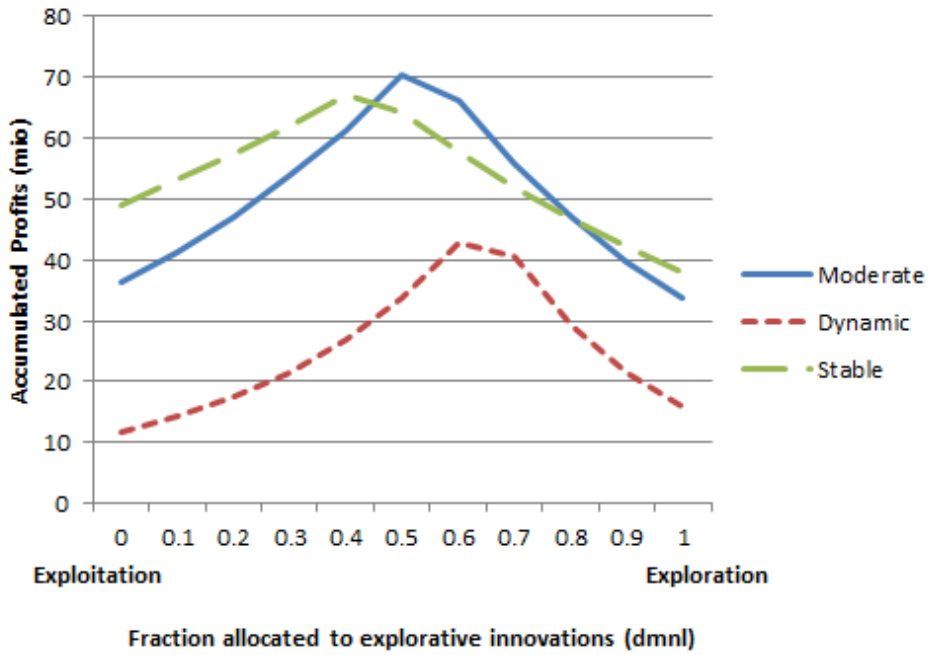
explorative innovation trigger the search for new ideas, implying the creation of entirely new, innovative products (Winter, 1971). The creation of new products based on resources allocated to explorative innovation is associated with higher investments, takes more time, and is more uncertain than the refinement of existing products (March, 1991). The creation of new products improves a firm's sales and increases its R&D resources (Hambrick and Macmillan, 1985; Katila and Ahuja, 2002; Macmillan *et al.*, 1982).

Finally, the third feedback loop, R3, depicts the relationship between a firm's new and mature products. Initially, a firm establishes its product portfolio by creating new products. These products mature over time and finally become obsolete (Levitt, 1965). The dynamic of the environment – i.e., the intensity of market competition and the velocity of industry changes – influences the time it takes for an innovative product to mature, or for a mature product to become obsolete (Atuahenegima, 1995). Under dynamic environmental conditions, a product's lifecycle will be shorter and its obsolescence will be faster than under moderate environmental conditions. In contrast, stable environmental conditions will expand the product life-cycle and delay maturation and obsolescence (Covin and Slevin, 1989; Houston, 1986; Kohli and Jaworski, 1990). Given environmental dynamisms' impact on a product's lifecycle, product prices may also vary in accordance with the environmental conditions, for example, shorter lifecycles require higher prices to recover development and production costs (Berger and Mester, 2003; Jovanovic and Macdonald, 1994) (please see Table 7 in the Appendix for the parameters for the different environmental conditions).

We simulated the quantitative model for 80 quarters. Consequently, we account for the different long-term effects of exploitative and explorative innovation. To validate our initial model, we conducted simulation runs to evaluate the model's ability to reproduce established theory. Prior studies on organizational ambidexterity have found evidence that firms promoting both exploitative and explorative innovation show a superior profitability than those only focusing on one or the other (e.g., Jansen *et al.*, 2006; Lubatkin *et al.*, 2006; Venkatraman *et al.*, 2007). Environmental dynamism was thereby introduced as an external factor that shifts the optimal balance towards exploration under dynamic conditions, and towards exploitation under stable conditions (Jansen *et al.*, 2005, 2006; Sidhu, Volberda, and Commandeur, 2004).

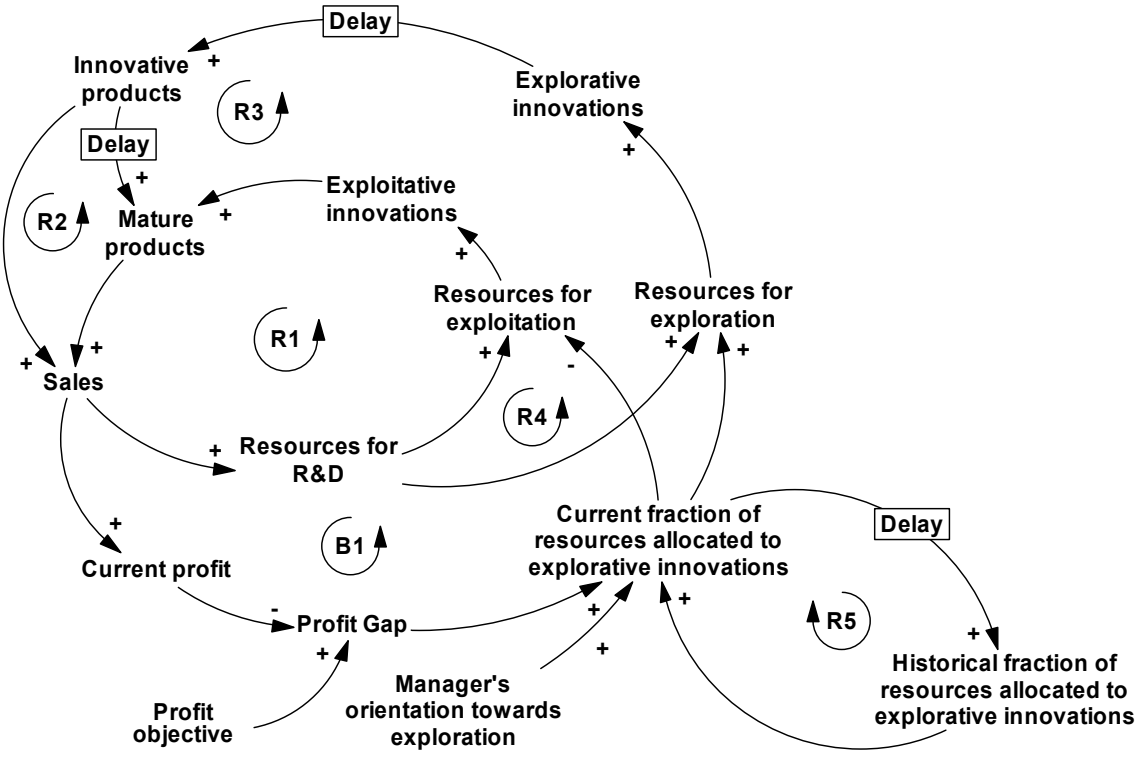
We simulated 200 runs for different resource allocation decisions. RA_t^{ER} thus refers to the relative share of resources invested in explorative innovation and ranges from zero (a firm that invests its entire R&D resources in exploitative innovations) to one (a firm that only invests in explorative innovations). The 200 simulation runs were executed for different resource allocation decisions and different environmental conditions (stable, moderate, and dynamic). Figure 5 displays the results of our simulation runs. The vertical axis represents accumulated long-term profits at t=80; the horizontal axis represents the share of resources allocated to exploration. Figure 5 demonstrates that our model is consistent with prior research in the sense that the ambidextrous firm allocating its R&D resources equally to exploitative and explorative innovations shows the highest accumulated profit in the long run under moderate environmental conditions. Furthermore, under stable environmental conditions, a slight bias towards exploitative innovation results in the highest accumulated profit, while, under dynamic environmental conditions, allocating slightly more R&D resources to explorative innovation is most beneficial. Summarizing, our model reproduces prior theory on firms' optimal resource allocation to exploitative and explorative innovation under varying environmental conditions.

Figure 5: Resource Allocation and Accumulated Profits (Base Case)



Our initial model is based on the established theoretical assumption that a firm always allocates a constant share of its R&D budget to exploitative and explorative innovation regardless of the profit feedback, path dependency, or managerial inclination (e.g., Jansen *et al.*, 2005, 2006). We expand this static perspective by detailing and endogenizing the managerial resource allocation decision. These stem from the interaction of the two extrinsic antecedents (i.e., profit feedback and path dependency) and one intrinsic antecedents (i.e., manager's inclination) (see Figure 6).

Figure 6: Full Causal Loop Diagram



First, the balancing loop B1 represents the organizational-level profit feedback (*PG*) as one extrinsic antecedent of the resource allocation decision. In keeping with previous studies, we assumed that firms define a profit objective (*PO*) for each period beforehand (Levinthal and March, 1981). Since firms generally strive to increase their profits over time, we further assumed that the profit objective equals the initial profit in the first period (P_{t_0}) and subsequently grows at a constant rate (τ) in each subsequent period. This growth rate tends to be higher under dynamic environmental conditions than under stable environmental conditions (Lant and Mezias, 1990). In order to calculate the profit gap, we compare the actual profit in a certain period (P_t)

with the profit objective (PO_t) for this period (Garcia *et al.*, 2003; Levinthal and March, 1981).

$$PG_t = PO_t - P_t \quad \text{(Eq. 1)}$$

As previously explained, a positive profit gap indicates that a firm cannot meet its profit objective by relying on its current products and therefore needs to increase its explorative innovation. Conversely, a negative profit gap indicates that expectations are being exceeded, inducing a performance feedback to focus stronger on exploitative innovation targeted at mature products (Garcia *et al.*, 2003). If the profit objectives are exactly met, the profit gap is zero, incentivizing managers to consider both exploitative and explorative innovation (Garcia *et al.*, 2003; Levinthal and March, 1981). In line with prior simulations studies, we modeled an S-shaped performance feedback function contingent on the normalized profit gap (Garcia *et al.*, 2003). The constant ω describes the slope of the function at the inflection point (PG = 0 and $f^{P}_{(PG_t)}$ = 0.5). Similar to previous studies, we used a sigmoid curve (Eq. 2) to normalize the function's output between 0 and 1 in terms of the profit feedback's minimum and maximum absolute values.

$$f^{P}_{(PG_t)} = \frac{1}{1+\exp(-\omega * PG_t)} \quad \text{(Eq. 2)}$$

Second, with the reinforcing loop R5, we introduced path dependency to the model as the second extrinsic antecedent of resource allocation decisions. We modeled path dependency by linking a firm's historical resource allocation ($RA^{ER}_{t-\phi}$) with its actual resource allocation (RA^{ER}_{t}). Following previous simulation studies of path dependency (Sterman, 2000), we modeled it on a yearly basis, which implies that managers consider their resource allocation decisions in the four preceding quarters as the basis of a new decision (ϕ=4).

Finally, we introduced managers' individual inclination (I_z) as the third antecedent that guides resource allocation decisions. Other than the extrinsic antecedents, which are endogenous to the model, we follow prior research in the assumption that the intrinsic inclination depends on managers' personal characteristics and cognition, which we assume to be exogenous in the sense that they are not altered by changes in

the model (e.g., Smith and Tushman, 2005). This variable is standardized and ranges on a unit scale from exploitation-focused, risk-averse managers (I_z = 0) to ambidextrous managers (I_z = 0.5), to exploration-focused, risk-prone managers (I_z = 1). In our model, the weights of all three antecedents of the resource allocation policy are equal ($\alpha = \beta = \gamma = 0.33$).[3] Accordingly, their mean determines the fraction of the resources allocated to explorative innovation (RA_t^{ER}).

$$RA_t^{ER} = \alpha * f_{(PG_t)}^{P} + \beta * RA_{t-\phi}^{ER} + \gamma * I_z \quad \text{(Eq. 3)}$$

The fraction of the resources allocated to explorative innovation determines the absolute value of the resources allocated for explorative innovation (ER_t) from the overall R&D budget (B_t) in each period (Eq. 4).

$$ER_t = RA_t^{ER} * B_t \quad \text{(Eq. 4)}$$

In order to model the resources for exploitative innovation (EI_t), we followed previous work by March (1991), who suggests that exploitation and exploration are a zero-sum game. Accordingly, the R&D resources not allocated to explorative innovation (ER_t) are available for exploitative innovation (Eq. 5).

$$EI_t = (1 - RA_t^{ER}) * B_t \quad \text{(Eq. 5)}$$

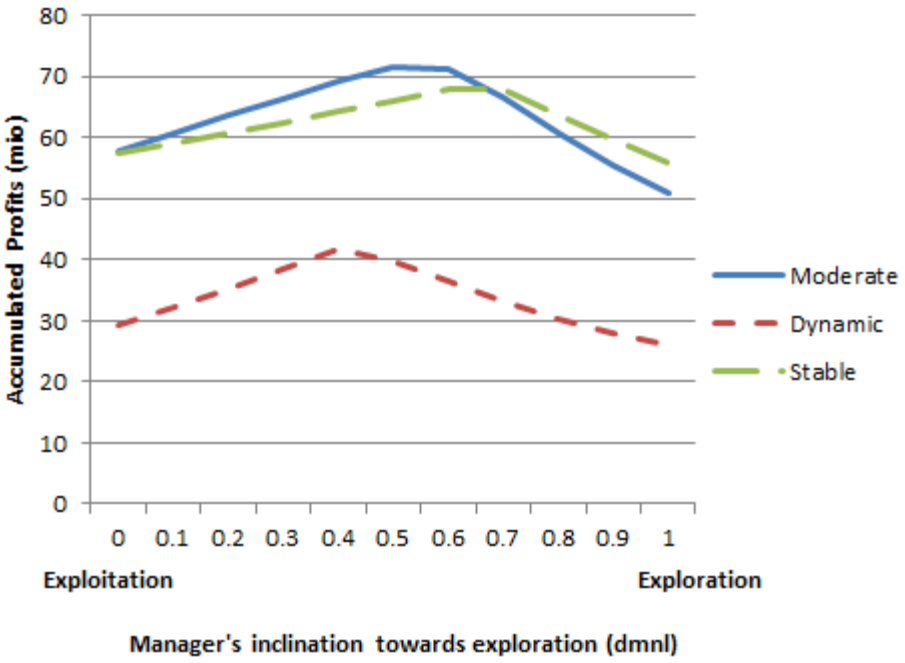
3.5 Simulation Experiments

Figure 7 summarizes this study's results. We simulated the impact of managers' intrinsic inclination on firms' accumulated long-term profits under moderate, stable, and dynamic environmental scenarios. We simulated 200 different settings for each scenario, ranging from a manager with a strong preference for exploitation (I_z=0) to a truly ambidextrous manager with equal preferences for exploitation and exploration (I_z=0.5), and, finally, to a manager with a strong preference for exploration (I_z=1). Figure 7 shows that a truly ambidextrous manager (I_z=0.5) prevails under moderate environmental conditions. Surprisingly, a manager with an inclination biased towards exploration (I_z=0.7) achieves the highest accumulated long-term profits under stable

[3] We changed the relative impact of each of the antecedents using sensitivity analysis. Changing the weights of each antecedent in the range from 0.2 to 0.5 did not significantly change our results, but led to a vertical shift in the output tables.

environmental conditions, and a manager with an inclination biased towards exploitation (I_z=0.3) is most successful under dynamic environmental conditions. In this section, we describe and explain our findings in more detail and develop theoretical propositions regarding the effects of managers' intrinsic inclination on organizational ambidexterity and accumulated long-term profit.

Figure 7: Manager's Intrinsic Inclination and Accumulated Profits

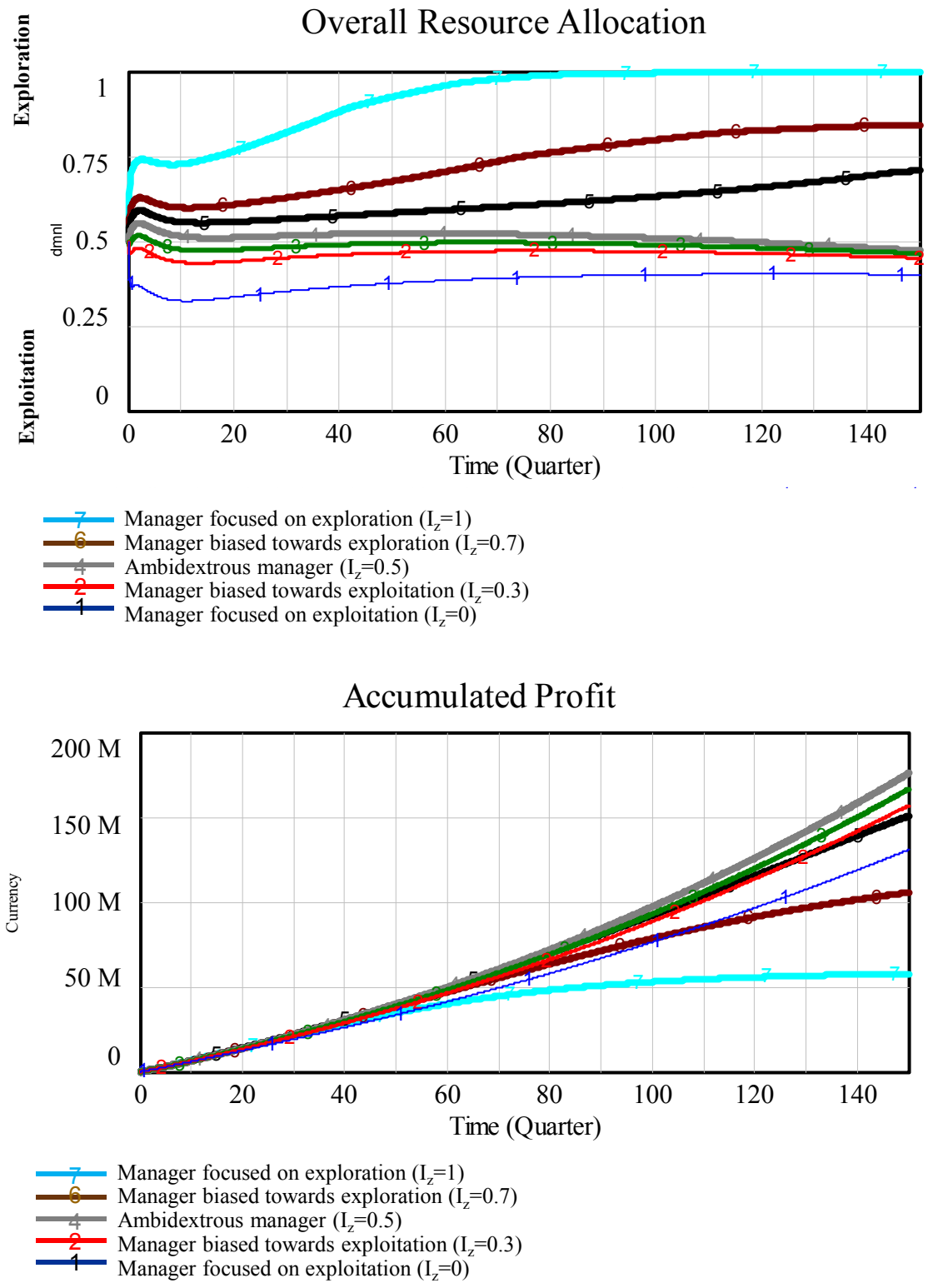


3.5.1 Moderate Environmental Conditions

Under moderate environmental conditions, we find that ambidextrous managers with an equal intrinsic preference for exploitation and exploration contribute to the highest accumulated long-term profit (see Figure 7). In order to understand the reasons for this insight, we need to consider the interacting effects of the three decision-making antecedents and how they determine resource allocation over time. Figure 8 shows the effects of managers' intrinsic inclinations on the resource allocation and the accumulated profit. In order to illustrate our findings, we show the results of managers focused on exploration (I_z =1), biased towards exploration (I_z =0.7), ambidextrous managers (I_z=0.5), managers biased towards exploitation (I_z =0.3), and managers focused on exploitation (I_z =0). [4]

[4] We modeled 200 different inclinations ranging from I_z=0 to I_z=1 for each of the three environmental conditions. For reasons of clarity and comprehensibility, Figures 8, 9, and 10 only show five exemplary cases of this analysis.

Figure 8: Moderate Environment: Resource Allocation & Accumulated Profit



The exploration-biased manager (I_z =0.7) is inclined to engage in developing new products from the beginning. The intuitive result is that the number of new products is always higher than that of the ambidextrous or exploitation-biased managers. Conversely, the number of mature products is largely stable at first but declines after about 40 quarters due to a very short product lifecycle caused by the exploration-biased manager's reluctance to engage in exploitative innovation. Despite the continuous stream of new products, the firm's overall product portfolio decreases. This limits the firm's ability to generate sales and profits. After 15 quarters, it is no longer able to meet the profit expectations. At this point, the extrinsic profit feedback that accentuates explorative innovation emphasizes the manager's intrinsic inclination if the profit objectives cannot be achieved. Although path dependency retards this vicious cycle, it results in about 75% of the resources being allocated to explorative innovation after 80 quarters. This deviates strongly from the equal balance between exploitation and exploration that prior theory has suggested for moderate environmental conditions. Accordingly, an exploration-biased manager contributes to the lowest accumulated profit in such a context.

From the beginning, the exploitation-biased manager (I_z =0.3) aims at increasing the lifecycle of mature products at the expense of the explorative innovation of new products. Accordingly, under such a manager, the firm has the lowest stock of new products. Surprisingly, however, a firm led by an exploitation-biased manager ranks just behind the one with an ambidextrous manager with regard to the number of mature products. This ranking is due to the number of mature products not only depending on the product lifecycle, but also on the inflow of new products that mature over time. The lack of new products not only limits the growth of the overall product stock, but also reduces the average margins – which are higher for new products than for mature products – further. Consequently, the firm fails to meet the profit expectations from the beginning. This implies that the extrinsic profit feedback emphasizes explorative innovation to close the profit gap, thus counteracting the manager's intrinsic inclination towards exploitation to some extent. However, owing to the inertial effect of path dependency, the firm retains a resource allocation bias towards exploitation over time. This results in an accumulated long-term profit that lies between that which the exploration-biased and the ambidextrous manager can achieve.

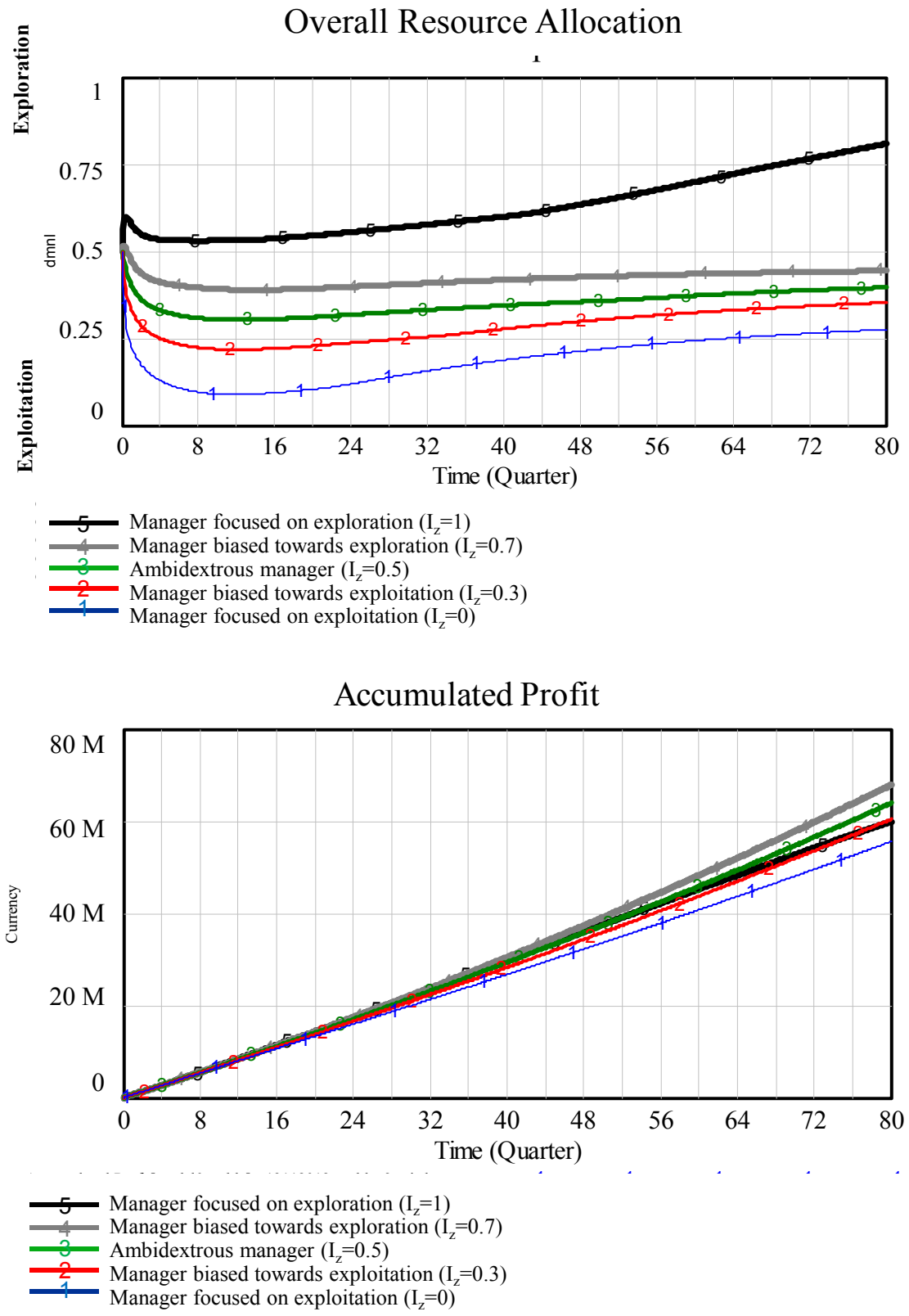
Under moderate environmental conditions, the ambidextrous manager (I_z =0.5) prevails. This largely corresponds to prior theoretical assumptions. By not emphasizing exploitation or exploration at the expense of the other, ambidextrous managers can extend the lifecycle of mature products and secure a continuous inflow of new products. Consequently, an ambidextrous manager can best fulfill the profit objectives under moderate environmental conditions. Over time, we see that the resource allocation cycle comprises an equal balance between exploitation and exploration, resulting in organizational ambidexterity. The extrinsic profit feedback thus fulfills its objective to react to slight shortfalls in profits by emphasizing additional exploratory innovation, or by fostering exploitative innovation when the firm outperforms its objectives. Path dependency has a stabilizing effect as it reduces the amplitude of these cycles. Accordingly, our simulation indicates that, for moderate environmental conditions, managers' intrinsic ambidextrous inclination complements the extrinsic antecedents of resource allocation decisions by balancing exploitative and explorative innovation. We thereby support prior studies' implicit assumption that managerial ambidexterity leads to organizational ambidexterity and is beneficial for a firm's long-term profit.

Proposition 1: Under moderate environmental conditions, managerial ambidexterity leads to organizational ambidexterity and superior accumulated long-term profit.

3.5.2 Stable Environmental Conditions

As shown in Figure 7, our simulation experiments indicate that an exploration-biased manager prevails under stable environmental conditions. This finding is counterintuitive, as prior research has suggested that a bias towards exploitation could be beneficial in such a context. We next describe how the interaction of the intrinsic managerial inclination, the extrinsic profit feedback, and path dependency determine the resource allocation and accumulated profit over time (see Figure 9).

Figure 9: Stable Environment: Resource Allocation & Accumulated Profit



On the basis of prior theory, we assume that exploitation-biased managers (I_z =0.3) are most successful under stable environmental conditions. They emphasize exploitative innovation at the expense of explorative innovation, thereby increasing mature products' lifecycle. However, the limited inflow of new products equalizes this effect; the number of mature products is therefore largely consistent in all three types of managerial inclination. Conversely, the exploitation-biased manager who largely neglects explorative innovation has the lowest number of new products. Despite this lower stock of new products, the exploitative manager still fulfills, and mostly exceeds, the profit objectives until the end of the 80-quarter period. The extrinsic profit feedback thus further emphasizes the manager's intrinsic bias towards exploitative innovation. This results in an overemphasis on exploitation that is lessened but not compensated by path dependency. At the end of the 80-quarter period, the firm therefore allocates nearly two-thirds of its resources to exploitation. Despite the stable environment, such a misbalance does not contribute to organizational ambidexterity, or to superior accumulated long-term profit.

The ambidextrous manager (I_z =0.5) can deal with stable environmental conditions better than the exploitation-biased manager. Despite focusing less on exploitative innovation to increase the product lifecycle, this manager contributes to an even higher stock of mature products through the continuous inflow of new products. Additionally, the higher number of new products allows ambidextrous managers to report higher profits than their exploitation-biased counterpart. Accordingly, the extrinsic profit feedback puts an even stronger emphasis on exploitative innovation to leverage the mature product portfolio. The ambidextrous manager's balanced inclination towards both exploitation and exploration is not strong enough to counteract this effect. Furthermore, the path dependency also impedes the manager's influence on the resource allocation, thus stabilizing the resource split between exploitative and explorative innovation at nearly the same ratio as that achieved by the exploitation-biased manager.

Surprisingly, the exploration-biased manager (I_z =0.7) prevails under stable environmental conditions. The firm obtains the highest stock of mature products compared to that achieved by ambidextrous or exploitation-biased managers, while the inclination towards exploration contributes to the highest number of new products. This results in the highest profit and an extrinsic profit feedback that strongly emphasizes exploitation. Owing to the manager's intrinsic inclination towards

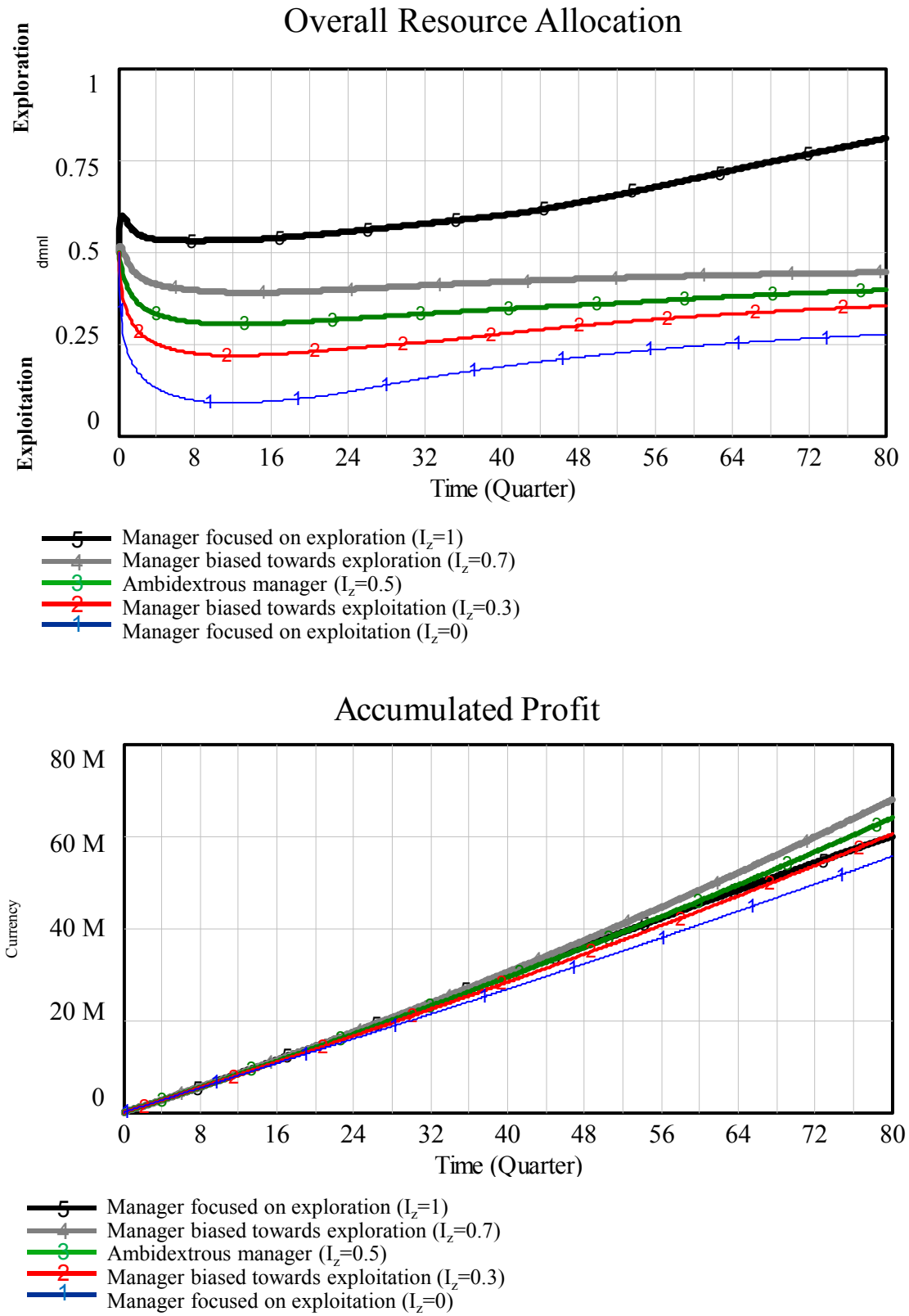
exploration, this effect can, however, be balanced over time. Supported by path dependency, the exploration biased manager can stabilize the firm's resource allocation, whose cycle over time comprises a slight bias towards exploitation, which has been found to be beneficial under stable environmental conditions. Accordingly, our simulation indicates that, under stable environmental conditions, only exploration-biased managers can counteract their extrinsic tendency to invest heavily in exploitative innovation and, thus, find an ambidextrous balance in order to contribute to the highest accumulated long-term profit. However, additional simulation experiments also confirmed prior managerial ambidexterity research's assumption that an inclination towards exploration (I_z =1.0) is detrimental for a firm's long-term profit under stable environmental conditions.

Proposition 2: Under stable environmental conditions, managers with an inclination biased towards exploration contribute to organizational ambidexterity and superior accumulated long-term profit.

3.5.3 Dynamic Environmental Conditions

Under dynamic environmental conditions, Figure 7 indicates that an exploitation-biased manager appears best suited to achieve a beneficial balance between exploitation and exploration and superior accumulated profit in the long-run (see Figure 10). This is again contrary to the assumption that dynamic environments call for exploration-biased managers. We next describe how this finding is generated by the interplay of intrinsic managerial inclination, the extrinsic profit feedback, and path dependency.

Figure 10: Dynamic Environment: Resource Allocation & Accumulated Profit



Prior theory has generally suggested that exploration-biased managers (I_z =0.7) are best-suited to deal with the challenges imposed by dynamic environments. They can initially successfully foster the development of new products. In the first eight quarters, such a manager can also extend the stock of mature products and is best able to meet the profit objectives. The profit feedback therefore suggests only a slight resource allocation bias towards exploration, supporting the manager's inclination. However, this picture changes dramatically after about eight quarters. At this point, the exploration-biased manager's neglect of exploitative innovation becomes fully effective. The stock of mature products begins to decline and even falls behind the initial stock after about 24 quarters. This is accompanied by a significant decrease in profits. Accordingly, the profit feedback begins emphasizing a resource allocation bias towards exploration. Simultaneously, the overall resources decline. These two effects reinforce each other in the sense that they reduce the resources for exploitative innovation. This has an additional negative impact on the profits. After 24 quarters, the investments in explorative innovation are reduced, even though the profit feedback strongly fosters exploration. Consequently, the stock of new products also begins to decrease. Notwithstanding the stabilizing effect of path dependency, the exploration-biased manager allocates over 80% of the resources to exploration, but still experiences continuous drops in both new and mature products after 80 quarters. Beyond the 80 quarter-period, this development will contribute to the collapse of the system and, ultimately, the failure of the firm.

In the long run, ambidextrous managers (I_z =0.5) appear to be better suited to deal with dynamic environmental conditions, even though, in the first quarters, they are less able to meet the profit objectives due to the smaller stock of new products. However, the stronger investments in exploitative innovation pay-off in the long run. When the exploration-biased manager already faces declining stocks of mature products, the ambidextrous manager still manages to increase the overall product portfolio. This has a positive effect on sales and profits, but still does not allow for meeting the profit objectives. The extrinsic profit feedback therefore emphasizes a stronger resource allocation towards exploration. Even though retarded by path dependency, this reallocation hinders the growth of mature products and, as described regarding the exploration-biased manager, ultimately results in decreasing stocks of both new and mature products. However, the ambidextrous manager can limit this decrease by paying sufficient attention to exploitation, thus ensuring the firm's long-term survival.

Surprisingly, the exploitation-biased manager (I_z =0.3) appears most successful under dynamic environmental conditions. Even though such a manager contributes to the lowest profits in the first quarters, the strong emphasis on exploitative innovation pays off in the long-run. The exploitation-biased manager is the only one who can continuously grow sales and profits over the entire period of 80 quarters and beyond. This is due to the continuous growth of both mature and innovative products. At the same time, such a continuous growth in profits also stabilizes the influence of the profit feedback. Together with path dependency, the manager's intrinsic exploitation inclination counteracts the extrinsic profit feedback's emphasis on exploration. The three antecedents jointly contribute to a final resource allocation that is slightly biased towards exploration. They thereby establish a beneficial ambidextrous balance between exploitative and explorative innovation under dynamic environmental conditions that results in the highest accumulated profit. Additional simulation experiments showed that a focused inclination towards exploitation (I_z =0.0) is less successful than an exploitation-biased or ambidextrous one. However, even an exploitation-focused manager appears to be better able to deal with dynamic environmental conditions than an exploration-biased or exploration-focused manager.

Proposition 3: Under dynamic environmental conditions, managers with an inclination biased towards exploitation contribute to organizational ambidexterity and superior accumulated long-term profit.

3.6 Discussion

In this study, we aimed to understand how different intrinsic managerial inclinations (exploitation-biased, exploration-biased, ambidextrous) interact with extrinsic organizational policies and restrictions (profit gap and path dependency) to develop organizational ambidexterity and foster accumulated long-term profits under different environmental conditions. Our simulation approach allowed us to contribute important theoretical insights to research on managerial and organizational ambidexterity.

Our first contribution refers to the understanding of the relationship among managerial ambidexterity (i.e., a manager's simultaneous intrinsic inclination to exploitation and exploration) and organizational ambidexterity (i.e., an orgnaization's simultaneous pursuit of exploitative and explorative innovation). Supporting most previous study's assumptions (e.g., Lubatkin et al., 2006), we hold that managerial

ambidexterity may indeed be synonymous to organizational ambidexterity, yet only for moderate environmental conditions, where firms strive for an equal mix of exploitation and exploration. If environmental conditions, however, change and firm's need to make adjustments in their exploitation-exploration balance, managerial and organizational ambidexterity may no longer be synonymous. Given that a manager's intrinsic inclination is complemented by extrinsic organizational antecedents to resource allocation decisions, the interplay of these antecedents determines the relationship among managerial and organizational ambidexterity. As shown by our simulation experiments, there are environmental conditions (e.g., dynamic or stable) where exploitation- or exploration-biased managers are needed to create ambidexterity at the organizational level, whereas ambidextrous managers would actually prevent it.

From a theoretical perspective, we learn that environmental dynamism not only influences the organizational ambidexterity-profitability relationship, as suggested by prior research, but has an additional effect on the interplay of intrinsic and extrinsic antecedents to resource allocation decisions that contribute to organizational ambidexterity. Our simulation experiments indicate that, in order to establish organizational ambidexterity, the extrinsic and intrinsic antecedents of resource allocation decisions may only reinforce one another under moderate environmental conditions, but need to act as opposing forces under stable and dynamic environmental conditions.

Second, prior research on managerial ambidexterity has been largely cross-sectional in nature, measuring profitability at a single point in time. However, our simulation results indicate that the effects of different intrinsic managerial inclinations change over time. Under dynamic environmental conditions, for example, managers biased towards exploration achieve the highest profits in the first quarters before falling sharply behind both ambidextrous and exploitation-biased managers, and they may even lead the firm into bankruptcy in the long run.

While scholars have previously argued that researchers should consider ambidexterity's short-term and long-term profitability implications (e.g., Raisch and Birkinshaw, 2008), our study is, as far as we know, the first to describe and explain the potential differences between the short-term and long-term effects of different antecedents to resource allocation decisions that contribute to organizational ambidexterity. Specifically, our simulation indicates that the intrinsic antecedent

(managerial inclination) tends to have an immediate impact, while the effect of extrinsic antecedents (performance feedback and path dependency) gradually emerges over time. This delayed effect may potentially lead to adverse results, if managerial choices are oriented to fit short-term requirements, potentially causing an overreaction of the organization. Accordingly, long-term success might, in some cases, require managerial choices that appear counterintuitive at first.

Finally, our findings may contribute an important insight to organizational ambidexterity research in general by proposing that managers need to deal with two paradoxical sub-challenges when developing organizational ambidexterity under varying environmental conditions. The first sub challenge has already been studied and relates to the different degrees of exploitation and exploration that are required by varying environmental conditions. While dynamic environments call for a slight exploration bias, stable environments can better be addressed by more exploitation-biased organizations (Jansen *et al.*, 2005; Uotila *et al.*, 2009). We refer to this as the *adaptation challenge*, where managers need to adapt an organization's mix of exploitation and exploration to fit the environmental conditions. However, given our study's findings, we claim that achieving organizational ambidexterity under varying environmental conditions might be accompanied by an additional challenge that has not been discussed previously – the *balancing challenge* that requires managers to act into the opposite direction to return to a balanced state of organizational ambidexterity.

Prior research has suggested that adapting to environmental conditions might tempt firms to arrive at over-exploitation or over-exploration (Wang and Li, 2008). Our study illustrates this by showing that managers, whose intrinsic bias to exploitation or exploration is aligned with the environmental requirements, tend to lead their organization into overshooting to one extreme or the other. In order to return to a balanced state and prevent overshooting, the complementary intrinsic and extrinsic antecedents to resource allocation need to act as opposing forces. This, however, means that managers have to lead their organizations to adapt to a mix of exploitation and exploration that is contrary to their own intrinsic behavioral inclination (e.g., exploitation-biased managers need to operate in exploration-biased organizations that are adapted to dynamic environmental conditions). Only this allows a gradual adaptation of the degrees of exploitation and exploration, resulting in a balanced state of organizational ambidexterity that is aligned with the environmental requirements.

The adaptation challenge and the balancing challenge appear to be paradoxical in nature. They require managers to think into opposite directions in their efforts a) to adapt the mix of exploitation and exploration to fit the environmental conditions and, at the same time, b) to counteract the organizational tendency to move too far into exactly that direction. It appears a very promising path for future research to explore, how this meta-paradox in the pursuit of organizational ambidexterity can be solved.

Complementing our theoretical contributions, this study allowed us to derive an interesting implication for managerial practice. It may encourage firms to search for ambidextrous managers in times of moderate environmental conditions. We would, conversely, encourage the selection of risk-averse managers with an inclination biased towards exploitation if firms face dynamic environmental conditions, and the selection of risk-prone, exploration-biased managers under stable environmental conditions.

As in any theoretical simulation, this study has several limitations. First, we had to limit our simulation model to only include those intrinsic and extrinsic factors previously introduced as decisive for resource allocation decisions regarding exploitation and exploration. While this enables us to draw from existing theory when building our model, we are aware that we had to neglect other antecedents that may influence managers' decision making such as their individual work experience (e.g., Adner and Helfat, 2003) or age (e.g., Taylor, 1975). Second, the creation of a formal quantitative model requires assumptions regarding some parameters. While we have validated our assumptions based on established theory, we are aware that some parameters may differ between companies and industries, and encourage future research to study the outcome of managerial ambidexterity in different external settings. Third, we follow prior research on managerial ambidexterity and focus on the manager as an individual decision maker (e.g., Mom *et al.*, 2007). However, we are aware that some resource allocation decisions are taken by multiple individuals in top management teams. While not within the scope of this study, it would be a promising path for future research to examine how, for example, TMT composition and processes (e.g., Finkelstein, Hambrick, and Cannella, 2009) influence managerial and organizational ambidexterity over time. Finally, our propositions were derived from a conceptual, theory-based simulation model and thus require further empirical testing.

3.7 Appendix

Table 5: Selected Variables

Variable	Definition	Symbol	Unit
Resources for R&D	Amount of resources designated for research and development in any given period	B_t	Currency
Resources for exploitative innovations	Amount of R&D resources allocated to exploitative innovations in any given period	EI_t	Currency
Resources for explorative innovations	Amount of R&D resources allocated to explorative innovations in any given period	ER_t	Currency
Manager's inclination towards explorative innovations	Manager's individual preference for allocating R&D resources to explorative innovations	I_z	Dimensionless
Innovative products	Number of new, innovative products on the market in any given period	IP_t	Currency
Margin	Share in profits from innovative products (M^i) or mature products (M^j)	M	Dimensionless
Mature products	Number of existing, reworked products on the market in any given period	MP_t	Currency
Current profit	Amount of a firm's actual profits in the current period	P_t	Currency
Profit gap	Profit objective-current profit	PG_t	Currency
Profit objective	Amount of a firm's profit objective in the current period	PO	Currency
Fraction allocated to explorative innovations	Current fraction allocated to explorative innovations (based on the profit gap (α), historical fraction (β), and manager's inclination (γ).	RA_t^{ER}	Dimensionless
Historical fraction allocated to explorative innovations	Fraction allocated to explorative innovations ϕ quarters ago	$RA_{t-\phi}^{ER}$	Dimensionless
Sales	Amount of a firm's sales in the current period	S_t	Currency

Table 6: Selected Equations

Variable	Equation	Range/ Values	Unit of Measure
Sales	$S_t = IP_t * \Pr^i + MP_t * \Pr^j$	Pr^i = 275 – 1'760 Pr^j = 250 – 1'600	Currency/quarter
Current profit	$P_t = IP_t * \Pr^i * M^i + MP_t * \Pr^j * M^j$		Currency/quarter
Profit objective	$PO_t = P_{t0}(1+\tau)^t$	$1 \le \tau \le 1.5$	Percent/quarter
Manager's inclination towards explorative innovations	Scenario Variable	$0 \le I_z \le 1$	Dimensionless
Fraction allocated to explorative innovations	$RA_t^{ER} = \alpha * f^P_{(PG_t)} + \beta * RA^{ER}_{t-\phi} + \gamma * I_z$	$\alpha = \beta = \gamma = .33$	Dimensionless
Resources for explorative innovations	$ER_t = RA_t^{ER} * B_t$		Currency/quarter

Table 7: Parameters for Different Environmental Conditions[5]

Parameter	**Environmental conditions**		
	Stable	Moderate	Dynamic
Mature product obsolescence time (quarters)	25	10	5
Maturation time of innovative products (quarters)	10	6	2
Product price mature products (currency/widget)	250	470	1600
Product price innovative products (currency/widget)	275	517	1760

[5] The experiment includes different scenarios for model parameters in which the "mature product obsolescence time," "maturation time of innovative products," "product price mature products," and "product price innovative products" are varied using the values as specified in Table 7. We simulated 200 iterations in each condition in terms of environmental dynamism. The iterations differ in the realization of the manager's inclination towards exploration (Iz), which varies in the range [0;1] and follows a uniform distribution. The time horizon for each simulation is 80 quarters. Simulations were conducted with Vensim® software, version DSS 6.00, using Euler integration with a time step of 0.125 quarters. The results are not sensitive to the use of Runge-Kutta integration methods (RK2, RK4 and RK-Auto were tested) or smaller time steps.

4 Content Design of Acquisition Streams: Balancing Exploration and Exploitation[6]

Abstract:

In recent years, researchers have become increasingly interested in serial acquirers and the performance implications of their different types of acquisition sequences. While prior research has focused mostly on the externally observable structural characteristics of these sequences, we make a finer-grained distinction between explorative and exploitative acquisitions and examine how the timing of these different types acquisitions affects acquirer performance. Based on a sample of 21.264 acquisitions of 172 largest public U.S. firms during 21 years (1990 – 2010), we find that the temporal separation of explorative and exploitative acquisitions has a positive effect on acquirer performance and that engaging in different types of acquisition simultaneously has an inverted U-shaped effect on acquirer performance. We contribute to the existing research by putting forward a novel concept, the strategic content design of acquisition streams, and by providing novel empirical evidence on the performance of acquisition streams.

Keywords: Mergers & Acquisitions, Acquisition Streams, Exploration & Exploitation, Paradox,

[6] Luger, J. Zimmermann, A., Laamanen, T. 2013: This paper has been presented at the Academy of Management Annual Meeting 2013 (Orlando), the Strategic Management Society International Conference 2012 (Prague), the Strategy Research Colloquium 2013 at Aalto University, at the Global Junior Faculty Development Program 2013 at the Wharton School, and the CORE Research Workshops 2011 and 2012 (Geneva).

4.1 Introduction

In recent years, scholars have become increasingly interested in serial acquirers and the performance implications of their different types of acquisition sequences (e.g., Barkema and Schijven, 2008b; Laamanen and Keil, 2008; Shi and Prescott, 2011; Shi, Sun, and Prescott, 2012). While prior research found that individual acquisitions tend to have a negative, or at best a neutral, effect on a firm's performance (Haleblian, Devers, McNamara, Carpenter, and Davison, 2009; King, Dalton, Daily, and Covin, 2004), there is also some indicative evidence that systematically managed acquisition streams aimed at implementing a firm's strategy can have positive longer-term effects on firm performance (Chatterjee, 2009; Laamanen and Keil, 2008; Rovit and Lemire, 2003; Schipper and Thompson, 1983).

In order to better understand the performance implications of acquisition streams, researchers have studied the timing of acquisitions both in relation to each other (Hayward, 2002) and in relation to acquisition waves (Haleblian, McNamara, Kolev, and Dykes, 2012; McNamara, Haleblian, and Dykes, 2008), the rate and variability of the rate at which acquisitions are performed (Laamanen and Keil, 2008; Vermeulen and Barkema, 2002), and the implications of different acquisition sequence patterns (Shi and Prescott, 2011). However, despite the important progress that has been done, research on acquisition streams has been relatively silent on acquisition motives. At the same time, however, it is well established that there is a diversity of acquisition motives (Trautwein, 1990) and calls have been made that different types of acquisitions should be managed differently (Bower, 2001). We extend the existing research by making a distinction between explorative and exploitative acquisitions and by incorporating this distinction into an analysis of the performance of serial acquirers' acquisition streams.

Even though there are a number of acquisition motives that have been identified in prior research (Haleblian *et al.*, 2009), the distinction between exploitative and exploratory acquisitions is one of the most central ones (Karim and Mitchell, 2000; March, 1991). Most prior work suggests a trade-off between the two, arguing that acquisitions can have either an explorative strategic intent to enter new market, product, or technology areas (Karim and Mitchell, 2000; Lee and Lieberman, 2010), or an exploitative strategic intent to enhance a firm's scale or scope and to strengthen its market position (Biggadike, 1979; Lee and Lieberman, 2010).

Prior research has also emphasized the importance of being able to balance between exploration and exploitation (e.g., March, 1991) and developed different ways of realizing it. Some of the most prominent of these include the creation of an ambidextrous organization (Gibson and Birkinshaw, 2004; Jansen *et al.*, 2009; O'Reilly and Tushman, 2008b; Raisch and Birkinshaw, 2008; Raisch *et al.*, 2009) and vacillation over time (Boumgarden *et al.*, 2012). Despite these advances in the intra-firm context, there are no prior studies that would have examined how to reconcile exploration and exploitation motives in a firm's acquisition activity.

In order to develop an understanding of the effects of exploration and exploitation in acquisition streams, we rely on previous theoretical insights from the intra-firm context and three balancing modes – temporal differentiation, structural differentiation, and contextual integration – suggested by different scholars in prior research to reconcile the conflicting demands of exploration and exploitation (Raisch and Birkinshaw, 2008; Simsek *et al.*, 2009). By applying these in the context of acquisitions streams allows us to study, what is the most effective way to resolve the conflicting requirements of the different types of acquisitions.

Based on a sample of 21.264 acquisitions of 172 active U.S. acquirers during 21 years (1990 – 2010), representing the 200 largest U.S. firms in the Global Fortune 500 list, we find that temporal separation of exploration and exploitation-oriented acquisitions within an acquisition stream, contributes positively to acquirer performance. This is consistent, for example, with the recent findings on the higher performance of firms that vacillated between renewal and efficiency oriented strategies over time (Boumgarden *et al.*, 2012).On the other hand, in acquisition streams that combine exploration and exploitation motives at the same time through parallel acquisitions, the co-existence of the two motives is related to acquirer performance in an inverted U-shaped manner. It would seem that doing both exploration and exploitation simultaneously contributes positively to performance, but that there are limits to the complexity that a firm can manage. Finally, we hypothesize that the co-existence of multiple motives in an individual acquisition is negatively related to acquirer performance, but do not find statistically significant support for it.

Building on our findings, we put forward a novel concept, the strategic content design of acquisition streams. It is defined as the combination of the strategic objectives acquisition and the way they are implemented within and across

transactions in an acquisition stream. We contribute to the prior research on acquisition streams that has examined the performance effects of acquisitions without distinguishing between the different types of acquisitions. In addition, our use of the different structural balancing modes used in prior research for studying the balance of exploration and exploitation in an intra-organizational context allows us to also complement the prior research on exploration and exploitation in the intra-organizational context by showing that the optimal balance may depend on the balancing mode.

4.2 Theoretical Background

The performance of acquisition streams has attracted increasing attention from acquisition researchers in recent years (Haleblian, Kim, and Rajagopalan, 2006; Hayward, 2002; Laamanen and Keil, 2008; Shi and Prescott, 2011). It has, for example, been found that acquisitions tend to lead to further acquisitions (Haleblian *et al.*, 2006) and that a predictable and steady rhythm of acquisitions is positively related to acquirer performance (Laamanen and Keil, 2008; Shi and Prescott, 2011). Predictability and stability have been argued to support the development of acquisition routines (Laamanen and Keil, 2008), the coordination of learning processes across repeated acquisitions (Hayward, 2002), and the effective utilization of scarce managerial attention (Laamanen and Keil, 2008). In contrast, the rate of acquisitions has been found to be negatively related to acquirer performance. A high rate of acquisitions has been argued to lead to time compression diseconomies (Dierickx and Cool, 1989) and indigestion (Kusewitt, 1985), making an acquirer unable to accumulate capabilities and manage its acquisitions efficiently (Laamanen and Keil, 2008; Vermeulen and Barkema, 2002).

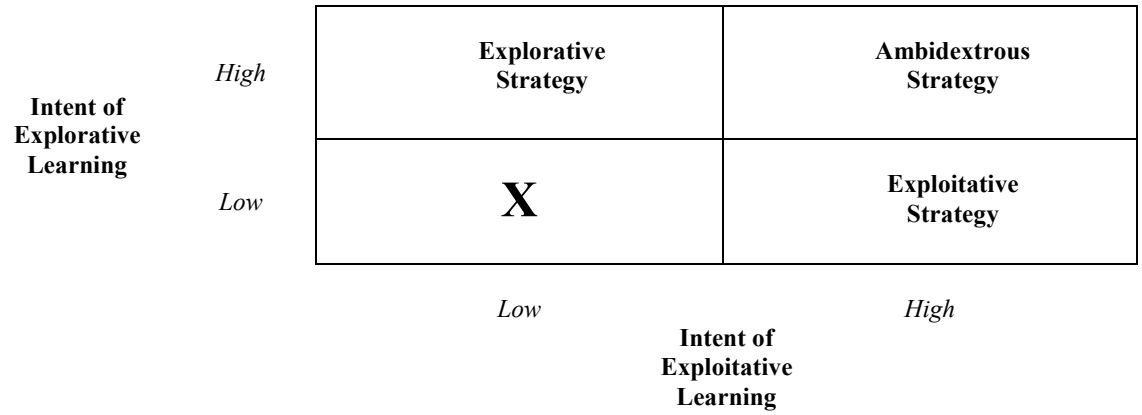
In addition, scholars have also examined the different contingencies that could affect the performance of acquisition streams. For example, Shi and Prescott (2011: 1064) highlight the effects of "liability of newness and smallness", arguing that inexperienced and small firms might find it more challenging to benefit from steady acquisition rates. To our surprise, however, research on serial acquirers has not distinguished between different acquisition motives even though the research on acquisition capabilities has extensively discussed the different learning implications of different types of acquisitions (Barkema and Schijven, 2008a; Haleblian and Finkelstein, 1999). This is particularly noteworthy also taken into account the calls for

better distinguishing between different acquisitions and acquisition motivations (e.g. Bower, 2001).

4.2.1 Strategic Motives of Acquisition Streams

While there are a number of different ways to distinguish between different acquisition motives, one of the most common ones is to distinguish between exploration and exploitation (Karim and Mitchell, 2000; Keil, 2004; Uotila *et al.*, 2009). On the one hand, acquisitions may enable firms to engage in exploratory learning by adopting new technologies or products (e.g., Ahuja and Katila, 2001), to enter new industries (e.g., Finkelstein and Haleblian, 2002), or to expand geographical presence (e.g., Hennart and Reddy, 1997). On the other hand, acquisitions may serve to foster efficiency through the improvement of a firm's existing product bases (e.g., Amburgey and Miner, 1992), the penetration of existing industries (e.g., Prager, 1992), or the strengthening of an existing geographical presence (e.g., Baum *et al.*, 2000). As an acquisition stream includes multiple acquisitions, its content design be either explorative, exploitative, or a combination of the two (For an illustration, see Figure 11).

Figure 11: Strategic Objectives of Acquisition Streams



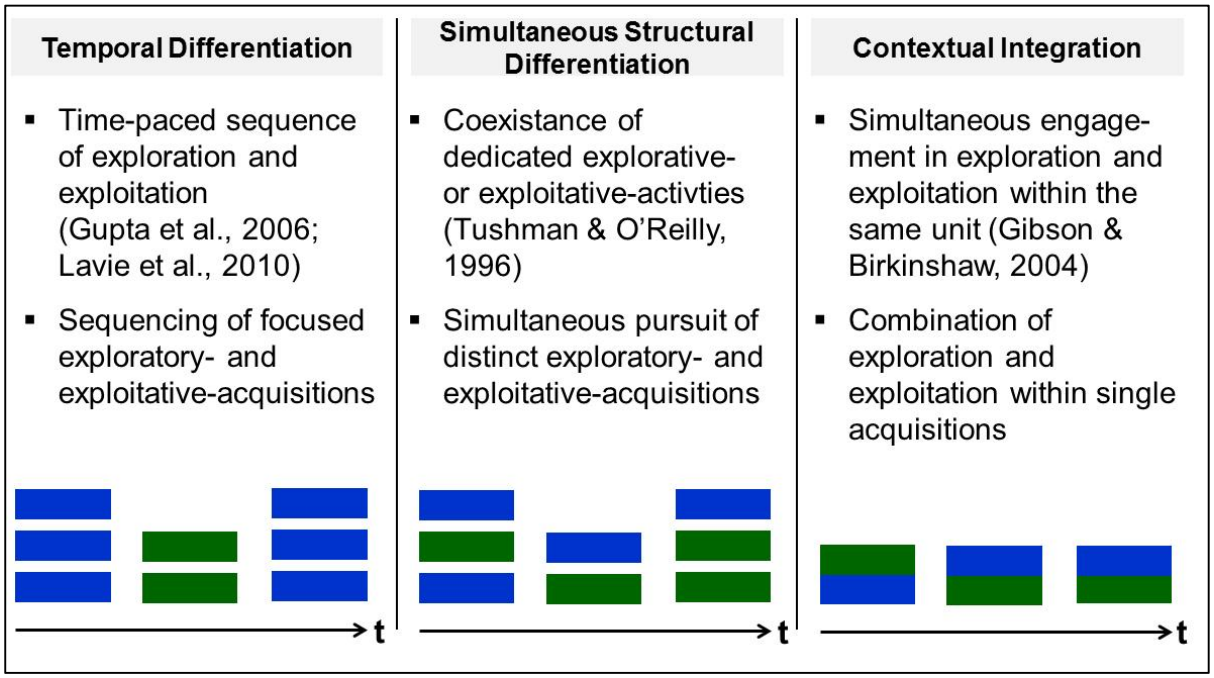
Explorative and exploitative acquisition motives have complementary strengths and weaknesses. Explorative acquisitions contribute to a firm's R&D output (Hitt, Hoskisson, Ireland, and Harrison, 1991) and longer term performance (Ahuja and Katila, 2001; Graebner, 2004; Nicholls-Nixon and Woo, 2003; Puranam *et al.*, 2006), but they also may be associated with short-term performance declines. In contrast,

exploitative acquisitions tend to improve short-term performance through economies of scale and scope, but they can also impede a firm's long-term performance due to the higher investments required for consolidation and possible inertia and rigidities caused by the resulting larger size (Capron, 1999; Flanagan, 1996).

4.2.2 Balancing Modes for Explorative and Exploitative Acquisitions

Given their complementary nature, combining explorative and exploitative strategies in an acquisition stream may be more beneficial than solely focusing on one or the other. However, due to the conflicting nature of the motives, there are may also be difficulties associated to the simultaneous pursuit of both objectives. In order to shed light on how to mitigate the challenges of combining explorative and exploitative learning objectives in an acquisition stream, we build on the theoretical insights of prior research on organizational ambidexterity and adopt three balancing modes that may be deployed to reunite explorative and exploitative acquisitions: temporal differentiation, structural separation, and contextual integration. Figure 12 provides an illustration of the conceptual idea of these balancing modes in the context of acquisition streams.

Figure 12: Balancing Modes



Temporal separation. In general terms, temporal differentiation refers to the pursuit of conflicting activities at different points of time. Applied to the exploration-exploitation trade-off, firms may cycle through periods of pure exploration or pure exploitation. The idea of temporal differentiation is grounded in the literature on punctuated equilibrium (Gersick, 1991; Tushman and Romanelli, 1985). It argues that, during periods of exploration, firms discover new technologies or innovations that are subsequently commercialized during periods of exploitation (Rothaermel and Deeds, 2004). Over recent years, a number of studies referred to the concept of temporal differentiation describing it using notions such as cycling (Nickerson and Zenger, 2002), temporal separation (Lavie *et al.*, 2010), or sequential exploration and exploitation (Raisch *et al.*, 2009).

Structural differentiation. Rather than balancing exploration and exploitation across time, structural differentiation is aimed at resolving the exploration-exploitation tension through spatial separation (Tushman and O'Reilly, 1996). On the organizational level, this can be achieved, for example, by establishing structurally separated explorative and exploitative units (Benner and Tushman, 2002, 2003; Lavie *et al.*, 2010). In the acquisition context, structural differentiation refers to an acquisition stream, where each single acquisition has a dedicated focus, either explorative or exploitative. Even though none of the individual acquisitions combine explorative and exploitative motives, on the acquisition stream level the acquisition stream as a whole contributes to the fulfillment of both objectives. Following a similar kind of logic of reasoning, Chatterjee (2009) provides a detailed account on how Oracle and Nestlé compiled multiple different acquisitions to create a coherent overall program.

Contextual integration. Doing exploration and exploitation at the same time in the same domain is one of the most challenging tasks for firms (Raisch and Birkinshaw, 2008). Yet, it has been argued that the design of a behavioral context, characterized by discipline, stretch, support, and trust may enable firms to host the challenges of both conflicting objectives within the same unit (Gibson and Birkinshaw, 2004). In the context of acquisition streams, contextual integration refers to the combination of explorative and exploitative objectives at the same time and in the same acquisition. In other words, contextual integration means that an acquirer engages in acquisitions that in themselves have both explorative and exploitative motives. It well established in prior acquisition research that an individual acquisition can have multiple motives that

can in some cases even be conflicting with each other (Bergh, 1997; Rao, Mahajan, and Varaiya, 1991; Walter and Barney, 1990) and lead to ambiguity when managing the acquisition integration process (Cording, Christmann, and King, 2008; Vaara, 2003).

4.3 Hypotheses

Karim and Mitchell (2000: 1079) argued that firms commonly engage in acquisitions "*either for close reinforcement of existing skills or for substantial jumps into new skill sets*". Consistent prior research on exploration and exploitation in intra-organizational (e.g. Simsek *et al.*, 2009) and alliance contexts (e.g. Lavie *et al.*, 2011), our baseline hypothesis is that combining explorative and exploitative strategies in an acquisition stream combines the best of both worlds resulting to higher acquirer performance. Doing purely explorative acquisitions could sacrifice the efficiency and scale improvement opportunities in the core business while consuming the money generated by it. On the other hand, going entirely for scale driven acquisitions could sacrifice the renewal opportunities of explorative acquisitions.[7]

The benefits of the different types of acquisitions can be argued to be complementary. Explorative acquisitions improve a firm's R&D output (Hitt *et al.*, 1991) fostering longer term performance (Ahuja and Katila, 2001; Graebner, 2004; Nicholls-Nixon and Woo, 2003; Puranam *et al.*, 2006). Exploitative acquisitions strengthen a firm's core through economies of scale and scope (Capron, 1999; Flanagan, 1996). Moreover, a mixed set of explorative and exploitative acquisitions can also be argued to optimize a firm's overall acquisition capability development as it exposes it to a balanced set of knowledge of different kinds of acquisitions. In line with this argument, Hayward (2002) found that firms can best learn from acquisitions that are neither too-homogenous nor too-heterogeneous. Thus, we state our baseline hypothesis as follows:

H1: Combining both explorative and exploitative acquisitions in an acquisition stream has a positive effect on subsequent firm performance.

[7] While one could also complement exploratory (exploitative) acquisitions with a stronger exploitative (exploratory) emphasis in internal development, if a stream of acquisitions is acquired with a purely explorative or exploitative focus it will gradually start changing also the internal balance as the acquired firms are integrated organizationally.

While our baseline prediction is that balancing between explorative and exploitative acquisition motivations contributes to higher acquirer performance, the performance effects are likely to differ depending on how this is realized. We will next proceed to put forward our hypotheses on three alternative ways to create this balance: temporal differentiation, structural differentiation, and contextual integration. These three ways of achieving the balance between exploration and exploitation oriented acquisitions in an acquisition stream bear resemblance to what prior literature on organizational ambidexterity has labeled as cyclical or temporal, partitional or structural, and harmonic or contextual ambidexterity (Simsek *et al.*, 2009).

Temporal differentiation. In general, temporal differentiation between exploration and exploitation oriented actions can be argued to be beneficial for a firm as it evades the conflicting pressures of exploration and exploitation through their chronological breakdown (Lavie and Rosenkopf, 2006). It creates capability development and efficiency benefits as it allows the firm to concentrate on optimizing its acquisition screening criteria and integration processes only on acquisition type at one time. While explorative learning acquisitions tend to require specialized processes and practices for integration in order to ensure that the intellectual capital is not lost and innovator productivity is not threatened (Kapoor and Lim, 2007; Puranam, Singh, and Chaudhuri, 2009; Puranam *et al.*, 2006; Puranam and Srikanth, 2007a), exploitative acquisitions require a constant focus of resource recombination and efficiency improvements in order to ensure synergy realization (Capron, 1999; Capron and Hulland, 1999; Capron, Mitchell, and Swaminathan, 2001; Fee and Thomas, 2004). The styles for managing these different kinds of acquisitions are so different that by optimizing in each time period for a particular acquisition type could be expected to contribute to higher overall performance in an acquisition stream.

This argumentation is also be consistent with the prior literature on acquisition capability development. Haleblian and Finkelstein (Finkelstein and Haleblian, 2002; Haleblian and Finkelstein, 1999) demonstrate that a firm's acquisition capabilities tend to develop over time through a process of experience transfer where experiences from previous acquisitions are used to perform subsequent ones. When a firm's acquisitions are similar than its previous ones, the experience transfer can be expected to be beneficial, but when the new acquisitions differ significantly from the earlier ones, acquirer performance can be expected to be significantly impaired before the acquirer has developed a sufficient diversity of acquisition experiences.

We extend the argument of Haleblian and Finkelstein and argue that when a firm paces its different types of acquisitions over time in streams of mutually similar acquisitions, the problems of negative experience transfer are contained to the time periods in which the shift happens. In the sub-periods, however, the acquirer can then develop specialized acquisition practices that are more optimized for a particular acquisition type than would ever be possible if the acquisition types would constantly change. Therefore, we argue that, despite the potentially negative effects that could occur when shifting from one acquisition type to another, the benefits of specialization and optimization of a firm's capabilities and attention to only one acquisition type in one time period can be expected to be so significant that they outweigh the negative effects. We find support for this line of reasoning also from outside the acquisition context from the prior research on organization vacillation according to which the temporal separation of efficiency and renewal oriented strategies contributes positively to a firm's longer term performance (e.g., Boumgarden *et al.*, 2012). Summarizing our argumentation, we hypothesize as follows.

H2: The temporal differentiation of explorative and exploitative acquisitions over time in an acquisition stream has a positive effect on subsequent firm performance.

Structural differentiation. Another way to manage the different needs of different types of acquisitions is to separate them structurally so that one part of the organization engages in exploratory and another part in exploitative acquisitions. The advantage of balancing exploration and exploitation across multiple subunits has been argued to stem from the avoidance of the exploration-exploitation conflicts (O'Reilly and Tushman, 2004).

In the context of acquisitions, we argue that simultaneous engagement of explorative and exploitative acquisitions has an inverted U-shaped effect on subsequent firm performance. When engaging in the different types of acquisitions simultaneously, it is possible to structurally contain and buffer the complexity in a large organization to some extent, by having different integration teams and different divisions responsible for the acquisitions, but the more there are such acquisitions in parallel, the harder it becomes to contain the organizational complexity even in a large organization (e.g. Laamanen and Keil, 2008).

Consistent with this line of reasoning, prior research has found that when a firm simultaneously engages in multiple acquisitions that either foster exploration or exploitation, it might burden a firm's capacity to successfully complete each acquisition successfully (Ranft and Lord, 2002). The engagement in multiple different acquisitions might also expose a firm to over-complexity. Given that even a single acquisition is a complex event (Chaudhuri, Iansiti, and Tabrizi, 2005), firms can be expected to struggle to accommodate the different requirements and needs of diverse types of acquisitions. Accordingly, we suggest that firms may benefit from a combination of explorative and exploitative acquisitions as long as the complexity does not become unmanageable. Thus, we conclude by hypothesizing an inverted U-shaped effect:

H3: The structural differentiation of explorative and exploitative acquisitions in an acquisition stream has an inverted-U-shaped effect on subsequent firm performance.

Contextual integration. Contextual integration refers to the capacity to pursue exploration and exploitation in the same business unit at the same point in time (Gibson and Birkinshaw, 2004; Lavie et al., 2010). Even though such integration has been found to have positive effects in business units (e.g., Gibson and Birkinshaw, 2004) and small and medium-sized enterprises (Lubatkin *et al.*, 2006) when carefully managed, we argue that the integration of explorative and exploitative objectives within a single acquisition has a predominantly negative effect on subsequent firm performance. While acquisitions already in themselves require a careful approach to ensure the realization of the targeted benefits, the existence of multiple competing motives is likely to increase this difficulty even further. In line with this reasoning, Ambrosini, Bowman, and Schoenberg (2011: 174) found that acquisitions with a single value creation strategy perform significantly better than those that seek to implement multiple value creation strategies simultaneously.

We see the core challenge in combining exploration and exploitation motives in one acquisition in integration management. It is hard to optimize the integration process for ensuring the learning benefits and employee retention when there is also a need to ensure the elimination over overlaps in order to maximize efficiency. Explorative acquisitions tend to require separation and knowledge sharing while exploitative acquisitions tend to benefit from a faster and tighter integration. The co-existence of these pressures in the integration process can impair cultural assimilation (Nahavandi

and Malekzadeh, 1988), information sharing (Yu, Engleman, and Van de Ven, 2005), and the ability to successfully leverage the acquired firm's technology (Puranam and Srikanth, 2007b). As a consequence, we conclude by hypothesizing:

H4: The contextual integration of explorative and exploitative acquisitions in an acquisition stream has a negative effect on subsequent firm performance.

4.4 Methodology

In order to test our hypotheses, we compiled a sample of the largest 200 publicly listed Global Fortune 500 companies, covered over a period of 21 years (1990 – 2010). We selected the Global Fortune 500 ranking list from 1999 to reduce potential survivor bias. For concerns of data availability, we excluded all private companies to arrive at a final sample of 172 firms covered over a period of 21 years. In total, we analyzed 21.264 acquisitions that were carried out during this time. We derived the data on acquisitions from the Thomson Financial M&A database and complemented it with accounting and stock market data from Compustat and Datastream.

4.4.1 Dependent Variables

We chose return on assets (RoA) as our main dependent variable. Rather than selecting a short-term window event research design, we used long-term accounting measures to address the long-term performance effects of exploration and exploitation (see e.g., Lavie *et al.*, 2010). Similar to prior research on acquisitions (e.g., Zollo and Singh, 2004) we used a firm's industry adjusted net income scaled by firm total assets in the three years following the year of the focal acquisition program to assess firm performance. We tested the reliability of our performance measure by drawing on several other accounting performance measures such as return on equity or return on capital employed (Zollo and Meier, 2008).

4.4.2 Independent Variables

Our analyses include four core independent variables: the co-existence of exploration and exploitation in an acquisition stream and the three different ways to realize it through temporal differentiation, structural separation, or contextual integration. All independent variables are based on the assessment of each individual acquisition's exploration-orientation (x_i). In this measurement, we follow the prior

work by Lavie and Stettner (2011), who developed a measure to assess an single acquisition's degree of exploration. The measure is based on the target firm's (1) industry and (2) international presence and how they compare to the acquirer.

Industry exploration. Consistent with prior research (Vermeulen and Barkema, 2001; Yip, 1982), measured industry exploration by comparing the acquirer's and target's industry presence. If the target firm has the same 4-digit SIC code than the acquirer, the indicator for this transaction's industry exploration receives a value of "0". For a target with a primary SIC code different from the acquirer, the indicator receives a value of "1" if the first 3-digit SIC code is equal, a value of "2" if the 2-digit SIC code is equal, a value of "3" if the 1-digit SIC code is equal, and a value of "4" if the target firm operates in an entirely unrelated industry.

International exploration. International exploration is captured by cultural, geographical, institutional, and economic national differences between the firm's home country and the home country of its acquisition target (Ghemawat, 1991). Information on the targets' countries of origin was extracted from the SDC database and cross-national cultural distance was measured using Kogut and Singh's (1988) composite index of Hofstede's (1984) culture dimensions of uncertainty avoidance, individuality, tolerance of power distance, and masculinity-femininity. The cultural distance between country c and the acquirer's home country is indicated by CDj= $\frac{1}{4}\sum_{d=1}^{4}(I_{dc} - I_{du})^2/V_d$, where I_{dc} is the value of the Hofstede Index for cultural dimension d of country c, u indicates the acquirer's home country, and V_d represents the inter-country variance of the Hofstede Index along dimension d. Geographical distance was be measured with the average city-to-city great-circle distance in kilometers between the acquirer's home country capital and the capital of the target's home country. Institutional distance will be measured using World Bank data that offer six aggregate country governance indicators: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufmann, Kraay, and Mastruzzi, 2007). For each of the k = 6 indicators GI_k, institutional distance was measured using the formula $|GI_{kc} - GI_{ku}|$, where c refers to the targets' countries of origin and u indicates the acquirer's home country. Finally, economic distance based on the World Bank's World Development Indicators was calculated using the absolute GDP_{pc} difference between the target's country of origin and the acquirer's home country. Finally, the composite

international exploration measure was constructed based on the factor score derived from the above nine indicators.

In order to get a combined measure for a given acquisition's exploration-orientation, we combined the industry exploration and international exploration measures for each acquisition. After normalizing this compound measure, we were able to rate each acquisition on a continuous scale from purely exploitative (x_i=0) to purely explorative (x_i=1). Our measure of overall *acquisition ambidexterity* of an acquisition stream was then based on the arithmetic average of all acquisition's exploration-orientations during the considered acquisition streams. In line with prior empirical work using an exploration-exploitation continuum, we measured it as the interaction term of an acquisition stream's average exploration- and exploitation-orientation (x_i * (1-x_i)) (He and Wong, 2004). Acquisition ambidexterity received its highest values (x_i=0.25) if there is an exploration-exploitation balance within a firm's acquisition stream and lowest values (x_i=0) if firm's engage in exploration- or exploitation-focused acquisition streams. Acquisition ambidexterity, thus, distinguished balanced from focused acquisition streams, regardless of the specific exploration-exploitation balancing mode. The different balancing modes were then labeled as *temporal differentiation*, *structural separation*, and *contextual integration* and calculated as follows:

Temporal differentiation. Temporal differentiation refers to the execution of focused exploration- and exploitation-oriented acquisitions at different points in time. The formula below operationalizes the concept of temporal differentiation (TD), based on an exploration-exploitation score calculated for each single acquisition within an acquisition stream. Temporal differentiation compares the average exploration-exploitation orientation at two subsequent points in time (t-1 and t). It takes its highest values (TD = 1) as firms cycle through periods of pure exploration (or exploitation) followed by pure exploitation (or exploration). Conversely, it takes its lowest values (TD = 0) if firms keep a constant level of their acquisitions' exploration-exploitation orientation over time. Finally, it takes medium values (e.g. TD = .5), if firms alter their acquisitions' exploration-exploitation orientation over time, yet without cycling through the extreme values.

$$\mathrm{TD} = \left(\left(\frac{\sum_i^n x_i^t}{n} \right) - \left(\frac{\sum_i^n x_i^{t-1}}{n} \right) \right)^2$$

Structural separation. We operationalize structural separation (SD) as the composure of single acquisition's explorative- and exploitative-orientation within an acquisition stream. SD takes highest value (SD = 0.5) when firms compose perfectly exploration-oriented (x_i=1) and exploitation-oriented acquisitions (x_i=0) within an acquisition stream. It receives its lowest values (SD = 0) when firms engage in a one-sided acquisition stream (i.e. either explorative or exploitative acquisitions), or if firms execute unfocused acquisitions that show no clear dedication to either exploration or exploitation (x_i=0.5). SD takes medium values (e.g., SD=0.21) for firms balancing explorative- and exploitative-acquisitions that are, by themselves, not fully focused on exploration or exploitation (e.g., x_1=0.2 and x_2=0.8).

$$SD = \left(0.5 - \left|\frac{1}{n}\sum_{i=1}^{n} xi - 0.5\right|\right)\left(\frac{1}{n}\sum_{i=1}^{n}\frac{|xi - 0.5|}{0.5}\right)$$

Contextual integration. Finally, we operationalize contextual integration (CI) through a single acquisition's explorative and exploitative-orientation within an acquisition stream. The formula below gives a detailed account of how the concept of contextual integration is operationalized. CI receives its highest values (CI=0.25) when firms execute fully exploration-exploitation balanced acquisitions (x_i=0.5) in their acquisition program and lowest values when firms engage in acquisitions that are, by themselves, unbalanced (e.g. x_i=0 or x_i=1), irrespectively of whether a balance is achieved across acquisitions (e.g. x_1=0 and x_2=1: CI=0).

$$\mathrm{CI} = \frac{\sum_{i=1}^{n}(x_i \times (1 - x_i))}{n}$$

4.4.3 Control Variables

We included seven main variables to control for the known effects that have been found in prior research: prior acquirer performance, acquirer size, acquisition activity, acquisition experience, acquirer leverage, degree of acquirer diversification, and degree of acquirer internationalization. Furthermore, we included year-fixed effects to control for time-dependent effects. *Prior performance* is regarded as one of the most important predictors regarding a firm's long-term performance (Carpenter and Sanders, 2002). We included lagged RoA instrumental variables due to correlated error terms arising from our dependent variable. *Acquirer size* was defined as log of

assets of the acquiring firm at the end of the year of the focal period. Size was selected because larger companies have more resources, which may enhance the performance of acquisitions (Barkema, Bell, and Pennings, 1996; Laamanen and Keil, 2008). Logarithmic transformation was adopted because the distribution of assets violates the normality assumption of regression analysis.

Acquisition activity was measured as the log of the total acquisitions executed by the acquirer in the focal period. We included acquisition activity since previous studies repeatedly reported the negative performance effects of acquisitions for the acquiring firm (Haleblian *et al.*, 2009). *Acquisition experience* was defined as the total number of acquisitions that an acquirer has conducted in the three years prior to the focal acquisition program. as a proxy for acquisition capability. Finally, we included *acquirer leverage* in our analysis as it was found to have a negative impact on M&A performance (Barkema and Schijven, 2008b). Acquirer leverage was defined as the total long-term debt of the acquirer divided by the total assets in the focal year. Finally, *acquirer diversification* and *internationalization* were found as important determinants of a firm's acquisition behavior (Anand, Capron, and Mitchell, 2005; Barkema and Vermeulen, 1998). We calculated them in accordance to Jacquemin and Barry's (1979) entropy measure.

4.4.4 Data Analysis

In order to test our hypotheses, we adopted an Arellano-Bond dynamic panel data model (Arellano and Bond, 1991; Blundell and Bond, 1998). The generalized method of moments (GMM) estimator includes lagged dependent variables as instruments, together with the moment conditions of lagged differences as instruments for the level equation (Arellano and Bond, 1991; Halaby, 2004). Due to its specific characteristics, the GMM estimator seems to be suitable for our research design for several reasons.

First, firm performance tends to correlate over time (e.g., Carpenter and Sanders, 2004; Jacobsen, 1988). Roberts and Dowling (2002: 1077), for example, claim that 'financial performance persists over time', so that, including lagged performance measures to our estimation equation may hurt the normality assumption of residuals. Given the potential threat of autocorrelation in our analysis, the GMM estimator allows, through the inclusion of instrument variables, for the correction of autocorrelation (Wooldridge, 2010). The inclusion of instrument variables might

further help us to deal with potential endogeneity (Roodman, 2006). Scholars mentioned that firms might modify their acquisition behavior based on their performance situation, so that our research design might suffer from potential reverse causality (Shaver, 1998). Next, the GMM estimator is designed for samples with limited amounts of time periods and multiple firm observations, thereby overcoming the finite sample bias for panels (Roodman, 2006). Finally, the robust GMM estimator provides estimates that are robust to the presence of potential heteroskedasticity. We adopted a robust two-step difference GMM estimator with the Windmeijer corrected standard errors to correct for the downward bias on standard errors (Arellano and Bond, 1991; Blundell and Bond, 1998). The difference GMM estimator additionally allowed us to control for potential firm-specific omitted variable bias, as unobserved firm fixed effects are excluded through first-differencing (Bowen and Wiersema, 1999).

With respect to model specification we used the Arellano Bond test for autocorrelation to verify the choice of dynamic panel data estimation, including the use of instruments for our lagged dependent variable. As indicated in Table 9, first order serial correlation is indicated (AR 1), whereas the error terms for the second order are serially uncorrelated (AR 2). We treated the lagged dependent variable as endogenous and used all available lags as instruments, but collapsed the instrument matrix to prevent instrument proliferation (Roodman, 2008b). The Difference-in-Sargan test rejected the hypothesis that a firm's acquisition activity can be considered exogenous, so it was treated as predetermined, which was not rejected by the Difference-in-Sargan. Overall, we conducted a Hansen test to evaluate the validity of instrumental variables (Roodman, 2008b). As pictured in Table 9, the Hansen P-values of over-identifying restrictions for the five models are larger than the 5% significance level, indicating that our model's instrument variables are valid.

4.5 Results

4.5.1 Main Analysis

Table 8 provides the descriptive statistics for all the variables of this study. The correlations indicate that multicollinearity is not a serious problem to our analyses. We verified this by additionally calculating the variance inflation factors (VIF). The results (the highest value of VIF = 2.85) further confirmed that multicollinearity is not a major concern. Table 9 provides the results from our hypothesis tests. Model 1 provides our control variables only, whereas the separated main effects from our four independent variables are displayed in models 2 through 5. Finally, model 6 represents the full model, where the main effects of all balancing modes are included simultaneously. Each of the models in Table 2 report a Wald χ^2 test for overall model fit showing that the variables are jointly significant in models 1 through 6, and that each model is a significant improvement over the control model.

Table 8: Descriptive Statistics

		Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	LT-performance	0.0193	0.0558	1											
(2)	Temporal differentiation	0.0221	0.0466	-0.04+	1										
(3)	Simulataneous structural differentiation	0.1156	0.0525	0.08***	-0.11***	1									
(4)	Contextual integration	0.1753	0.0566	-0.04	-0.19***	-0.10***	1								
(5)	Acquisition ambidexterity	0.2061	0.0556	-0.02	-0.19***	0.25***	0.85***	1							
(6)	Diversification	0.7666	0.5949	-0.01	-0.13***	0.08***	0.16***	0.14***	1						
(7)	Firm size (log)	9.5182	1.1749	0.02	-0.12***	0.10***	0.09***	0.10***	0.16***	1					
(8)	Firm leverage	0.6516	0.1911	-0.46***	0.01	-0.08***	0.16***	0.14***	0.10***	0.13***	1				
(9)	Industry instability	0.8294	0.416	-0.15***	0.06**	-0.09***	0.08***	0.04+	-0.17***	0.08**	0.02	1			
(10)	Internationalization	0.5879	0.492	0.20***	-0.06*	0.28***	0.10***	0.12***	0.25***	0.07**	-0.11***	-0.20***	1		
(11)	Acquisition activity (log)	1.4688	1.0322	0.17***	-0.26***	0.15***	0.16***	0.19***	0.28***	0.23***	-0.01	-0.16***	0.17***	1	
(12)	Acquisition experience	18.284	29.185	0.08**	-0.19***	0.09***	0.15***	0.16***	0.30***	0.33***	0.15***	-0.11***	0.14***	0.66***	1

N=1678 + p<0.10 * p<0.05 ** p<0.01 *** p<0.001

Model 2 in Table 9 provides the test of our Hypothesis 1. We argued that the combination of exploration and exploitation in an acquisition stream is superior to engaging in an exploration or exploitation-focused stream. The positive sign of acquisition ambidexterity in model 2 supports this baseline assumption, but coefficient remains insignificant ($\beta = .14$; $p < .15$). In order to test Hypothesis 2, we regressed temporal differentiation in a firm's acquisition stream on subsequent long-term firm performance. As shown in model 3, temporal differentiation in acquisition streams has a statistically significant positive effect on firm performance ($\beta = .20$; $p < .01$). It also continues to be significant level in the full model (model 6: $\beta = .23$; $p < .05$).

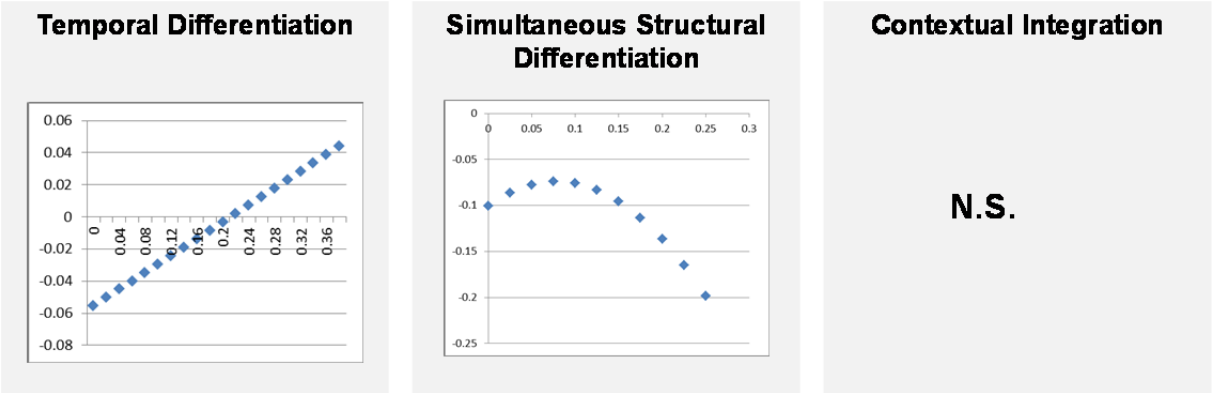
Hypothesis 3 predicted an inverted U-shaped relationship between the structural separation of explorative and exploitative acquisition and the subsequent firm performance. Model 4 provides support for this relationship ($\beta_{(main)} = .28$; $p < .05$; $\beta_{(sq)} = -.19$; $p < .05$). In order to visualize the relationship, we plotted the extreme points by using the unstandardized beta coefficients. Figure 13 shows the plot and, in combination with a scatter plot of the actual data, we conclude that the relationship is indeed a U-shape instead of a concave drift. Moreover, we ran regressions for both coefficients individually: Both coefficients were individually significant and showed the expected signs. The results for Hypothesis 3 weaken in the full, model, but remain still at a moderate significance level when tested in the full model ($\beta_{(main)} = .28$; $p < .1$; $\beta_{(sq)} = -.19$; $p < .1$). Finally, in Hypothesis 4 we predicted a negative relationship between the contextual integration of explorative and exploitative motives in individual acquisitions. As depicted in model 5, the coefficient shows a negative sign, but the effect is non-significant ($\beta = -.02$; $p < .8$). We are thus unable to provide support for Hypothesis 4.

Table 9: GMM Regressions

	(1) LT - performance	(2) LT - performance	(3) LT - performance	(4) LT - performance	(5) LT - performance	(6) LT - performance
LT - performance (lag)	0.6432***	0.6298***	0.4662***	0.6396***	0.6493***	0.5296***
Diversification	-0.0144	-0.0349	-0.0157	-0.0383	-0.0166	-0.0282
Firm size (log)	0.0389+	0.0344	0.0359	0.0081	0.0418+	0.0146
Internationalization	0.0366+	0.0222	0.0511	-0.0092	0.0528*	-0.0053
Acquisition activity (log)	-0.0091	-0.0325	0.0390	-0.1030	-0.0512	-0.0616
Acquisition experience	0.0181	0.0165	0.0339	0.0424	0.0344	0.0568
Firm leverage	-0.0921**	-0.1032**	-0.1446***	-0.0722*	-0.0836*	-0.1069*
Industry instability	-0.3369	-0.4545	-0.0460	-0.0941	-0.2083	-0.0107
Acquisition ambidexterity		0.1395				
Temporal differentiation			0.2111**			0.2336*
Simultaneous structural differentiation				0.2864*		0.2808+
Simultaneous structural differentiation (sq.)				-0.1845*		-0.1894+
Contextual integration					-0.0376	0.0018
Constant	0.0965	0.1720	0.0356	0.1043	0.0428	0.0987
Observations	1715	1715	1496	1715	1715	1496
Firms	172.00	172.00	171.00	172.00	172.00	171.00
Instruments	86.00	86.00	76.00	86.00	85.00	75.00
AR (1)	-3.13***	-2.74***	-2.86***	-3.49***	-3.23***	-2.88***
AR (2)	1.06	1.13	-0.32	0.61	1.12	-0.08
Hansen test of over-identifying restrictions (p-value)	0.10	0.08	0.09	0.16	0.16	0.10
Wald (χ^2)	957.01***	815.10***	310.40***	779.63***	898.94***	271.96***
Difference in Sargan	0.316	0.260	0.303	0.342	0.541	0.134

Standardized beta coefficients; Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 13: Plots for Hypothesis 2 – 4



(vertical axis: Firm performance)

4.5.2 Robustness Checks

We conducted a series of robustness checks and supplementary analyses. First, we *extended and reduced the observation period* for our independent variables by one year. We recalculated the formulas for acquisition ambidexterity, temporal differentiation, structural separation, and contextual integration for a period of two and four years. We ran our dynamic panel estimations for the new operationalizations resulting in the following outcomes: For temporal differentiation, the two year observation window resulted in a positive, yet insignificant relationship, whereas the four year window produced a positive significant relationship with regard to subsequent long-term performance ($\beta = .55$; $p < .1$). The four year observation window also provided further support for our findings for the association of simultaneous structural differentiation and subsequent firm performance ($\beta_{(main)} = .35$; $p < .05$; $\beta_{(sq)} = - .22$; $p < .1$). In the case of a two year observation window, we found the expected signs for simultaneous structural differentiation, yet were unable to receive significant results for the squared term ($\beta_{(main)} = .30$; $p < .05$; $\beta_{(sq)} = - .07$; $p < .6$).

Second, we employed alternative operationalizations for our dependent variable. We substituted RoA with the return on equity (RoE) and extended the period for long-term firm performance from an average industry adjusted three year RoA to an average six year RoA. Regarding Hypothesis 2, temporal differentiation resulted in a positive statistically significant relationship with regard to RoE ($\beta = .17$; $p < .05$). The model for calculating the six year average RoA for the case of temporal differentiation

reduced our available observations to N=1113, leading to a positive but insignificant relationship. In the case of Hypothesis 3, we found significant support for the six year RoA ($\beta_{(main)}$ = .61; p < .05; $\beta_{(sq)}$ = - .53; p < .05).

Finally, we substituted our GMM estimator by running a ordinary least square (OLS) model. We ran fixed-effects OLS regressions, as the Hausman (1978) test rejected the consistency of random effects (p < .001). To account for autocorrelation and potential heteroscedasticity, we used the Huber White Sandwich Estimator to calculate robust, clustered standard errors (Anderson and Reeb, 2003). With regard to Hypothesis 2, the OLS model resulted in a positive, yet insignificant association between temporal differentiation and long-term firm performance. Regarding Hypothesis 3, we found significant results for the inverted U-shaped effect among simultaneous structural differentiation and long-term firm performance ($\beta_{(main)}$ = .04; p < .05; $\beta_{(sq)}$ = - .04; p < .1).

4.6 Discussion

Based on a sample of 21.264 acquisitions of 172 large public U.S. acquirers during 21 years (1990 – 2010), we find that the temporal separation of exploration and exploitation-oriented acquisitions in an acquisition stream contributes positively to acquirer performance. In contrast, acquisition streams that combine exploration and exploitation motives at the same time in parallel acquisitions are related to acquirer performance in an inverted U-shaped manner. It would seem that while parallel explorative and exploitative acquisitions can be used to achieve multiple objectives simultaneously, there are limits to the complexity that a firm can manage.

4.6.1 Theoretical Implications

Our findings provide novel insights for theoretical debates on acquisition streams and the research on exploration and exploitation. First, we do not find any general statistically significant effect between the existence of explorative and exploitative acquisitions in an acquisition stream and acquirer performance. Instead, it appears that it is the ‘strategic content design’ of the acquisition stream, the temporal differentiation or structural separation of explorative and exploitative acquisitions, that matters for subsequent firm performance.

Our study suggests that, in order to foster superior firm performance, the strategic motives need to be carefully aligned with the design mode chosen to structure different strategies within and across acquisition streams. This is important, as previous studies have mostly focused on the structural aspects acquisition streams, such as acquisition rate and rhythm, when studying performance implications of acquisition sequences (Laamanen and Keil, 2008; Shi and Prescott, 2011). Based on our findings, we encourage future research to include the strategic objectives into their models when studying the effects of acquisition patterns.

Second, our analysis of acquisition stream's strategic content design also allows us to complement prior research by combining multiple, strategically related acquisitions. As suggested by prior studies (Ambrosini *et al.*, 2011) and according to our own empirical results, the combination of conflicting strategic objectives within a single transaction has a negative or at best neutral effect on performance. Given the complementary benefits of explorative and exploitative acquisitions (Phene, Tallman, and Almeida, 2012), the trade-off between explorative and exploitative motives would, however, seem to be possible to reconcile on the acquisition stream level. We encourage future research to study the ability of acquisition streams to reconcile also other potentially conflicting strategic objectives.

Third, prior studies on exploration and exploitation have tested and discussed the different balancing modes for reconciling the two activities. Despite the particular context of acquisition streams, our findings can inform this theoretical debate by suggesting that the most beneficial balance between explorative and exploitative learning may depend on the balancing mode deployed to reconcile the conflicting requirements. This appears as a promising direction for future studies, as it holds the potential to shed additional light on the omnipresent question where an appropriate balance between exploitation and exploration lies (e.g., Gupta et al., 2006).

Finally, our study may also provide some interesting insights for practitioners. Many companies are using acquisition programs to realize their strategic aspirations. Our findings suggest that a transaction, which is aligned with the overall strategic intent of the company, may not necessarily result in subsequent performance improvements if its timing and interactions with other acquisitions in the program or other programs are not taken into account. Instead, the acquisition programs have to be designed so that they do not conflict with each other.

4.6.2 Limitations and Directions for Future Research

Our study has several limitations that we perceive as interesting avenues for future research. First, we conceptualize acquisitions as exploratory and exploitative endeavors. Even though this is largely aligned with prior theory, some acquirers may also pursue strategic objectives that are entirely unrelated to exploration or exploitation. It would be highly interesting to better understand, if and how these other types of acquisitions could be integrated into the strategic content designs discussed in this study.

Second, scholars have also discussed alternative mechanisms, such as intra-firm research and development (Lavie and Stettner, 2011), or inter-firm alliances (e.g., Lavie and Rosenkopf, 2006), which can additionally contribute to the balance between exploration and exploitation. We encourage future research to increasingly study the interaction of these mechanisms in order to develop a more integrated understanding of firms' learning activities (Keil, Maula, Schildt, and Zahra, 2008; Uotila *et al.*, 2009).

Third, we follow prior research in operationalizing an acquisition stream as a series of transactions within a three-year period. While our robustness checks with shorter and longer periods showed no significant changes in our main empirical results, we may not rule out that the effects of acquisition streams differ with regard to their duration within and across firms.

Finally, we provide novel evidence for the performance implications of strategic content designs of acquisition streams. However, our quantitative data did not allow insights into the actual managerial mechanisms that could explain how some firms attain a more aligned strategic content design than others. This is, however, an important question that would strongly benefit from more in-depth qualitative research.

5 Benefits of Conflicting Activities: Intra and Inter-Temporal Economies of Scope in Balancing Exploration and Exploitation[8]

Abstract:

Following March's (1991) emphasis on firms' resource allocation decisions during exploration-exploitation trade-offs, this paper investigates firms' simultaneous and sequential pursuit of the two conflicting tasks from a resource perspective. Intra and inter-temporal economies of scope (Helfat & Eisnehardt, 2004) are applied to the exploration-exploitation paradox. More specifically, this study examines the three major input resources (human resources (HR), financial resources, and operational resources) in the global insurance industry and finds disparate efficiency effects of either resource for the simultaneous and sequential pursuit of exploration and exploitation. For example, balancing both conflicting tasks simultaneously benefits from relatively lower financial and operating costs, whereas it suffers from relatively higher HR costs. This paper contributes by investigating the costs of ambidexterity, contrasting the simultaneous and sequential balancing modes, and clarifying the nature of the exploration-exploitation paradox.

Keywords: Exploration; Exploitation, Economies of Scope, Resources

[8] Luger, J. 2013: This paper has been presented at the Sol C. Snider Research Colloquium 2013 at the Wharton School (University of Pennsylvania) and the Research Colloquium 2013 at Paul Merage School of Business at University of California, Irvine.

5.1 Introduction

Ever since March's seminal paper was published in 1991, scholars have studied the conflicting activities of exploration and exploitation. Briefly outlining more than two decades of scholarly work, it can be concluded that practicing both exploration and exploitation is a costly and challenging endeavor that is required to ensure firms' survival and prosperity (see O'Reilly and Tushman, 2013 for a recent review). Scholars have proposed different methods for effectively balancing the two conflicting tasks. Most notably, they have distinguished between the simultaneous or sequential balancing of exploration and exploitation (Raisch et al., 2009).

Scholars have found positive performance effects for both balancing modes (e.g., Boumgarden et al., 2012; Gibson and Birkinshaw, 2004). However, their studies were conducted from a marginalist perspective (Jones and Hill, 1988). Thus, while arguing that the benefits of exploration and exploitation outweigh their costs, scholars did not distinguish between the two elements.

This paper differentiates these costs and benefits, with a particular focus on clarifying the costs related to firms' exploration-exploitation balancing efforts. In contrast to general assumption in the field, this study argues that balancing exploration and exploitation can actually result in efficiency gains, that is, lowered relative cost effects. Drawing on the literature of economies of scope (Panzar and Willig, 1981), this study argues that the simultaneous or sequential pursuit of exploration and exploitation allows firms to achieve intra and inter-temporal economies of scope (Helfat and Eisenhardt, 2004).

These theoretical arguments were tested on a sample consisting of 64 insurance firms' exploration and exploitation behavior during a nine-year window (1999 – 2007). Insurance firms' major input resources are human resources, financial resources, and operating resources (e.g., IT systems) (Fiegenbaum, 1987; Segal, 2002). This study investigated whether firms that balance exploration and exploitation (simultaneously or sequentially) utilize their resources more effectively than firms that focus on either activity. Specifically, the author argues that firms balancing exploration and exploitation simultaneously (i) are less efficient at utilizing their workforce, (ii) are more efficient at allocating financial resources (due to efficient internal capital markets), and (iii) are more efficient at utilizing their operational

resources. On the other hand, if firms balance exploration and exploitation sequentially, he argues that they (i) are more efficient at utilizing their workforce, (ii) are less efficient at capital allocation, and (iii) are less efficient at utilizing operational resources.

Although exploration and exploitation have been considered conflicting learning activities (Raisch and Birkinshaw, 2008), this study claims that both activities depend on the utilization of similar resources. This argumentation is based on previous work that has considered exploration and exploitation interdependent learning processes that need to be combined and embedded in order to generate synergistic outcomes (Cao et al., 2009). While this study does not negate the conflicts or costs arising from a simultaneous or sequential combination of exploration and exploitation, it argues that an effective combination of both activities is beneficial beyond the complementarity of performance effects.

Finding partial evidence for its hypothesis, this study makes three contributions to the literature. First, it challenges the assumption that the benefits from exploration and exploitation result from rising profits outpacing rising costs. Instead, it proposes that firms pursuing simultaneous and sequential exploration and exploitation can benefit from more efficient use of their resources. The performance effects of exploration and exploitation may not only stem from their superior revenue outcomes (He and Wong, 2004), but also from their cost advantages. Second, this paper compares the simultaneous and sequential balancing of exploration and exploitation. The two balancing modes were found to have opposite effects on resource utilization. This study indicates the advantages and disadvantages of either mode and subsequently provides guidance on choosing between them. Finally, there is an ongoing debate on whether exploration and exploitation should be seen as complementary or contradictory endeavors (Lavie et al., 2010). This study's findings suggest that, although exploration and exploitation are distinct learning tasks, the resources used to execute either task may, in fact, be quite similar.

5.2 Exploration and Exploitation in Organizations

The simultaneous pursuit of exploration and exploitation implies the coexistence of the two activities at a certain point in time (Raisch and Birkinshaw, 2008). According to Tushman and O'Reilly (1996: 24), firms' exposure "to a world of evolutionary and revolutionary change" justifies their simultaneous pursuit of exploration and exploitation. Firms' survival, particularly in the context of environmental change, has been linked to their constant engagement in explorative and exploitative activities (March, 1991). A further argument to support the simultaneous pursuit of exploration and exploitation is the complementarity of returns from either activity (Levinthal and March, 1993; March, 1991). It was mentioned that exploration leads to more variable, long-term returns, while returns from exploitation are more certain and short-term (March, 1991). Consequently, firms that balance explorative and exploitative activities simultaneously can optimize their overall performance outcomes. Finally, Yang and Atuahene-Gima (2007: 5) mentioned that "the interaction of exploitation and exploration enhances firm performance because it generates an ambiguous resource, the value of which only exists in their relationship."

Opposing this viewpoint, and given the conflicting nature of exploration and exploitation, scholars have mentioned that it is difficult to accommodate both activities within a firm. They have claimed that there is a trade-off between aligning the organization to exploit existing competencies and exploring new ones (Ancona, Goodman, Lawrence, and Tushman, 2001; Floyd and Lane, 2000; Levinthal and March, 1993). Yang and Atuahene-Gima (2007) pointed out that "significant resources and managerial efforts need to be invested up front to develop the superior capabilities for reining the two opposing forces." Earlier research often claimed that organizational practices that simultaneously address efficient exploitation and effective exploration may be impossible to achieve (e.g., Hannan and Freeman, 1977; McGill, Slocum, and Lei, 1992). More recent research, however, mentioned that – by establishing dual structures (Tushman and O'Reilly, 1996), a collective organizational context (Gibson and Birkinshaw, 2004), cross-functional interfaces (Jansen *et al.*, 2009), or ambidextrous senior teams (Smith and Tushman, 2005) – firms can successfully handle the conflicting requirements of exploration and exploitation.

The sequential pursuit of exploration and exploitation, that is, the successive use of the two conflicting tasks (Gupta *et al.*, 2006), was considered an alternative to

balancing them simultaneously (Boumgarden et al., 2012). Based on the punctuated equilibrium literature (Gersick, 1991; Tushman and Romanelli, 1985), authors have argued that, during periods of exploration, business units discover new technologies that are subsequently commercialized on the market (Rothaermel and Deeds, 2004) during shifts to exploitation. As Levinthal and March (1993: 98) argued, “less prominent in the normative literature on strategy and organizations, but prominent in more descriptive accounts (…), is the sequential allocation of attention to divergent goals." Temporal separation at the organizational level assumes that organizations proactively manage the transition between exploratory and exploitative efforts, irrespective of environmental conditions (Siggelkow and Levinthal, 2003). Simulation studies provide preliminary support for the assertion that exploration followed by gradual refinements, which dislodge firms from their preordained trajectories of evolution, enable firms to avoid competency traps (Siggelkow and Levinthal, 2003). In a recent study, Boumgarden and colleagues (2012) suggested that the sequential pursuit of exploration and exploitation is more beneficial than a simultaneous pursuit of these tasks.

The sequential pursuit of exploration and exploitation was claimed to be beneficial as it evades the conflicting pressures associated with simultaneous exploration and exploitation (Lavie and Rosenkopf, 2006). However, there are also arguments against sequential ambidexterity. Temporal shifts from one activity to the other are not trivial, given that conflicting pressure is still present during exploration and exploitation transitions. Having concentrated on a particular activity at a given point in time only reinforces organizations’ path dependence, which may delay subsequent transitions and make them costly to implement. Hence, temporal separation entails developing efficient procedures for managing transitions from one mode to the other (Brown and Eisenhardt, 1997). Regarding performance implications, very few empirical studies have investigated the relationship between the sequential pursuit of exploration and exploitation and firm performance (Boumgarden et al., 2012).

5.3 Exploration, Exploitation, and Economies of Scope in Insurance Firms

Exploration and exploitation have often been studied in the context of insurance firms (e.g., Jansen *et al.*, 2008; Jansen, Simsek, and Cao, 2012a; Luger and Raisch, 2012). Exploration describes activities, such as expansions into new geographical or product markets, the diversification of new industries (e.g., banking), the launch of new distribution channels (e.g., bancassurance), or the creation of new business units or ventures. In contrast, exploitation describes activities, such as strengthening or withdrawing from a firm's existing geographical or product markets, focusing on a firm's core industry (i.e. de-diversification), reorganizing existing distribution channels, or restructuring a firm's organization (Luger and Raisch, 2012).

When executing such activities, insurance firms draw on three major resource categories (Segal, 2002). Human resources are the most important input factor for insurance firms' production function (Fiegenbaum, 1987). Employees represent insurance firms' major assets and generate the largest portion of costs (Segal, 2002). Financial resources are another important input factor for these firms (Fiegenbaum and Thomas, 1993; Segal, 2002). A major part of insurance firms' production function relates to their "strategic financial skills" (Fiegenbaum and Thomas, 1993: 81), that is, their ability to access financial resources at a relatively low price. Finally, operational resources complete the list of most important resources for insurance firms' production function (Segal, 2002). Operational resources comprise IT systems, equipment, or offices, all of which are required to sell new policies or maintain existing ones (Segal, 2002).

Having outlined the major input resources in insurance firms' production function, the concepts of intra and inter-temporal economies of scope (Helfat and Eisenhardt, 2004) illustrate that the combined use of these resources leads to relatively lower production costs than when using them on their own (Bailey and Friedlaender, 1982). In formal terms, intra-temporal economies of scope are a condition of cost sub-additivity in a joint cost function for multiple activities C(Y1, Y2), with:

$$C(Y_1, Y_2) < C(Y_1, 0) + C(0, Y_2) \qquad (1a)$$

Intra-temporal economies of scope have mostly been linked to the joint use of a fixed resource (Bailey and Friedlaender, 1982) and have often been described in the context of financial institutions (see Clark, 1988 for a review). Firms may benefit from the use of specialized labor for different activities, the utilization of computer and telecommunications equipment during different activities, or internal capital markets that allocate financial resources to different activities more efficiently than external capital markets.

Inter-temporal economies of scope are defined as the condition of cost sub-additivity in a joint cost function for multiple activities and multiple time periods (Helfat and Eisenhardt, 2004):

$$C(Y_{1,t}, Y_{2,t+1}) < C(Y_{1,t}, 0) + C(0, Y_{2,t+1}) \qquad (2a)$$

With regard to inter-temporal economies of scope, the redeployment of resources over time has certain cost advantages (Helfat and Eisenhardt, 2004). Inter-temporal economies of scope do not evolve from the shared use of firms' existing resources, but from their temporal redeployment as firms adapt their activities over time.

In general, economies of scope have been linked to resource sharing opportunities across different time periods that led to efficiency gains, or reduced the cost of combined production (Gimeno and Woo, 1999). In the context of the exploration-exploitation trade-off, this indicates that the intra-temporal (i.e. simultaneous) or inter-temporal (i.e. sequential) pursuit of exploration and exploitation leads to increased efficiency or reduces the relative cost of production. This can be formulated as follows:

$$C(explore_t, exploit_t) < C(explore_t, 0) + C(0, exploit_t) \qquad (1b)$$

$$C(explore_t, exploit_{t+1}) < C(explore_t, 0) + C(0, exploit_{t+1}) \qquad (2b)$$

In the following paragraphs, both argumentations are adapted to the three most important resource categories of insurance firms. Each paragraph draws a distinction

between the intra-temporal (i.e. simultaneous) or inter-temporal (i.e. sequential) balancing of human, financial, and operational resources.

5.3.1 The Utilization of Human Resources in Simultaneous and Sequential Exploration and Exploitation

Several studies have approached the exploration-exploitation dilemma from the perspective of an individual manager (e.g., Adler *et al.*, 1999; Gibson and Birkinshaw, 2004). This paper investigates whether firms that simultaneously balance exploration and exploitation are able to utilize their workforce (or individual managers) more efficiently than firms that focus on one of the two activities. It argues that this is not the case, especially because the simultaneous pursuit of exploration and exploitation overstrains individual employees' skills and cognition (McGill et al., 1992; Smith and Tushman, 2005).

In general, integrating exploration and exploitation at the individual level seems like a promising idea that evades costly coordination or integration mechanisms (Gibson and Birkinshaw, 2004; Jansen et al., 2009). Nevertheless, most scholars consider managers unable "to play two games simultaneously" (Tushman and O'Reilly, 1996: 10), as it overstrains (McGill et al., 1992), or even confuses them (Smith and Tushman, 2005). Scholars have proposed alternative approaches, such as the separation-reintegration strategy, to help individual managers overcome the difficulties they face when combining exploration and exploitation (Lavie et al., 2010). For example, prior studies have suggested using exploration and exploitation separately in different units or domains (Lavie and Rosenkopf, 2006; Tushman and O'Reilly, 1996). However, such an approach would automatically lead to redundancies or create a need for additional upper-tier managers (Lavie et al., 2010). Firms thus have a choice between conducting simultaneous exploration and exploitation, which leads to redundancies and a need for more personnel, or focusing on either exploration or exploitation. These arguments led to the following hypothesis:

H1a: The stronger a firm's simultaneous pursuit of exploration and exploitation, the lower its HR efficiency.

This hypothesis proposes that firms that either focus on exploration or exploitation at a specific point in time are able to utilize their employees more efficiently than

firms conducting exploration and exploitation simultaneously. This study extends this argument by claiming that firms that sequentially alternate between exploration and exploitation, utilize their workforce more efficiently than firms that continuously focus on one of them. Two arguments support this statement. First, studies have claimed that individual managers are able to sequentially switch between explorative and exploitative tasks without incurring major costs or facing major challenges (Brown and Eisenhardt, 1997; Laureiro-Martinez *et al.*, 2010). Although scholars assert that simultaneously pursuing exploration and exploitation overstrains employees, it also enables them to sequentially attend to contradictory demands (Lewis, Andriopoulos, and Smith, Forthcoming) without becoming confused (Lavie et al., 2010). Second, as the sequential shift between exploration and exploitation does not seem to seriously impede firms' workforce, it may foster learning and creativity among employees (Smith and Lewis, 2011). Scholars have claimed that juxtaposing opposing activities can create a context for creative problem solving. Switching between explorative and exploitative activities does not completely erode firms' knowledge base. In fact, it may be beneficial as employees can transfer their experience of one task to the opposite task (Smith and Lewis, 2011). This led to the following hypothesis:

H1b: The stronger a firm's sequential pursuit of exploration and exploitation, the higher its HR efficiency.

5.3.2 The Utilization of Financial Resources in Simultaneous and Sequential Exploration and Exploitation

In this paragraph, the author applies the economies of scope concept to a firm's financial resources. It is questioned whether or not firms that simultaneously or sequentially engage in exploration and exploitation have lower cost of financing when compared to firms focusing on either activity. In detail, the efficiency of firms' internal capital markets, which apportion financial resources among exploration and exploitation, is compared to the external financing of either activity. The author argues that internal capital markets are more efficient at apportioning resources to exploration and exploitation than external markets and that it is more financially efficient to simultaneously pursue the two conflicting tasks than to pursue them sequentially.

How can the allocation of financial resources be more efficient for firms' who use internal capital markets to fund both exploration and exploitation activities than for

two stand-alone companies that raise external financing for one of the two activities? In general, firm-internal capital markets are considered superior as they have to deal with asymmetric information and firms have information advantages over external capital markets (Stein, 1997). Information advantages allow firms to assess the risk-return relationships of their investment portfolio more accurately and, hence, to conduct more efficient investments than external capital markets. Especially in the context of exploration and exploitation, information asymmetries are very likely to occur. Risk and uncertainty are the major criteria for distinguishing between the two activities (March, 1991). March (1991: 73) asserts that "compared to returns from exploitation, returns from exploration are systematically less certain, more remote in time, and organizationally more distant from the locus of action and adaption." Especially when firms' activities involve a high dispersion of risk-return combinations, the information advantages of internal over external capital markets increase (Shin and Stulz, 1998). Subsequently, this study hypothesizes that firms pursuing simultaneous exploration and exploitation are more efficient at allocating their financial resources than firms that use external capital markets to finance separate explorative or exploitative activities.

H2a: The stronger a firm's simultaneous pursuit of exploration and exploitation, the higher its financial efficiency.

Extending the information asymmetry argument above, the author claims that firms that sequentially alter between exploration and exploitation are unable to benefit from a more efficient allocation of financial resources. He argues that such firms' portfolios of risk-return combinations are rather uniform at any point in time, reducing the internal capital markets' advantages over external capital markets. The following hypothesis is thus proposed:

H2b: The stronger a firm's sequential pursuit of exploration and exploitation, the lower its financial efficiency.

5.3.3 The Utilization of Operational Resources in Simultaneous and Sequential Exploration and Exploitation

Finally, this study examines the question of whether firms that simultaneously balance exploration and exploitation are able to utilize their operational resources more efficiently. The author argues that this is the case, especially since operational resources in an insurance setting predominately represent fixed resources that are not fully utilized in the pursuit of either one of the conflicting activities (Clark, 1988).

The main argument of economies of scope is that a fixed resource is not fully utilized in the production of a single output (Bailey and Friedlaender, 1982). Applied to an insurance context, this study maintains that operational resources, such as equipment or IT resources, are more efficiently utilized by firms that simultaneously conduct exploration and exploitation than those pursuing either of the two activities. This argument is based on the high portion of fixed costs for equipment or IT resources as well as their low idiosyncrasy, which makes them accessible for a broader range of activities (Agarwal and Prasad, 1997). This allows for a cost-effective adaptation of operational resources so that they are applicable to both activities. While IT systems that are specifically designed for either exploration or exploitation might be more effective than IT systems that serve the two activities simultaneously, their high proportion of fixed costs can get leveraged through an exploration-exploitation double-usage. The author thus proposes the following hypothesis:

H3a: The stronger a firm's simultaneous pursuit of exploration and exploitation, the higher its operational efficiency.

Firms that use specialized IT systems in their sequential pursuit of exploration and exploitation can split the high fixed costs between the two activities. However, during the transition phase between activities, these firms either need to invest in an entirely new IT system, or fundamentally adapt their existing IT system so that it operates well for the respective task. In that case, firms that conduct exploration and exploitation sequentially will not have an advantage over firms that conduct either of these tasks in separation. Therefore, the following hypothesis is proposed:

H3b: The stronger a firm's sequential pursuit of exploration and exploitation, the lower its operational efficiency.

5.4 Methodology

The hypotheses outlined above were tested using a sample of global insurance firms. The insurance industry seems suitable for this study for a number of reasons. First, prior studies investigating the exploration-exploitation dilemma have frequently mentioned this industry's suitability (e.g., Luger and Raisch, 2012) as it has been exposed to deregulations, capital market volatility, demographic change, and major exogenous shocks (e.g., September 11 Terrorist Attacks; Hurricane Katrina), all of which are conducive to testing firms' sequential or simultaneous pursuit of exploration-exploitation balance (see Jansen *et al.*, 2006 for further reasons to study the insurance industry in an exploraiton-exploitation setting). Second, the insurance industry's reliance on the three major homogenous resource categories of human, financial, and operational resources allows for investigating the importance of economies of scope. This is not the case for more technologically oriented firms, which mostly rely on idiosyncratic resources (such as tailored machinery or patents) that are difficult to compare within or even across different firms.

This study's sample was derived from the Dow Jones Stoxx Insurance Index (81 firms) for the period 1999 to 2007. The author relied on the Index's initial configuration to avoid survivor bias (Mitchell, 1991). Eleven broker firms that solely focused on the retailing of financial products, and 14 firms with insufficient data were excluded from the sample. The final sample consisted of 56 insurance firms and 1,792 firm-quarter observations.

5.4.1 Dependent Variables

This study used three different dependent variables that account for the insurance industry's reliance on the three major resource categories in order to examine the role of economies of scope. In line with previous work (Gimeno and Woo, 1999), the economies of scope cost advantage is operationalized as efficiency gains. Specifically, HR efficiency is operationalized as a firm's number of employees per net premiums written (NPW[9]). This employee per unit of sales ratio indicates how efficiently insurance firms deploy their workforce and indicates how many employees they need to generate one unit of sales. Financial efficiency is operationalized as a firm's interest on debt per total debt. This ratio indicates the price of a firm's debt, that is, it measures

[9] NPW represents the sales equivalent in insurance firms (Fiegenbaum & Thomas, 1993).

the firm's cost of financing. Finally, operational efficiency is operationalized as a firm's operational expenses per NPW. As indicated earlier, operational expenses in the insurance industry largely account for IT and equipment (incl. office or administrative costs) costs. The ratio indicates how much operational expenditure generates one unit of sales.

5.4.2 Independent Variables

In accordance with prior work, firms' pursuit of exploration-exploitation was measured by means of a content analysis (Luger and Raisch, 2012; Uotila *et al.*, 2009). Textual data, in the form of press releases on firms' corporate webpages were analyzed in order to measure the relative quarterly degree firm exploration and exploitation. A total of 14,666 press releases were analyzed. Each one was assigned to a specific firm quarter. A specific exploration-exploitation measure (0-1 scale) for each firm-quarter was obtained from this analysis. Luger and Raisch's (2012) robustness test was applied to cross-check the validity of this measure.

A firm's simultaneous balance between exploration and exploitation is operationalized as the interaction between explorationi,t and exploitationi,t in period t (e.g., Gibson and Birkinshaw, 2004; He and Wong, 2004; Katila and Ahuja, 2002). The measure has a minimum value of 0 (representing firms with a one-sided focus on either exploration or exploitation (i.e. 1*0 or 0*1)) and a maximum value of .25 (representing firms that operate at an intermediate point on the exploration-exploitation continuum (i.e. 0.5*0.5)). A firm's sequential pursuit of exploration and exploitation is operationalized as the interaction between explorationi,t and exploitationi,t-1 in two consecutive time periods (Venkatraman *et al.*, 2007). This measure has a minimum of 0 (representing firms that do not adapt their relative level of exploration over two periods) and a maximum value of 1 (representing firms that shift from pure exploration in one period to pure exploitation in the following period or vice versa).

5.4.3 Control Variables

Conducting analyses with different dependent variables, the set of control variables was adapted to the specific models. Two different sets of control variables were used: one for the HR and operational efficiency models and one for the financial efficiency models.

In addition to controlling for time and firm effects, this analysis adopted four control variables that were considered likely to influence firms' HR and operational efficiency. First, a firm's profitability was considered to impact its ability to efficiently utilize its resources. Firm profitability was calculated as a firm's net income divided by its total assets. Additionally, a firm's exposure to different industries or geographical areas was considered to impact its ability to efficiently utilize HR or operational resources. Firms' degree of diversification and internalization was measured using Jacquemin and Berry's (1979) entropy measure, which quantifies the extent of diversity in a firm's lines of business and the relative importance of foreign sales. Finally, firm's availability of excess resources was found to impact their efficiency. Hence, firm slack was included in the analysis. Slack was calculated as a firm's current liabilities-to-current assets ratio.

Time and firm-fixed effects as well as five additional control variables were integrated into the models used to estimate firms' financial efficiency. Moreover, firm profitability was included in the models as it was considered to influence firms' ability to access capital markets or its ability to gain access to favorable financing conditions. Larger firms are considered to have access to more sources of external funding, which influences their ability to achieve financial efficiency. Firm size was operationalized as the natural logarithm of insurance firms' NPW. Besides size, insurance firms' financial leverage strongly influences the conditions for financing. The debt-to-equity ratio was included in the models as a control variable to indicate financial leverage. Similar to financial leverage, firms' investment strategy strongly influences their cost of capital (Fiegenbaum and Thomas, 1995). Since their balance sheets display large amounts of financial assets, insurance firms are exposed to various risk factors within the broad asset classes, such as equity or fixed income (Schimmer and Brauer, 2012). This study consequently controls for firms' equity holdings divided by total investments. Finally, firms' reinsurance strategy is likely to impact their cost of capital. The more premiums ceded to reinsurance, the lower an insurance firm's

remaining risk profile and the lower its refinancing costs (Schimmer and Brauer, 2012). This paper includes the ratio of insurance firms' premiums transferred to reinsurers per net premiums written.

5.4.3 Analysis

A longitudinal data analysis approach was used to test for economies of scope in firms' simultaneous and sequential pursuit of exploration and exploitation. As the Hausman (1978) test rejected the consistency of random effects ($p < 0.001$), fixed effects OLS regressions were run. Additionally, a Wooldridge (2010) test was conducted to check for autocorrelation. The p-values of all three dependent variables indicated the potential existence of autocorrelation. A subsequent test for heteroscedasticity (Breusch and Pagen, 1979) indicated that the variance of the residuals is not likely dependent on the values of the independent values. Nevertheless, due to the positive test for autocorrelation, the Huber White Sandwich Estimator was used to calculate robust, clustered standard errors (Anderson & Reeb, 2003). Furthermore, time-fixed effects (Hayward, 2003) were included to account for unsystematic time-specific events (e.g., exogenous shocks, such as those caused by Hurricane Katrina). Finally, as indicated in Table 10, multicollinearity did not seem to be a major threat to the implemented econometric models.

5.5 Results

Table 10 illustrates the descriptive statistics for and correlations between all variables, pooled over the observation period. Table 11 reports the fixed effects panel regression models. The first two hypotheses proposed that firms' simultaneous pursuit of exploration and exploitation lowers HR efficiency (H 1a), while the sequential pursuit increases HR efficiency (H 1b). As indicated in Models 2-4 in Table 11, these claims are weakly supported. While the positive significant effect in Model 2 ($\beta = 0.0427$; $p < 0.05$) indicates that the simultaneous pursuit of exploration and exploitation increases firms' relative HR expenses, the positive coefficient of sequential exploration and exploitation in Models 3 and 4 indicates the opposite (albeit not significant) effect to the one put forward in Hypothesis 1b. In sum, weak evidence was found for Hypothesis 1a, and no support was found for Hypothesis 1b.

Hypotheses 2a and 2b postulated that the simultaneous pursuit of exploration and exploitation increases financial efficiency, while the sequential pursuit of these tasks decreases financial efficiency. The negative significant coefficients in Models 6 and 8 (Model 6 $\beta = -0.0907$; $p < 0.05$; Model 8 $\beta = -0.105$; $p < 0.05$) show support for Hypothesis 2a. Following the argumentation of Hypothesis 2b, the positive coefficients in Models 7 and 8 indicate that the sequential pursuit of exploration and exploitation increases firms' relative cost of financing. However, these effects are not significant.

Hypotheses 3a and 3b are the most strongly supported. The negative significant coefficients in Models 10 and 12 (Model 10 $\beta = -0.0923$; $p < 0.05$; Model 12 $\beta = -0.118$; $p < 0.01$) indicate that the simultaneous pursuit of exploration and exploitation helps firms lower their relative operational expenses. However, this does not seems to apply for sequential exploration and exploitation. Models 11 and 12 (Model 11 $\beta = 0.0637$; $p < 0.10$; Model 12 $\beta = 0.0838$; $p < 0.05$) indicate that the sequential pursuit of exploration and exploitation increases firms' relative operational expenses.

Table 10: Descriptive Statistics

		Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	HR Efficiency	4.201	2.703	1												
(2)	Financial Efficiency	0.018	0.011	-0.21***	1											
(3)	Operational Efficiency	0.154	0.368	-0.13**	0.02	1										
(4)	Simultaneous E&E	0.159	0.09	0.02	-0.11**	-0.14***	1									
(5)	Sequential E&E	0.084	0.162	-0.07	0	0.09*	0.24***	1								
(6)	Diversification	0.524	0.382	0.05	-0.05	0.02	-0.01	0.10*	1							
(7)	Globalization	0.453	0.57	0.21***	-0.14***	-0.24***	-0.04	-0.06	0.09*	1						
(8)	Firm Performance	0.004	0.007	-0.01	0.02	-0.24***	0.02	-0.02	0.01	0.20***	1					
(9)	Firm Slack	1.161	0.135	0.11*	0.12**	-0.30***	0.04	-0.04	-0.11**	0.20***	0.62***	1				
(10)	Firm Size (log)	8.219	1.213	-0.04	-0.09*	0.23***	0.04	0	0.11*	-0.18***	-0.28***	-0.59***	1			
(11)	Firm Leverage	1.528	3.579	0.02	-0.22***	0.26***	0	0.07	0.11*	-0.19***	-0.17***	-0.34***	0.38***	1		
(12)	Investment Strategy	0.176	0.166	0.04	0.03	0	-0.13**	0.02	0.35***	0.15***	0.11**	-0.04	0.03	0	1	
(13)	Reinsurance Strategy	0.174	0.199	0.13**	0.08*	-0.14***	0.01	-0.04	-0.14***	-0.09*	-0.16***	-0.03	0	-0.09*	-0.13**	1

N = 546

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Talbe 11: Regression Results

	HR Efficiency				Financial Efficiency				Operational Efficiency			
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Simultaneous E&E		0.0427*		0.0359		-0.0907*		-0.105*		-0.0923*		-0.118**
Sequential E&E			0.0182	0.0109			0.00397	0.0290			0.0637+	0.0836*
Diversification	0.0197	0.00163	-0.00810	-0.0115					0.000996	-0.0150	-0.0376	-0.0345
Globalization	-0.0212	-0.0167	-0.0302	-0.0238					-0.0189	0.0180	0.0390	0.0167
Firm Slack	-0.00866	0.0231	0.0203	0.0245					0.0514	0.177	0.250+	0.237+
Firm Performance	-0.0830*	-0.0819*	-0.0745+	-0.0771+	-0.0138	-0.0242	-0.0257	-0.0219	-0.0557	-0.0676	-0.0919	-0.0814
Firm Size (log)					-0.0807	0.185	0.176	0.206				
Firm Leverage (D/E)					-0.0394	-0.134+	-0.185*	-0.170				
Investment Strategy					-0.235	-0.0975	-0.0714	-0.0747				
Reinsurance Strategy					-0.0228	-0.126	-0.134	-0.129				
Constant	***	*	*	*	*							
	(1.001)	(1.809)	(1.882)	(1.940)	(0.0126)	(0.0104)	(0.0112)	(0.0160)	(0.208)	(0.413)	(0.468)	(0.454)
Observations	1,361	1,013	940	940	928	728	681	681	1,040	776	727	727
R-squared	0.230	0.245	0.233	0.236	0.047	0.098	0.092	0.103	0.192	0.204	0.196	0.212
Number of firms	62	62	61	61	56	53	53	53	60	60	60	60

Standardized Beta Coefficients

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

5.6 Discussion

This paper investigates firms' exploration-exploitation paradox from a novel, resource-utilization oriented perspective. According to March's (1991: 71) seminal work, the "competition for" and the "allocation of" scarce resources lies at the heart of the exploration-exploitation dilemma. However, prior to this study, the literature had devoted very little attention to understanding firms' resources when studying both conflicting activities. The paper makes three contributions that are discussed in the following three paragraphs. Concluding this paper, the last two paragraphs focus on the study's limitations, suggest avenues for future research, and discuss the study's relevance to managerial practice.

5.6.1 The Cost and Benefits of Exploration and Exploitation

Many prior studies have discussed the challenges and benefits of exploration and exploitation (e.g., Gupta *et al.*, 2006; Lavie *et al.*, 2010; Simsek *et al.*, 2009). According to these works, there are three main advantages: (i) Exploration and exploitation have positive effects on short and long-term performance (Levinthal and March, 1993); (ii) they reconcile paradoxical demands in firms' task environments (O'Reilly and Tushman, 2008a); and (iii) their integration can help firms create a valuable resource (Yang and Atuahene-Gima, 2007). The disadvantages of exploration and exploitation have mostly been attributed to their conflicting nature. Nevertheless, there is very little theory on or empirical evidence of the specific costs of this duality (Lavie et al., 2010). The dominant logic in the field is that the "benefits of achieving (exploration and exploitation) outweigh the associated costs" (Jansen *et al.*, 2012a: 1300).

This paper focuses on the specific costs involved in simultaneous or sequential exploration and exploitation. In contrast to previous assumptions, this study's findings suggest that the two conflicting tasks are not always associated with increased cost levels, but may actually imply the opposite. Firms conducting both exploration and exploitation may benefit from relative cost advantages over firms focusing on only one of the activities. While this study also highlights resource categories that imply increasing relative costs (e.g., HR costs for simultaneous, or operational costs for sequential exploration and exploitation), this study emphasizes that conducting exploration and exploitation is not associated with higher cost levels per se. Instead, specific resources' characteristics indicate whether or not exploration and exploitation

is linked with higher or lower relative cost levels. Distinguishing between the specific costs and benefits of exploration and exploitation instead of using a "gross approach" can provide valuable insights into the nature of the two conflicting tasks and how firms can implement ambidexterity effectively.

5.6.2 The Simultaneous vs. Sequential Balancing of Exploration and Exploitation

Given the challenges of exploration and exploitation, the identification of balancing modes that can cope with the two conflicting activities has ever been a central topic in the field (Lavie et al., 2010; Raisch and Birkinshaw, 2008). This paper is among the first to directly contrast balancing modes – in this case the sequential versus the simultaneous pursuit of exploration and exploitation – to investigate their particular advantages or disadvantages (Venkatraman et al., 2007). The two balancing modes were found to have contrasting effects when efficiently utilizing operational resources. If one considers operational efficiency as a major decision making criterion, the simultaneous pursuit of exploration and exploitation seems to be superior to sequentially pursuing the two tasks. While no other resource categories (e.g., human resources) could be identified as distinguishing among the simultaneous or sequential balance, future research will likely identify additional contingencies that indicate the superiority of either approach. This paper provides insights into the comparison of the two balancing modes, as well as the implementation of either balancing mode.

In line with previous work (e.g., Adler *et al.*, 1999; Tushman and O'Reilly, 1996), this study suggests that firms' workforce seems to have the most difficulty in simultaneously implementing exploration and exploitation. For such firms, a higher percentage of personnel indicates that employees cannot waver between the two conflicting tasks, or that they need to deal with increased management personnel required to reconcile the two activities. Despite its HR disadvantages, the simultaneous pursuit of exploration and exploitation, seems to be favorable to focusing on only one of the two activities. Surprisingly, simultaneous exploration and exploitation provided cost savings when utilizing financial or operational resources. This contradicts prior studies that assumed that the conflicts of simultaneously conducting exploration and exploitation entail increased costs for which the revenue advantages should compensate (He and Wong, 2004). However, this paper's findings suggest that firms

that simultaneously focus on exploration and exploitation do not even need to rely on relative revenue advantages, and might even enjoy relative cost savings.

With regard to implementing sequential exploration and exploitation, this study's findings largely support previous work that emphasized the costs and challenges involved in firms' transitions between the two conflicting tasks (Lavie et al., 2010; Raisch et al., 2009). While the results of sequential exploration and exploitation are not particularly strong, all three resource categories' coefficients seem to indicate the relative cost disadvantages of this balancing mode. However, the relative higher costs of sequential exploration and exploitation, do not mean that this balancing mode is not a promising solution. Instead, the benefits of sequential exploration and exploitation might outweigh these increased costs (Boumgarden et al., 2012).

5.6.3 The Nature of Exploration and Exploitation

The debate on the costs, benefits, and balancing modes of exploration and exploitation, revolves around the characteristics of exploration and exploitation. How do the conflicts between the two activities arise? Why do some scholars highlight positive interactions between them (e.g., Smith and Lewis, 2011), while others stress their incompatibility (McGill et al., 1992)? This study argues that such contradictions stem from an incomprehensive understanding of either activity's characteristics.

The organizational learning perspective is the most common theoretical lens through which the exploration-exploitation dilemma is explored (Lavie et al., 2010; March, 1991). However, paying sole attention to highlighting conflicts in the activities' learning processes may fall short of properly explaining the comprehensive construct of organizational learning. We know that organizational learning is a multi-dimensional activity that involves characteristics of individuals, organizational context, tools, etc. (Argote and Miron-Spektor, 2011). Examining the exploration-exploitation learning trade-off from a resource perspective, this paper indicates that the two learning activities can actually build on the same (non-contradictory) resources. While employees seem to be overstrained by exploration and exploitation, other resources (e.g., IT systems) seem to be more efficiently utilized during the two activities. This also relates to the ongoing discussion on the orthogonal versus the continuous nature of exploration and exploitation. In their comprehensive debate, Gupta and colleagues (2006: 697) concluded that "the relationship between exploration and exploitation depends very much on whether the two compete for

scarce resources and whether or not the analysis focuses on a single or on multiple domains." This paper extends their conclusion by integrating different resources' characteristics. While all three resource categories in this paper represent scarce resources, the differences in their specific characteristics indicate whether exploration and exploitation should be considered orthogonal or continuous constructs.

5.6.4 Limitations and Future Research

In addition to introducing a new resource perspective on exploration and exploitation, this paper raises many questions, especially with regard to studying the role of additional resources in firms' exploration-exploitation duality. As mentioned in the methodology section, this paper focuses on the insurance industry to obtain a high level of comparable input resources. The hypotheses are adjusted to the insurance industries' three major resource categories, and cannot be directly transferred to other industry settings. While fundamental resource categories such as human, financial, and operational resources exist in mostly any industry, future research should review this paper's findings in other industry contexts. It would be particularly interesting if future studies considered the role of more idiosyncratic resources, such as intangible resources or machinery. Future research might even dig into the micro-mechanisms of individual resource categories, in an attempt to identify why either category is able to deliver inter or intra-temporal economies of scope.

As one of the first studies of resources' role in firms' exploration-exploitation paradox, this paper focuses on the fundamental distinction between simultaneous and sequential exploration and exploitation. With the simultaneous balancing mode in mind, scholars have introduced a finer distinction between structural separation (Tushman and O'Reilly, 1996), domain separation (Lavie and Rosenkopf, 2006), and contextual integration (Gibson and Birkinshaw, 2004). Given the comprehensive differences, for example, between structural separation and contextual integration, future research should look into the role of resources in these different balancing modes. These studies might provide deeper insights into how the specific resource categories function with regard to the intra-temporal economies of scope.

Finally, this paper is a starting point for a better delineation of the specific costs and benefits of exploration and exploitation. Instead of adopting a marginalist perspective (Jones and Hill, 1988) or "gross approach," future research should distinguish between

the specific advantages and disadvantages of exploration and exploitation and, hence, provide a more accurate picture of whether or not the two activities should be considered compatible or incompatible.

5.6.5 Implications for Managerial Practice

Resource allocation decisions are part of firms' daily routine and have often been the focus of practitioner-oriented research (Bower and Gilbert, 2007; Buchanan and O'Connell, 2006). This paper links specific resource allocation decisions with firms' struggle to strike an exploration-exploitation balance. Given this paper's findings, managers are advised to ask the following three questions: Which resources are the most important for my production function? Which resources are at hand and which ones may be available in future? What are the characteristics of these resources with regard to exploration and exploitation? Depending on their answers, managers can decide whether to strive for a simultaneous or sequential balance. Given this decision, they can decide on whether and how to deploy their existing resources or whether to acquire new ones. For example, firms that exhibit high capital and/or operational intensity are better off simultaneously balancing exploration and exploitation. However, they should be aware that they may need to augment their workforce.

6 Application: Organizing for the Implementation of New Technology: The Dilemma of Organizational Separation and Integration[10]

Abstract:

During periods of change and competitive pressure, technological innovation is among the most important antecedents to firm-growth and -prosperity. The organization of technological innovation, however, is a difficult task and involves multiple challenges. This study takes an organization theory perspective and investigates the dilemma of organizational separation and integration when implementing technological innovation. Studying ten innovation projects at a global technology firm, two organizational models for the effective implementation of technological innovation are identified and contrasted from each other (i.e. *Integrated* and *Separated Model*). It is found that the selection of either model depends on four different innovation-strategies (i.e., *Substitution-, Alternative-, Extension-*, and *Differentiation-Strategy*). This study assigns technological innovation to either of the four innovation strategies and, based on this assignment, recommends the implementation of either organizational model.

Keywords: Innovation & Technology, Paradox, Organizational Design, Autonomy and Integration

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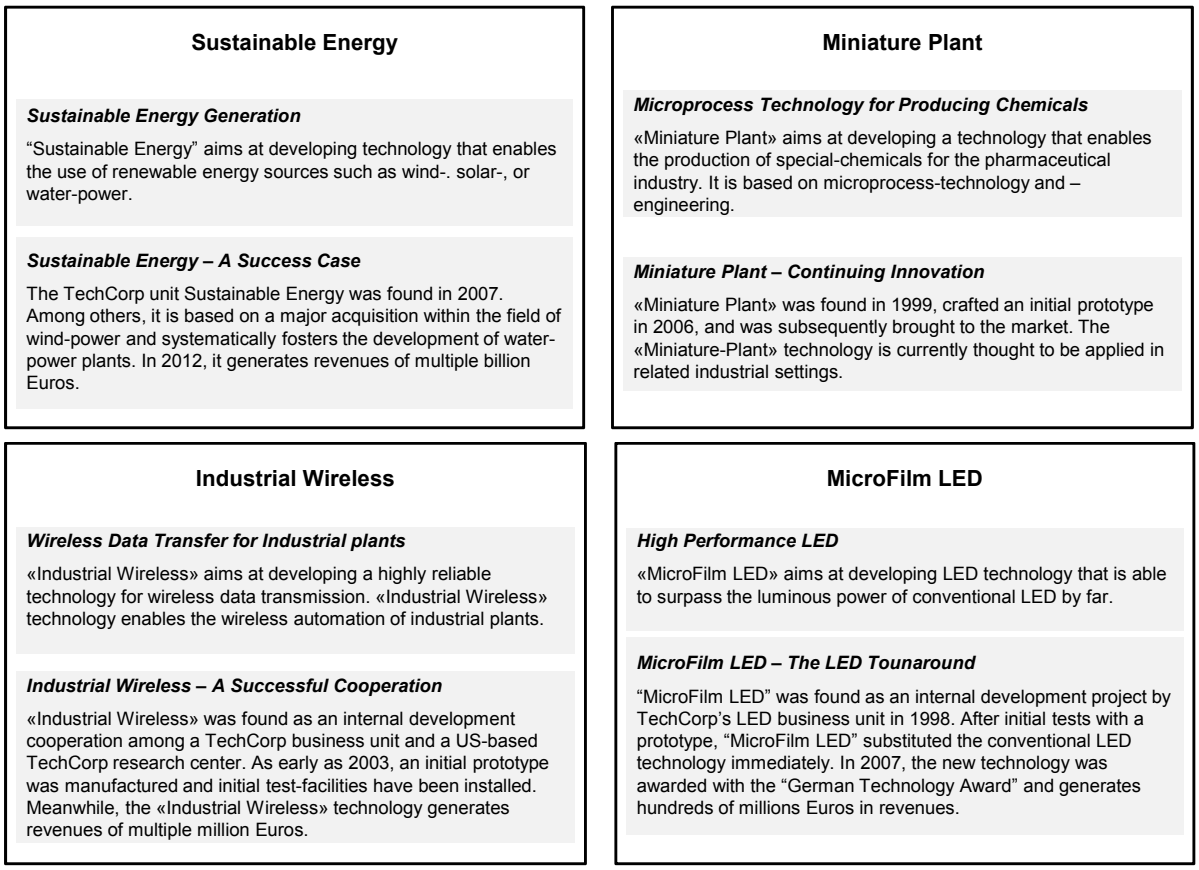
6.1 Introduction

Being exposed to dynamic and global markets, innovations are a key element for a firm's survival and prosperity. Despite this importance of innovations, multiple firms struggle with their successful implementation (Garvin and Levesque, 2008). Especially the organization of technological innovation needs to overcome a central dilemma (Ford and Randolph, 1992): On the one side, technological innovation may only succeed through autonomy and independence from firms' established operations and businesses. Without such autonomy, the threat of inertia, insufficient flexibility, and the focus on daily operations may impede the successful pursuit of technological innovation (Kim and Mauborgne, 2009). On the other side, technological innovation can strongly benefit from linkages to firms' established operations and businesses. Especially the exchange of knowledge, the common utilization of resources and capabilities, and the coordination of operations or customer relationships are central to an innovation's long-term prosperity (Tushman and O'Reilly, 1996). In short, the effective implementation of technological innovation requires both, the creation of independence and autonomy, as well as the integration and coordination with a firm's established businesses.

This study is based on investigating ten technological innovation projects at TechCorp, a leading global technology firm. The study questions how the creation of autonomy and integration within firms' established businesses can successfully be implemented. Results indicate that this dilemma is not resolved by a single organization model. Rather, different innovation strategies call for adapted organization models. Providing detailed explanations for four of the ten covered technological innovation projects (Sustainable Energy, Miniature Plant, Industrial Wireless, and MicroFilm LED – see Figure 14 for further explanations), this study describes two organizational models (*Integrated* and *Separated Model*) that fit for four innovation strategies (*Substitution-, Alternative-, Extension-*, and *Differentiation-Strategy*). It is shown that technological innovation following a *Substitution-* and *Extension-Strategy* prevails within the *Integrated Model*. In contrast, the *Separated Model* suits best for innovations following an *Alternative-* or *Differentiation-Strategy*. In the following paragraph, the organizational characteristics of the *Integrated* and *Separated Model* are described. Subsequently, the four innovation strategies are described and matched with the two organization models. Finally, three crucial success factors are summarized for the effective implementation of technological innovation.

Figure 14: Overview on Innovation Projects



6.2 Organizing Technological Innovation

Investigating the ten technological innovation projects, two organization models – the *Integrated* and *Separated Model* – could be distinguished. Both models differ with regard to their organization structure (i.e. the reporting lines of an innovation project within the firm), their leadership model (i.e. the characteristics of the project's management team), and their incentive systems (i.e. the configuration of monetary and non-monetary target-systems of a project). Both organization models combine the creation of autonomy (e.g., by hiring a firm-external technology-oriented management team) and elements of integration with a firm's established operations (e.g., by using integrated organization structures). Through this combination, both organization models create an overall balanced level of autonomy and integration, yet principally differ and exhibit distinct advantages and disadvantages.

6.2.1 Separated Model

Four of the ten investigated technological innovation projects (among others, Sustainable Energy and Miniature Plant) were implemented by using the *Separated Model*. The newly found innovation projects were characterized by being structurally and geographically separated from the firm's established businesses. Each project directly reported to a member of TechCorp's executive board. Sustainable Energy, for example, was found in 2007 as a new independent business unit directly reporting to one of TechCorp's board members. Although, during this time, multiple other business units were engaged in fossil energy production, Sustainable Energy was deliberately separated from these business units and set-up as an autonomous start-up at a new location. The leadership model of the *Separated Model* is characterized by firm-internal managers with a longstanding experience, an established firm-record, and a comprehensive firm-internal network. Managers with such characteristics act as an anti-pole to the separated organization structure and enable the integration and coordination with TechCorp's established businesses. For example, Miniature Plant was led by a TechCorp-internal management team that, through its extensive firm-internal network, was capable of integrating its new technology with existing TechCorp software applications. Finally, the *Separated Model* is characterized by individually tailored incentive systems. The structural separation from the established businesses allows the deviation from TechCorp's established incentive systems that were most dominantly focused on financial profitability measures. Rather, the tailored incentive systems allowed catering the special needs of technological innovation projects. As an example, the incentive systems of Sustainable Energy showed a combination of technological milestones (e.g., the creation of a prototype), efficiency-oriented targets (e.g., the energy-yield of a prototype), and growth-oriented targets (e.g., the number of installed test facilities).

Summarizing, the *Separated Model* is characterized by a high degree of autonomy from a firm's established businesses. Even so experienced firm-internal managers ensure a minimum level of integration and coordination, the structural separation and the tailored incentive systems enable the pursuit of entirely new technological approaches without the necessity to consider the daily needs of a firm's established businesses. Through their executive board reporting, the *Separated Model* moreover benefits from a company-wide strategic attention and support.

6.2.2 Integrated Model

The six remaining innovation projects (among others, Industrial Wireless and MicroFilm LED) were implemented by using the *Integrated Model*. In contrast to the model described above, the *Integrated Model* describes innovation project teams that are assembled within an established business unit and can draw on the resources and infrastructure of this business unit. The *Integrated Model* includes business unit internal reporting lines, such that a project team gives account to the operating management of its affiliated business unit. MicroFilm LED, for example, was created as a project team within TechCorp's established Semiconductor business unit. The team reported to the business unit's CEO and was encouraged to access any resources owned by the existing Semiconductor business unit. Different from the *Separated Model*, the *Integrated Model* installs a management team from outside the focal firm. This management team is sourced from external experts characterized by a strong technological and market background in the newly developed technological innovation. An external management team can more easily overcome the established paths and thought patterns of an existing business unit and can, therefore, build an anti-pole to the integrated organization structures. For example, MicroFilm LED was led by a former university professor who was, due to his strong expertise in latest LED-technology, able to overcome TechCorp's established technological approaches. Lastly, the *Integrated Model* is described by profitability oriented incentive systems. Innovation projects organized within the *Integrated Model* compete for scarce resources with established businesses and, therefore, need to distinguish themselves through superior efficiency or effectiveness. The router produced by Industrial Wireless, for example, was required to have a higher profitability than the related business unit's established activities.

Summarizing, the *Integrated Model* is characterized by a strong structural integration and coordination with an established business unit. The integrated model benefits from the access of existing resources, capabilities, and infrastructure. At the same time, the external management team enables to break new grounds and engage in yet unknown technology fields.

Due to their configuration, the *Integrated* and *Separated Models* are mutually exclusive. Figure 15 provides an overview on the different characteristics of each model. Investigating the ten innovation projects, it was found that either model does

not suit any innovation projects. Rather, the *Integrated* and *Separated Models* seem to be appropriate for different kinds of technological innovation projects. In the following paragraph, this study describes the relationship among both, organization models and different innovation strategies. We delineate specific requirements for the different innovation strategies and describe which organization model best suits these requirements.

Figure 15: Overview on Organizational Models

	Separated Model	Integrated Model
Organization Structure	▪ Foundation of a structurally separated unit («Start-up») ▪ Reporting lines to the executive board	▪ Creation of an integrated project-team ▪ Reporting lines to the operating management
Leadership Model	▪ Internal management team ▪ Focus on longstanding internal experience and a comprehensive personal network	▪ External management team ▪ Focus on technology- and/or market-expertise
Incentive Systems	▪ Individually tailord incentive systems ▪ Combination of technology-, efficiency-, and growth-oriented targets	▪ Standardized (company-wide) incentive systems ▪ Focus on efficiency-oriented targets

6.3 Innovation Strategies

Investigating the ten innovation projects, this study identifies four innovation strategies (*Substitution-, Alternative-, Extension-, and Differentiation-Strategy*). The strategies differ with regard to three strategic dimensions. The market-dimension describes whether a technological innovation aims at entering new markets or targets an existing market by delivering a new or superior good. Second, the functional-dimension describes whether a technological innovation serves an existing customer need or, through the creation of a new feature, creates a new customer need. Finally, the technological dimension distinguishes between disruptive technological innovations, that are innovations entirely replacing and existing technology, from radical technological innovations, that are innovations based on entire newly created technology without replacing the current technological approach. The four innovation

strategies are categorized through different characteristics on the market-, functional-, and technology-dimension (see Figure 16). In the following paragraphs, we delineate each innovation strategy in more detail, describe their organizational requirements, and derive the most suitable organization model.

6.3.1 Substitution Strategy

The *Substitution Strategy* aims to create technological innovation within a firm's established businesses. The strategy focuses on technology to better address customer needs in a firm's existing market segments. Additionally, the *Substitution Strategy* targets the development of disruptive innovation, that is, innovation replacing a firm's existing technology. For example, MicroFilm LED served the existing market of light-issuing diodes, a market that was already served by TechCorp's existing Semiconductor business unit. MicroFilm LED moreover served the existing customer needs for energy-efficient illumination and was, through its strongly improved luminous power, able to completely replace Semiconductor's existing technology.

Technological innovation following a *Substitution Strategy* imposes specific requirements on their proper organization. In general, the development of a disruptive technology requires the ability of engaging in entirely new technological approaches. Besides knowledge on the latest technological approaches, the *Substitution Strategy,* however, targets at existing markets, customers, or business models. Accordingly, a close collaboration with the established businesses is required in order to benefit from existing knowledge and resources at hand. Moreover, the substitution of an existing technology requires a high degree of operational attention and assertiveness to convince employees and managers from abandoning the established technology and rather focus on the newly created innovation.

This study's analyses revealed that the requirements of a S*ubstation Strategy* are best fulfilled by choosing the *Integrated Model*. The *Integrated Model* allows a shared use of existing resources and knowledge. For example, MicroFilm LED benefited from existing supplier relationships, from the integration with a well-performing production process, and from established distribution channels as well as customer relationships. Due to its direct reporting to Semiconductor's business unit CEO, MicroFilm LED obtained a high level of operative attention and assertiveness. Finally, a management team recruited from outside of TechCorp was able to overcome

established firm-internal thought patterns. Enabled by the command of a former university professor, the innovation team was able to pursue entirely different technological approaches and finally arrived at MicroFilm LED technology which proofed to be the most promising approach.

6.3.2 Alternative Strategy

The *Alternative Strategy* – similar to the *Substitution Strategy* – aims at technological innovation to improve the satisfaction of existing customer needs in existing market segments. The *Alternative Strategy*, however, focuses on innovation that presents an alternative to a firm's existing technology, that is, not substituting the existing technology. Sustainable Energy represents an example for radical technological innovation following the *Alternative Strategy*. Before entering renewable energies, TechCorp was already operating in the market for fossil energy generation. Sustainable Energy was aimed at fulfilling the same customer needs as well as serving the same customer group of electric utility companies. In contrast to MicroFilm LED; Sustainable Energy did not replace TechCorp's exisiting technology or business, but the established and new technology co-existed.

Given the explanations above, the *Alternative Strategy* describes innovations that are in direct competition with an established and still highly profitable technology. Deriving from this, two major requirements emerge for the successful organization of innovation following the *Alternative Strategy*. First, the permanent and direct comparison to an established and profitable technology requires a high level of top management attention to ensure the access to resources and capabilities. Second, the parallel pursuit of an established and a new technology requires a high level of autonomy to ensure that the new technological approaches are promoted without facing resistant from the established businesses.

The *Separated Model* seems to best fit the described requirements of the *Alternative Strategy*. The *Separated Model* describes the pursuit of technological innovation detached from the operations of an established business unit, includes a direct reporting to the executive board and, thereby, receives the required strategic attention as well as the required autonomy to engage in the development of an alternative technology. Sustainable Energy was organized by using the *Separated Model* and was able to prosper besides TechCorp's established fossil energy generation. The project

directly reported to one of TechCorp's board members and was, hence, not in a direct relation to the established and highly profitable business of fossil energy generation. Besides its independence and the high level of strategic attention, the *Separated Model's* focus on an experienced internal management team ensured an adequate level of internal coordination and collaboration. Sustainable Energy's initial CEO, who was a veteran from TechCorp's fossil energy business, was able to draw on a longstanding expertise and a comprehensive internal network to ensure the start-up with access to crucial resources such as patent protected technology-components or customer relationships.

6.3.3 Extension Strategy

The *Extension Strategy* describes a technological innovation, which addresses new customer needs within and existing market segment. For example, Industrial Wireless was aiming at TechCorp's existing market for industrial automation, yet was neither supposed to substitute TechCorp's existing technology nor to create an alternative to it. Rather, Industrial Wireless was supposed to create a new customer need for flexible, place-saving, and highly reliable wireless connection between individual manufacturing facilities.

The *Extension Strategy* describes innovation that expands a firm's established businesses through the implementation of a new technology. This property requires a permanent and comprehensive coordination among the technological innovation and a firm's existing business. Technology interfaces need to be matched, product components need to be pooled or synchronized, and customer groups need to be integrated. Besides a comprehensive coordination, the *Extension Strategy* requires a high level of knowledge- and resource-exchange. Innovations within the *Extension Strategy* are built upon an established market or business and, hence, share the majority of knowledge and resources from established businesses.

This study's analyses have shown that the *Integrated Model* suits best for innovation following the *Extension Strategy*. The integrated model enables a high degree of coordination and facilitates a constant exchange of knowledge and resources. As an example, Industrial Wireless strongly benefited from its close coordination with TechCorp's existing Industrial Automation business unit. Within Industrial Wireless's early development, customer requirements could be incorporated, technological

interfaces could be matched, and a combined production process could get installed. Besides this close coordination, Industrial Wireless was also able to strongly benefit from Industrial Auomation's existing infrastructure. Directly after assembling a functioning prototype, Industrial Wireless was prepared to enter the market, without engaging in the time- and cost-extensive process of establishing supplier relationships, building production facilities, or creating customer relationships. Besides the high levels of coordination and integration, Industrial Wireless was also relying on a firm-external management team. The technological breakthrough was only achieved as an external team of researchers took the lead in the Industrial Wireless project.

6.3.4 Differentiation Strategy

The fourth innovation strategy, which is called *Differentiation Strategy*, recalls a technological innovation that focuses on a new, yet TechCorp-untreated market. As an example, the project Miniature Plant dealt with the market segment of building miniature plants that produce specialty chemicals. TechCorp's existing operations were located in the market of industry automation, however, never dealt with the actual manufacturing of industrial plants.

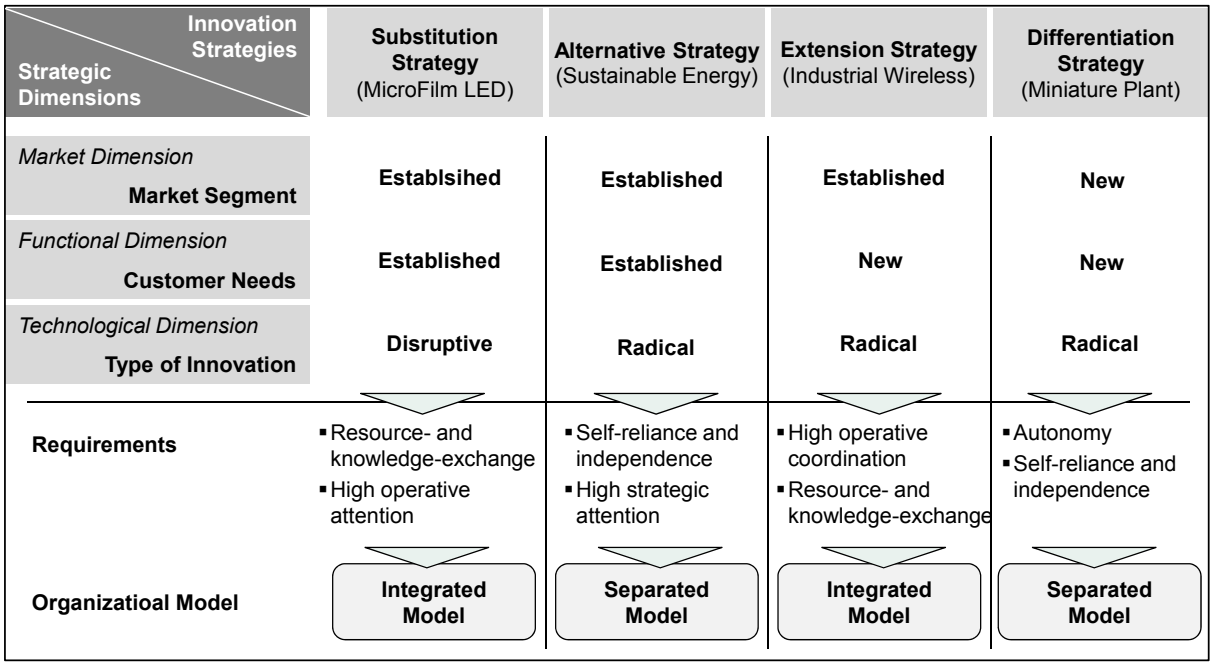
The successful implementation of innovation within the *Differentiation Strategy* requires a great extent of creativity and independency. Innovation following the *Differentiation Strategy* aim at a new customer need within a new market segment. It is, hence, required to fully focus on this new market segment, without being biased by the needs and interests of an established business unit. Entering a new market segment, moreover, goes in hand with the impracticality of a firm's existing resources. The coordination and integration with a firm's established businesses does hence not create substantial advantages for technological innovation following a *Differentiation Strategy*.

The *Separated Model* is most suited to implement technological innovation within the *Differentiation Strategy*. Miniature Plant was able, without considering the interest of established TechCorp businesses, to enter the new market for miniature plant production and tailor all its operations for this new market segment. The direct reporting to TechCorp's board members ensured Miniature Pant's independence and provided the small start-up with the required strategic attention. Since Miniature Plant was led by an experienced TechCorp-internal management team, the projects firm-

internal coordination and integration, e.g., with regard to accessing existing TechCorp customer relationships, was assured.

Figure 16 provides an overview on the four innovation strategies and their matching with one of the two organizational models. The figure displays the three innovation dimensions that distinguish between the four innovation strategies, delineates each strategies requirements with regard to an effective organization, and finally assigns the suitable organizational model (either the *Separated* or *Integrated Model*)

Figure 16: Innovation Strategies and Organizational Models



6.4 Success Factors for Implementing Technological Innovation

This study illustrates that the organizational implementation of technological innovation projects has a central meaning to an innovation's prosperity. The analyses showed that the characteristics of an innovation are a key element to determine its most suited organizational model. The following three paragraphs summarize the key take-aways from this study.

Adjusting organizational models on different innovation strategies. As described earlier, different innovation strategies exhibit different requirements to an innovation's proper organization model. The analyses revealed that a mismatch between innovation strategy and organizational model provided severe challenges to the successful implementation of a technological innovation.

The separated and integrated models need to be installed consistently. Each of the two described organizational models need to be consistently implemented along all three dimensions, without combining both approaches. For example, it was found that the combination of separated organizational structures and an external management team was unable to successfully implement technological innovation. Such a combination of both organizational models was found to fully detach an innovation project without ensuring the links to the focal firm.

Balance autonomy and integration across rather than within organizational dimensions. The analysis showed that an effective balance of autonomy and integration was achieved by balancing both requirements across the organizational dimensions of organization structure, leadership model, and incentive systems rather than within. Organizational solutions that tried to balance autonomy and integration within a single organizational dimension, e.g., by installing inconsistent organizational structures did not prove to be suitable.

6.5 Methodology

6.5.1 Research Setting and Sampling

Large, diversified technology firms were suggested as an appropriate setting to study the life cycle of innovation (Brown and Eisenhardt, 1995). Given that, this study focuses on TechCorp, one of the leading global technology companies with a heavily diversified business portfolio and a strong track record in generating technological innovation. Through a research collaboration with TechCorp, this study could rely on in-depth insights about the evolution of technological innovation. Technological innovation projects were previously suggested as a suitable unit of analysis for studies on exploratory activities (Westerman *et al.*, 2006).

6.5.2 Data Collection

As primary data source, I conducted semi-structured interviews with a total of 32 informants, which were interviewed (some several times) over a one year period. I questioned two to four informants per initiative, including project-CEOs, technical managers, representatives from different functional areas, project consultants, and corporate managers. Interviews lasted between 45-120 minutes and, apart from several follow-up telephone calls, were conducted during on-site visits. All interviews were recorded and transcribed (Eisenhardt, 1989). I relied on an interview guide that covered a broad set of organizational mechanisms introduced in previous research on studying the organization of innovation projects (Brown and Eisenhardt, 1995). Complementing the interview data, I was able to access multiple documents that were either publicly available (i.e. segment reports) or confidential (technical documentation, consultant reports, memoranda, and financial/accounting documents) (Creswell, 2003).

6.5.3 Data Analysis

For the data analysis, I followed a multistage process of independent, comparative, and collaborative analysis, which had been suggested for process studies by Faems, Janssens, Madhok, and Van Looy (2008). First, I focused on the information provided by the respondents. Second, I applied a theoretical lens on the empirical findings. This allowed plunging deeply into the implemented organizational models before extracting theory from ground up (Pettigrew, 1992; VandeVen, 1992). In the first phase of data analysis, two of the co-authors individually conducted a content analysis on the

specific innovation projects covered. We independently developed visual maps of the organizational models as well as the strategic dimensions. Subsequently, we compared our initial findings from the successful projects with the unsuccessful cases in our sample in order to confirm our observations (Yin, 2003). Finally, both authors addressed the few inconsistencies in their understandings of the empirical evidence by going back to the data, contacting informants, and discussing intensively.

7 Overall Discussion and Conclusion

The detailed contributions of this dissertation can be found in the papers' respective discussion sections. The aim of this overall summary is to synthesize the different studies' most important contributions. This overall summary discusses four theoretical and two managerial contributions.

7.1 Theoretical Contributions

7.1.1 Contribution 1: Revising the Exploration-Exploitation Balance

A major contribution of this dissertation is that it revisits the notion of balance when simultaneously pursuing exploration and exploitation. Investigating the simultaneous pursuit of the two conflicting tasks from a longitudinal perspective, this dissertation introduces the construct of dynamic ambidexterity and, thus, proposes a "dynamic equilibrium" perspective (Smith and Lewis, 2011). Such a perspective is important, since it shifts the literature's research focus from investigating how firms become ambidextrous to building theory on how they can maintain and sustain their ambidextrous orientation over time. While some ambidexterity scholars have already suggested a dynamic perspective (e.g., Raisch et al., 2009; Simsek et al., 2009), this dissertation goes a step further by conceptualizing it and clarifying its related drivers, capabilities, and outcomes.

A first insight relates to the drivers of changes in firms' exploration-exploitation allocations. While earlier theoretical models describing temporal shifts in firms' exploration and exploitation activities (Boumgarden *et al.*, 2012; Nickerson and Zenger, 2002) assume that these shifts follow a regular rhythm that top management set internally, this dissertation shows that more irregularly occurring environmental changes drive these shifts. In agreement with previous studies that relate environmental dynamism to (static) ambidexterity (Jansen et al., 2005), this dissertation argues that static ambidexterity is insufficient to accommodate varying levels of environmental dynamism, which require dynamic ambidexterity. Similar arguments and empirical evidence is provided for the role of exogenous shocks (Lavie et al., 2010) and competitive moves (Auh and Menguc, 2005) as drivers of dynamic ambidexterity. The dissertation focuses on the external drivers of changes in firms' exploration-exploitation allocations, but future research should explore the role of

potential internal drivers, such as performance shortfalls (March, 1991), CEO or top management team replacements, and changes in corporate or business-level strategies.

A second insight relates to the previously described balancing capabilities, or the ability to manage the paradoxical tensions that arise from simultaneously pursuing exploration and exploitation (O'Reilly and Tushman, 2008a). While this dissertation acknowledges that these capabilities are important, it also highlights that they may be insufficient to sustain ambidexterity. It is argued that firms wishing to sustain their ambidextrous abilities have to combine balancing capabilities with adaptation capabilities: the ability to transition between different exploration-exploitation allocations over time. Prior studies taking a longitudinal perspective of firms' shifting exploration-exploitation allocations (e.g., Boumgarden *et al.*, 2012) have not explored the capabilities that enable firms to conduct such shifts. While this dissertation provides first conceptual insights, future research should empirically explore how organizations identify "early warning signs" that signal that "the time for a course correction has come" (Probst and Raisch, 2005: 100). An organization's capability to proactively adapt its exploration-exploitation balance to changing environmental conditions may be associated with its absorptive capacity (Lavie and Rosenkopf, 2006); that is, the ability to assess the value of external knowledge, internalize it, and apply it (Cohen and Levinthal, 1990).

A third insight is that the interaction between static and dynamic ambidexterity is more positively related to firm performance than either concept in isolation. This dissertation expands and complements earlier ambidexterity literature's arguments that (static) ambidexterity contributes to firm performance by enabling complementarities that arise from combining exploration and exploitation (March, 1991; Smith and Lewis, 2011). However, it reveals an additional, distinct performance effect that arises from (dynamic) ambidexterity's ability to ensure dynamic fit with the changing environmental conditions (Miller, 1992; Venkatraman and Prescott, 1990). Although previous studies argue that maintaining a "static balance in exploration and exploitation compromises the levels of each that are attained" (Boumgarden *et al.*, 2012: 592), dynamic ambidexterity has the benefit that the paradox is partly nested in time (Farjoun, 2010). Organizations can thus temporarily focus their primary attention on either the one or the other task, which reduces the extent to which they experience tension between them (Poole and Van de Ven, 1989). Future research should further assess the alternative approaches' short and long-term performance effects across

different geographical, industry, and firm settings. We recommend that such longitudinal studies in changing contexts use a combined measure (static ambidexterity * dynamic ambidexterity) to fully capture ambidexterity as a long-term, dynamic capability.

7.1.2 Contribution 2: Adapting the Exploration-Exploitation Balance

While this dissertation's first contribution is a novel understanding of firms' exploration-exploitation balance, the second contribution relates to the question of how firms adapt their exploration-exploitation balance over time. Specifically, it was established that individual preferences' interaction with organizational structures or policies determine firms' exploration-exploitation adaptations. As an example, Chapter 3's (Paper 2's) findings suggest that managerial inclinations' interaction (i.e. exploitation-biased, exploration-biased, and ambidextrous) with organizational policies and restrictions (i.e. profit gap and path dependency) causes firms' overreactions toward either of the conflicting activities. Likewise, Chapter 6 (Paper 5) indicates that the combination of leadership systems and organizational structures creates an overall organizational model that allows firms to adhere to the conflicting requirements of exploration and exploitation. Both chapters illustrate that considering either the managerial or organizational mechanism in isolation – as previous studies often do (e.g., Jansen *et al.*, 2009; Mom *et al.*, 2009) – may explain why firms drift toward over-exploration or exploitation.

Chapter 3 additionally introduces two sub-challenges when adapting ambidextrous firms' exploration-exploitation balance. Prior studies (e.g., Jansen *et al.*, 2006) have already investigated the first sub-challenge, which relates to the different degrees of exploitation and exploration that are required in various environmental conditions. While dynamic environments call for a slight exploration bias, stable environments require more exploitation-biased organizations (Jansen *et al.*, 2005; Uotila *et al.*, 2009). Chapter 3 refers to this situation, in which managers need to adapt an organization's combination of exploitation and exploration to fit the environmental conditions, as the *adaptation challenge*. However, given Paper 2's findings, achieving organizational ambidexterity under varying environmental conditions might be faced with an additional, previously unexplored, challenge: the *balancing challenge.* This challenge requires managers to adjust their actions to the opposite condition in order to return to a balanced state of organizational ambidexterity.

Prior research has suggested that adapting to environmental conditions might cause firms to arrive at over-exploitation or over-exploration (Wang and Li, 2008). Chapter 3 illustrates this by showing that managers, whose intrinsic bias toward exploitation or exploration is aligned with the environmental requirements, tend to lead their organization to overshoot to one extreme or the other. In order to return to a balanced state and prevent overshooting, the complementary intrinsic and extrinsic antecedents to resource allocation need to act as opposing forces. This, however, means that managers have to lead their organizations to adapt to a combination of exploitation and exploration that is contrary to their own intrinsic behavioral inclination (e.g., exploitation-biased managers need to operate in exploration-biased organizations that are adapted to dynamic environmental conditions). This allows for a gradual adaptation to the degrees of exploitation and exploration, resulting in a balanced state of organizational ambidexterity that is aligned with the environmental requirements.

The *adaptation challenge* and the *balancing challenge* appear to be paradoxical. They require managers to adopt the opposite condition a) in order to adapt the combination of exploitation and exploration to fit the environmental conditions and, at the same time, b) to counteract the organizational tendency to move too far into that direction. This finding perfectly relates to the first contribution (or Chapter 2) in which the concepts of static and dynamic ambidexterity call for a balancing and adaption-challenge.

7.1.3 Contribution 3: Firm-Internal Mechanisms to Balance Exploration and Exploitation

The first two contributions provide conceptual insights into the definition of a longitudinal exploration-exploitation balance as well as the adaptation of this balance. The third and fourth contributions, on the other hand, refer to specific firm-internal (third contribution) and firm-external (fourth contribution) mechanisms to implement organizational ambidexterity.

With regard to firm-internal mechanisms, Chapter 5 (Paper 4) is among the first studies to contrast the balancing modes of pursuing exploration and exploitation simultaneously or sequentially (Venkatraman *et al.*, 2007). Referring to firms' core resources (i.e., human, financial, and operational resources), Paper 4 focuses on the resource requirements of simultaneously or sequentially balancing exploration and

exploitation. As an example, when considering the role of operational resources, contradictory effects were found for both balancing modes. For firms with very important operational resources, the simultaneous pursuit of exploration and exploitation seems to be superior to their sequential pursuit. While this paper does not find opposite effects for other resource categories (such as, e.g., human resources), future research might identify additional contingencies that indicate the superiority of either balancing mode. In addition to directly comparing the distinct balancing modes, this dissertation provides specific insights into either balancing exploration and exploitation simultaneously or sequentially.

In line with previous work (e.g., Adler *et al.*, 1999; Tushman and O'Reilly, 1996), this paper suggests that firms' workforces seem have the most difficulty when implementing exploration and exploitation simultaneously. A larger percentage of employees indicates that such firms' managers cannot waver between both conflicting tasks, or that they need to deal with additional personnel in higher hierarchies in order to reconcile the two activities. Besides its HR disadvantages, the simultaneous pursuit of exploration and exploitation, however, seems to be more favorable than focusing on only one of the activities. Surprisingly, simultaneous exploration and exploitation allows for cost savings in that fewer financial or operational resources are spent. This contradicts prior work, which assumed that the conflicts associated with simultaneously exploring and exploiting lead to increased costs for which revenue advantages are expected to compensate (He and Wong, 2004). However, according to Paper 4's findings, firms that simultaneously focus on exploration and exploitation do not need to rely on relative revenue advantages, but might even benefit from relative cost savings.

With regard to implementing sequential exploration and exploitation, this study largely confirms previous work, highlighting the costs and challenges involved in firms' transitions between the two conflicting tasks (Lavie *et al.*, 2010; Raisch *et al.*, 2009). While this dissertation does not find particularly strong results for sequential exploration and exploitation, Paper 4's empirical outcomes indicate the relative cost disadvantages of this balancing mode. Finding relative higher costs for sequential exploration and exploitation, however, does not indicate that this balancing mode is not a promising solution. The benefits of sequential exploration and exploitation might outweigh these increased costs (Boumgarden *et al.*, 2012).

7.1.4 Contribution 4: Firm-External Mechanisms to Balance Exploration and Exploitation

The final contribution of this dissertation is that it points out firm-external mechanisms to find a balance between exploration and exploitation. Chapter 4 (Paper 3) is among the first studies to introduce acquisitions as a means to balance the two conflicting tasks (Phene *et al.*, 2012). Given this dissertation's longitudinal focus, Paper 3 explores the role of acquisition streams and questions how a series of interrelated acquisitions is an effective mechanism to implement exploration and exploitation simultaneously or sequentially.

Paper 3 does not find any general statistically significant effect between the presence of explorative and exploitative acquisitions in an acquisition stream and acquirer performance. Instead, its findings suggest that it is the acquisition stream's "strategic content design" – the temporal differentiation between or structural separation of explorative and exploitative acquisitions – that influences the subsequent firm performance.

Paper 3 suggests that, in order to foster superior firm performance, the strategic motives need to be carefully aligned with the design mode chosen to structure different strategies within and across acquisition streams. This is significant, as previous studies have mostly focused on the structural aspects of acquisition streams, such as the acquisition rate and rhythm, when analyzing acquisition sequences' performance implications (Laamanen and Keil, 2008; Shi and Prescott, 2011).

7.2 Managerial Implications

In addition to the theoretical contributions, this dissertation provides insights into how managers can effectively create ambidextrous organizations. The managerial implications are divided into two sub-chapters: The first focuses on determining an effective exploration-exploitation balance. It aims to provide managers with detailed insights into the characteristics of an effective balance between exploration and exploitation. The second chapter aims to provide insights into specific tools and mechanisms that allow managers to accomplish such an "optimal" allocation.

7.2.1 Defining the Exploration-Exploitation Balance

What should managers' aim be when designing ambidextrous organizations? This dissertation suggests that there are two options for effectively combining exploration and exploitation. The first is dynamic ambidexterity and considers the simultaneous pursuit of exploration and exploitation. The following paragraph describes this option in more detail. The second option stresses the sequential pursuit of the two conflicting tasks; it is described in the second paragraph. Finally, the third paragraph introduces resources' role as a criterion for deciding between the two options.

The notion of dynamic ambidexterity advises managers to promote ambidexterity (i.e. the simultaneous pursuit of exploration and exploitation), yet, also cautions them to remain adaptive and to continue adjusting their firm's exploration-exploitation balance over time (i.e. dynamic ambidexterity). From this new perspective, sustaining ambidexterity is about creating an organization that is able to (1) resolve the conflicts associated with simultaneous exploration and exploitation while it is also able to (2) adapt this balance over time without overshooting to either extreme. This is particularly challenging as it forces managers to simultaneously address multiple challenges: First, they need to host and harmonize the conflicting exploration and exploitation requirements. Second, they need to withstand the temptation to continue their current, successful paths in favor of (more challenging) adaptations. Third, they need to maintain their dual focus on exploration and exploitation while aligning themselves with new environmental requirements. This advice fundamentally differs from previous work, which predominantly asked managers to strengthen their exploration-exploitation balance to prevent over-allocations to either activity.

The sequential pursuit of exploration and exploitation provides an alternative to dynamic ambidexterity. In line with other studies (e.g., Boumgarden *et al.*, 2012), this dissertation's findings suggest that the sequential pursuit of both activities (Chapter 5), which is characterized by focusing on either conflicting task at a specific point in time, is advisable. While the adaptation challenge remains for the sequential pursuit of exploration and exploitation, it evades the pressure of simultaneous exploration and exploitation.

Proposing two alternatives to balancing exploration and exploitation, this dissertation also provides a decision criterion for choosing between the options. The

roles of distinct firm resources that are more or less adequate for pursuing either balancing mode are discussed. As an example, this dissertation introduces the role of operational resources that are more efficiently utilized in simultaneous than sequential exploration-exploitation. Managers are urged to analyze their firm's resource base and assess their resources' characteristics with regard exploration and exploitation. As they come to the conclusion that exploration and exploitation are competing activities with regard to their major resources, they are advised to implement sequential exploration and exploitation. In the opposite case – that is, a firm's resources are jointly usable – managers are advised to implement dynamic ambidexterity.

7.2.2 Implementing Organizational Ambidexterity

After defining firms' most promising options for balancing exploration and exploitation, this chapter delineates how to implement either of these options. The papers in this dissertation investigated many different mechanisms for balancing exploration and exploitation (including incentive systems, leadership models, etc.). Their findings led to two major insights that can help in either simultaneously or sequentially balancing exploration and exploitation.

The first major insight is that managers need to consider many different organizational mechanisms simultaneously in order to effectively implement organizational ambidexterity. Especially Chapters 3 and 6 indicate how considering individual organizational mechanisms (e.g., leadership models) may lead firms to unbalanced allocations that result in over-exploration or exploitation (Wang and Li, 2008). In practical terms, it seems reasonable to appoint risk-prone managers during unstable environmental conditions (Chapter 3) or to install separate organizational structures for pursuing technological innovations (Chapter 6). However, this dissertation suggests that considering any of these mechanisms separately may cause unbalanced allocations. As firms in unstable environmental conditions combine risk-prone managers with exploration-oriented organizational structures, their overall resource allocation becomes skewed and they suffer from unbalanced orientations. Instead, managers should consider the combined effects of leadership models, organizational structures, etc. to design effective ambidextrous organizations. This policy might not only help ensure an exploration-exploitation balance, but can also ensure a dynamic adaptation among the two conflicting activities as described in the previous chapter.

In addition to these internal mechanisms to implement organizational ambidexterity, Chapter 4 emphasizes the role of acquisition streams in designing organizations that adhere to exploration and exploitation. Given the findings of this dissertation, however, managers are cautioned to use multiple acquisitions for implementing ambidexterity. While the sequential pursuit of explorative and exploitative acquisitions was found to improve firm performance, such acquisition streams are generally difficult to implement. It seems that firm-internal mechanisms (e.g., leadership models and organizational structures) are better suited to implementing organizational ambidexterity than firm-external mechanisms.

7.3 Limitations and Future Research

The papers' specific limitations are discussed in the respective chapters (see Chapters 2.7.4, 3.6, 4.6.2, and 5.6.4). This section discusses the dissertation's overall limitations and areas for future research.

First, this dissertation focuses on the fundamental difference between firms' simultaneous or sequential pursuit of exploration and exploitation. Simultaneous ambidexterity can moreover be divided into different balancing modes, such as structural (Tushman and O'Reilly, 1996) or domain separation (Lavie and Rosenkopf, 2006), or contextual integration (Gibson and Birkinshaw, 2004). The different modes deploy very different measures to balance exploration and exploitation. Given these differences, the role of time also seems to have distinct implications for the longitudinal implementation of either balancing mode. As an example, adapting the structural mechanisms for separating exploration and exploitation over time might differ substantially from adapting cultural elements in firms pursuing contextual ambidexterity. Future research should study the role of time in any of the three balancing modes and investigate how they can be sustained over time.

Future research could moreover focus on the antecedents of firms' transitions between exploration and exploitation. Whether dealing with dynamic ambidexterity (firms' ability to adapt their exploration-exploitation balance over time) or the sequential pursuit of both conflicting tasks, we lack a theoretical understanding of the triggers of adaptations in firms' exploration-exploitation allocation. Future research might focus on the distinction between the triggers of dynamic ambidexterity and the sequential pursuit of exploration and exploitation. Which antecedents persuade firms

to switch between discrete activities (i.e. sequential exploration-exploitation), and which antecedents convince firms to adapt their existing exploration-exploitation allocation (i.e. dynamic ambidexterity)? Illustrating the differences between these antecedents can help delineate the conceptual differences between the two balancing modes.

Finally, future research should verify this dissertation's findings in different industry contexts or through different theoretical lenses. This dissertation mostly focused on one particular industry (i.e., the insurance industry (Chapters 2 and 5)) to increase the validity of its findings. Future research may review these findings in broader industry contexts (e.g., S&P 500) or may transfer these findings to particular different industries (e.g., the biotechnology industry (Hoang and Rothaermel, 2010)). Moreover, this dissertation mostly focused on March's (1991) initial theoretical understanding of exploration and exploitation as distinct learning activities. The exploration-exploitation dilemma, however, has been viewed through various theoretical lenses, including technological innovation and strategic management (see Raisch and Birkinshaw, 2008 for an overview). Future research should verify the findings of this dissertation against these related theoretical lenses and confirm whether they apply to these related domains.

7.4 Overall Conclusion

This dissertation aimed to enhance our understanding of firms' exploration-exploitation dilemma by focusing on the role of time. Among others, it was shown that considering time (i) shifts our understanding of a proper exploration-exploitation balance, (ii) provides insights into why firms often end up in unbalanced allocations, and (iii) provides multiple insights into specific mechanisms to establish organizational ambidexterity. However, given the comprehensive influence of time on firms' exploration-exploitation dilemma (e.g., time might also influence the implementation of specific exploration-exploitation balancing modes, such as contextual or structural ambidexterity), future empirical research should further explore how the consideration of time influences our understanding of the exploration-exploitation dilemma. As mentioned in Chapter 7.3, scholars from domains outside the area of organizational ambidexterity should look into this topic to provide more comprehensive insights into the longitudinal perspective on the exploration-exploitation dilemma.

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