Product- and Factor Market Contact and Competitive Aggressiveness: The Moderating Effect of Competitive Intensity

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Abstract

In the quest to understand the antecedents and outcomes of firms' competitive behaviours, theories about the consequences of interdependencies have received increasing attention. While the literature on multimarket contact has contributed valuable insights, there is still limited understanding of how different types of interdependencies influence competitive behaviour. In particular, limited research has analysed the effects of factor market interdependencies. Drawing on multimarket contact and factor market competition literature, the study argues that firms refrain from competitive behaviour when they experience multimarket contact in both product and factor markets, but that this effect is stronger in the case of product multimarket contact. Identifying boundary conditions has also become an integral part of multimarket contact literature. In this vein, competition has received particular attention, with a focus on industry and market level competition. Complementing these approaches, the study builds on ecological models of competition to analyse how idiosyncratic competitive circumstances influence the multimarket contact-competitive aggressiveness relationship. The study argues that competitive intensity limits aggressive behaviour. Furthermore, it argues that competitive intensity positively moderates the relationship between product multimarket contact and competitive aggressiveness and negatively moderates the relationship between factor multimarket contact and competitive aggressiveness. The study tests these predictions on 1,276 (8,065 firm-year observations) large bank holding companies operating from 2001-2011 in the US. The empirical results suggest that different types of interdependencies have distinct implications for competitive behaviour and that idiosyncratic competitive circumstances may contribute towards understanding the boundary conditions of the mutual forbearance hypothesis. These findings contribute to the literature on multimarket contact, competitive dynamics, factor market competition and ecological models of competition. In particular, current multimarket contact literature largely focuses on the same types of contact to analyse the effect on competitive behaviour, yet the results of this study show that different types of contact may have distinct effects. In addition, the effect of industry or market level competition has received some attention, but this study emphasises idiosyncratic competitive circumstances. Specifically, the results reported here suggest that idiosyncratic competitive circumstances play a significant role in delineating the boundaries of the mutual forbearance hypothesis.

To Manu and Alyna

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List of Abbreviations

AMC – Awareness-Motivation-Capabilities

BCBS – Basel Committee on Banking Supervision

BHCs – Bank Holding Companies

CALL Reports – Reports of Condition and Income

CEOs – Chief Executive Officers

FDIC – Federal Deposit Insurance Corporation

FFIEC – Federal Financial Institution Examination Council

FMMC – Factor Multimarket Contact

FRB – Federal Reserve Board

FRED – Federal Reserve Bank of St. Louis Economic Data Series

FR Y-9 Reports – Consolidated Financial Statements for Holding Companies

GDP – Gross Domestic Product

MFB – Mutual Forbearance

MMC – Multimarket Contact

NAICS – North American Industrial Classification System

OCC – Office of the Comptroller of the Currency

OLS – Ordinary Least Squares Regression

PMMC – Product Multimarket Contact

SCP – Structure-Conduct-Performance

US – United States

USD – US Dollars

VIF – Variance Inflation Factor

CHAPTER 1
INTRODUCTION

1 INTRODUCTION

1.1 Background

In the quest to understand the antecedents and outcomes of firms' competitive behaviour, theories about the consequences of interdependencies have received increasing attention (Greve & Baum, 2001; Jayachandran, Gimeno, & Varadarajan, 1999; Yu & Cannella, 2013). A number of theories explain how interdependencies may affect competitive behaviour, but the mutual forbearance hypothesis (Edwards, 1955) has emerged as one of the most influential (Yu & Cannella, 2013). The fundamental argument of this hypothesis is that multimarket contact (MMC) creates interdependencies that incentivise firms to reduce competitive behaviour. For example, firms can respond to competitive aggressions not only in the focal market but in all markets they share. Various theoretical lenses have been used to analyse the influence of interdependencies on competitive behaviour, notably the industrial organisation (Scherer & Ross, 1990) and the competitive dynamics (Chen, 1996; Ketchen, Snow, & Hoover, 2004) perspective, as well as a variety of game-theoretic models (e.g. Bernheim & Whinston, 1990; Shakun, 1965, 1966). To date a long tradition of studies has established the theoretical and empirical relevance of the impact of MMC on competitive behaviour, has explained and analysed the main ideas from a variety of theoretical perspectives and in a number of empirical contexts, and has begun to outline boundary conditions (Greve & Baum, 2001; Jayachandran *et al.*, 1999; Yu & Cannella, 2013).

This literature has mainly analysed how interdependencies in activities such as product MMC (PMMC) or geographic MMC influence competitive behaviour. Even though this focus has significantly advanced our understanding, it neglects that firms simultaneously experience interdependencies in a number of different types of activities along the entire value chain (Anand, Mesquita, & Vassolo, 2009; Markman, Gianiodis, & Buchholtz, 2009; Scott, 2001) and that firms actively compete in a range of activities along the value chain (Capron & Chatain, 2008; Markman *et al.*, 2009). By zooming in on the effect of interdependencies in a particular type of activity (e.g. PMMC or geographic MMC), the effect of interdependencies in other types of activities are neglected. This focus also points to a crucial, yet mostly implicit, assumption in MMC literature,

namely that different types of interdependencies have a similar effect on competitive behaviour. Anand *et al.* (2009), however, show that, while firms with MMC in exploitation activities forbear, they follow a mimicking logic in exploration activities even in the presence of MMC. On the other hand, Scott (2001) suggests that contact in innovation markets has a positive effect on citing competitors' patents. Similarly, factor MMC (FMMC) may have implications for competitive behaviour in product markets and vice versa (Capron & Chatain, 2008; Gardner, 2005; Lerner, Tirole, & Strojwas, 2003; Markman *et al.*, 2009). Markman *et al.* (2009), in particular, suggest that when firms "*interact more regularly in product markets than in factor markets, awareness is higher in product markets, but vulnerability and motivation to take action lie predominantly in factor markets*" (p. 434).

Hence, the assumption that different interdependencies have a similar effect on competitive behaviour is problematic given that interdependencies at various stages of the value chain may have distinct implications for competitive behaviour. Taken together these arguments highlight the need to probe how different types of interdependencies affect competitive behaviour. In particular, focusing on any one type of contact in isolation neglects that other types of contact may have implications for competitive behaviour. For example, firms may not respond to competitive aggressions in product markets because this may jeopardise forbearance in factor markets. Contact in factor markets may have an independent effect on competitive behaviour in factor markets or product markets. Then again, firms may engage in less competitive behaviour in product markets while competing more aggressively in factor markets. Thus, it is essential to begin to gain a deeper understanding as to how different types of interdependencies influence competitive behaviour.

Identifying boundary conditions has also become a fundamental aspect of MMC literature. Analysing these, contingency models have shown that firm-specific factors such as economies of scope (Gimeno & Woo, 1999), Chief Executive Officers (CEOs) (Stephan, Murmann, Boeker, & Goodstein, 2003) and resource flows to business units (Sengul & Gimeno, 2013) affect the relationship between MMC and competitive behaviour. Moreover, dyadic interdependencies such as spheres of influence (Baum & Korn, 1996; Bernheim & Whinston, 1990; Gimeno, 1999), reciprocity of contacts (Gimeno, 1999), strategic and resource similarities (Fuentelsaz & Gómez,

2006; Gimeno, 1999; Gimeno & Woo, 1996), and mutual footholds (Upson, Ketchen, Connelly, & Ranft, 2012) also have important moderating effects. Furthermore, environmental characteristics such as cultural distance, local regulations, and strong local competition (Yu, Subramaniam, & Cannella, 2009) can have an influence.

In identifying boundary conditions, competition has received particular attention. Much of this work builds on industrial organisation theories in general (Bain, 1956; Porter, 1980; Scherer & Ross, 1990) and the Bernheim and Whinston (1990) model in particular. The Bernheim and Whinston (1990) model stipulates that, when markets differ in terms of how competitive they are, this creates asymmetries that facilitate mutual forbearance because it allows enforcement powers to be transferred to markets. Accordingly, competition has mostly been analysed in terms of market or industry concentration. Results, however, have remained inconclusive with some finding an accentuating effect (Fernández & Marín, 1998; Haveman & Nonnemaker, 2000; Heggestad & Rhoades, 1978; Scott, 1982), others find this only in some markets (Alexander, 1985; Feinberg, 1985; Hannan & Prager, 2004) while others again find the opposite effect (De Bonis & Ferrando, 2000; Mester, 1987; Prince & Simon, 2009) or no effect at all (Baum & Korn, 1996; Fuentelsaz & Gómez, 2006).

In light of the central importance that has been ascribed to identifying how competition influences the relationship between MMC and competitive behaviour further investigation is warranted. To resolve mixed results, this study proposes that analysing the role of competition from a different perspective may produce additional insights. To do so, this study draws on firm-level theories of competition (Barnett, 1997, 2008; Barnett & McKendrick, 2004; Baum & Singh, 1994b; Chen, 1996; Chen & Miller, 2012; Chen, Su, & Tsai, 2007) to analyse how competition influences the relationship between MMC and competitive behaviour. Considering firm-level competition in theories of mutual forbearance is of particular importance because a fundamental assumption is that competitive parity or the situation in which "*no actor possesses an initial overwhelming competitive advantage and all actors initially have equal opportunities to gain access to resources that give competitive advantage*" (Bowers, Greve, Mitsuhashi, & Baum, 2014, p. 42) results in mutual forbearance.

However, competitive parity may not always exist. MMC literature, for instance, describes that certain firms may have incentives to escalate competition despite MMC (Baum & Korn, 1996, 1999; Thomas & Willig, 2006; Young, Smith, Grimm, & Simon, 2000). For example, firms with greater MMC can retaliate against competitive attacks faster than firm with less MMC (Young *et al.*, 2000) and MMC may lead to competitive escalation when contagion across markets occurs (Thomas & Willig, 2006). What is more, especially early theoretical work has suggested that the incentives to engage in competitive behaviour depend on the ability of firms to enforce forbearance (Bernheim & Whinston, 1990) and on the firms' overall competitive awareness, motivation and abilities (Chen, 1996; Karnani & Wernerfelt, 1985; McGrath, Chen, & MacMillan, 1998). Indeed, the very market entry and exit behaviours, even if aimed at stabilising competitive relationships, destabilise these relationships initially (Baum & Korn, 1996, 1999) and might be followed by a series of entry and exit moves until a new equilibrium is established (Fuentelsaz & Gómez, 2006; Haveman & Nonnemaker, 2000). Since competitive parity is an essential condition for mutual forbearance, it seems important to gain a better understanding of how idiosyncratic incentives for and constraints on competitive behaviour influence the relationship between MMC and competitive behaviour.

Firm-level theories of competition, in particular, highlight that even within the same industry or market, firms experience idiosyncratic competitive pressures and have idiosyncratic competitive abilities that create incentives for and constraints on competitive behaviour. For instance, the competitive dynamics perspective through the awareness-motivation-capabilities (AMC) perspective explains that competitive behaviour is a function of the idiosyncratic awareness of competitive threats, the motivation to respond to these threats, and the capability to do so (Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007). Similarly, theories grounded in organisational ecology argue that the degree to which firms occupy the same resource space influences their ability to access resources and their moves between resources spaces (Baum & Singh, 1994a, 1994b; Dobrev, 2007; Dobrev & Kim, 2006). Building on this notion, models of Red Queen competition suggest that competitive intensity is a function of surviving the idiosyncratic history-dependent cycle of competitive interactions (Barnett, 1997, 2008; Barnett & Hansen, 1996; Barnett & McKendrick, 2004). In this model, firms that do well become stronger while their competitors face increasingly greater competitive intensity. Hence, a focus on firm-level

competitive incentives and constraints allows a deeper understanding of parity conditions and how these may influence the relationship between MMC and competitive behaviour.

In summary, the study argues that it is necessary to understand how different types of interdependencies influence competitive behaviour. Secondly, it argues that by analysing firms' idiosyncratic competitive circumstances additional insights about how competition influences the relationship between MMC and competitive behaviour can be gained.

1.2 Research Questions

This study focuses on answering two interrelated research questions. The first question revolves around gaining a better understanding of how different types of interdependencies influence competitive behaviour. The focus in MMC literature has been on analysing how interdependencies in activities such as PMMC or geographic MMC are related to competitive behaviour, without considering that firms simultaneously experience interdependencies in a number of different types of activities along the entire value chain. Recognising the need to gain a better understanding of how contact in different types of activities influences competitive behaviour, scholars have begun to analyse the behavioural consequences of this type of contact theoretically (Chen & Ross, 2007; Markman *et al.*, 2009) as well as empirically (Anand *et al.*, 2009; Scott, 2001). At the same time, scholars have highlighted that there is a need to understand competitive dynamics along the entire value chain and in factor markets in particular because these dynamics have critical implications for firm behaviour and outcomes (Asmussen, 2015; Capron & Chatain, 2008; Chatain, 2014). More specifically, this literature builds on the idea that firms need to acquire some resources in factor markets (Barney, 1986a; Ricardo, 1817) but access to these resources may be contested (Capron & Chatain, 2008; Markman *et al.*, 2009). Empirically, this literature has begun to show that firms do engage in competitive behaviour on a range of factor markets such as markets for human resources (Aime, Johnson, Ridge, & Hill, 2010; Carnahan & Somaya, 2013; Gardner, 2005) or technology (Anand *et al.*, 2009; Kapoor & Furr, 2015; Lerner *et al.*, 2003; Scott, 2001). Building on these ideas, the study argues that

integrating theories about factor market competitive dynamics with theories about the role of interdependencies may provide valuable insights.

In addition, the majority of studies that investigate the behavioural consequences of MMC have drawn on the competitive dynamics perspective to examine market entry and exit behaviour (Yu & Cannella, 2013). The competitive dynamics perspective highlights the importance of considering the strategic actions and responses between competitors in their struggle for supremacy (Chen & Miller, 2012; Chen *et al.*, 2007; Grimm, Lee, & Smith, 2006; Ketchen *et al.*, 2004; Smith, Ferrier, & Ndofor, 2001). In this approach firms launch strategic attacks, and, in as far as the challenged firm cannot respond to these attacks, the attacker wins the competitive exchange, whereas an appropriate response can put the attacker on the back foot. Building on this approach, a majority of MMC studies focus on entry and exit moves (e.g. Fuentelsaz & Gómez, 2006), while studies that observe a broader range of competitive behaviours among incumbents that experience MMC are less frequent (Yu & Cannella, 2013). This focus in the literature is in contrast to the main tenet of the mutual forbearance hypothesis that proposes a reduction in competitive behaviour among incumbents (Edwards, 1955). In addition, entry behaviour might occur as a result of imitative entry and chance (Korn & Baum, 1999). Hence, to gain a deeper understanding of the effects of MMC more recent studies have begun to focus on the effect of MMC once it has been established (Yu & Cannella, 2013). In following these studies, the present study focuses on the behavioural consequences of MMC among incumbents. To do so, the study draws on competitive dynamics literature (Chen & Miller, 2012; Chen *et al.*, 2007; Grimm *et al.*, 2006; Ketchen *et al.*, 2004; Smith *et al.*, 2001) and the concept of competitive aggressiveness in particular (Yu *et al.*, 2009). Competitive aggressiveness is suited for analysing the behavioural consequences of MMC among incumbents since it does not only consider entry and exit behaviour but a broader range of competitive behaviours. Accordingly, the study sets out to investigate the following research question:

How do PMMC and FMMC affect competitive aggressiveness?

The second research question centres on understanding how idiosyncratic competitive circumstances influence the relationship between PMMC and FMMC and competitive aggressiveness. As discussed above, studies based on industrial organisation logic have produced mixed results. This may be because focusing on competition at the industry level alone neglects that firms' idiosyncratic competitive circumstances can give incentives for and impose constraints on competitive behaviour (Barnett, 1997, 2008; Barnett & McKendrick, 2004; Baum & Singh, 1994b). To analyse how idiosyncratic competitive circumstances influence firm behaviour this study builds on organisational ecology logic. Organisational ecology combines evolutionary economics (Alchian, 1950; Nelson & Winter, 1982; Schumpeter, 1934), behavioural theories of the firm (Cyert & March, 1963; March & Simon, 1958), and resource dependency theory (Pfeffer & Salancik, 1978) with sociological ideas that draw parallels between natural evolution described in ecology and societal evolution (Hawley, 1950; Simmel, 1950) to highlight the constant selection pressure firms experience in their struggle for scarce resources (Hannan & Freeman, 1989).

In this approach, the two dominant forces shaping firm behaviour are mutualism and competition (Barnett & Carroll, 1987; Hannan & Freeman, 1989; Hawley, 1950). While the focus has traditionally been on competition as a substitute for mutualism, more recent theories illustrate that both shape market evolution concurrently (Dobrev & Kim, 2006). For instance, the traditional density dependence model explains that in early stages of industry evolution firms exhibit mutualism to gain legitimacy while this is replaced by competition as the organisational field matures and gains legitimacy (Hannan & Carroll, 1992). Dobrev (2007), however, highlights that ecologically proximate firms continuously construct shared identities, but competition for resource drives some firms to abandon such shared identities. It also needs to be noted that while early ecological approaches have analysed selection pressures at the population level, more recent approaches focus on firm-level pressures (Baum & Singh, 1994b; Dobrev & Kim, 2006).

The dynamics of selection pressures can be analysed through the lens of a self-reinforcing coevolutionary process of Red Queen competition (Barnett, 1997, 2008; Barnett & Hansen, 1996; Barnett & McKendrick, 2004). It describes how firms engage in a dynamic selection and learning race for comparative competitive superiority where the strong become increasingly stronger while the weak struggle to keep up. Hence, at any given point in time firms

facing greater competitive intensity have fewer accumulated competitive abilities and more restricted access to resources making it harder to improve their competitive circumstances even if these firms have more incentives to do so. The concept of competitive intensity, in particular, is used to describe this situation (Barnett, 1997). It thus reflects the idiosyncratic incentives for and constraints on competitive behaviour. In an early approach that combines MMC literature with this kind of reasoning, Barnett (1993) finds that ecological competition is stronger among single market firms than among multimarket firms and that MMC can increase survival chances. As such, analysing how competitive intensity influences the relationship between MMC and competitive behaviour might begin to shed some light on how idiosyncratic competitive circumstances influence competitive behaviour in the presence of interdependencies. Accordingly, the second research question this study asks is:

How does the competitive intensity firms face influence the relationship of PMMC and FMMC and competitive aggressiveness?

1.3 Research Objectives and Contribution

This study intends to make theoretical, methodological, and empirical contributions to existing MMC, competitive dynamics, factor market competition and organisational ecology literature. The two main objectives of this study are to explain theoretically and examine empirically how different types of MMC influence competitive aggressiveness and how these relationships are moderated by competitive intensity. This study thus contributes to our understanding of the behavioural consequences of interdependencies and clarifies boundary conditions of the mutual forbearance hypothesis. In doing so, the study builds on the works of Anand *et al.* (2009) and Markman *et al.* (2009), among others, who have created an awareness of the importance of paying attention to the differences between interdependencies when analysing their behavioural consequences. It also builds on the works of Markman *et al.* (2009) and Capron and Chatain (2008), among others, who have pointed to the dynamic nature of competition in factor markets. In addition, it draws on the works of Barnett (1997) and Barnett and McKendrick

(2004), among others, who illustrate the need to consider idiosyncratic competitive abilities and constraints when analysing firm behaviour.

The study contributes to our understanding of the behavioural consequences of interdependencies by analysing the distinct effects of contacts at various stages of the value chain. Understanding the role of these interdependencies is crucial for advancing MMC literature because such interdependencies may have distinct effects (Anand *et al.*, 2009; Chen & Ross, 2007; Markman *et al.*, 2009) and because there might be contagion effects especially when contact occurs in upstream activities (Thomas & Willig, 2006). More specifically, while previous research has shown that certain types of interdependencies may be associated with less competitive behaviour, relatively little attention has been paid to understanding if this relationship holds for all types of interdependencies. In focusing on different types of interdependence, the study relaxes an implicit assumption in MMC literature that different types of interdependencies have a similar effect on competitive behaviour. By systematically analysing how PMMC and FMMC influence competitive behaviour, the study advances a more nuanced understanding of how interdependencies shape competitive behaviour.

Moreover, the growing literature on factor market competition has begun to point towards the importance of understanding dynamics between product and factor markets (Asmussen, 2015; Chatain, 2014), the dynamics between buyers and sellers in factor markets (Chatain, 2011), the competitive dynamics among factor market buyers (Capron & Chatain, 2008; Gardner, 2005; Markman *et al.*, 2009) and how these dynamics affect firm behaviour and outcomes (Adegbesan, 2009; Schmidt & Keil, 2013). The study contributes to the literature analysing competitive dynamics among factor market buyers in particular by highlighting how interdependencies across various factor markets may influence competitive behaviour. The consequences of interdependencies in product markets are becoming increasingly well understood. However, it is not clear if interdependencies in factor markets have the same consequences. As this study argues, outcomes from interdependencies may be different in factor markets since these markets differ on important dimensions such as the uncertainty about the benefits of competitive behaviour, the extent to which competitors can observe and make

inferences about competitive behaviour, and the ability of competitors to engage in competitive behaviour.

Furthermore, the study contributes to a better understanding of the boundary conditions of the mutual forbearance hypothesis. Understanding boundary conditions has become of central importance for advancing this literature (Yu & Cannella, 2013; Yu *et al.*, 2009). Incorporating ideas about the influence of idiosyncratic competitive circumstances into models of MMC highlights that even within the same industry different firms may have distinct incentives for and constraints on competitive behaviour. More specifically, this focus explains that the competitive intensity firms face creates constraints that limit firms' abilities to take competitive actions. By integrating organisational ecology reasoning about competitive intensity (Barnett, 1997; Barnett & McKendrick, 2004) with competitive dynamics and MMC literature the study contributes insights for respective literature. For instance, the study highlights that theories of MMC cannot ignore the idiosyncratic competitive circumstances firms face when assessing how MMC influences competitive behaviour. Understanding these effects is particularly important since there is a fundamental assumption in theories of mutual forbearance that competitive parity between competitors exists (Bowers *et al.*, 2014). Hence, by analysing the role competitive intensity plays this study enables a more fine-grained understanding of the boundary conditions of the mutual forbearance hypothesis.

In addition, this study also makes some minor contributions. The study contributes to ecological theories of competitive intensity by showing how competitive intensity can have significant implications for competitive behaviour. Few studies have integrated theories of organisational ecology with the competitive dynamics perspective (see Derfus, Maggitti, Grimm, & Smith, 2008 for an exception) even though both analyse how idiosyncratic competitive situations shape firm behaviour. Moreover, analysing the behavioural consequences of competitive intensity from an ecological perspective may be the critical next step in advancing these theories (Swaminathan, 2009). In doing so, the study also points to the possibility that the mutualistic behaviour observed in more mature organisational populations (e.g. Dobrev, 2007) may be driven by interdependencies such as PMMC and FMMC. By integrating both perspectives, the study

highlights that such theoretical integration can lead to novel and interesting insights into the intricacies of firm-level competition.

By testing the theoretical predictions on a sample of bank holding companies (BHCs) operating in the United States (US) in the period from 2001 to 2011, the study contributes a novel empirical setting. MMC among financial intermediaries has received some attention, however, there have been significant regulatory changes under the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 that lifted many restrictions on interstate banking and the Financial Services Modernisation Act (Gramm-Leach-Bliley Act) of 1999 that repealed most of the provisions of the 1933 Banking Act. Recent studies have shown that as a result markets are no longer locally constrained and financial intermediaries have adapted their multimarket strategies (Hannan & Prager, 2004, 2009). Moreover, the study observes competitive behaviour among incumbent financial intermediaries. Empirical studies of MMC among financial intermediaries have mostly focused on outcome variables such as performance (Alexander, 1985; Hannan & Prager, 2009; Rhoades & Heggestad, 1985; Whalen, 1996) or entry moves (Fuentelsaz & Gómez, 2006; Greve, 2006; Haveman & Nonnemaker, 2000). It is, however, also important to understand the effect of MMC on a broader range of competitive behaviours. In particular, because firms experiencing MMC have been shown to respond with actions in different categories than the focal attack (Kang, Bayus, & Balasubramanian, 2010). Hence, this study builds a more extensive model for competitive activity among financial intermediaries. Extending competitive dynamics models to financial intermediaries while focusing on a broader range of competitive behaviours can give valuable insights not only to MMC literature but also to competitive dynamics research in general as well as to the literature analysing competitive dynamics among financial intermediaries.

In sum, the objectives of this study are:

i. to test if greater PMMC is associated with less competitive aggressiveness
ii. to test if greater FMMC is associated with less competitive aggressiveness
iii. to test if the negative association between PMMC and competitive aggressiveness is stronger than the negative association between FMMC and competitive aggressiveness

iv. to test if greater competitive intensity is associated with less competitive aggressiveness

v. to test if the negative association between PMMC and competitive aggressiveness is weaker with greater competitive intensity

vi. to test if the negative association between FMMC and competitive aggressiveness is stronger with greater competitive intensity.

1.4 Structure of the Thesis

The structure of the remainder of the thesis is as follows. Chapter two reviews the relevant MMC and competition literature. Chapter three presents the hypotheses. Chapter four describes the empirical setting. Chapter five outlines the methodology used to test the theoretical predictions. Chapter six presents the results of the hypotheses testing. Chapter seven discusses the results and their implications in light of existing literature. Chapter eight addresses some limitations, offers some suggestions for further research, and rounds up the thesis with some concluding remarks.

CHAPTER 2
LITERATURE REVIEW

2 LITERATURE REVIEW

This chapter reviews the relevant literature. First, it focuses on MMC literature. Second, it discusses competition literature.

2.1 Multimarket Contact

This section reviews MMC literature. It gives some theoretical background and surveys game-theoretic, industrial organisation, strategic management literature as well as literature on pertinent moderators that have been studied. This section then reviews studies that analyse MMC among financial intermediaries and provides a table that lists the most influential studies.

2.1.1 Theoretical Background

MMC, considered here as *the situation in which firms simultaneously meet in multiple markets,* and the implications for competitive behaviour have become a central aspect of inquiry in strategic management and economics (Greve & Baum, 2001; Jayachandran *et al.*, 1999; Yu & Cannella, 2013). The intellectual origins of how MMC might influence competitive behaviour reach back to economics and sociological theories about the role of interdependencies. The sociologist Georg Simmel (1950) argues that in social interactions one actor does not necessarily dominate the other when individuals meet in multiple domains. Coordination between them may develop as long as superordination and subordination are reciprocal. Public policy concerns about the impact of conglomerates motivated economists such as Corwin D. Edwards (1955) to frame the idea that by considering markets in isolation, economic thinking about the anticompetitive impacts of market power is ineffective. This is because market interdependence even without monopolistic positions in either of the markets can give incentives for implicit anticompetitive behaviour. Edwards (1955) contends that interdependencies offer advantages such as cross-subsidisation, financial leverage, and ability to sustain losses in some markets which can result in firms being able to credibly threaten to retaliate with more force and in more markets than would have been possible for single-market firms. He suggests that:

"The interests of great enterprises are likely to touch at many points, and it would be possible for each to mobilize at any one of these points a considerable aggregate of resources. The anticipated gain to such a concern from unmitigated competitive attack upon another large enterprise at one point of contact is likely to be slight as compared with the possible loss from retaliatory action by that enterprise at many other points of contact." (Edwards, 1955, p. 335)

The idea that MMC might reduce competitive behaviour has become known as the mutual forbearance hypothesis. Following these initial theoretical advances, marketing and industrial organisation literature have briefly described the interdependence of markets. Shakun (1965, 1966), for example, takes a static and a dynamic game-theoretic approach to explain that in coupled markets advertising expenditures in one market have an impact on sales in other markets. Solomon (1970) proposes that MMC can be understood in terms of linkages among oligopolists from a public policy perspective. Porter (1980) argues that in 'cross-parry' situations firms attack in one market, while competitors respond in another to express discontent with the attack and to signal the threat of serious retaliation. He also suggests that firms keep small market shares in competitors' markets, as a deterrent to excessive competition.

Karnani and Wernerfelt (1985) clarify that MMC is more accurately conceptualised as multimarket competition. They suggest that MMC is "*a situation where firms compete against each other simultaneously in several markets*" (Karnani & Wernerfelt, 1985, p. 87). This slight difference in terminology hints at an active competitive encounter in all markets where the competitive encounter in each market is part of an overall competitive game. They analyse MMC based on business portfolio theory. Firms, when meeting in multiple markets, could adopt a strategy of attacking in markets that are vital to their rivals in order to cause the rival to overinvest in these markets so that fewer funds are available to defend other markets that might be of strategic importance to the attacker. Such strategies will influence the competitive outcomes in markets other than the focal market of attack and retaliation. Furthermore, they explain that

equilibria situations such as a limited war or mutual footholds can emerge. In their view, mutual footholds reduce competitive behaviour when one firm establishes and maintains a position in a market dominated by another firm. By establishing mutual footholds, firms can credibly threaten retaliation where it hurts competitors most without compromising the markets in which they dominate. They caution, however, that disruptions to such equilibria might frequently occur due to changes in competitors' capabilities as well as environmental changes. They also note that other firms in the respective markets might play an important role in sustaining equilibria situations as some might benefit from the forbearance equilibrium while others might benefit from disruptions.

Others further extend theoretical discussions by suggesting that MMC might have a non-monotonic relationship with market entry (Baum & Korn, 1999; Stephan & Boeker, 2001). Their main arguments build on the idea that for MMC to reduce competitive behaviour it needs to be created first, but it can only be created through entry. Firms enter rivals' markets up to the point at which additional entry does not yield any additional deterrent benefits. Once entry occurs, it also gives firms competitive intelligence because firms can observe competitors more closely and learn how they act and react. These interactions breed familiarity that allow for better forbearance once a certain level of MMC is reached. Golden and Ma (2003) point out that not only external interdependence is necessary but internal coordination mechanisms and rewards need to be aligned as well. Business unit managers need to be aware and willing to cede control to competitors in their respective markets to sustain the corporate goal of mutual forbearance and to avoid unwanted competitive attacks and retaliation. They also suggest that firms might benefit from operational interdependencies across businesses; these could hinder the implementation of mutual forbearance in specific markets.

2.1.2 Game-Theory

The influence of interdependencies on firm behaviour and outcomes has received ample attention in game-theoretic models. Early models focused on market linkages (e.g. Bulow, Geanakoplos, & Klemperer, 1985; Shakun, 1965, 1966), but Bernheim and Whinston (1990) are credited with having first formalised the mutual forbearance logic in a game-theoretic model. They explain that mutual forbearance is not limited to large conglomerates but that any firm that

experiences MMC has incentives to forbear under certain conditions. They analyse a model with firm A and B in market X and Y in an infinitely repeated game. In each period, the players need to decide whether to collude or whether to compete. Mutual forbearance awards monopoly rents, while competition leads to a Bertrand outcome. A player might gain from deviation in one period. The punishment for such behaviour, however, is a loss of future profitability. In their baseline model, the irrelevance result suggests that with identical markets and players, perfect monitoring, and constant returns to scale, MMC does not reduce competition. MMC only facilitates mutual forbearance when asymmetries between players exist. When markets have asymmetric growth rates, when they are asymmetric in terms of the number of competitors and the observability of actions, players have incentives to forbear by shifting market and enforcement power between markets. If, for instance, market X is a duopolistic market while market Y is a competitive market the two players will be able to transfer their enforcement power from market X to impose a higher price even in the competitive market Y. This holds true even if firm A and B differ in cost structures – in terms of both fixed and marginal costs –, economies of scale, efficiency of production, pricing, and if those firms have heterogeneous products. In each of these circumstances, firms merely establish spheres of influence, which means domains in which firms specialise. Spheres of influence develop because more efficient firms assume a dominant position but allow less efficient firms to obtain some profits. Spheres of influence facilitate mutual forbearance because firms expect their competitors to respect their sphere of influence to the same extent that they respect the competitors' sphere of influence. The repetition of strategic interactions over time is a fundamental condition in this model because without repeated interactions firms can neither transfer market power between markets nor can they credibly threaten to retaliate.

Over the years, several assumptions of the Bernheim and Whinston (1990) model have been scrutinised. Spagnolo (1999) has extended the model by showing that mutual forbearance can also occur if there are no asymmetries between firms. He argues that, due to imperfections in the real world such as managerial risk aversion, firms' static objective functions are strictly concave, and thus MMC always facilitates mutual forbearance. Strictly concave objective functions suggest that strategic interactions become interdependent and thus the utility gained from profitability in one market depends on the total profits and losses in all other markets. The

model suggests that the greater utility loss of retaliation in multiple markets does not offset the utility gain of short-run profits from deviation. As firms prefer the evenly distributed streams of return that mutual forbearance enables rather than the larger but short-term profits, MMC can lead to less competitive behaviour even in the absence of asymmetries. Even though asymmetries might not be a necessary condition, reciprocal advantages among firms may facilitate mutual forbearance more than other factors (Sorenson, 2007). In particular, when firms sell differentiated products and have demand based advantages in a market, mutual forbearance strategies are sub-game perfect and weakly renegotiation-proof meaning that forbearance equilibria based on asymmetries might be more stable due to credible punishment threats.

Matsushima (2001) addresses the assumption of perfect monitoring and shows that even with imperfect monitoring mutual forbearance can be sustained. He models imperfect monitoring in terms of observing market prices; since market prices are not a perfect signal as demand fluctuates and market-clearing prices are randomly determined, realised market prices only provide noisy information. In particular, when rivals can only observe such public signals as market prices and react to them in an indefinitely repeated identical prisoner dilemma game in duopolistic markets, MMC reduces the incentives to deviate because it increases the likelihood of detecting deviations. Mester (1992) suggests that when information is imperfect and games are not infinite, MMC might result in more competitive behaviour; at least if the strategic variable of interest is quantity. Firm's unit costs follow a first order autoregressive process and are not constant over time; therefore, firms produce quantities greater than the profit-maximizing quantity in early periods of the game implying that MMC can have rivalry enhancing elements. Moreover, under conditions of imperfect monitoring and asymmetric information, strategic linkages across markets can lead to lower payoffs (Thomas & Willig, 2006). This is because mistaken retaliatory punishment, when firms wrongly infer that competitors have broken mutual forbearance norms, can have more ruinous effects when markets are linked strategically. Losses sustained from the contagion effects of retaliatory punishment can outweigh the gains from strategic linkages. Thomas and Willig (2006) thus point out that the mere existence of MMC between rivals should not be viewed as reliable evidence that these markets are conducive to coordination but that competitive efforts can also increase due to MMC.

All the theoretical models discussed above, assume demand side interdependence between markets; however, interdependence can also originate on the supply side. Recent game-theoretic extensions have shown that even with markets that are independent in terms of demand some joint factors of production might serve these markets (Chen & Ross, 2007). For example, when serving demand independent markets from a single facility, the output produced for one market affects the costs and consequently the price of the output produced for other markets especially when capacity constraints or other factors lead to rising marginal costs. Chen and Ross (2007) explain that when firm A and B meet in markets linked by marginal production costs, an expansion of output of firm A for market X might lead firm B to reduce output in market X because both firms have rising marginal costs. Lower output of firm B could induce firm A to expand output in other markets due to the lower marginal costs of doing so. In terms of the competitive implications of market interdependence through rising marginal costs, they suggest that for competitive markets retaliation in terms of entry is the best-response. Thus, recent game-theoretic models point to the importance of considering supply-side interdependencies in MMC research.

2.1.3 Industrial Organisation

Drawing on and complementing the theoretical understandings outlined in the two previous sections, a broad body of theoretical and empirical literature about the MMC mutual forbearance nexus has emerged. The industrial organisation approach is a dominant theoretical approach to analysing the effect of MMC on competitive behaviour. In industrial organisation economics, markets can either be monopolistic, duopolistic, oligopolistic, or competitive where the degree of competition depends on markets structural attributes such as concentration or mobility barriers (Scherer & Ross, 1990). Stigler (1964) has laid some of the theoretical foundations for mutual forbearance analysis in industrial organisation literature by highlighting that in an oligopoly collusive outcomes, whether explicit or tacit, can only be sustained if defectors can be punished. Based on these early theoretical discussions, industrial organisation economics mainly use extensions to oligopoly theory or linked oligopoly theory (Martinez, 1990; Scott, 1991; Solomon, 1970; Whitehead, 1978) as well as duopoly models (Bernheim & Whinston, 1990; Parker & Röller, 1997) to describe the mutual forbearance effect of MMC. Yet, Scott (1982, 1991, 2001) also

points to the importance of understanding how repeated interactions, rather than only market structures, influence competitive behaviour. In these approaches, competitive behaviour or a reduction thereof due to MMC is not measured directly but inferred based on the structure-conduct-performance (SCP) paradigm which suggests that conduct can be approximated through observation of outcome variables such as performance or price.

Accordingly, studies based on industrial organisation thinking find that MMC is associated with greater market share stability (Heggestad & Rhoades, 1978), better performance (Gimeno, 2002; Li & Greenwood, 2004; Shipilov, 2009), higher prices (Alexander, 1985; Busse, 2000; Chintagunta & Desiraju, 2005; Evans & Kessides, 1994; Fernández & Marín, 1998; Gimeno & Woo, 1999; Jans & Rosenbaum, 1997; Parker & Röller, 1997; Singal, 1996), higher profits (Feinberg, 1985; Hughes & Oughton, 1993; Scott, 1982, 1991), higher yields (Gimeno, 1999; Gimeno & Woo, 1996, 1999; Zou, Dresner, & Windle, 2011; Zou, Yu, & Dresner, 2012), higher airfares (Murakami & Asahi, 2011), higher advertising rates (Fu, 2003), higher interest rates (Más-Ruiz & Ruiz-Moreno, 2011), stable sales growth (Greve, 2008b), stable size rankings (Martinez, 1990), winning with lower bids (Gupta, 2001), avoiding geographies shared with competitors (Cotterill & Haller, 1992; Rose & Ito, 2009) and lower service quality (Prince & Simon, 2009). However, some scholars in this tradition find no support for the idea that MMC is associated with better performance (Alexander, 1985; Rhoades & Heggestad, 1985), higher profits (Mester, 1987; Strickland, 1985; Whitehead, 1978), stable market shares (De Bonis & Ferrando, 2000; Mester, 1987; Sandler, 1988), and higher interest rates (De Bonis & Ferrando, 2000) or find that only similarity weighted MMC has a positive effect on performance while MMC by itself has a negative association with performance (Li & Greenwood, 2004).

2.1.4 Strategic Management

The second body of research is based on the AMC perspective of strategic management (Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007; Ketchen *et al.*, 2004). In this tradition, studies have built on theoretical insights in two complementary ways. One stream of research has focused on how MMC influences entry and exit dynamics; here firms behave competitively by entering into or exiting from markets with competitors. Some scholars studying market entry and

exit decisions have cautioned, however, that MMC might arise due to other considerations than the reduction of competition (Greve, 2000; Korn & Baum, 1999). In particular, Korn and Baum (1999) suggest that MMC might arise due to chance, imitation and learning from high-performing competitors rather than as a result of purposively establishing interdependencies. Based on these reservations a second stream of research focuses on how MMC impacts on a broader range of competitive activities.

The majority of studies analysing the MMC market entry nexus have found an inverted-U-shaped relationship (Baum & Korn, 1999; Fuentelsaz & Gómez, 2006; Haveman & Nonnemaker, 2000; Stephan *et al.*, 2003). At low levels of MMC, entry escalates, and MMC increases until reaching a certain threshold, after which firms avoid further entry, and the relationship stabilises. The rationales for the existence of this inverted-U shape differ slightly between authors. Baum and Korn (1999) use competitive dynamics reasoning to suggest that at low levels of MMC a tit-for-tat situation develops as initial entry moves to establish footholds provoke counterattacks. This process continues until reaching a level of MMC at which familiarity breeds coordination. This level is reached when there is a mutual recognition of interdependencies, when credible threats of retaliation exist, when firms are likely to interact in the future and when additional entry contributes little in terms of additional incentives for deterrence and information about competitors. Upon meeting these conditions, the relationship stabilises, and entry rates decline.

Haveman and Nonnemaker (2000) draw on sociology and economics to argue that at low levels of MMC, firms grow and enter to reinforce footholds and to use the knowledge about competitors gained in other markets. At a high level of MMC, on the other hand, firms will refrain from aggressive growth and entry as part of mutual forbearance strategies. Similarly, Stephan *et al.* (2003) draw on competitive intelligence and decision making theory and argue that firms do not only enter markets due to the possibility to forbear but primarily at low levels of MMC because competitors can be used as reference points in market entry decisions in order to reduce uncertainty. As MMC increases, forbearance rationales become more important and after reaching a certain level of MMC the relationship stabilises due to better access to competitive intelligence, hence entry declines. Fuentelsaz and Gómez (2006) synthesise these arguments to suggest that a low level of MMC competition escalates as firms establish footholds and familiarise

themselves with each other. However, after a certain level of MMC is reached firms start to forbear as they recognise their interdependencies and their ability to harm each other.

In addition, entry behaviour might occur as a result of imitation, learning and chance (Korn & Baum, 1999). Korn and Baum (1999) show that, in contrast to earlier work that found MMC to be non-random (Scott, 1982, 1991), in their sample MMC arose more out of chance and trait-based imitation than strategic coordination. A few scholars have addressed these reservations about focusing only on entry dynamics (Gimeno, 2002; Greve, 2006). Gimeno (2002), for instance, shows that MMC results in higher performance, even if it emerges by chance. Additionally, firms tend to enter markets to extend intentional contact rather than entering markets with random contact (Greve, 2006). Interestingly, Skilton and Bernardes (2015) find that the MMC diversity has a positive association with entry, indicating that interdependencies between more diverse competitors (in terms of MMC) increases competitive behaviour.

Studies about the effect of MMC on exit have either found a negative linear relationship between MMC and exit (Audia, Sorenson, & Hage, 2001; Barnett, 1993; Boeker, Goodstein, Stephan, & Murmann, 1997) or an inverted-U shape relationship (Baum & Korn, 1999). Both findings seem to be complementary rather than contradictory, as the former models do not consider the impact of the different level of MMC explicitly. Barnett (1993), for example, shows that exit rates for MMC firms are lower than expected by analysing single market competitors only. Similarly, Boeker *et al.* (1997) only theorise about the effect of MMC at high levels of MMC and find that, in this case, the probability of exit is lower. Baum and Korn (1999) highlight that exit rates are low with less MMC because firms are neither in an intense competition that would cause them to exit nor are they in need to signal subordination. However, exit rates are highest with moderate MMC because competition intensifies causing some firms to fail and because firms start to develop spheres of influence. With higher levels of MMC, the intensity of competition reduces as firms begin to realise their interdependencies, try to maintain them and start to forbear. Consequently, exit rates recede. Interestingly, the relationship between MMC and entry and exit does not seem to be the same for exploration activities as for exploitation activities (Anand *et al.*, 2009). Exploration activities are characterised by high uncertainty and to reduce uncertainty firms follow a mimetic logic rather than a mutual forbearance logic. Hence, MMC and entry are

positively related. In exploitation activities, on the other hand, MMC and exit are negatively related.

Fewer studies take a more encompassing approach to analysing competitive behaviour in terms of observing a broader range of competitive activities. The ones that take this approach, however, do paint a more nuanced picture of how MMC impacts competitive behaviour. Scott (2001) finds that MMC in both product and innovation markets is positively associated with citing a competitor's patents. Young *et al.* (2000) shows that while there are fewer attacks with MMC, there is also faster retaliation in case of an attack. By the same token, Yu *et al.* (2009) and Yu and Cannella (2007) show that – in the same sample of firms – MMC generally reduces competitive aggressiveness, but greater MMC increases the likelihood of response as well. Marketing scholars have shown that MMC is positively associated with price and negatively associated with new product introductions, but firms respond to price competition with new product introductions rather than with price cuts of their own (Kang *et al.*, 2010). Bowers *et al.* (2014) show that analysts only refrain from issuing bold earnings estimates under conditions of competitive parity where bold estimates are constructed as competitive aggressions because such estimates, if correct, allow the analyst to gain investor attention.

In summary, this literature has provided detailed theoretical explanations for why a competition reducing effect of MMC may exist. In addition, it has found support for the idea that MMC leads to a reduction in competitive behaviour using a variety of theoretical perspectives and empirical tests. Despite the broad support for this idea, there is also a recognition that the competition reducing effect of MMC may be contingent on a range of variables and that there are a number of boundary conditions to this general relationship. Based on this understanding a range of moderating variables has been analysed theoretically and empirically.

2.1.5 Moderators

Based on the premise that certain conditions might accentuate or attenuate the effect of MMC, studies have analysed a variety of variables as moderators. These consist of three different categories, firm-specific or internal factors, dyadic or interdependence factors and environmental

or external factors. Studies of internal factors have shown that the effect of MMC on yields and performance is greater in markets that share economies of scope (Gimeno & Woo, 1999). On the other hand, in markets in which firms cannot leverage economies of scope, but competitors can, the effect of MMC on yields and performance is negative. Another internal factor is CEO tenure (Stephan *et al.*, 2003). Longer tenured CEOs tend to abide by mutual forbearance norms while shorter tenured CEOs do not seem to forbear as much. In addition, the negative relationship between intraorganisational MMC and divisional entry is negatively moderated if the same firm has a dominant position in the market, but the negative relationship of cross-organisational MMC and entry is positively moderated if this is not the case (Kalnins, 2004).

Studies that analyse dyadic or interdependence factors also scrutinise a number of factors. Firstly, similarity has long been regarded as a possible factor that reduces competition because more similar firms recognise their interdependencies and anticipate moves more accurately thereby facilitating mutual forbearance (Caves & Porter, 1977). Moreover, early theoretical explanations point to the importance of considering both market commonality and resource similarity (Chen, 1996). In this literature, strategic groups have received some attention based on the idea that firms within strategic groups are similar on a range of strategic dimensions. Barnett (1993) applies the strategic group concept to show that MMC reduces competitive behaviour within strategic groups, but not across them. Recently, there has been renewed interest in these ideas with Guedri and McGuire (2011) studying the impact of mobility barriers between strategic groups. They show that the effect of MMC within-groups only exists in groups with high mobility barriers whereas in groups with moderate mobility barriers there is no impact of MMC and in groups with low mobility barriers MMC has a positive effect on competitive behaviour. Más-Ruiz and Ruiz-Moreno (2011) suggest that factors such as market power, efficiency, differentiation and MMC are responsible for decreased competition and the increased performance of strategic groups with large firms.

Others focus more directly on the concept of similarity in general and strategic similarity in particular (Gimeno & Woo, 1996). Gimeno and Woo (1996) find that similarity increases competition once MMC is controlled for. Young *et al.* (2000) suggest that similarity and MMC are complementary mechanisms to gain information about competitors. They find that action

frequency and action speed increase when firms' resources are dissimilar. In addition, the effect of MMC on strategic action frequency is greatest when resources are dissimilar but the impact on time to move is greatest when resources are similar. Fuentelsaz and Gómez (2006) examine the influence of strategic dissimilarity. They find that only with less MMC more similarity decreases competition while with great MMC similarity has a direct positive impact on competitive behaviour. Upson *et al.* (2012) show that resource similarity has a negative effect on the likelihood of a foothold attack and a foothold withdrawal. In addition, the likelihood of attack and withdrawal are both highest when market commonality and resource similarity are both low. Li and Greenwood (2004) suggest that only similarity weighted MMC has a positive effect on performance while MMC by itself has a negative association with performance.

Secondly, reciprocity of contacts and spheres of influence are regarded as basic conditions for mutual forbearance to occur (Bernheim & Whinston, 1990; Edwards, 1955). Baum and Korn (1996) suggest that firms have spheres of influence in markets in which they have the largest market share and model them accordingly as single firms' domination of a market. They find that the effect of MMC on entry and exit is greatest when markets are dominated by a single firm. Gimeno (1999) takes a more refined approach, and models spheres of influence as asymmetric reciprocal MMC where two firms meet in two markets but the relative strategic importance of each market is different for each firm. His empirical model confirms that reciprocity of contacts and spheres of influence facilitate mutual forbearance. Fuentelsaz and Gómez (2006) also find support for the positive moderating influence of contact reciprocity in their empirical model. Kang *et al.* (2010) assess the moderating effect of more and less MMC and find that firms with more MMC retaliate against competitors' price increases by introducing new products but not with price increases of their own. More recently Upson *et al.* (2012) have investigated the role of footholds for competitive interactions and find that market commonality and resource similarity are in fact negatively associated with foothold attacks and withdrawals lending further support to the notion that footholds stabilise competitive relationships.

Thirdly, Baum and Korn (1999) highlight that relative size, as well as relative MMC, might moderate the relationship between MMC and competitive behaviour. They suggest that the relative size of firms is an important moderating variable because firms of different relative sizes

might perceive asymmetric competitive threats. A large firm might not consider a small firm to be a threat; however, the reverse might be true for a small firm. In their empirical model, they find that smaller competitors are less likely to enter but are not likely to exit competitor's markets. Relative MMC also moderates the relationship because competitors that forbear against each other direct their competitive efforts towards firms with whom they have lower competitive interdependence. Shipilov (2009) suggests that open networks and high levels of historic MMC interact to affect performance positively.

Studies of environmental or external contingencies that moderate the relationship between MMC and competitive behaviour have mostly focused on the impact of industry or market concentration, albeit with the least consistent results. Some studies find that the influence of MMC on competitive behaviour is more pronounced in concentrated markets (Fernández & Marín, 1998; Haveman & Nonnemaker, 2000; Heggestad & Rhoades, 1978; Scott, 1982) and moderately concentrated markets (Alexander, 1985; Feinberg, 1985), while others find the opposite effect (De Bonis & Ferrando, 2000; Mester, 1987) or no effect at all (Baum & Korn, 1996; Fuentelsaz & Gómez, 2006). Hannan and Prager (2004) focus on concentration in local markets only and show that it affects the pricing behaviour of single-market firms. The relationship weakens when MMC firms have more market share in these markets. Prince and Simon (2009) focus on different degrees of concentration and find – contrary to their theoretical predictions – that MMC in more concentrated markets has a weaker deterring effect than MMC in less concentrated markets. Interestingly, Yu *et al.* (2009) show that in international markets, the presence of strong local competitors weakens the effect of MMC.

Apart from the focus on competition, others have analysed a broader range of external moderators. Kalnins (2004) shows that uncertainty positively moderates the negative relationship of intraorganisational MMC and cross-organisational MMC because headquarters may mimic competitors' market choices. Other important moderating variables in an international context show a complex pattern, subsidiary ownership moderates the effect of MMC negatively, while cultural distance and local regulatory restrictions moderate it positively (Yu *et al.*, 2009). Bowers *et al.* (2014) show that competitive and status parity both moderate the relationship between MMC and bold earnings estimates. In particular, regulatory changes that introduce competitive

parity activate mutual forbearance logics among analysts, and high-status analysts forbear more strongly.

This literature highlights that a range of variables are important moderators of the relationship between MMC and competitive aggressiveness. Yet, it also shows that while some firm-specific variables have been analysed, little attention has been paid to idiosyncratic competitive circumstances.

2.1.6 MMC among Financial Intermediaries

A variety of empirical settings have been analysed in MMC studies. Support for the negative effect of MMC on competitive behaviour has been found in a range of manufacturing industries in the US (Feinberg, 1985; Scott, 1982, 1991; Strickland, 1985), the United Kingdom (Hughes & Oughton, 1993) and France (Sengul & Gimeno, 2013). In particular, MMC reduces competitive behaviour in the cement industry (Ghemawat & Thomas, 2008; Jans & Rosenbaum, 1997), the newspaper publishing industry (Fu, 2003), the pharmaceutical industry (Chintagunta & Desiraju, 2005; Guedri & McGuire, 2011; Shankar, 1999), the shoe manufacturing industry (Audia *et al.*, 2001), and the global automobile industry (Yu & Cannella, 2007; Yu *et al.*, 2009). Similar support has been found in the telephone industry (Busse, 2000; Parker & Röller, 1997) and the highway construction industry (Gupta, 2001). In the service sector studies have also mainly confirmed the mutual forbearance predictions for hotels (Fernández & Marín, 1998), software firms (Young *et al.*, 2000), insurances (Greve, 2008b; Li & Greenwood, 2004), fast-food franchises (Kalnins, 2004), supermarkets (Cotterill & Haller, 1992), and airlines (Evans & Kessides, 1994; Gimeno, 1999, 2002; Gimeno & Woo, 1996, 1999; Singal, 1996; Zou *et al.*, 2011; Zou *et al.*, 2012).

Apart from these empirical settings, the financial intermediation industry in a range of national contexts has received some attention. Some studies in this tradition have a focus on BHCs in the US. Whitehead (1978), for instance, analyses 31 BHCs in 47 markets but does not find that MMC reduces competitive behaviour. Heggestad and Rhoades (1978) analyse the top three BHCs in 187 geographic markets from 1966 to 1972 and find that greater market share

stability exists with MMC and that MMC has the largest impact in concentrated markets. Alexander (1985) analyses BHCs in six states in 67 geographic markets to show that the service charges and fees increase with greater MMC and that in moderately concentrated markets the anticompetitive impact of MMC is greatest. On the other hand, he finds that loan interest rates are lower in markets with greater MMC. Martinez (1990) studies the stability of size rankings based on market shares of the 100 largest BHCs from 1984 to 1989 to find that there is a greater stability in size rankings with greater MMC. Whalen (1996) studies dominant BHCs by focusing on the top five interstate BHCs that are also among the top ten in other states in 1994 and finds that greater MMC is associated with greater return on assets and that greater MMC in conjunction with high concentration is associated with higher profitability. De Bonis and Ferrando (2000) study the 55 largest Italian banks and find that geographic MMC has a positive effect on changes in market share and a negative impact on lending rates. Also, this effect is positively moderated by concentration.

Others focus on individual institutions rather than BHCs in the US. Rhoades and Heggestad (1985) conduct two studies one covering the period from 1968 to 1974 and the second from 1970 to 1979. The samples in both studies differ, but both cover geographic markets. They find only partial support for the effect of MMC in their first study and find no support in the second study. They find that greater MMC is associated with higher interest rates and higher service charges but that there is no association between MMC and profit. The second study shows that greater MMC is associated with high rivalry when rivalry is measured as the mobility and turnover in the ranking of the leading three or five firms. In addition, MMC has a negative effect on net income and a positive effect on interest and fees. These findings combined lead them to reject the rivalry-reducing effect of MMC. Similarly, Mester (1987) studies 171 savings and loan firms in 56 Californian counties and rejects the idea that MMC reduces competitive behaviour but instead finds that MMC is associated with market share volatility, higher interest on deposits, and lower net income. Interestingly, concentration seems to positively moderate these relationships such that when both MMC and concentration are high, market share volatility is higher, deposit interest rates are higher, and net income is lower.

Pilloff (1999) analysed a sample of 6,233 US institutions constructed from all institutions in the industry and showed that MMC is associated with higher performance. The effect is so small, however, that is only likely to have a meaningful real world effect for those institutions most heavily exposed to MMC. Coccorese and Pellecchia (2009), on the other hand, analyse 655 commercial banks in Italy and find strong support for a positive effect of MMC on performance. Their computations with different measures of MMC also show that MMC has a meaningful positive effect on performance. Similarly, Molnar, Violi, and Zhou (2013) analyse 105 Italian banks in 20 regional markets. Their models show that the best collusive outcome is obtained when eight firms form coalitions in at least 19 overlapping regions. This indicates that firms with extensive MMC behave as if they maximised profits jointly. Moreover, Coccorese and Pellecchia (2013) assess MMC at the regional market level in 20 Italian regions and report that MMC only has an effect on market power when it interacts with local market concentration.

Entry and branching behaviour has also received some attention. Haveman and Nonnemaker (2000) study savings and loans associations in California and find an inverted-U-shaped relationship between MMC and market entry and growth rates. Single market firms benefit from MMC of competitors through higher growth rates. Market dominance moderates the effect of MMC on market entry and growth rates positively. Greve (2000) studies branching in the modern metropolitan area of Tokyo in Japan but does not find support for the idea that the number of competitor branches influences branching decisions. Branches are located close to single market competitors, indicating that branching may be driven by a desire to increase MMC. Greve (2006) – using the same sample as Greve (2000) – shows that firms entered into markets with great MMC but avoided contact with MMC competitors suggesting that while MMC may be coincidental, with greater MMC, further MMC may be due to the desire to benefit from forbearance. Fuentelsaz and Gómez (2006) analyse 34,529 observations in Spanish geographic markets and show that MMC has an inverted-U-shaped relationship with entry. They further find that strategic dissimilarity negatively moderates this relationship, but they do not find an effect of the interaction of MMC and concentration on market entry. Shipilov (2009) assesses relationships among advisory units of investment banks in the United Kingdom. He shows that historic MMC positively moderates the relationship between network openness and performance.

This literature highlights that MMC among financial intermediaries has received some attention and that the primary focus of this literature has been on outcome variables rather than observing competitive behaviour directly. Studies that do observe competitive behaviours directly have focused mostly on entry and branching dynamics while broader sets of actions have not been analysed. Table 1 lists the most influential empirical studies on the subject.

Table 1: Empirical Studies and Findings on Multimarket Contact

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Whitehead	1978	No support	Cross-sectional	31 Florida BHCs in 47 markets	1974		MMC is negatively related to market performance.	SCP	Market performance	Negative linear	Product
Heggestad & Rhoades	1978	Support	Longitudinal	Top three BHCs in 187 banking areas	1966-1972		Market shares more stable in markets with MMC.	SCP	Market share stability	Positive linear	Geographic
Scott	1982	Support	Cross-sectional	437 US manufacturing firms	1974	Concentration	Interaction of MMC and concentration has a positive effect on profits.	SCP	Profits	Positive linear	Product
Alexander	1985	Partial support	Cross-sectional	BHCs in six states in 67 markets	1975	Concentration	Service charges and fees are higher in markets with MMC. Loan rates lower in markets with MMC. The squared interaction of concentration and MMC is significant only with MMC in deposit markets.	SCP	Performance	Negative linear / Moderator curvilinear	Product
Rhoades & Heggestad	1985	No support	Longitudinal	1,074 US banks in 154 markets; 1,443 US banks in 210 markets	1968-1974 and 1970-		MMC is associated with higher interest rates and service charges but not profit. MMC is positively associated with the volatility in the ranking of the leading	SCP	Performance	Negative linear / Positive linear	Product

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
					1979		three or five firms. MMC has a negative effect on net income and a positive effect on interests and fees.				
Strickland	1985	No support	Cross-sectional	195 top US manufacturing firms	1963		Negative association between cost-price margins in SICs with higher MMC.	SCP	Profits	Negative linear	Product
Feinberg	1985	Support	Cross-sectional	391 US firms	1982	Concentration	Higher cost-price margins with MMC only significant at moderate levels of concentration.	SCP	Profits	Positive linear	Product
Mester	1987	No support	Cross-sectional	171 savings and loans firms in 56 Californian country markets	1982	Concentration	MMC is positively associated with market share volatility, interest on deposits, and negatively associated with net income. Positive interaction effect of MMC and concentration.	SCP	Profits / Market share	Positive linear	Geographic
Sandler	1988	No support	Longitudinal	123 US airline markets	1974-1976 and 1978-1980		MMC is positively associated with market share volatility.	SCP	Market share	Positive linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Martinez	1990	Support	Longitudinal	100 largest US BHCs	1984-1989		Firm size rankings are more stable in markets with MMC.	SCP	Stability in size ranking	Positive linear	Geographic
Scott	1991	Support	Cross-sectional	64 US diversified firms in 35 oligopolistic industries	1950	Concentration	Profits of diversified oligopolists are higher with greater MMC. Profits are higher for diversified oligopolists in concentrated markets.	SCP	Profits	Positive linear	Product
Cotteril & Haller	1992	Support	Longitudinal	20 largest US supermarket chains, 129 sample markets	1971-1981		Lower market entry rates with a greater number of large chains.	SCP	Entry	Negative linear	Geographic
Hughes & Oughton	1993	Support	Cross-sectional	418 United Kingdom manufacturing firms	1979		Higher price-cost margins and industry return on capital with MMC.	SCP	Industry profits	Positive linear	Product
Barnett	1993	Support	Longitudinal	48 US markets in customer-premises equipment	1981-1986		Lower exit rates from markets with MMC.	Organisational ecology	Exit	Negative linear	Geographic
Evans & Kessides	1994	Support	Cross-sectional	1,000 largest US city-pair routes	1984-1988		MMC has a strong positive effect on prices.	SCP	Prices	Positive linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Gimeno & Woo	1994	Support	Longitudinal	48 airlines in 3,171 US city-pair routes	1984-1988		Higher yields on routes with higher average MMC. Strategic similarity has a negative association with yields.	SCP	Yields	Positive linear	Geographic
Smith & Wilson	1995	Partial support	Cross-sectional	Ten major US airlines in 112 city-pair routes	1983-1984	Dependency, Entry barriers, Synergy, Capacity	Nonresponse was most frequently observed, but price increase in the entered market was second most frequently observed response.	Competitive dynamics	Entry	N/A	Geographic
Jans & Rosenbaum	1996	Support	Longitudinal	25 US regional cement markets	1974-1989	Concentration	Higher MMC has a greater positive effect on prices as concentration increases.	SCP	Prices	Positive linear	Geographic
Singal	1996	Support	Longitudinal	14 mergers among airline companies	1984-1987		MMC is positively associated with prices.	SCP	Prices	Positive linear	Geographic
Gimeno & Woo	1996	Support	Longitudinal	48 airlines in 3,171 US city-pair routes	1984-1988		Higher yields on routes with higher average MMC. Strategic similarity has a negative effect on yields, but the effect turns positive after controlling for MMC.	SCP	Yields	Positive linear	Geographic
Wahlen	1996	Support	Cross-sectional	Top five interstate BHCs that are top 10 in other states	1993-1994	Concentration	MMC, in conjunction with high concentration, is associated with higher profitability.	SCP	Profit	Positive linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Baum & Korn	1996	Support	Longitudinal	40 California commuter airlines	1979-1984	Spheres of influence, Concentration	Lower entry and exit rates in routes with greater MMC. Interaction effect of MMC and spheres of influence negative significant. Interaction effect of MMC and concentration insignificant.	Organisational ecology	Entry / Exit	Negative linear	Geographic
Parker & Roller	1997	Support	Longitudinal	US mobile telephone industry	1984-1988		MMC positively associated with prices.	SCP	Prices	Positive linear	Geographic
Boeker, Goodstein, Stephan, & Murmann	1997	Support	Longitudinal	286 California hospitals in 163 markets	1980-1986		Lower probability of exit with greater MMC.	SCP, Competitive dynamics	Exit	Negative linear	Product
Fernandez & Marin	1998	Support	Cross-sectional	2,221 hotels in Spain	1996	Concentration	MMC has a positive effect on prices when concentration is low and a negative effect on prices when concentration is high.	SCP	Prices	Negative/ positive linear	Geographic
Pilloff	1999	Support	Longitudinal	6,233 US banks	1992-1995		MMC outside of a reference market is positively associated with performance in the reference market.	SCP	Performance	Positive linear	Product
Gimeno & Woo	1999	Support	Longitudinal	28 airlines in 3,008 US city-pair routes	1984-1988	Economies of scope	MMC correlates with economies of scope; MMC effect on prices and performance is greater with economies of scope.	SCP	Prices / Performance	Negative linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Gimeno	1999	Support	Longitudinal	48 airlines in 14,129 US airline-routes	1984-1988		Reciprocal MMC has a stronger positive association with prices and market share than nonreciprocal MMC.	SCP	Prices / Market share	Positive linear	Geographic
Shankar	1999	Support	Longitudinal	6 US prescription drug markets (23 entries and 59 responses)	The 1970s and the 1980s		Marketing expenditure is lower when MMC with the incumbent is present. The response of the incumbent is milder with MMC.	Competitive dynamics	Marketing expenditure/ Incumbent response	Negative linear	Product
Baum & Korn	1999	Support	Longitudinal	15 competitor dyads among California commuter airlines,	1979-1984	MMC with rivals relative to MMC with other rivals Rival size	An inverted U-shaped relationship between dyadic market entry and exit and MMC exists. The interaction of MMC and relative MMC is negative. The interaction of MMC and relative firm size is negative.	Competitive dynamics	Entry / Exit	Negative curvilinear	Geographic
De Bonis & Ferrando	2000	No support	Longitudinal	Top 55 Italian banks, 6,935 firm-year observations	1990-1996	Concentration	MMC is positively associated with market share increases and lower lending rates. Concentration positively moderates these relationships.	SCP	Market share / Interest rates	Positive linear	Geographic
Young, Smith, Curtis, Grimm, & Simon	2000	Support	Longitudinal	152 observations of 20 US firms in 7 markets	1987-1991	Resource dissimilarity	Fewer attacks in markets with MMC, and faster retaliation in markets with MMC.	Competitive dynamics	Competitive actions / responses	Positive/ negative linear	Product

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Haveman & Nonnemaker	2000	Support	Longitudinal	321 savings and loan associations in 58 Californian counties	1977-1991	Market dominance	An inverted U-shaped relationship between rates of market growth and entry and MMC exists. The positive interaction effect of MMC and market dominance is significant.	SCP, Competitive dynamics	Entry	Negative curvilinear	Geographic
Greve	2000	Partial support	Longitudinal	174 Tokyo-based banks in 20 geographic markets	1894-1936		Density dependence, imitation of large firms' decisions, and momentum are sufficient for predicting branch location decisions. Organisations are likely to establish MMC with single-market competitors but unlikely to do so with MMC competitors.	Organisational ecology, Institutional theory, Behavioural theory	Entry	Positive linear	Geographic
Gupta	2001	Support	Longitudinal	1,738 projects with 8,943 bids in highway procurement	1981-1986		MMC has a positive effect on winning with a low bid.	SCP	Winning with a low bid	Positive linear	Projects
Audia, Sorenson, & Hage	2001	Support	Longitudinal	All 5,119 distinct American shoe manufacturing plants	1940-1989		As MMC increases, the likelihood of exit declines.	Competitive dynamics, Organisational ecology	Exit	Negative linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Scott	2001	Support	Longitudinal	42 firms (1,722 pairs) in the chemicals-related industry	1990-1996		MMC in product and innovation markets is positively related to citing a competitor's patent.		Citations	Positive linear	Product/ Innovation
Gimeno	2002	Support	Longitudinal	28 airlines in 3,000 US city pair routes	1984-1988		MMC (chance, positive, negative) is positively associated with performance.	SCP	Performance	Positive linear	Geographic
Fu	2003	Support	Cross-sectional	465 daily newspapers in the US	1998		MMC is positively associated with reduced circulation competition. Advertising rates are higher with MMC.	SCP	Circulation coordination / Advertising rates	Positive linear	Geographic
Stephan, Murmann, Boeker, & Goodstein	2003	Support	Longitudinal	395 California hospitals in 163 product markets	1980-1986	CEO tenure	An inverted U-shaped relationship between entry and MMC exists. Newer CEOs enter markets, even at higher MMC.	Competitive dynamics	Entry	Negative curvilinear	Product
Kalnins	2004	Support	Longitudinal	203 Texas franchisees of McDonald's, Burger King, and Wendy's restaurants	1980-1995	Same-firm dominance, Uncertainty	Intraorganisational MMC is negatively associated with entry. This effect is stronger in markets dominated by the firm. The negative effect of cross-organisational MMC on entry is weaker in markets dominated by the firm.	Institutional theory Behavioural theory	Entry	Negative	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
							Uncertainty positively moderates the relationship between intraorganisational MMC and cross-organisational MMC and entry.				
Li & Greenwood	2004	Partial support	Longitudinal	276 Canadian insurance companies	1993-1998	Similarity	MMC is negatively associated with performance. Similarity weighted MMC has a positive effect on performance.	SCP	Performance	Positive linear	Geographic / Product
Chintagunta & Desiraju	2005	Support	Longitudinal	Antidepressant markets in the US, United Kingdom, Germany, France, and Italy	1988-1999		Within and across market interactions impact on detailing and pricing. In the detailing market, firms behave cooperatively. For the US within market interactions are most important. Market interactions in the US reduce competition in the Italian market, but the interactions are more competitive in the UK.	SCP	Detailing / Prices	Positive linear	Geographic / Product
Fuentelsaz & Gómez	2006	Support	Longitudinal	77 Spanish savings banks, 34,529 bank-market-year observations	1986-1999	Strategic dissimilarity, Reciprocity of contacts, Concentration,	Inverted U-shaped relationship between MMC and market entry rate. The effect of MMC is greater when strategic dissimilarity is greater and is weaker when contacts are reciprocal. The impact	Competitive dynamics	Entry	Negative curvilinear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
						Coordination mechanisms	of concentration is not significant.				
Greve	2006	Partial support	Longitudinal	174 Banks in Tokyo, Japan	1894-1936		Firms avoid extending MMC beyond two contacts. Firms enter markets when intentional contact is high.	Organisational ecology	Entry	Negative curvilinear	Geographic
Yu & Cannella	2007	Support	Longitudinal	13 largest global automobile firms, 27 countries	1995-2001		MMC among MNEs increases the likelihood of response.	Competitive dynamics	Competitive response	Positive linear	Geographic
Ghemawat & Thomas	2008	Support	Longitudinal	Six biggest cement firms	1988-2000		Non-random agglomeration of plant ownership can be explained by MMC.	MFB	Entry	Positive linear	Geographic
Greve	2008	Support	Longitudinal	329 insurance companies in Norway	1912-1986		Defection from MFB is more likely when firm-specific MMC is low. Defection is more likely when market-level MMC is high.	SCP	Sales growth rate deviations	Negative linear	Product
Coccorese & Pellecchia	2009	Support	Longitudinal	655 Italian commercial banks in 103 provinces	2002-2005	MMC	ROA is positively associated with average MMC; the relationship is stronger with more MMC.	SCP	Profit	Positive linear	Geographic
Rose & Ito	2008	Support	Longitudinal	Nissan, Honda,	1957-		The number of domestic competitors has	SCP	Location / Entry	Positive /	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
				Toyota, Mitsubishi, and Mazda in 52 countries	1933		a negative effect on location choices and a positive effect on entry timing.		timing	negative linear	
Yu, Subramaniam, & Cannella	2009	Support	Longitudinal	13 largest global automobile firms, 27 countries	1995-2001	Subsidiary ownership, Cultural distance, Regulatory restrictions, Local rivals	MMC decreases competitive aggressiveness. Greater subsidiary ownership strengthens the effect. Cultural distance weakens the effect. The presence of stronger local rivals weakens the effect.	Competitive dynamics	Competitive aggressiveness	Negative linear	Geographic
Anand, Mesquita, & Vassolo	2009	Partial support	Longitudinal	34(19) pharmaceutical firms (SIC 2834 and SIC 2836)	1989-1999		Inverted U-shaped relationship between MMC and the likelihood of entry in exploitative activities. MMC positively affects the likelihood of entry in explorative activities (significant squared terms no in the range of the data). MMC negatively affects the likelihood of exit in explorative activities.	Competitive dynamics	Entry / Exit	Negative curvilinear Positive/ negative linear	Product

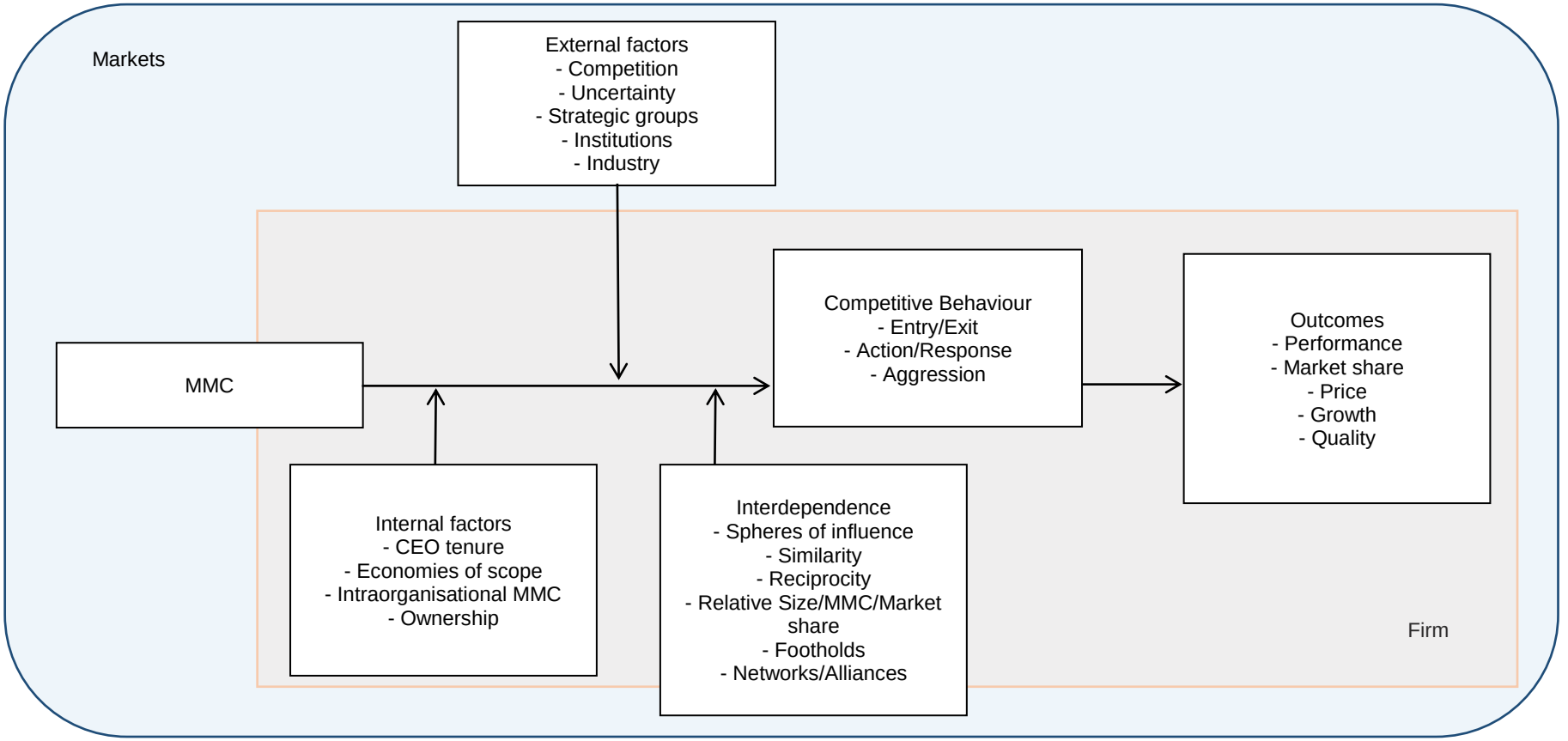
Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Prince & Simon	2009	Support	Longitudinal	10 US airlines in 1,000 busiest routes on Fridays (3.5 million flights)	1995-2001	Concentration	MMC is negatively associated with arrival delay. MMC in high concentration routes has a weaker positive effect on arrival delay than MMC in low-concentration routes.	SCP	Quality	Negative linear	Geographic
Shipilov	2009	Support	Longitudinal	482 investment banks	1992-2001	Effective network size, Historic MMC	Effective network size and historic MMC moderate the effective networks size performance relationship positively.	SCP	Market share	Positive linear	Product
Kang, Bayus, & Balasubramanian	2010	Support	Longitudinal	45 firms (122 brands, 927 products) in the personal computer industry	1995-1999	MMC	MMC is positively associated with price increases and negatively associated with product introductions. MMC moderates the MMC-price relationship negatively. Also, firms do not respond to price competition with lower prices but with product introductions.	Marketing	Price / Product introduction	Positive/ negative linear	Product
Guerdi & McGuire	2011	Partial support	Longitudinal	68 US, European and Japanese pharmaceutical firms	1997-2000	Mobility barriers	Within-group MMC positive effect on performance for groups with high mobility barriers, non-significant for groups with medium mobility barriers, and negative for groups with low mobility barriers.	SCP	Performance	Positive linear	Product

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Murakami & Asahi	2011	Partial support	Cross-sectional	4,484 non-connecting flights from top 30 US airports	2006	Low-cost carriers	MMC is positively related to airfares, but the effect decreases with competition from low-cost carriers. MMC among low-cost carriers does not influence low-cost carrier prices.	SCP	Price	Positive linear	Geographic
Zou, Dresner, & Windle	2011	Support	Cross-sectional	19 US airlines on 998 US domestic origin and destination routes	2002	Cost	Average airfare per passenger-mile charged by a carrier is higher on routes with greater MMC. When there is MMC between airlines having dissimilar cost levels, there is little or no significant impact on airfares.	SCP	Airfare per passenger-mile	Positive linear	Geographic
Upson, Ketchen, Connelly & Raft	2012	Support	Longitudinal	285 footholds in the US computer-related industries	2004-2006		Market commonality and resource similarity are negatively associated with foothold attack and withdrawal.	Competitive dynamics	Foothold attack / Foothold withdrawal	Negative linear	Product
Will	2012	No support	Cross-sectional	17 passenger airlines	2003		There is a positive relationship between MMC posture and spending on customer service and promotion and sales.	MFB	Promotion and sales / Service quality	Positive linear	Geographic
Zou, Yu, & Dresner	2012	Support	Cross-sectional	176 transpacific routes from Asia	2007	Rival alliances	MMC is associated with higher international airfares. The relationship is	SCP	Airfare	Positive linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
				to the US			stronger when firms are members of rival alliances.				
Sengul & Gimeno	2013	Support	Longitudinal	Majority-owned subsidiaries of French groups	1997-2004	Relative market share Industry growth	MMC is negatively related to subsidiary discretion. MMC is positively associated with the likelihood of getting financial resources. The likelihood of resources flowing to subsidiaries with low relative market share or/and in high growth industries is lower when MMC is high.	MFB	Subsidiary discretion / Inflow of financial resources	Negative linear	Product
Coccorese & Pellecchia	2013	Support	Longitudinal	20 Italian regional banking markets	1997-2009	Concentration	MMC is positively correlated with market power. Concentration positively moderates this relationship.	SCP	Market power	Positive linear	Geographic
Molnar, Violi, & Zhou	2013	Support	Longitudinal	105-102 banks in 20 Italian regions	2003-2007	Concentration	The average deposit interest rate minus service rate is lower for coordinated banks.	SCP	Deposit interest rates minus service rate	Negative linear	Deposit / geographic markets
Feinberg	2013	Support	Cross-sectional	Leading exporter countries of 12 products in the fats and oils industry	2007		MMC reduces future entry into home markets of competing exporters.	SCP	Entry	Negative linear	Geographic

Author Names	Year	MFB	Study design	Sample	Time	Moderator(s)	Findings	Theoretical perspective	Outcome variable(s)	Main relationship	Market type
Skilton & Bernardes	2015	N/A	Longitudinal	671 US aircraft modification industry firms	1990-2009		Competitor diversity (in terms of MMC) increases the rate of entry.	Network theory	Entry	Positive linear	Product
Bowers, Greve, Mitsuhashi, & Baum	2014	Support	Longitudinal	1,229,872 earnings estimates issued by analysts	1995-2007	Competitive parity, Status parity	The likelihood of issuing a bold earnings estimate is lower for analysts with high MMC. Competitive and status parity strengthens this relationship.	MFB	Bold earnings estimates	Negative linear	Product

Figure 1: A Graphical Summary of MMC Literature



2.2 Competition

This section reviews competition literature. It gives some theoretical background first and then reviews competitive dynamics literature. This is followed by a review of the emerging literature on factor market competition and a section on the ecological concept of competitive intensity.

2.2.1 Background

"*Competition is a rivalry between individuals (or groups or nations), and it arises whenever two or more parties strive for something that all cannot obtain*" (Stigler, 2008, p. 1). Even though the concept of competition has been ever-present in business and economics thinking, a formal definition of the concept has only started to emerge with Cournot's oligopoly theory in 1838 (Stigler, 2008). Cournot explained that supernormal profits tend towards zero when the number of producers producing the same product is large. This treatment of competition implies that the number of competitors in a particular industry or market determines competition. Based on this idea, neoclassical microeconomics theory defines industries or markets with different numbers of firms and the corresponding competition that exists as monopolistic, duopolistic, oligopolistic, and competitive. Monopolies exist when there is only one firm, a duopoly when there are two firms, an oligopoly when there are a few firms and a market is perfectly competitive when there are many firms (Ricketts, 1988).

To date, a variety of approaches have developed to explain what determines competition. Among these approaches, the industrial organisation perspective describes how entry barriers and the degree of dispersion of market share within an industry determines the degree of competition (Bain, 1956). In this approach, also known as the SCP paradigm, market structural attributes such as barriers to entry, buyer and supplier concentration, consumer switching costs, demand elasticity, product heterogeneity, and the concentration and relative size of firms in an industry determine the degree of competition (Porter, 1980). For example, in industries with high barriers to entry, high consumer switching costs, heterogeneous products and few firms,

competition is low and hence firms earn higher returns than in industries in which structural attributes allow for more competition.

Chamberlin (1933) has built on neoclassical economic notions of monopolistic competition to explain that even in markets that could be characterised as otherwise competitive, idiosyncratic firm attributes can insulate firms from competition and thereby confer quasi-monopolistic power. In this approach, firm heterogeneity provides an isolating mechanism reducing competition, irrespective of market structure. Building on these ideas, strategic management scholars argue that competition is not merely a function of market structure, but also a function of firm resources because heterogeneous and inimitable bundles of resources can confer *ex-ante* and *ex-post* limits to competition (Barney, 1991; Peteraf, 1993). For example, firms possessing valuable, rare, costly to imitate and non-substitutable resources can use these to generate abnormal returns even in markets with many firms.

Evolutionary economics does not rely on neoclassical economic theories, but borrows notions of competition from evolutionary biology and blends these ideas with Schumpeterian ideas of dynamic change (Alchian, 1950; Kirzner, 1973; Schumpeter, 1934). While competition still plays out in the market, it is a dynamic process by which markets move towards and away from equilibrium without ever reaching it. Nelson and Winter (1982), for instance, build on these ideas to describe organisations as bundles of routines that interact dynamically – mostly through recombinations of organisational routines that lead to innovation – to create competitive pressures that other firms face in a dynamic contest. Building on these ideas, competitive dynamics literature uses the AMC perspective to analyse how the awareness of competitive threats, the motivation to respond to these threats and the capabilities to carry out actions and responses result in dynamic competitive moves and countermoves that firms use to gain competitive advantage (Chen & Miller, 2012; Chen *et al.*, 2007; Grimm *et al.*, 2006; Ketchen *et al.*, 2004; Smith *et al.*, 2001).

In organisational theories, competition is a dominant force that shapes organisational behaviour and is, at the same time, generated by organisational behaviour. More specifically, while behavioural theories point to bounded rationality, to limited information processing capacities of organisational decision makers and to satisficing behaviour as important

determinants of firm behaviour, competition remains a main driving force of this behaviour (Cyert & March, 1963; March & Simon, 1958). In particular, the behaviour of competitors creates uncertainty and performance shortfalls that trigger organisational actions. Resource dependence theory is similar in its conception of competition as a source of uncertainty that places constraints on organisational actions and structures (Pfeffer & Salancik, 1978). Network theories, drawing on the ideas of Simmel (1950), regard competition as an environmental constraint. In particular, competition is rooted in network structures such as structural holes that limit the access to resources or information (Burt, 1987, 1992). In this approach, firms that fill structural holes, for example, are less constrained whereas firms that face more structural holes are more constrained.

Organisational ecology builds on some of these ideas and on Simmel (1950) as well as on ideas about the links between social structure and ecology (Hawley, 1950) to suggest that competition is the constant selection pressure that firms face in ecological niches characterised by resource scarcity (Hannan & Freeman, 1989; Hannan, Pólos, & Carroll, 2007). In the face of constant selection pressure, firms that are better adapted to their environment gain competitive supremacy while firms that are not well adapted lose out. However, adaptation, even in the face of selection pressure, is difficult due to inertial forces. The density dependence model formalises these intuitions by suggesting that firm density determines selection pressure (Barnett & Carroll, 1987; Hannan & Freeman, 1989). When density is low selection pressures are low because resources are relatively abundant; as density increases the resource niche gets crowded, and the selection pressure rises. Thus, early models in organisational ecology characterise competitive pressure as homogeneously distributed in an organisational population (see McPherson, 1983 for an exception). More recent approaches highlight that firms have different resource requirements (Baum & Singh, 1994a, 1994b). This suggests that selection pressures are unequally distributed. Models of size-localised competition, for instance, highlight that firms of similar size require similar resource mixes, pursue similar strategies, and have similar structures suggesting that they compete more intensely with each other (Amburgey, Dacin, & Kelly, 1994; Baum & Mezias, 1992; Hannan & Freeman, 1977; Ranger-Moore, 1997; Wholey, Christianson, & Sanchez, 1992). In fact, since selection is localised, differentiation arises which further contributes to competitive asymmetry (Amburgey *et al.*, 1994). Similarly, new entrants face more competition from larger,

well-established firms as their accumulated resources form effective barriers to entry (Barron, 1999; Barron, West, & Hannan, 1994).

Competition at different levels influences firm behaviour. While neoclassical, industrial organisation and early organisational ecology approaches focus on the industry-, market-, or population-level, more recent organisational ecology models, as well as resource-based and competitive dynamics models, focus on the firm-level. This study follows these latter approaches to analyse how competition influences the relationship between MMC and competitive behaviour. Focusing on the influence of idiosyncratic competitive circumstances is important because depending on idiosyncratic circumstances firms may have different incentives to adhere to or deviate from forbearance while at the same time facing different constraints. Accordingly, the remainder of the literature review concentrates on literature that analyses competition at the firm-level.

2.2.2 Competitive Dynamics

The competitive dynamics perspective analyses how awareness, motivation and capabilities result in dynamic competitive moves and countermoves (Chen & Miller, 2012; Chen *et al.*, 2007; Grimm *et al.*, 2006; Ketchen *et al.*, 2004; Smith *et al.*, 2001). Competitive moves have traditionally been defined as: "*externally directed, specific, and observable competitive moves initiated by a firm to enhance its relative competitive position*" (Ferrier, Fhionnlaoich, Smith, & Grimm, 2002, p. 307), but more recent approaches incorporate a broader range of moves including moves that may not necessarily be externally directed and observable (Chen & Miller, 2012). Conversely reactions are responses to moves initiated by competitors. Early on, the focus has been on characteristics of specific competitive attacks and responses and the dyadic interplay of attacks and responses (Smith *et al.*, 2001). Attacks have been analysed in terms of characteristics such as extent, magnitude, threat, irreversibility and how radical they are while responses have been analysed in terms of characteristics such as timing, scope, similarity and likelihood. This early focus on individual competitive actions and responses has been complemented by studies that incorporate competitive actions and response in complex competitive interaction scenarios and a broader range of actions (Ketchen *et al.*, 2004). For long-

term survival, for example, not only the characteristics of actions seems to matter but also the consistency with which these actions are carried out (Lamberg, Tikkanen, Nokelainen, & Suur-Inkeroinen, 2009). A similar argument is reflected in nascent markets. Here strategic actions that confer legitimacy seem to confer more value (Rindova, Ferrier, & Wiltbank, 2010). Hence, firms tend to use simple, predictable actions that follow a consistent motif in order to convince potential investors of their legitimacy.

In addition to scrutinising action characteristics and sequences, studies have paid particular attention to leader-follower dynamics and the first-mover phenomenon. First-mover advantages have been analysed in terms of internal and external contingencies and sustainability (Ketchen *et al.*, 2004). In particular, the sustainability of first-mover advantage has attracted much theoretical and empirical debate. It seems that while first-mover advantages exist, they erode over time. Boyd and Bresser (2008) clarify that first-movers benefit from response delays; for responders, however, both fast and late responses lead to performance shortfalls. Studying how incumbents respond to followers' entry, Simon (2005) shows that incumbents' responses depend on the incentives of incumbents. Incumbents that compete in fewer markets and incumbents that compete in competitive markets cut prices less often, but newer incumbents cut prices more often.

To clarify sustainability conditions, studies have started to analyse in which circumstances first-mover advantages might be sustained for longer or might be more pronounced. In international business, first-movers benefit from political resources that enable cost asymmetries, spatial, technological and customer pre-emption (Frynas, Mellahi, & Pigman, 2006). This is because first-movers can influence government intervention in the early stages of industry formation and thus generate lasting asymmetries between competitors. In acquisition waves early movers perform better, while firms that move at the height of the acquisition wave do not gain much because they might not undertake acquisitions based on a sound analysis of the benefits but merely join the industry trend (McNamara, Haleblian, & Dykes, 2008). Follower entry can also have beneficial implications for incumbents when agglomeration benefits from entry are stronger than competitive effects (McCann & Vroom, 2010).

Others focus on followers, factors that influence followers' entry timing and the consequences of entry timing. Fuentelsaz, Gómez, and Polo (2002) show that firm size, profitability, proximity, rivalry in existing markets and potential demand have a positive influence on followers' speed of entry. Among late entrants, performance differentials are a function of remaining market opportunities, resource commitment and strategic positioning (Shamsie, Phelps, & Kuperman, 2004). Ethiraj and Zhu (2008) show that imitators can erode the innovators advantage more effectively when entering later, because later imitators can offer better quality as compared to simply being able to offer different product attributes with faster entry. Semadeni and Anderson (2010) suggest that firm-level characteristics exert influence when followers imitate competitors. Imitators, for example, follow competitors that are innovative and have related product offerings. On the other hand, the more radical the innovation, the less likely the imitation.

In the quest to find the antecedents of competitive behaviour, scholars have scrutinised firm-specific factors (Smith *et al.*, 2001). Early studies in this area predict how different top management team demographic characteristics such as top management team age, size, education, tenure, reputation, functional background and heterogeneity of characteristics impact on the propensity to act and react (Ferrier, 2001; Hambrick, Cho, & Chen, 1996; Smith *et al.*, 2001). More recently, cognitive and perceptual characteristics of top managers have attracted increasing attention as antecedents of competitive behaviour. Nadkarni and Barr (2008), for example, combine cognitive models with industry dynamics to explain that both impact on the strategic responses of executives because industry dynamics shape mental models which in turn influence strategic decision-making. In addition, executive cognition explains reaction speed and to which actions firms react (Marcel, Barr, & Duhaime, 2011). Firms attacked in markets they consider central are more likely to react aggressively even if the economic potential of the market would not justify such aggressive behaviour (Livengood & Reger, 2010). This is because the market might hold the highest psychological value for the top management team. In the case of competing in hypercompetitive environments, better teamwork in the top management team leads to more action aggressiveness (Chen, Lin, & Michel, 2010b). The top management team might be the actor executing actions. However, ownership structure might impact on what kind of actions the top management team chooses (Connelly, Tihanyi, Certo, & Hitt, 2010). Connelly *et al.* (2010) show that concentrated ownership by dedicated institutional owners correlates positively with

strategic actions while dispersed ownership by temporary institutional investors correlates negatively with strategic actions and positively with tactical actions.

Because firms need resources to leverage strategic actions, the impact of resources as a trigger of competitive actions has been analysed as well. In this approach, high levels of slack have a positive relationship with attack volume, duration, complexity and unpredictability (Ferrier, 2001). Nevertheless, not only do excess resources drive competitive actions but also particular resources influence particular actions. Having a reputation for being a strategic player, for instance, triggers slower responses, while a reputation as price predator triggers faster responses (Smith *et al.*, 2001). Firms that have a reputation for being the market leaders attract more responses to their actions and have their actions imitated more often. It has also been shown that firms that can rely on a broad set of technological resources can leverage more complex and more diverse competitive actions (Ndofor, Sirmon, & He, 2011). What is more, effective resource management is essential in order to launch competitive actions and to benefit from these actions (Sirmon, Gove, & Hitt, 2008).

A range of other internal variables as antecedents of competitive behaviour have been analysed as well. Some investigate how competitive behaviour depends on prior performance; with good past performance being negatively related to competitive activities (Ferrier, 2001). However, good performance can trigger bold actions in new markets and conservative actions in established markets; on the other hand, bad performance triggers bold actions in established markets and conservative actions in new markets (Chen, Katila, McDonald, & Eisenhardt, 2010a). Chen *et al.* (2007) suggest that when the perceived competitive tension between rivals becomes too strong, this can trigger attacks and retaliations. Tsai, Su, and Chen (2011) further suggest that when firms frame competitors as particularly important based on the structural and relational embeddedness, they develop competitor acumen towards these competitors resulting in more aggressive behaviour. As outlined before, the role of MMC for competitive dynamics has been studied as well with Young *et al.* (2000) showing fewer attacks and faster retaliation and Yu *et al.* (2009) and Yu and Cannella (2007) showing reduced competitive aggressiveness but a higher likelihood of response.

Scholars of competitive dynamics have also investigated the role of external environments for competitive behaviour. Industry variables such as munificence, growth and concentration are negatively related to competitive behaviour because firms in such industries might not have a need to compete aggressively (Ferrier, 2001). In addition, in co-operative networks, differential structural positions lead to different competitive actions and responses (Gnyawali, He, & Madhavan, 2006; Gnyawali & Madhavan, 2001). Central firms initiate more actions while relatively autonomous firms take more diverse actions. This is especially true when firms serve a wide variety of markets. In addition, competitive actions in themselves can trigger more action because actions by one firm lead to an increase in actions and speed of actions taken by its rivals (Derfus *et al.*, 2008). This self-exciting pattern of actions and reactions seems to follow a model of Red Queen competition in which actions trigger reactions that trigger actions and so forth.

Of late there has been an increased focus on hypercompetitive environments because behaviour might be different in these environments (D'Aveni, 1994; D'Aveni, Dagnino, & Smith, 2010). Pacheco-de-Almeida (2010) shows that in hypercompetitive environments leaders can lose their leading position not due to an inability to respond to competitive threats, but due to a rational choice because market leadership is too costly to sustain. Also, in hypercompetitive environments, action aggressiveness and top management team team-work predict how successful a firm is (Chen *et al.*, 2010b). In emerging economies, the development of institutions might contribute to the emergence of hypercompetitive markets (Hermelo & Vassolo, 2010). In particular, more developed institutional environments seem to be conducive to the development of hypercompetiton. In addition, firms that compete with complementary products contribute to the emergence of hypercompetitive escalation if they have capabilities that allow them to reconfigure resource allocations dynamically (Lee, Venkatraman, Tanriverdi, & Iyer, 2010).

Competitive behaviour in strategic groups has received particular attention, where group membership is used as a predictor of the way in which firms compete. The general assumption in these models is that within-group competition is less intense than between-group competition (Caves & Porter, 1977; Ketchen *et al.*, 2004; Smith *et al.*, 2001; Smith, Grimm, Young, & Wally, 1997). This general model has been challenged because the performance variance within groups

is largely explained by firm-level effects (McNamara, Deephouse, & Luce, 2003). To gain a deeper understanding of how group membership impacts on competitive behaviour, more recent studies have analysed whether strategic group member strategies tend towards a long-run equilibrium (Nair & Filer, 2003). Nair and Filer (2003) find that group members used convergent and divergent actions depending on how satisfied they were with group performance. In addition, asymmetries based on relative size between strategic groups predict response speed and magnitude with relatively smaller firms being slower to respond but using a larger range of responses (Más-Ruiz, Nicolau-Gonzálbez, & Ruiz-Moreno, 2005). What is more, inter- and intra-group competitive behaviour seems to be affected by market power, efficiency, differentiation and MMC (Más-Ruiz & Ruiz-Moreno, 2011). Groups of large firms reduce competitive behaviour because players can use switching costs to leverage market power and economies of scale to benefit from efficiency. In addition, groups of large firms decrease competitive behaviour because reputation allows differentiation, and MMC allows mutual forbearance. Más-Ruiz, Ruiz-Moreno, and Ladrón de Guevara Martínez (2014) also show that asymmetric rivalry between strategic groups exists where large firms experience a lot of retaliation from within the group but not from strategic groups comprised of small firms, whereas small firms experience little reaction from others in their group and no retaliation from firms in the large group.

The consequences of competitive behaviour have also been widely investigated. There is consistent support for the idea that faster reactions to rivals' actions reduces the performance benefits of the attacker, that action and reaction aggressiveness increases performance and that attack volume, duration, complexity and unpredictability lead to relative performance gains for the attacker (Derfus *et al.*, 2008; Ferrier, 2001; Smith *et al.*, 2001). For example, when market leaders are less aggressive and use simpler competitive actions, they are more likely to lose market share and to be replaced by followers (Ferrier, Smith, & Grimm, 1999). It leads to performance gains, when competitors initiate more actions than rivals, but when competition escalates and rivals respond with more actions faster, the focal firm's performance suffers (Derfus *et al.*, 2008). Recently, Chen *et al.* (2010b) show that especially in hypercompetitive environments action aggressiveness directly increases firm performance. Ferrier and Lyon (2004) show that even though action simplicity is usually associated with lower performance, firms with heterogeneous top management teams that rely on simpler repertoires of actions gain performance benefits.

Action simplicity is only related to lower performance for firms with homogeneous top management teams. In addition to studying the impact of actions on performance, researchers have analysed how actions impact on reputation building to show that a firm's reputation increases with the volume and complexity of its actions (Basdeo, Smith, Grimm, Rindova, & Derfus, 2006). It also increases when rivals take longer to respond and respond with similar actions. Sirmon *et al.* (2008) highlight that efficient resource management is necessary in order to gain competitive advantage from competitive actions.

In summary, this literature provides a detailed analysis of antecedents, contingencies and consequences of competitive behaviour. It needs to be noted, however, that idiosyncratic competitive circumstances as drivers of competitive behaviour have received only scant attention, and the attention they have received has mainly focused on perceptual dimensions.

2.2.3 Factor Market Competition

Factor markets are markets for inputs, resources, or factors of production (Barney, 1986a, 1986b; Markman *et al.*, 2009; Ricardo, 1817). The notion that competition may arise in factor markets can be traced back to economics thinking in Chamberlinian economics (Chamberlin, 1933) which postulates that in competing, firms leverage resources from overlapping resources spaces. This approach implies that it is necessary to obtain resources in factor markets to be able to leverage them in product markets. In particular, Barney (1986b, p. 798) clarifies that when firms do not have the necessary resources to implement their product market strategies, they "*engage in a struggle to obtain those resources and skills that will allow them to successfully compete*". In addition, Barney (1986a) suggests that factor markets, like product markets, might vary in terms of their competitive characteristics. In this early treatment of factor markets, factor markets were any market for resources, defined as "... *where firms buy and sell the resources necessary to implement their strategies"* (p.1232).

Building on these early ideas about factor markets, a number of studies have focused on identifying the properties and functioning of factor markets. According to Barney (1986a), gains from acquiring resources in factor markets only arise out of luck or out of asymmetric information

about the future value of resources (Ahuja, Coff, & Lee, 2005). Building on Barney (1986a), Makadok (2001) clarifies that factor markets and internal resource development represent alternative mechanisms that enable access to resources. Early approaches to thinking about factor markets assume that asymmetric information is the only market friction these markets experience, yet Mahoney and Qian (2013) highlight that factor markets are subject to similar market frictions as product markets. It cannot, for instance, be assumed that firms in factor markets are strict profit maximisers, and hence governance mechanisms are important considerations for both types of markets (Makadok, 2003). In addition, when analysing factor markets it is not only necessary to understand market frictions, but also the role of existing resource endowments (Denrell, Fang, & Winter, 2003; Wernerfelt, 2011) and the complementarity of resources owned and resources acquired in these markets (Adegbesan, 2009; Schmidt & Keil, 2013). The value that can be extracted from resources obtained in factor markets depends on the complementarity of existing resources of the buyer, on the scarcity of the resource offered, and on the bargaining ability of buyers and sellers (Adegbesan, 2009). Since resources bought have different types of complementarities with a given set of resources owned, different resources have different scarcities and different buyers and sellers have different bargaining abilities, factor markets are characterised by *"double-sided competition for **both** buyers and sellers.*" (Adegbesan, 2009, p. 472, original italics in bold).

There has also been some theorising about the types of resources that firms acquire in factor markets. According to Barney (1986a), it is not the type of resource but rather the tradability of the resource that determines whether it can be acquired in factor markets. Hence, all tradable resources can be obtained in factor markets. This implies that a broad range of resources is purchased in factor markets since the concept of resources is very expansive, including assets that can be termed commodity resources as well as highly complex sorts of assets that accumulate in path-dependent fashion over organisational life histories such as routines and dynamic capabilities (Barney, 1991; Capron & Chatain, 2008; Denrell *et al.*, 2003; Sirmon, Hitt, & Ireland, 2007). In fact, very early definitions of resources have also included firm attributes that confer disadvantages (Wernerfelt, 1984). Others, however, have stressed that only certain types of resources can be acquired in factor markets because some resources are the result of dynamic accumulation and are embedded in a particular context (Dierickx & Cool, 1989). Although Dierickx

and Cool (1989) argue that many competitive advantage-conferring resources cannot be acquired in factor markets, they concede that less complex resources are acquired in factor markets. Despite these arguments about the limited tradability of competitive advantage conferring resources, Knott (2003) shows that even for such complex resources as organisational routines, factor markets can emerge. What is more, recent theories about the necessity to manage a broad range of diverse resources to gain competitive advantage also point out that a broad range of different resources can be acquired in factor markets (Sirmon *et al.*, 2008; Sirmon *et al.*, 2007; Sirmon, Hitt, Ireland, & Gilbert, 2011).

Rather than analysing the properties of factor markets and the resources acquired there, an emerging stream of research focuses on why competition develops in factor markets, on the competitive dynamics that play out in factor markets and on how they affect competition in product markets. In factor markets, for example, just like in product markets, competition needs to be assessed not only in terms of direct competitors but in terms of indirect competitors and substitutability of factors (Peteraf & Bergen, 2003). Firms need to be wary of direct competitors in product and factor markets as well as of indirect competitors in both markets. In factor markets, in particular, competition does not only arise from identical factors but it also arises from functionally similar factors. Competition in factor markets might arise because firms want to secure access to scarce resources but also because hindering competitors from gaining access to resources can have important competitive implications for product markets (Capron & Chatain, 2008). Capron and Chatain (2008) highlight that firms are more likely to direct their competitive actions at rivals' resources in factor markets when resource environments are in their formation stages or are undergoing rapid transformations, when property rights are well-defined, when firms expect to gain or lose more relative to rivals for not controlling the resources, when firms have better resource scanning capabilities, and when firms have a competitor-oriented culture. Markman *et al.* (2009) also highlight that a detailed understanding of both product and factor market competition is necessary to understand competitive dynamics. They focus on a range of competitive dynamics that play out in both, factor and product markets. Resources versatility and mobility, for instance, can be used to explain how competition in factor markets can spill over into product markets if firms try to gain access to rivals semi-mobile human resources. Moreover, they suggest that firms use resource leapfrogging when they employ novel resources or novel

resource combinations to leapfrog the competitive positions of their product market rivals. Firms can also use resource captivity strategies aimed at disrupting competitors' access to critical resources.

Chatain and Zemsky (2009) explain that frictions between buyers and suppliers can preclude some suppliers from working with certain buyers, which increases the competition among suppliers as they compete for a limited number of buyers. They further explain that the degree to which such frictions develop depends on the competitive advantage of the buyer in product markets. Chatain (2011) shows that the value added in buyer-supplier relationships depends on the stability of the relationship and the profitability of the suppliers, highlighting how competitive conditions in factor markets may have implications for product markets. Ross (2012) further explains that the supplier only gains from increasing buyer competition until a critical number of buyers is reached. After that, the increased number of buyers decreases the profit of suppliers because the evaluation costs that need to be incurred to participate in the market may disincentivise some buyers since there may be no gains from doing so. In a game theoretical model Chatain (2014) also highlights that buyers bid higher for factors in factor markets when competition is more intense in product markets, leading to heterogeneity in factor markets. Moreover, the economic profits firms can earn from strategic factor markets depend on the competitive conditions in product markets (Asmussen, 2010, 2015). More specifically, when competition in product markets is high, resource suppliers can set prices such so that the acquiring firm earns negative economic profits in factor markets. In these cases, buyers may need to subsidise factor market losses with market power rents from product markets.

The approaches outlined above focus on factor markets in general. However, there have also been some advances concerning particular types of factor markets. Factor markets for human resources, for instance, have received some conceptual and empirical attention in recent years. From a conceptual point of view, labour markets are factor markets (Fulmer & Ployhart, 2014). Brymer, Molloy, and Gilbert (2014), however, point out that labour markets are unique types of factor markets because they require a two-sided match. In general, the resource owner sells resources on factor markets, but for human resources there is no distinction between the owner and the resource. Hence, the acquiring firm needs to be willing to buy the resource, but at

the same time the resource needs to be willing to be acquired. Ployhart, Nyberg, Reilly, and Maltarich (2014) clarify that factor markets for individual human resources may be relatively efficient. However, markets for the aggregated human resources in a given firm and their interaction with other resources in the firms are relatively inefficient because it is the bundling of resources that makes them valuable and, at the same time, this bundling makes factor market transactions complex.

Empirically, a study of labour market competition for human resources in the US software industry in the period from 1999 to 2002 shows that competition for human resources follows a cycle of competitive dynamics (Gardner, 2005). In particular, competition for human resources in labour markets triggers strategic responses in terms of defence and retaliation against labour market competitors. Interestingly, firms losing employees to a product market competitor are less likely to initiate a defensive or defensive-retaliatory response. On the other hand, if the competitor is located outside the local labour market, and thus a non-local factor market competitor, the firm losing employees is more likely to initiate a defensive or defensive-retaliatory response. Soltis, Sterling, Borgatti, and Ferrier (2010) study high school football players that are being recruited by teams in the National Collegiate Athletic Association in 2008. They show that product market competition, historic competition and strategic group membership spill over to factor markets whereas geographic distance and image similarity are negatively related to factor market competition. Also, higher quality human resources attract more competition than lower quality human resources. Focusing on American Football, Aime *et al.* (2010) study 412 games between the San Francisco 49ers and any other team in the National Football League over the 1979 to 2002 period. They find that when competitors hired key employees from the San Francisco 49ers, they could decrease the victory margin of the San Francisco 49ers because these key employees enabled access to understanding competitive routines. Thus, while the routines themselves were not traded, the knowledge about these routines embedded in knowledgeable individuals can give effective access to routines.

Carnahan and Somaya (2013) analyse how the hiring of human resources from competitors of suppliers influences the relationship between buyers and suppliers. They analyse 417 buyer-supplier dyads consisting of Fortune 500 firms that outsource the legal prosecution of

patent claims to specialised law firms from 1991 to 1995. This analysis reveals that when a buyer hires from a supplier's competitor the supplier is less likely to gain outsourcing work from that buyer. The relationship is weaker when the buyer has more employees that were hired from the supplier. However, the relationship is stronger when the buyer firm has a high turnover and when the hired employees are from a geographically close competitor of the supplier. Moliterno and Wiersema (2007) focus on the seller side in factor markets for human resources and explore the effect of monopolistic versus monopsonistic factor markets. They argue sellers can only extract economic rents from the sale of human resources on monopsonistic factor markets. They analyse the sale of pitchers in Mayor League Baseball in the US from 1969 to 1983. They find that teams can appropriate rents from selling pitchers under monopsonistic factor market conditions, but this changes when monopsonistic factor market conditions no longer exist.

A second type of factor market that has received some empirical attention in recent years is the market for technology. Lerner *et al.* (2003), for example, in a study of 63 patent pools in the US between 1895 and 2001 suggest that anticompetitive concerns have precluded the formation of new patent pools in recent times. These concerns have made patent pools more selective. Ziedonis (2004) studies the patenting activities of 67 US semiconductor firms between 1980 and 1994. She shows that patenting activities are more aggressive when technology markets are more fragmented. Anand *et al.* (2009) analyse a sample of biopharmaceutical firms from 1989 to 1999. They show that entry and exit in R&D markets under MMC follows a mimetic logic rather than following forbearance considerations. In particular, they find a positive relationship between MMC in R&D markets and entry into R&D markets and a negative relationship between MMC in R&D markets and exit from R&D markets. They suggest that due to the high uncertainty inherent in R&D markets mimicry rather than forbearance motivates firms. Clarkson and Toh (2010) indicate that the presence of a competitor in a technological space can be an effective deterrent for keeping rivals from entering. In a study of 253 US communication equipment firms from 1990 to 1999, they show that rivals shy away from locating inventive effort in technological spaces in which a competitor holds a dominant position. This effect is attenuated if the incumbent also has strong downstream and litigation capabilities. Grimpe and Hussinger (2014) study acquisition as a mechanism to gain access to patent portfolios that can be used to pre-empt competition. To do this, they analyse premiums paid in 1,428 acquisitions in Europe from 1997 to 2010. Their

findings indicate that firms pay higher premiums to access related and complementary patent portfolios because the property rights associated with ownership of patents allow firms to pre-empt competition in technological spaces. Kapoor and Furr (2015) study 176 firms in the global solar photovoltaic industry from 1978 to 2010. They show that firms are more likely to enter technological fields not just because of the performance of the technology but because there is an ecosystem of complementary technological assets. They further show that start-ups trade-off technological performance for the availability of complementary assets while the reverse is true for diversifying entrants.

In sum, it can be observed that the literature on factor market competition has continually gained traction in recent years. A number of important theoretical contributions have begun to clarify the properties of factor markets, how factor markets function, and what types of resources can be purchased in factor markets. In addition, there is an emerging stream of research that analyses factor markets in terms of why competition develops, how it plays out and how it spills over into product markets. There is also a growing empirical literature on competition in particular types of factor markets.

2.2.4 Competitive Intensity

The ideas about a firm-level concept of competitive intensity used in this study build on organisational ecology insights in general and on models of Red Queen competition in particular. Organisational ecology has mainly focused on competition as a function of selection pressure due to resource scarcity conditions (Hannan & Freeman, 1989; Hannan *et al.*, 2007). However, the idiosyncratic competitive intensity that a firm faces is not only dependent on resource scarcity but also on relative competitive fitness (Barnett, 1997, 2008; Barnett & McKendrick, 2004). In this approach, relative competitive fitness develops through an on-going interplay of learning driven adaptations and selection in which only better adapted competitors survive whereas less adapted competitors fail. The learning and selection process follows a Red Queen model in which selection pressures incentivises firms to continually search for ways to improve competitiveness which lead to adaptations (Barnett, 1997; Barnett & Burgelman, 1996; Barnett, Greve, & Park, 1994; Barnett & Hansen, 1996; Barnett & McKendrick, 2004). In particular, facing intense

competition leads to performance shortfalls. When performance falls below expectations, firms begin a process of satisficing localised search and adaptations until performance rises sufficiently to exceed expectations or until expectations are adjusted. In the process of doing so firms develop competitive capabilities and thereby reduce the competitive pressures they face. Their competitors on the other hand now face more intense competition, and the cycle begins anew. Firms that cannot keep up with this cycle fail while those that adapt well, become ever-stronger competitors in terms of both, internal viability and threat to rivals. In these models, competitive intensity is defined as "*the magnitude of effect that an organisation has on its rivals' life chances*" (Barnett, 1997, p. 130). Hence, competitive intensity can be thought of as the firms' idiosyncratic competitive circumstances.

Literature around the concept of competitive intensity that draws on this perspective has paid special attention to how competitive intensity emerges. In these models, surviving the Red Queen process and learning from competition are important antecedents. For example, when facing great competitive intensity in past periods and surviving the selection process, firms face less competitive intensity as illustrated by their superior financial performance (Barnett *et al.*, 1994). The performance-enhancing effect of surviving past competitive intensity becomes particularly apparent when the performance reducing effect of current competition is controlled for. Barnett (1997) further focuses on the development of competitive intensity over time suggesting that competitive intensity is a function of surviving historical competition and other factors that enhance internal viability. Hence, firms that have survived competition in the past are more internally viable and will face less competitive intensity. Similarly, Barnett and McKendrick (2004) show that when firms survive great competitive intensity when they are still small, they face less competitive intensity when they become larger. On the other hand, large firms that face less competitive intensity due to their size are isolated from the competitive learning effects of the Red Queen process. Barnett and Sorenson (2002) focus on the organisational learning aspect in particular. They show that firms that learn from competition grow faster and face lower competitive intensity than firms that do not learn. However, learning can also result in competency traps in which case firms still face more intense competition. This suggests that both survival and successful learning lead to firms facing lower competitive intensity.

Others, focusing on determinants that contribute to competitive intensity, suggest that internally viable firms face less competitive intensity. Barnett and Freeman (2001), for example, suggest that while early product introduction can have positive viability implications, firms that enter at a later stage might face less competitive intensity because their technological capabilities are more advanced. Similarly, Phillips (2002) shows that it increases survival chances of new firms when the founders transfer capabilities learned in strong firms. Capabilities learned in weak firms, however, have negative implications for survival. In environments characterised by scale advantages, relative size by itself can be a good indicator of the firm facing lower competitive intensity (Dobrev & Carroll, 2003). On the other hand, in environments characterised by scale- and specialisation advantages relatively large and relatively small firms face the least competitive intensity. What is more, product portfolio characteristics can be an indicator of internal viability (Khessina, 2006; Khessina & Carroll, 2008). Non-innovative, old product portfolios are indicative of lower internal viability whereas newer more innovative product portfolios reflect higher internal viability. At the same time, incumbents that enter new industries face lower competitive intensity if they can draw on a superior pool of resources than start-ups that cannot rely on such resource advantages. In combination, these studies seem to suggest that internally viable firms do face less competitive intensity.

Some studies in this literature have also established the link between competitive intensity and the competition for resources. Silverman and Baum (2002), for instance, suggest that firms can decrease competitive intensity by engaging in horizontal alliances because such alliances foreclose other alliance opportunities and at the same time do not add resources to the industry. Furthermore, Dobrev (2007) shows that as firms move away from crowded market segments resources free up, and the competitive intensity other firms face diminishes. Voss and Voss (2008) suggest that firms need to maintain a fit between the competitive intensity they face and the resources acquisitions strategies they pursue. In particular, when firms face greater competitive intensity they need to move away from customer retention strategies towards customer acquisition strategies. Ang (2008) highlights that collaboration is most likely between firms facing moderate competitive intensity. Firms facing greater competitive intensity offer little in terms of access to resources while firms facing lower competitive intensity have no need to

collaborate to access resources. Taken together, these studies suggest that firms facing greater competitive intensity are constrained in their access to resources.

Most early studies in this tradition have analysed the outcomes of competitive intensity in terms of firm death and survival (Barnett, 1997; Hannan & Freeman, 1989); more recent approaches analyse the effect of competitive intensity on a range of strategic behaviours. Dobrev and Kim (2006) show that competitive intensity can also impact on firms' moves between markets segments. In particular, firms experiencing greater competitive intensity might move away from market segments or even abandon market segments. Further supporting this idea, Dobrev (2007) also shows that firms move away from crowded market segments. Ang (2008) analyses how competitive intensity can make firms unattractive alliances partners. This indicates that competitive intensity can have important implications for a range of strategic behaviours.

From this literature, it becomes apparent that firms face a different level of competitive intensity depending on how well they fared over their competitive histories. Firms that have been able to compete successfully have developed superior competitive capabilities and face less competitive intensity, while those that were less successful lack such capabilities and face greater competitive intensity. This also suggests that firms facing different competitive intensities have distinct incentives to improve their circumstances while at the same time facing the distinct constraints that their competitive circumstances impose.

CHAPTER 3
DEVELOPMENT OF HYPOTHESES

3 DEVELOPMENT OF HYPOTHESES

This chapter presents the hypotheses that this study investigates. First, it focuses on the relationship between PMMC and FMMC and competitive aggressiveness and argues that both types of interdependencies are associated with less competitive aggressiveness. It then argues that even though both types of interdependencies have a similar functional form, the negative relationship is stronger in the case of PMMC. The chapter goes on to explain the relationship between competitive intensity and competitive aggressiveness. In particular, it argues that competitive intensity has a negative association with competitive aggressiveness. Finally, the chapter argues that competitive intensity moderates the relationship between PMMC and FMMC and competitive aggressiveness such so that it attenuates the relationship in the case of PMMC but accentuates it in the case of FMMC.

3.1 Multimarket Contact and Competitive Aggressiveness

Theories about the influence of interdependencies on competitive behaviour are central to understanding the antecedence as well as the outcomes of competitive behaviour (Greve & Baum, 2001; Jayachandran *et al.*, 1999; Yu & Cannella, 2013). Literature that analyses the influence of MMC on competitive behaviour builds on the two fundamental assumptions that MMC increases familiarity and creates effective deterrence mechanisms (Edwards, 1955; Fuentelsaz & Gómez, 2006). Firms refrain from competitive behaviour because competitors can credibly threaten to retaliate and the losses from retaliation across markets are higher than the gains that can be obtained by engaging in competitive behaviour (Bernheim & Whinston, 1990). At the same time, MMC increases familiarity because firms that meet in a greater number of markets over extended periods can learn about their competitors (Boeker *et al.*, 1997; Jayachandran *et al.*, 1999; Scott, 1982, 1991, 2001). Building on ideas about deterrence and familiarity a large number of studies have found that MMC enables better performance and reduces competitive behaviour (Yu & Cannella, 2013).

The first hypothesis presented in this study is included as a baseline hypothesis about the relationship between interdependencies and competitive behaviour. It is included for theoretical completeness and to enable testing the interaction effects rather than for its theoretical contribution. It deals with the effect of PMMC on competitive aggressiveness. As such, it replicates prior findings and is directly derived from extant MMC literature that argues that PMMC has a negative association with competitive behaviour. However, it extends and replicates prior findings about the negative association of PMMC and competitive behaviour by not only focusing on a single type of behaviour such as market entry and exit (see for example Boeker *et al.*, 1997; Fuentelsaz & Gómez, 2006), but on a broad range of behaviours, encompassed in the concept of competitive aggressiveness (Yu *et al.*, 2009). The focus on competitive aggressiveness reflects the fundamental assumption about the effect of MMC on the overall competitive behaviour of firms rather than analysing a subset of behaviours.

The following sections discuss how different types of interdependencies influence competitive behaviour. This begins with a baseline hypothesis about the relationship between PMMC and competitive aggressiveness. It is followed by arguments that draw on MMC literature and factor market competition literature to explain why FMMC also reduces competitive aggressiveness. The final subsection explains why the aggressiveness-reducing effect is stronger in the case of PMMC.

3.1.1 Product Multimarket Contact and Competitive Aggressiveness

PMMC may reduce competitive aggressiveness because it creates interdependencies that act as effective deterrence mechanisms. When PMMC is lower, competitive aggressiveness might be greater because competitors retaliate to aggressions when they have no interdependencies (Karnani & Wernerfelt, 1985). It has, for instance, been shown that in circumstances in which firms meet in a limited number of markets competition escalates because competitive entries trigger responses (Baum & Korn, 1999; Boeker *et al.*, 1997; Haveman & Nonnemaker, 2000) and that exit rates are higher with low PMMC because unrestricted competition increases failure rates (Audia *et al.*, 2001; Barnett, 1993; Baum & Korn, 1999). When PMMC is greater, this incentivises firms to avoid aggressive behaviour because competitors can

transfer enforcement power between markets, especially if markets and firms are not identical (Bernheim & Whinston, 1990). But, even when only minimal asymmetries between firms exist, they have incentives to refrain from aggressive behaviour because firms prefer steady income streams and because overall profits are dependent on the profits firms can make in each market (Spagnolo, 1999). Moreover, even when firms cannot monitor their competitors perfectly, PMMC increases the likelihood that aggressive behaviour will be detected, thereby creating an effective deterrence mechanism even in the absence of perfect observability (Greve, 2008b; Matsushima, 2001). What is more, firms experiencing PMMC develop spheres of influence (Evans & Kessides, 1994; Gimeno, 1999) and mutual footholds (Upson *et al.*, 2012) that provide effective deterrence mechanisms. Empirically, it has been shown that PMMC acts as an effective deterrent for competitive aggressiveness (Yu *et al.*, 2009). This suggests that with lower PMMC firms do not have incentives to refrain from aggressive behaviour, while PMMC creates interdependencies that act as effective deterrence mechanisms.

Likewise, interdependencies can create familiarity that leads to reduced competitive aggressiveness. Familiarity develops from PMMC because firms that meet in multiple markets interact more frequently and potentially over longer periods. This enables them to gain information about their competitors that allows mutual forbearance to emerge even in the absence of formal deterrence mechanisms (Scott, 1991, 2001) because firms that interact repeatedly develop the ability to communicate tacitly to arrive at mutually beneficial outcomes (Scott, 1982). In addition repeated interactions lead to a superior capacity to recognise and understand the strategic information competitors are sending out through their behaviour (Boeker *et al.*, 1997; Stephan & Boeker, 2001) since competitors with whom firms have greater PMMC are more likely to be recognised in the process of collecting strategic intelligence (Jayachandran *et al.*, 1999). Based on these arguments it has been shown that familiarity reduces market entry rates (Fuentelsaz & Gómez, 2006), attack frequency (Young *et al.*, 2000) and foothold attacks and withdrawals (Upson *et al.*, 2012).

In sum, PMMC creates deterrence mechanisms and familiarity. When firms are more familiar with their competitors and when competitors can effectively retaliate this incentivises firms to refrain from aggressive behaviour. Accordingly, and building on extant MMC literature, this study proposes the following:

Hypothesis 1: As PMMC increases, competitive aggressiveness decreases.

3.1.2 Factor Multimarket Contact and Competitive Aggressiveness

To analyse the influence of FMMC, this study builds on insights from MMC literature about the effect of interdependencies and insights from factor market competition literature. The study argues that in factor markets exhibiting characteristics similar to product markets, that means factor markets characterised by relatively low uncertainty about the value of factors and by relatively high efficiency, deterrence and familiarity are important mechanisms for determining competitive behaviour. Considering factor market competition in theories of MMC reflects that competition does not only play out in product markets but can, in fact, take place at any point at which firms meet along the entire value chain (Anand *et al.*, 2009; Markman *et al.*, 2009). Moreover, this study contends that when firms meet in multiple factor markets characterised by relatively low uncertainty and relative efficiency, their competitive behaviour is influenced by familiarity and deterrence because firms are likely to recognise their interdependencies and deterrence mechanism are more likely to develop in these types of markets.

As outlined in the previous chapter, competitive dynamics in factor markets have received increasing attention in recent years. It becomes apparent from this emerging literature that firms obtain different types of resources in factor markets and that markets for various types of resources exhibit different properties. Specifically, while all factor markets experience market frictions (Denrell *et al.*, 2003; Mahoney & Qian, 2013), differences exist in terms of the efficiency of these markets (Barney, 1986a) and in terms of the uncertainty in these markets (Anand *et al.*, 2009; Markman *et al.*, 2009; Sirmon *et al.*, 2007). Labour markets for some human resources, for instance, may be relatively efficient, but they are distinct from other types of factor markets

because they require two-sided matches (Brymer *et al.*, 2014). On the other hand, factor markets for embedded human resource capital are relatively inefficient (Ployhart *et al.*, 2014). Markets for the development of new technology are characterised by high uncertainty promoting firms to depart from the competitive behaviour they follow in product markets (Anand *et al.*, 2009). Uncertainty in markets for the development of new technology arises mainly because it is impossible to make probabilistic predictions about future states of technology and because technological developments are path dependent (Anand *et al.*, 2009). Since imitation can be used to reduce uncertainty and because path dependencies make it difficult to forgo promising technological opportunities, it is unlikely that firms follow a mutual forbearance logic in such markets. Sirmon *et al.* (2007) further highlight that firms may use real options logics in resource acquisition strategies in factor markets characterised by uncertainty. In order to mitigate risks and to increase firms' abilities to respond to environmental threats and opportunities, firms may acquire some resources, not because of their current value, but because doing so gives the option to use the resource in the future.

Other factor markets are characterised by less uncertainty and greater relative efficiency. For instance, factor markets for tangible and less complex resources may be relatively efficient (Barney, 1986a, 1991; Barney, Ketchen, & Wright, 2011). Even though it might be harder to extract rents from resources obtained in those markets, firms may be willing to subsidise losses of economic rents in factor markets if they require access to particular resources to compete effectively in product markets (Asmussen, 2010, 2015). What is more, firms may engage in factor market competition because they expect that even non-complex resources could have important complementarities with existing resources (Adegbesan, 2009; Schmidt & Keil, 2013) and because the value extracted from resources depends in part on bargaining between buyers and sellers (Lippman & Rumelt, 2003). Highlighting that factor market competition can erupt over a broad range of resources, Capron and Chatain (2008) discuss how resources ranging from commodity resources such as airwaves to more complex resources such as portfolios of R&D projects are subject to competitive dynamics in factor markets. Similarly, Markman *et al.* (2009) suggest that highly mobile and versatile resources are particularly prone to competitive dynamics in factor markets because gaining access to such resources contributes towards strategic flexibility and allows implementing a broader range of product market strategies. Further supporting the notion

that firms may have incentives to compete even over commodity type resources, Kim and Bettis (2014) show that even resources as undifferentiated as cash can be valuable in combination with other organisational characteristics such as size.

Hence, one can argue that factor markets with relatively low uncertainty and relatively high efficiency are likely to follow competitive dynamics similar to product markets. At a basic level, market frictions in factor markets are comparable to market frictions in product markets (Mahoney & Qian, 2013). In addition, models of competitive dynamics build on the fundamental assumption that these dynamics are driven by market commonality *and* resource similarity (Chen, 1996), indicating that the positions in both spaces may be contested. Like in product markets, for example, firms need to be aware of their direct as well as indirect factor market competitors because substitution effects might create novel competitors that firms have not been aware of previously (Peteraf & Bergen, 2003). Moreover, Capron and Chatain (2008) portray factor market competition as following competitive dynamics cycles of attacks and responses. In particular, firms may attack rivals' resource positions through factor market attacks aimed at restricting access to resources to obtain scarcity rents, and rivals may retaliate against such attacks with factor market responses. Markman *et al.* (2009) also outlined how competitive dynamics in factor markets develop. In their model, versatile and mobile resources lead to competitive dynamics of attacks and responses as firms try to create resource discontinuities for rivals by engaging in strategic actions. Supporting the idea that firms' actions in factor markets may follow competitive dynamics, Gardner (2005) finds that firms respond to employee poaching with defensive actions such as pay rises or defensive retaliatory responses such as threats of legal actions or own attempts at employee poaching.

This study argues that when firms follow competitive dynamics in factor markets, their competitive behaviour is influenced by familiarity and deterrence considerations. The notion that firms' resource positions influence competitive behaviour has received some theoretical and empirical attention in MMC literature (Gimeno & Woo, 1996). Arguments about the effect of similarity build on the notion that strategic similarity derives from overlaps in resources positions (Fuentelsaz & Gómez, 2006; Gimeno & Woo, 1996). In these theories, similar resource profiles lead to a recognition of interdependencies that enable forbearance (Gimeno & Woo, 1999). More

specifically, Gimeno and Woo (1999) suggest that different types of markets, in particular, product markets linked by resource sharing opportunities may have distinct effects on competitive behaviour because firms may perceive interdependencies in these markets differently. Supporting this notion, they find that PMMC is more likely in markets in which firms can share resources and that the negative effect of PMMC on yields is stronger in those markets. These arguments build on the notion that similarity in resource profiles facilitates forbearance because firms are in a better position to recognise interdependencies and are more able to anticipate the strategic moves of competitors (Caves & Porter, 1977; Fuentelsaz & Gómez, 2006). This is because strategic similarity and PMMC may be alternative ways to acquire information about competitors (Young *et al.*, 2000). What is more, similarity in resource positions allows firms to deal with aggressive competitors more effectively (Gimeno & Woo, 1996), thereby making retaliations to competitive behaviour more credible and creating deterrence mechanisms. Supporting this idea, Yu and Cannella (2007) highlight that factors facilitating resource sharing between headquarters and subsidiaries enable quicker competitive responses to rival attacks.

Applying AMC reasoning, Markman *et al.* (2009) suggest that factor market competition is also subject to the awareness of competitive interdependencies, to the motivation to take actions and to the capability to execute actions. Specifically, when firms experience greater PMMC and greater FMMC, their awareness of interdependencies and their motivation to forbear is highest while awareness of interdependencies and motivation to forbear is lowest when PMMC and FMMC are lower. In support of the idea that awareness of interdependencies is important in factor market competition, Gardner (2005) shows that employee poaching by non-local labour market competitors leads to more aggressive responses because such non-local hiring is more visible to the decision makers in affected firms. In addition, when firms are clear about the competitive intentions of employee poaching, they are more motivated to engage in more aggressive labour market actions.

Extant theoretical arguments in MMC literature suggest that deterrence arises when firms can credibly threaten to retaliate against deviations from forbearance (Bernheim & Whinston, 1990; Edwards, 1955). This can, for instance, be achieved by developing spheres of influence (Bernheim & Whinston, 1990; Edwards, 1955; Gimeno, 1999). Bernheim and Whinston (1990)

argue that spheres of influence arise because firms can create dominant positions in certain markets, hence asymmetries in resource positions may be the origins of spheres of influence (Gimeno, 1999). Accordingly, Gimeno (1999) operationalizes spheres of influence not only as market dependence based on the revenues airlines earn from certain routes but also as resource centrality based on the hub positions of airlines in airports. Applying factor market reasoning to these insights it can be argued that firms are maintaining factor markets spheres of influence when they occupy dominant positions in factor markets. More specifically, to establish itself in a hub position, an airline needs to compete with other airlines for access to a number of resources such as gates, slots, and ground staff. Focusing on financial intermediaries, similar arguments can be made. For instance, to maintain a dominant position in deposit markets firms need to compete for these financial resources. They do so by, among other things, paying deposit interest rates, hiring human resources with relevant skills, creating processes and routines for taking on deposits, and establishing a network of automatic teller machines (ATMs) to allow withdrawals – some of these resources are in turn acquired in their respective factor markets, while others result from recombinations and bundling of these resources. Once a financial intermediary has established a sphere of influence in a particular factor market such as the market for transaction accounts, it can more credibly threaten to retaliate against competitive aggressions. As an example, consider firm A having a dominant position in the market for transaction type accounts by maintaining an extensive network of ATMs, while firm B has a dominant position in the market for accounts with relatively large savings by paying higher interest rates. If firm B were to expand aggressively in the market for transaction accounts firm A could respond by paying higher interest rates on its large savings accounts. To match or surpass firm A's position in the market for transaction accounts, firm B would have to make significant investments in expanding its network of ATMs. Hence, firm B may refrain from expanding aggressively in this factor market. This suggests that spheres of influence are likely to exist and influence competitive behaviour in factor markets as well.

In MMC theory, familiarity arises when firms repeatedly interact over multiple periods (Scott, 1982, 1991, 2001) and when such interactions lead to a superior capacity to recognise and understand the strategic information competitors send out through their behaviour (Boeker *et al.*, 1997; Stephan & Boeker, 2001). Firms arguably interact less frequently with factor markets

(Markman *et al.*, 2009). If one considers acquisitions as interactions in the market for corporate control (Grimpe & Hussinger, 2014), interactions may be less frequent because firms only meet in these markets if they both are bidding for the same target firm. On the other hand, firms may interact more frequently in markets for human resources if human resources form an integral part of firms' value creating activities (Gardner, 2005). Firms are likely to meet most frequently in factor markets for relatively undifferentiated resources (Barney, 1986a) and hence may interact with the same factor market competitors in these markets most frequently (Markman *et al.*, 2009). Markman *et al.* (2009) further highlight that with greater FMMC firms are likely to be more aware of each other than with less FMMC. To illustrate this consider three firms, firm C, firm D, and firm E. If we assume that firm C and firm D both obtain most of their financial resources from deposits on transaction and non-transaction savings accounts while firm E obtains most of its financial resources from large deposit accounts, it is conceivable that firm C and D will develop more familiarity with each other over time than firm C and E. While these examples are highly stylized, they serve to illustrate that in some factor markets firms may frequently interact and that these interactions may be frequent enough to develop the familiarity that is necessary to create forbearance.

In summary, this study argues that in factor markets characterised by relatively low uncertainty in which firms engage in dynamic competitive interactions deterrence and familiarity are likely to develop from FMMC. When interdependencies lead to familiarity and deterrence, this can reduce competitive aggressiveness. Accordingly, the study hypothesises that:

Hypothesis 2: As FMMC increases, competitive aggressiveness decreases.

3.1.3 Types of Multimarket Contact and Competitive Aggressiveness

In this section, this study argues that even if the relationship between PMMC or FMMC and competitive aggressiveness follows a similar functional form, there are significant differences between the two types of MMC. In particular, the study argues that while familiarity and

deterrence influence behaviour in both types of MMC, familiarity develops more readily, and deterrence is more feasible in product markets.

The study argues that familiarity develops more readily in product markets because monitoring and gathering competitive intelligence are more difficult in factor markets. Awareness of competitive independencies is a fundamental driver of competitive behaviour (Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007), where awareness can arise out of both, overlap in product markets and overlap in resource positions (Chen, 1996). Awareness, however, is likely to be higher in product markets because firms derive income from these markets (Chen, 1996; Chen & MacMillan, 1992). On the other hand, awareness of overlaps in resource positions may be lower (Chen, 1996; Chen & MacMillan, 1992) because the role of resources for competitive outcomes is more causally ambiguous (Barney, 1991; Chen, 1996; Sirmon *et al.*, 2007). Similarly, Markman *et al.* (2009) highlight that even if awareness is highest when both PMMC and FMMC are greatest, awareness with FMMC is lower than awareness with PMMC. Hence, awareness of competitors in factor markets may be lower than awareness of competitors in product markets.

Awareness by itself is not sufficient to breed familiarity, but needs to be accompanied by monitoring and the ability to gather competitive intelligence (Boeker *et al.*, 1997; Jayachandran *et al.*, 1999; Stephan & Boeker, 2001). Both monitoring and gathering competitive intelligence may, however, be more difficult with FMMC than with PMMC. First, monitoring competitors by observing prices, for instance, is difficult because signals such a prices only convey noisy information (Matsushima, 2001). In factor markets where sometimes price signals are not available or inaccurate (Barney, 1986a) the task of monitoring becomes more difficult. Price signals may contain more noise in factor markets for a number of reasons. Firms may, for instance, be willing to pay a premium in factor markets if accessing the factor of production allows them to compete better in product markets (Asmussen, 2015; Grimpe & Hussinger, 2014). At the same time, the price firms are willing to pay in factor markets depends on the complementarity of existing resources which is different across firms (Adegbesan, 2009; Schmidt & Keil, 2013). The observed price may also be high because the firm overestimated the potential for complementarity (Adegbesan, 2009). Second, firms may be biased towards focusing on product markets (Bergen & Peteraf, 2002). Bergen and Peteraf (2002) highlight that the extensive focus

on product markets rather than analysing both, product and factor markets to the same extent, may be an important reason for the myopic behaviour of managers. These arguments imply that familiarity will develop more readily with greater PMMC than with greater FMMC.

Credible threats of retaliation create effective deterrence mechanisms (Bernheim & Whinston, 1990). With FMMC, however, these threats might be lower than with PMMC. As suggested before, PMMC increases the likelihood of competitive behaviour being detected, thereby creating an effective deterrence mechanism (Greve, 2008b; Matsushima, 2001). Due to causal ambiguity in factor markets (Barney, 1986a), it may be more difficult to detect deviations than in product markets. There is a direct and proximate effect of competitive behaviour in product markets on market share and performance (Chen & MacMillan, 1992) allowing firms to infer deflections from variations in sales growth patterns (Greve, 2008b). It may not be possible to detect deflections in factor markets in the same manner because observable outcome variables such as sales growth or market share may not reflect factor market actions directly (cf. Gardner, 2005). In addition, in competitive interactions in factor markets firms need not only consider competitors but also their position vis-à-vis sellers (Chatain, 2011), indicating that a certain behaviour might be directed at sellers rather than competitors. Inferring a competitive attack from such behaviour could lead to mistaken retaliatory punishments (Thomas & Willig, 2006). As such mistaken punishments are particularly harmful in the presence of MMC, firms may only retaliate when they are certain that such retaliation is warranted. What is more, it may be harder to engage in retaliatory actions. Firms naturally could retaliate in product markets, but this option comes at the risk of jeopardising forbearance (Markman *et al.*, 2009). Firms could retaliate in factor markets, which, on the other hand, is more difficult. This is because finding the appropriate resource to acquire could be difficult because complementarity conditions need to be met (Adegbesan, 2009; Schmidt & Keil, 2013) while acquiring the wrong resource would put the firms at a further disadvantage defeating the purpose of retaliating. This indicates to the possibility that the threat of retaliation is higher with PMMC than with FMMC.

In sum, it can be argued that while firms develop familiarity and deterrence with both, PMMC and FMMC, it is likely that both will be higher with PMMC. The main reason being that even with a high level of FMMC it is more difficult for familiarity to develop, and more complicated

to detect when retaliations are warranted and to implement retaliatory actions. These arguments lead to the following hypothesis:

Hypothesis 3: The negative association between PMMC and competitive aggressiveness is stronger than the negative association between FMMC and competitive aggressiveness.

3.2 Competitive Intensity and Competitive Aggressiveness

As outlined in the literature review, antecedents of competitive behaviour have received some attention. This research has focused on the role of organisational decision makers (Chen *et al.*, 2010b; Ferrier, 2001; Hambrick *et al.*, 1996; Livengood & Reger, 2010; Marcel *et al.*, 2011; Smith *et al.*, 2001), resources (Ferrier, 2001; Ndofor *et al.*, 2011; Sirmon *et al.*, 2008; Smith *et al.*, 2001), past performance (Chen *et al.*, 2010a; Ferrier, 2001), action sequences (Derfus *et al.*, 2008), MMC (Young *et al.*, 2000; Yu *et al.*, 2009) and environmental characteristics (D'Aveni, 1994; D'Aveni *et al.*, 2010; Ferrier, 2001; Gnyawali *et al.*, 2006; Yu & Cannella, 2007).

The role of competitive circumstances at the firm-level is, however, not well understood (Chen & Miller, 2012). Some advances have been made in analysing how perceptions of competition influence competitive behaviour (Chen *et al.*, 2007; Tsai *et al.*, 2011), but this study suggests that an analysis of firms' idiosyncratic competitive circumstances can give additional insights. To gain a deeper understanding of how competitive incentives and constraints shape competitive behaviour, the study draws on ecological ideas of competitive intensity (Barnett, 1997, 2008; Barnett & McKendrick, 2004). While studies about the influence of competition have traditionally focused on the industry- or market-level (e.g. Scherer & Ross, 1990), there is an increasing recognition that competition also plays out at the firm-level (Barnett, 1997, 2008; Barnett & McKendrick, 2004; Baum & Singh, 1994b; Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007). More specifically, competitive dynamics research has made a particular point of highlighting that competitive actions may be the result of firm-level competitive considerations

(Chen & Miller, 2012; Chen *et al.*, 2007; Grimm *et al.*, 2006; Ketchen *et al.*, 2004; Smith *et al.*, 2001). Similarly, recent models in organisational ecology have stressed the importance of considering firm-specific competitive pressures (Ang, 2008; Dobrev, 2007; Dobrev & Kim, 2006) and relative competitive fitness (Barnett, 1997; Barnett & McKendrick, 2004) when analysing strategic behaviour. This latter literature highlights that firms face less competitive intensity when they have developed superior competitive capabilities and have better access to resources. On the other hand, firms facing greater competitive intensity lack such capabilities and are less able to access resources. Based on these ideas, the study argues that the idiosyncratic competitive intensity a firm faces places limits on its ability to carry out aggressive behaviour resulting in lower competitive aggressiveness for firms facing greater competitive intensity.

The study builds on competitive dynamics research that characterises aggressive behaviour as a function of the aggregated frequencies, magnitudes and characteristics of competitive actions over specific periods (Smith *et al.*, 2001). For example, when a larger total number of competitive actions is carried out with great speed over a given period this represents more aggressive behaviour, than when fewer competitive actions in slower sequences are carried out (Ferrier *et al.*, 1999; Young, Smith, & Grimm, 1996). Such sequences of aggregated competitive actions also confer information about the firms' competitive repertoires (Miller & Chen, 1996b). Such repertoires range from simple to complex depending on the range of actions used and on the degree of concentration on a few dominant actions. In this literature, complex repertoires or the extent to which a variety of actions form part of an action sequence are regarded as more aggressive behaviour (Ferrier, 2000). In order to carry out such behaviour, firms need to have – among other things – the capabilities to do so (Chen, 1996; Chen *et al.*, 2007). Such capabilities develop over time in a path-dependent manner where experiences shape future capabilities (Miller & Chen, 1994; Miller & Chen, 1996a, 1996b). Simple competitive repertoires, for instance, develop when firms have a narrow set of experiences and focus on a narrow set of search heuristics (Miller & Chen, 1996b). This is because experiences shape information processing capabilities and strategy executing capabilities (Smith, Grimm, Gannon, & Chen, 1991) and because action execution capabilities are a function of carrying out competitive actions in the past (Ferrier *et al.*, 1999). While simpler actions that follow a clear motif can be more effective in some contexts such as nascent industries (Rindova *et al.*, 2010), more complex

actions are generally regarded as a sign of greater aggressiveness (Yu *et al.*, 2009). Hence, firms engage in aggressive behaviour when they carry out complex sequences of actions over an extended period.

In addition, access to relevant resources is a critical enabler of aggressive behaviour (Sirmon *et al.*, 2007). While the empirical focus has been on slack resources (Ferrier, 2001; Haleblian, McNamara, Kolev, & Dykes, 2012; Miller & Chen, 1996a; Young *et al.*, 1996) and capable top-management teams (Ferrier, 2001; Ferrier *et al.*, 2002; Ferrier & Lyon, 2004), theoretical arguments point towards the importance of a broad range of resources and resource management processes (Sirmon *et al.*, 2007). Accordingly, the bundling of relevant resources that allows resources to be used in competitive activities requires that managers have the necessary managerial capabilities (Sirmon *et al.*, 2008). What is more, it has been shown that firms that can rely on a broad set of technological resources use more complex and more diverse competitive actions (Ndofor *et al.*, 2011). Hence, firms need to both possess and be able to access the resources necessary to engage in aggressive behaviour. Building on these insights, the study argues that firms facing greater competitive intensity are limited in their ability to engage in aggressive behaviour for two main reasons. First, according to ecological models, firms facing greater competitive intensity have failed to develop superior competitive capabilities during their competitive histories (Barnett, 1997, 2008; Barnett & McKendrick, 2004). Second, and relatedly, these firms have restricted access to the resources necessary to engage in aggressive behaviour (Dobrev, 2007; Dobrev & Kim, 2006).

When firms face great competitive intensity, this incentivises them to find ways to alleviate the competitive intensity they face (Barnett, 1997). To do so, firms engage in satisficing problemistic search processes (Barnett, 2008; Barnett & Hansen, 1996; Barnett & McKendrick, 2004; March, 1988). More specifically, satisficing problemistic search occurs when firms engage in a local search aimed at solving a specific problem (Cyert & March, 1963). Such processes are triggered, for instance, when performance falls below aspiration levels. These processes are local in the sense that they focus on incremental adjustments to routines and processes first and are satisficing in the sense that they stop as soon as a satisfactory solution has been found. While such processes can result in competitive activity (Derfus *et al.*, 2008), competitive actions only

result when other alternatives have been exhausted (Barnett & Pontikes, 2005). Moreover, firms may not be in a position to engage in competitive actions if these processes lead to maladaptive learning (March, 1988), if expectation levels are adjusted downwards (Cyert & March, 1963) or if firms fail to realise that there is a need for competitive activity because they fail to realise that this would be an effective solution. In line with these arguments, firms that experience less competitive intensity have been shown to engage in exploratory competitive activities such as entering new product markets more often (Barnett & Pontikes, 2008). Conversely, firms facing greater competitive intensity may try to reduce competitive intensity by engaging in exploitative activities (Barnett & Pontikes, 2008) because exploitative activities should generally be easier to implement as they require fewer changes to existing routines and processes (March, 1991). These arguments suggest that even if facing great competitive intensity incentivises firms to try to improve their situation, this may not necessarily result in competitive actions.

Even when firms facing great competitive intensity do engage in competitive actions, their focus on exploitative activities is likely to lead to a narrower set of actions. Focusing on exploitative activities has often been described in terms of focusing on improving existing activities (March, 1991). This may well lead to limiting firms to less diverse actions, as firms increasingly lack the knowledge of action alternatives when they do not have a broad range of exposure to diverse experiences (Miller & Chen, 1996b). In focusing on exploitative activities, firms may also develop more bias towards actions that conform to industry norms (Miller & Chen, 1996a). More specifically, Miller and Chen (1996a) suggest that in order to be able to launch nonconforming actions, firms need to interact with a broad range of diverse customers and competitors since this will increase their awareness of the possibility to engage in more diverse actions. Firms facing greater competitive intensity may, however, not have this exposure. Moreover, relying on actions that are similar to the actions of competitors may be less effective for firms facing greater competitive intensity because their situation is not likely to improve by merely engaging in the same actions as others (Mezias & Lant, 1994). In support of this idea, Katila and Chen (2008) find that firms benefit more when their innovation and product introduction actions are asynchronous to competitors' actions because by doing so they can avoid competitive contests to an extent. In addition, a focus on improving existing activities is likely to lead to improvements in the efficiency with which existing activities are carried out (Barnett & Pontikes,

2008). If this is the case, then it is unlikely that firms will try to break with known competitive repertoires and implement novel or more complex competitive repertoires. Doing so would require significant adjustment and possibly disruptions to existing activities and, even if misguided, this may be precisely what these firms are trying to avoid with a focus on exploitation.

Not only may firms facing greater competitive intensity carry out narrower sets of actions, but they may also only have restricted access to resources necessary to sustain the sequences of actions characteristic of competitive aggressiveness. Previous findings suggest that because resources are necessary to execute competitive actions, firms that can rely on a broad set of technological resources can leverage more complex and more diverse competitive actions (Ndofor *et al.*, 2011) and that a certain surplus of resources is necessary to sustain action sequences (Ferrier, 2001; Young *et al.*, 1996). Yet, one fundamental insight of ecological models of competition is that firms facing intense competition are less able to gain access to resources (Hannan & Carroll, 1992; Hannan & Freeman, 1989; Hannan *et al.*, 2007). Access to resources, for example, determines firm founding and failures (Baum & Singh, 1994a, 1994b) and restricted access to market share prompts departures from crowded market niches (Dobrev, 2007; Dobrev & Kim, 2006). Accordingly, firms facing great competitive intensity are unattractive alliance partners (Ang, 2008) even though alliances could alleviate some of the resource constraints these firms face (Silverman & Baum, 2002). Hence, firms facing greater competitive intensity may lack the resources necessary to engage in aggressive behaviour.

Firms facing greater competitive intensity are also less likely to be able to engage in aggressive behaviour because it is likely that they lack the necessary competitive capabilities. Launching competitive attacks, for instance, requires structuring, bundling and leveraging relevant resources, where structuring refers to the ability to acquire, accumulate and divest resources (Sirmon *et al.*, 2007). When firms face less competitive intensity at any given point in time, this is a function of both having been able to outcompete rivals over their competitive histories and a reflection of being well adapted to their current competitive context (Barnett, 1997, 2008; Barnett & McKendrick, 2004). Accordingly, these firms have accumulated relevant capabilities that may even isolate them from Red Queen processes to a certain extent (Barnett & Pontikes, 2005). Firms that face greater competitive intensity, on the other hand, have not been able to keep up

with competitors and are less adapted to their context (Barnett, 1997; Barnett & McKendrick, 2004). To accumulate relevant resources that are superior to those of competitors firms need to investment more in the accumulation process than competitors (Sirmon & Hitt, 2009). Sirmon and Hitt (2009) show that for financial intermediaries in particular investments in human and physical resources are essential in order to develop competitive advantage conferring resources. Firms facing greater competitive intensity may not have been in a position to make such investments. What is more, in order to bundle and leverage relevant resources, managers need to have the necessary managerial capabilities (Sirmon *et al.*, 2008), but firms facing greater competitive intensity may not possess such resources either. This suggests that firms facing greater competitive intensity cannot engage in aggressive behaviour because they do not have the competitive capabilities to do so.

In sum, firms facing greater competitive intensity are not likely to have accumulated superior capabilities or to obtain the resources necessary to carry out aggressive behaviour. Hence, the study hypothesises that:

Hypothesis 4: As competitive intensity increases, competitive aggressiveness decreases.

3.2.1 Competitive Intensity, Multimarket Contact and Competitive Aggressiveness

Although research about how competition influences the relationship between MMC and competitive behaviour has received substantial attention, the focus of this work has largely been at the industry level, and results have remained mixed. This focus is not surprising given that most early theories about the influence of MMC on competitive behaviour are rooted in the industrial organisation perspective that focuses on competition at this level (Bain, 1956; Porter, 1980; Scherer & Ross, 1990). As a result, little is known about how idiosyncratic competitive circumstances at the firm level influence the relationship between MMC and competitive behaviour. This is surprising given the number of theoretical perspectives that point to the

importance of considering the influence of firms' idiosyncratic competitive circumstances (Barnett, 1997, 2008; Barnett & McKendrick, 2004; Baum & Singh, 1994b; Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007). Accordingly, this study argues that additional insights can be gained by theorising and testing how competitive intensity influences the relationship between MMC and competitive aggressiveness. To do so the study draws on ecological ideas of competitive intensity (Barnett, 1997) to analyse the effects of competitive incentives and constraints. The study argues that competitive intensity moderates the relationship between different types of MMC and competitive aggressiveness in distinct ways. More specifically, the study argues that competitive intensity attenuates the negative association between PMMC and competitive aggressiveness and that it accentuates the association in the case of FMMC.

As argued in the previous section, firms facing less competitive intensity have developed superior competitive capabilities and have better access to resources suggesting that they would be in a better position to engage in aggressive behaviour. At the same time, these firms may have fewer incentives to disturb the status quo. First, these firms have incentives to avoid competitive behaviour since the potential gains from doing so are larger for these firms, especially with PMMC. The potential for benefiting from PMMC is well documented in terms of better performance (e.g. Gimeno, 2002; Haveman & Nonnemaker, 2000; Li & Greenwood, 2004), higher prices (e.g. Alexander, 1985; Gimeno & Woo, 1999), and higher profits (e.g. Scott, 1982, 1991). Moreover, firms facing less competitive intensity are better adapted to the current competitive situation (Barnett & McKendrick, 2004). When firms are well adapted to a given context, they have fewer incentives to engage in competitive behaviour (Barnett, 1997). These firms would, for instance, be less likely to experience performance shortfalls that trigger the search processes that may result in competitive behaviour (Barnett & Pontikes, 2005). Second, firms facing less competitive intensity have fewer incentives to launch competitive attacks with PMMC because, when detected, such behaviour may result in retaliatory actions (Bernheim & Whinston, 1990; Young *et al.*, 2000). The likelihood of being detected is particularly high with PMMC because firms are more aware of their competitors (Chen, 1996). Firms have, for example, been shown to retaliate faster with greater PMMC (Young *et al.*, 2000). In addition, even when actions are not observed directly they can be inferred (Greve, 2008b). Such inferences are possible because especially in product markets there is a direct relationship between competitive activities and

performance (Chen & MacMillan, 1992). Taken together, these arguments suggest that firms facing less competitive intensity may have incentives to refrain from competitive behaviour because engaging in competitive behaviour may be more harmful than beneficial for these firms.

This is, however, only the case for firms facing less competitive intensity. Firms facing greater competitive intensity have more incentives to engage in competitive behaviour even if they have less ability to do so. Such firms are more likely to experience performance shortfalls that result in search behaviour aimed at counteracting such shortfalls (Barnett, 1997; Barnett & Sorenson, 2002) and these firms are more likely to engage in competitive activities if other adjustments do not alleviate the pressure (Barnett & Pontikes, 2005). Any firm may disturb a competitive equilibrium if it expects to be better off as a result (Bowers *et al.*, 2014; Karnani & Wernerfelt, 1985; McGrath *et al.*, 1998). Especially firms facing greater competitive intensity may expect to gain from such disruptions because they are not as well adapted to the current competitive context (Barnett & McKendrick, 2004) and their current competitive situation indicates that they are less able to gain despite the benefits PMMC confers. Moreover, greater PMMC has a stronger effect on forbearance under conditions of competitive parity, when all firms have similar access to resources (Bowers *et al.*, 2014), but firms facing greater competitive intensity may be in a worse position to access resources prompting them to take action (Dobrev, 2007). Positional moves between market segments, for example, are more likely for firms facing greater competitive intensity (Dobrev & Kim, 2006). In addition, it has been shown that when competitors have an a priori competitive advantage, PMMC may not reduce competitive behaviour (Bowers *et al.*, 2014). While firms facing greater competitive intensity have less ability to carry out aggressive behaviour, greater PMMC gives more avenues for attack (Thomas & Willig, 2006) making it more feasible even for these firms to launch a range of competitive actions. In addition, with greater PMMC firms are more likely to have exposure to a broader range of experiences enabling them to be more aware of a border variety of action. Hence, firms facing greater competitive intensity have more incentives to engage in competitive behaviour with PMMC.

In summary, it can be argued that firms facing less competitive intensity have fewer incentives to engage in competitive behaviour with greater PMMC while firms facing greater competitive intensity have more incentives to engage in competitive behaviour with greater

PMMC. This is especially so because the gains from disturbing forbearance may be relatively more important for the latter firms since they are less able to benefit from the current situation. Taken together this suggests the following hypothesis:

Hypothesis 5: The greater the competitive intensity, the weaker the negative association between PMMC and competitive aggressiveness.

On the other hand, firms facing less competitive intensity may have more incentives to engage in competitive behaviour with FMMC. Firstly, while there may be a number of benefits to forbearing with PMMC it is less clear if the same benefits would eventuate when firms forbear with FMMC. For example, even when factor markets are not competitive, sellers may be able to appropriate most of the value in these markets since the profits that can be made in factor markets depend on the competitive conditions in product markets (Asmussen, 2010, 2015). This may even lead firms to subsidise losses in factor markets with profits made on product markets. Moreover, the competitive advantage in product markets seems to be driving the bargaining power between suppliers and buyers in factor markets (Chatain & Zemsky, 2009). This suggests that the advantages for forbearing with FMMC may be appropriated, at least in part, by suppliers. Hence, because the gains from forbearing in factor markets are less obvious firms facing less competitive intensity may have incentives to engage in competitive behaviour especially because their competitive capabilities may allow them to do so.

In addition, this study has argued that even with FMMC familiarity may not develop as readily because monitoring competitors and gathering competitive intelligence may be more difficult. Moreover, the likelihood of an action being detected is lower, as is the likelihood that competitors will retaliate to competitive behaviour. Hence, both familiarity and deterrence may be less important considerations with FMMC. When familiarity is lower, competitors are less likely to notice attacks and to interpret them correctly (Boeker *et al.*, 1997). Similarly, when the threat of retaliation is lower firms are more likely to launch competitive attacks (Bernheim & Whinston, 1990). As argued previously, firms facing less competitive intensity refrain from competitive

behaviour because their competitors are more familiar with them and because the threat of retaliation is higher. When the likelihood of actions being detected and the threat of retaliation is lower, firms facing less competitive intensity may well engage in more aggressive behaviour especially because they may be in a good position to do so. Such attacks by these firms are particularly likely with greater FMMC because markets for versatile and mobile resources are more vulnerable as such resources can be applied to a variety of activities while having the potential to enhance competitive capabilities in the long run (Markman *et al.*, 2009). Markman *et al.* (2009) further note that because firms are more vulnerable in factor markets, there is higher motivation to take action in these markets. In support of this idea, it has been shown that firms may more readily adapt resource strategies rather than changing product market strategies (Gimeno, Chen, & Bae, 2006). Moreover, Young *et al.* (2000) find that action frequency and action speed increase when firms' resources are dissimilar. In sum, it can be argued that with greater FMMC firms facing less competitive intensity have both the ability and incentives to engage in competitive behaviour.

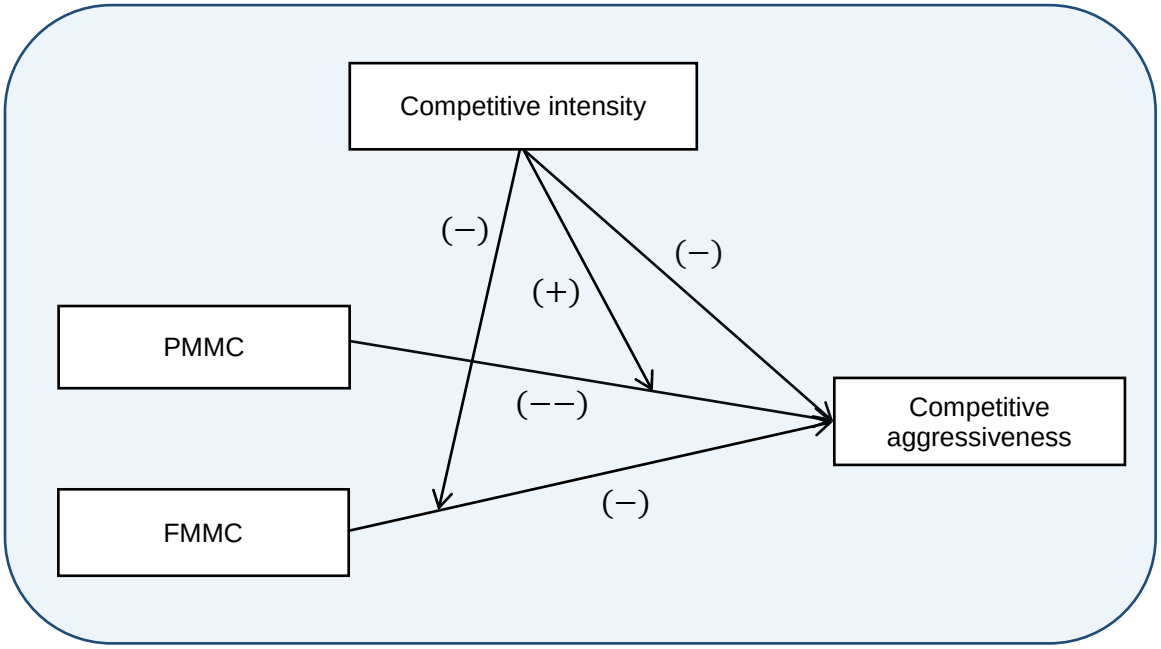
Firms facing greater competitive intensity, on the other hand, have fewer incentives to engage in competitive behaviour with FMMC. As suggested above, the benefits of competitive behaviour are less apparent and direct. However, firms facing greater competitive intensity may be more focused on finding immediate solutions to their performance problem (Barnett, 1997) rather than channelling resources towards activities that have less certain outcomes. Moreover, engaging in factor market actions may require more sophisticated competitive capabilities. As argued before, implementing competitive activities in factor markets requires not only the ability to carry out such activities but also evaluating the resources that may be the most valuable to gain access to. Hence, the effectiveness of factor market actions is contingent on existing resource endowments (Adegbesan, 2009) and the structure of the existing resource profile (Sirmon *et al.*, 2007). Firms facing greater competitive intensity may, however, not have the existing resource profiles to make such endeavours worthwhile while also lacking the capabilities to recognise the resources that are most valuable.

Accordingly, it can be argued that firms facing less competitive intensity have more incentives to engage in aggressive behaviour because the threat of retaliation is not as high, and

the potential to gain access to valuable resources is higher with FMMC. At the same time, these firms are likely to have the competitive capabilities to engage in such behaviour. On the other hand, firms facing greater competitive intensity have fewer incentives because the benefits of engaging in competitive behaviour may not be immediate while these firms may also lack the competitive capabilities to engage in such aggressive behaviour. Hence, the study hypothesises the following:

Hypothesis 6: The greater the competitive intensity, the stronger the negative association between FMMC and competitive aggressiveness.

Figure 2: Conceptual Model of the Thesis



CHAPTER 4
RESEARCH SETTING

4 RESEARCH SETTING

This chapter introduces the empirical setting used in the study. It describes the research requirements that need to be met by the empirical context. It then defines what is meant by a financial intermediary and explains why financial intermediaries constitute a good research setting. It goes on to give a short theoretical overview of regulation affecting financial intermediaries, explains the regulatory requirements financial intermediaries face and provides an overview of the developments in the industry during the study period.

4.1 Research Requirements

A few basic empirical features are necessary to isolate the relationships proposed in this study. First, the empirical setting must be characterised by firms experiencing potential interdependencies such as operating in multiple markets; a context in which firms mainly operate in one market would not be appropriate to test the predictions of the study. Interdependencies between firms are a necessary condition because theories about the effect of MMC on competitive behaviour assume that it is the interdependencies across multiple markets that enable firms to reduce competitive behaviour (Edwards, 1955). As outlined in the literature review, interdependencies in terms of MMC among financial intermediaries have received some attention (see Fuentelsaz & Gómez, 2006 for a recent example). Second, longitudinal observations are necessary because of the argument that repeated interactions over time create incentives to mutually forbear (Bernheim & Whinston, 1990). As described below, financial intermediaries are regulated by a number of different institutions that collect information, making it possible to collect longitudinal information about firms. Third, clear market boundaries need to exist. Clear market boundaries are present when there is limited cross-elasticity of demand between markets, which means that market offerings across markets are not close substitutes but, at the same time, there is a relative homogeneity of the offerings within markets, which means that differentiation is limited (Adams, Brevoort, & Kiser, 2007). Fourth, competitive behaviour needs to be observable and needs to occur during the study period. Observability conditions are particularly well met among financial intermediaries since they tend to set similar

prices across branches (Hannan & Prager, 2009). Moreover, financial intermediaries are required to report detailed information about their business to their respective regulators who make it publicly available. This gives an effective way to observe competitive behaviour. Lastly, a degree of intra-firm coordination must be possible to ensure that firms can coordinate activities across markets (Golden & Ma, 2003). While no study has systematically assessed whether financial intermediaries coordinate activities according to MMC considerations, there is evidence that financial intermediaries do coordinate activities across units and divisions, for example, when introducing new services (Weigelt & Miller, 2013). Given that financial intermediaries meet these research requirements, the remainder of the chapter presents an overview of the industry.

4.2 The Financial Intermediaries Industry

This subsection defines the term financial intermediary, provides a rationale for the existence of such firms and gives a short theoretical overview of regulation as well as an explanation of the regulatory requirements placed on financial intermediaries.

4.2.1 Financial Intermediaries

Financial intermediation refers to the act of channelling funds from those who have a surplus to those who have a deficit in funds but promise to repay the funds at an agreed time (VanHoose, 2010). Clients of financial intermediaries could choose to lend their funds directly to borrowers, without using the services provided by financial intermediaries. Nonetheless, the financial intermediary provides value to its clients, either because it satisfies their need to save surplus funds for use in the future and promises a flow of return on these funds or because it satisfies their need to gain access to funds that they do not possess presently but hope to be able to possess in the future. Financial market imperfections are the main reason for the existence of institutions that engage in financial intermediation because such institutions act as mechanisms to reduce such imperfections (Carletti, 2008). In a system characterised by asymmetric information and uncertainty, financial intermediaries provide information and insurance to those who are

uncertain about the timing of the consumption of the funds they have accumulated (VanHoose, 2010).

Although scholars tend to agree with the above description of financial intermediaries, there is still disagreement as to how exactly financial intermediaries should be defined and how exactly they operate (VanHoose, 2010). Hence, different definitions of financial intermediaries have emerged over the years. Most definitions can be grouped into two overarching approaches, the financial intermediary as a portfolio manager and the financial intermediary as a firm (VanHoose, 2010). The portfolio model has dominated discussions of financial intermediation in much of the earlier literature (Berger & Humphrey, 1997) while contemporary definitions focus on firms that engage in financial intermediation (Klein, 1971). In the portfolio approach, the financial intermediary converts a portfolio of assets into a range of financial instruments, that is to say, it is primarily engaged in producing financial instruments for its clients such as deposit accounts, loan accounts, and other credit and debt accounts (Dewatripont & Tirole, 1994). Savers desire to obtain these financial instruments for a variety of reasons, for example, lower transaction costs because neither party in the transaction needs to verify the solvency and creditworthiness of the counterparty. In addition, savers benefit from the information, risk management, and payment services that are tailored to their needs. In this approach, the financial intermediary profits if its revenues from deposit and lending activities are higher than the costs it incurs because of engaging in these activities.

Challengers to the portfolio approach to financial intermediation argue that a number of its assumptions seem unreasonable (VanHoose, 2010). This approach, for example, assumes that all owners are risk-averse, that financial intermediaries are price takers, that markets are perfectly competitive, and that economic agents have symmetrical information. Furthermore, the portfolio approach neglects interest expenses even though they can be up to two-thirds of total expenses and in the real-world, decisions about asset allocations need to reflect the real costs of acquiring these assets (Berger & Humphrey, 1997; Klein, 1971; Sealey & Lindley, 1977). Hence, this study conceptualises financial intermediaries as firms engaged in the intermediation of funds from savers to borrowers (Berger & Humphrey, 1997; Miller & Parkhe, 2002; Sealey & Lindley, 1977). Financial intermediaries are financial firms that transform inputs borrowed from actors that have a

surplus to outputs lent to actors that have a deficit. In this approach, only earning assets are outputs while labour, capital and deposits are inputs. Financial firms pay depositors for their funds either explicitly in the form of interest or implicitly in the form of services such as safekeeping and payment services. The financial firm transforms and repackages funds in terms of maturity, scale, and risk, and then sells these funds to its clients. The services to depositors incur positive costs without yielding direct revenue. This makes these services inputs in the financial firm's production process. On the other hand, funds lent out generate revenues in the form of interest payments. Even in this approach, while there is a consensus that loans are unambiguous economic outputs of financial intermediaries, it remains undefined what the inputs are. In particular, there is still some controversy if deposits should be counted as inputs or outputs because deposits have characteristics of both (Berger & Humphrey, 1997). Deposits can be considered outputs because they provide liquidity and are associated with payment services provided to depositors, on the other hand, deposits need to be paid for by interest payments and the funds raised are used as raw materials in the production process of financial intermediaries.

The three approaches to defining inputs in the financial intermediary production process that have emerged are the value-added method, the user-cost method, and the assets method. The value-added method defines outputs as any services that add substantial value for customers and necessitate extensive labour or capital expenditures to do so (Berger & Humphrey, 1991). Most commercial-, industrial-, real estate-, and instalment loans are outputs under this approach. However, certain types of deposit accounts such as demand, time, and savings deposits are also included as outputs in this approach. Merely funds raised on money markets are financial inputs because banks pay for these funds with interest payments rather than produced services. Hancock (1985) advances the user-cost method that defines all balance sheet items which incur negative user-cost as outputs. User-cost arises when financial intermediaries hold assets for a given period. If holding these assets incurs negative cash flow the user-cost is negative, if the assets generate positive cash flow the user-cost is positive. In this approach, loans and transaction deposits are outputs as they have positive user-cost. Savings, time deposits, and purchased funds incur negative user-cost and are therefore inputs. Finally, the assets method assumes all financial assets to be financial outputs and all financial liabilities to be financial inputs (Sealey & Lindley, 1977; VanHoose, 2010). In this approach, all loan types are outputs while all

deposits and purchased funds are financial inputs. This study, like others (e.g. Miller & Parkhe, 2002; VanHoose, 2010), uses the assets approach for conceptualising inputs and outputs in the intermediation-based production process.

4.2.2 Regulation of Financial Intermediaries

To what extent regulation and supervision of financial intermediaries is necessary is still subject to some debate. In this context, regulation refers to the rules that govern behaviour of financial intermediaries and supervision refers to the way in which adherence to these rules is organised (Barth, Caprio, & Levine, 2006, p. 4). The assumption behind financial intermediary regulation and supervision is that failures can result in a systemic crisis; such crises in turn can lead to a welfare loss and are, therefore, undesirable. Most proponents of regulation and supervision cite financial market failures such as externalities, market power, informational asymmetries and the resulting vulnerability to instability of the financial system as the primary rationale (Barth *et al.*, 2006; Carletti, 2008; Santos, 2001). For example, when financial intermediaries transform short-term deposits to long-term financial products, this can result in risks to the stability of the financial system. Depositor contracts often allow for the early withdrawal of at least some of the funds deposited. When early withdrawals exceed liquidity, this leads to liquidity bottlenecks and can result in insolvency and liquidation. Others suggest that regulation and supervision is necessary because market imperfections lead to agency problems (Barth *et al.*, 2006; Carletti, 2008). Financial intermediaries, for instance, have incentives to take risks that the borrower would consider excessive because they do not necessarily bear the downside risks of this behaviour. Moreover, regulation and supervision mechanism may be shaped by powerful interest groups and may not be in the public interest. Based on these arguments a number of regulations and supervisory mechanisms have been conceived and implemented at various points in time and a variety of different national contexts. These include activity restrictions, entry restrictions, capital requirements, supervision, lenders of last resort, deposit insurance, market monitoring and government control (Barth *et al.*, 2006).

The extent to which financial intermediaries should be regulated and supervised in a more active rather than in a more passive manner is, however, still being debated (Barth *et al.*,

2006). While both the active and passive approach accept the presence of market failure and agency problems, they propose distinct ways of dealing with these issues. Proponents of the active approach mainly emphasise that regulation and supervision should be aimed at actively counterbalancing market failures and protecting depositors while proponents of the passive approach point to the agency problems inherent in crafting regulations and the process of supervision (Barth *et al.*, 2006). The efficacy and implementation of regulation and supervision depend on the particular institutional environment of interest (Barth *et al.*, 2006). Hence, even though it is not the aim to paint a complete picture of all the intricacies of regulations and supervisory bodies that govern the behaviour of financial intermediaries in the US market, it seems important to explain some of the most important ones.

In the US, financial intermediaries have to abide by a number of regulations at the international, national and state level and are supervised by a number of supervisory bodies. The 1863 National Currency Act and the 1864 National Bank Act laid the foundations of the industry by encouraging the creation of a national currency and by establishing the Office of the Comptroller of the Currency (OCC) as the primary regulator of national banks. Many observers at the time regarded the 1864 National Bank Act as prohibiting branching by national banks. This, in combination with the 1927 McFadden Act and the Douglas Amendment to the Bank Holding Companies Act of 1956, has led to limited branching activity during most of the history of the industry, has hampered bank establishment rates, and has created effective barriers to entry in some locations. Notwithstanding this long tradition on limits to branching activity, the 1994 Riegle-Neal Interstate Bank Branching and Efficiency Act repealed restrictions on interstate branching and allowed almost universal inter- and intrastate branching.

The prevalence of failures during the early period of the industry has led to another set of regulations aimed at stabilising the system (Carletti, 2008). In 1933, the failures during the Great Depression led to the enactment of the 1933 Banking Act (Glass-Steagall Act) that was mainly aimed at restricting the range of business activities that banks could engage in and at putting into place interest rate ceilings on deposit accounts through the Regulation Q. In addition, the 1933 Banking Act established the Federal Deposit Insurance Corporation (FDIC) that insures deposits in deposit-taking financial institutions for up to a sum of $250.000 per depositor. Starting with the

1980 Depository Institutions Deregulation and Monetary Control Act that began to eliminate interest rate ceilings and thereby revoked some of the provisions of the 1933 Banking Act and Regulation Q, financial intermediaries have seen significant deregulations. The next major step towards deregulation was the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 that lifted many restrictions on interstate financial intermediation. Finally, in 1999, the Financial Services Modernisation Act (Gramm-Leach-Bliley Act) repealed most of the provisions of the 1833 Banking Act and allowed for a wider range of business activities by financial intermediaries. Hence, it becomes apparent that regulation has tended to move away from focusing on tools such as activity and entry restrictions towards deposit insurance and supervision aimed at facilitating solvency of financial intermediaries (Dewatripont & Tirole, 1994).

The FDIC and the OCC through the Federal Reserve Board (FRB) are the primary regulators and supervisors at the national level. The FDIC is an agency created by the American Congress as part of the Banking Act of 1933 in response to the failures of financial intermediaries during the Great Depression. The FDIC insurance covers all deposit accounts such as checking and savings accounts, money market deposit accounts and certificates of deposit. All individual FDIC-insured commercial banks, FDIC-supervised savings banks, and OCC-supervised non-insured trust companies are required by their respective regulators to file quarterly consolidated Reports of Condition and Income (CALL Reports). The FRB regulates all nationally chartered banks and collects Consolidated Financial Statements for Holding Companies (FR Y-9 Reports) to assess and monitor financial conditions of BHCs. The FR Y-9 series of reports have existed since 1978 as required by the Regulation Y and the Bank Holding Company Act 1956. A third important institution is the Federal Financial Institution Examination Council (FFIEC). It was established in 1979 according to the title X of the Financial Institutions Regulatory and Interest Rate Control Act of 1978. The FFIEC is responsible for developing uniform reporting requirements for all financial institutions supervised federally by the FRB, the FDIC, the National Credit Union Administration, the OCC, and the Consumer Financial Protection Bureau. In combination, these agencies are responsible for regulating and supervising the activities of BHCs.

At the international level, the Committee on Banking Regulations and Supervisory Practices was established in 1974 and later renamed as Basel Committee on Banking

Supervision (BCBS) (Basel Committee on Banking Supervision, 2014). Even though this body does not have any formal legal powers, its recommendations have become influential worldwide and US regulatory and supervisory agencies craft regulations based on these recommendations. In 1988 the first Basel Capital Accord also know as Basel I was implemented requiring a risk-weighted minimum capital requirement of eight percent. This recommendation, for example, was adopted in the US as the general risk-based capital rules (U.S. Department of the Treasury Office of the Comptroller of the Currency, Federal Reserve System, & Federal Deposit Insurance Corporation, 2012). While the initial focus was on credit risk only, later amendments broadened the scope to include interest risks and market risks. In this respect the issuance of core principles of bank supervision in 1996 are noteworthy as they outlined how banking supervision should best be approached and became the standard principles for supervision in many countries (Barth *et al.*, 2006). These principles were implementing in the US as the market risk capital rule in 1997 (U.S. Department of the Treasury Office of the Comptroller of the Currency *et al.*, 2012). Due to the range of concerns raised about Basel I, a Revised Capital Framework also known as Basel II was published in 2004 (Basel Committee on Banking Supervision, 2014). This new framework was based on the three pillars of minimum capital requirements, supervisory review processes and the use of disclosure to strengthen market discipline. In 2010, partly due to the global financial crisis of 2007-2008, the Basel Committee issued a new set of guidelines known as Basel III. This framework is built on Basel II but refines it in a number of ways especially in regards to capital requirements. In addition, it introduces a focus on risk coverage, leverage and liquidity. The market risk capital rules of 2012 implement many of these recommendations in the US (U.S. Department of the Treasury Office of the Comptroller of the Currency *et al.*, 2012). In adopting these recommendations it becomes apparent that regulation and supervision of financial intermediaries in the US market is moving further towards regulatory and supervisory tools such as capital requirements, active supervision and intervention, lenders of last resort, deposit insurance, and market monitoring that can be considered as more prudential forms of regulation.

As outlined in the previous paragraphs, the industry has seen significant shifts in regulation and supervision in the decade before the study period. As a result of the regulatory shifts in the 1990's, markets are no longer locally constrained and financial intermediaries have adapted their strategies (Hannan & Prager, 2004, 2009). The restrictions on activities and

geographic scope that were in place for most of the history of the industry also meant that MMC among BHCs might have been comparatively low. After deregulation, firms may have entered into each other's markets to take advantage of new opportunities and potentially to establish MMC (Fuentelsaz & Gómez, 2006). However, these behaviours stabilise when a certain degree of interdependency exists between firms. As the study period began in 2001, this should have allowed sufficient time to ensure that the regulatory shifts of the 1990's have no, or at least only minimal, effect on the relationships studied here. The BCBS proposed a second set of regulatory shifts during the study period. Yet, these recommendations were only implemented in the US market in 2012 (U.S. Department of the Treasury Office of the Comptroller of the Currency *et al.*, 2012). Even though these rules only took effect after the study period, it is possible that some firms may have begun to alter their behaviour given that the regulatory shifts were very likely to come. To the extent that this is the case, firms may have converted fewer liabilities to loans. This, in turn, could influence their market profiles and the MMC they experience. At the same time, these firms may have adapted their competitive behaviour. In particular, these looming changes may have led some firms to adjust competitive actions such as acquisition behaviours or pricing actions. While the study introduces control variables in the analysis that pick up some of these effects, not everything will be captured by these controls. Nonetheless, given that the new regulations were only implemented after the conclusion of this study, the influence is likely to be minimal.

4.3 Overview of the US Financial Intermediaries Industry

Most economic agents in the US economy use the services of financial intermediaries in some way. Businesses often take out loans to fund investments or deposit some of the surpluses they generate in order to finance future investments. Similarly, natural persons take out loans to finance private consumption of goods and services that exceed their funds and deposit funds for safekeeping and future use, convenience, interest gains, and risk reduction. In 2009, 94.6 percent of all households held some financial assets, and 77.5 percent held some financial debt (Bricker, Bucks, Kennickell, Mach, & Moore, 2011). In total, 92.3 percent of households had a transaction account while borrowing also played an important role for economic agents. 65.4 percent of

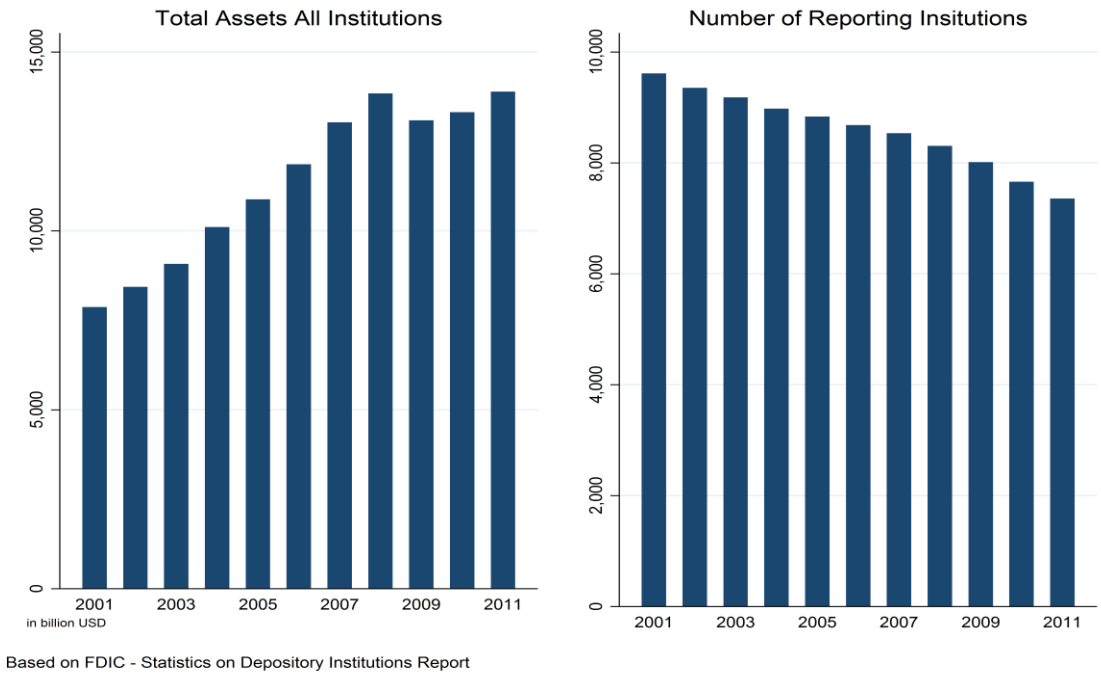
households had some instalment loans, 46.6 percent of households reported mortgage debt, 43.2 percent reported negative credit cards balances.

The financial intermediaries industry is part of the financial services sector of the US economy. According to the North American Industrial Classification System (NAICS) (U.S. Census Bureau, 2007), the financial services sector (NAICS 52) consists of Central Banks (NAICS 521), Credit Intermediation and Related Activities (NAICS 522), Securities, Commodity Contracts, and Other Financial Investments and Related Activities (NAICS 523), Insurance Carriers and Related Activities (NAICS 524), and Funds, Trusts, and Other Financial Vehicles (NAICS 525). Of these industries, the traditional financial intermediaries industry comprises the activities of firms that fall in the Credit Intermediation and Related Activities (NAICS 522) code. Based on this definition of the financial intermediaries industry, the industry comprises commercial banks, savings institutions, credit unions, and other non-depository credit intermediation such as credit card issuing, sales financing, consumer lending and real estate credit. In 2010, the financial services sector contributed around 8.5 percent to US Gross Domestic Product (GDP) (U.S. Bureau of Economic Analysis, 2011). In the same year, the financial intermediaries industry contributed roughly four percent or 590 billion US Dollars (USD) to GDP. In 2009, the financial services sector provided 6.2 million jobs to the US economy, this amounts to around 5.39 percent of total employment (U.S. Census Bureau, 2009). Of these, around 2.9 million work in the financial intermediaries industry, which means that the financial intermediaries industry contributes roughly 2.5 percent of total employment to the US economy. In 2010, the financial intermediaries industry incurred a total operating expense of 5 billion, around 3 billion or 35.8 percent were incurred as interest expenses. In comparison, a mere 1.9 billion or 23.6 percent were due to personnel costs (U.S. Census Bureau, 2011).

Figure 3 below gives an overview of the US financial intermediaries industry in terms of the total assets size of institutions reporting to the FDIC and in terms of the number of institutions reporting to the FDIC. The figure illustrates that while the industry has grown steadily during the study period, in terms of assets size the number of institutions has declined steadily. More specifically the number of reporting institutions was the highest in 2001 with 9,614 institutions registered with the FDIC and the lowest in 2011 with 7,357 institutions registered. The total size of

the industry rose from 7,869 billion USD in 2001 to 13,891 billion USD in 2011 with a slight decline from 2008 to 2009 as a result of the global financial crisis of 2007-2008.

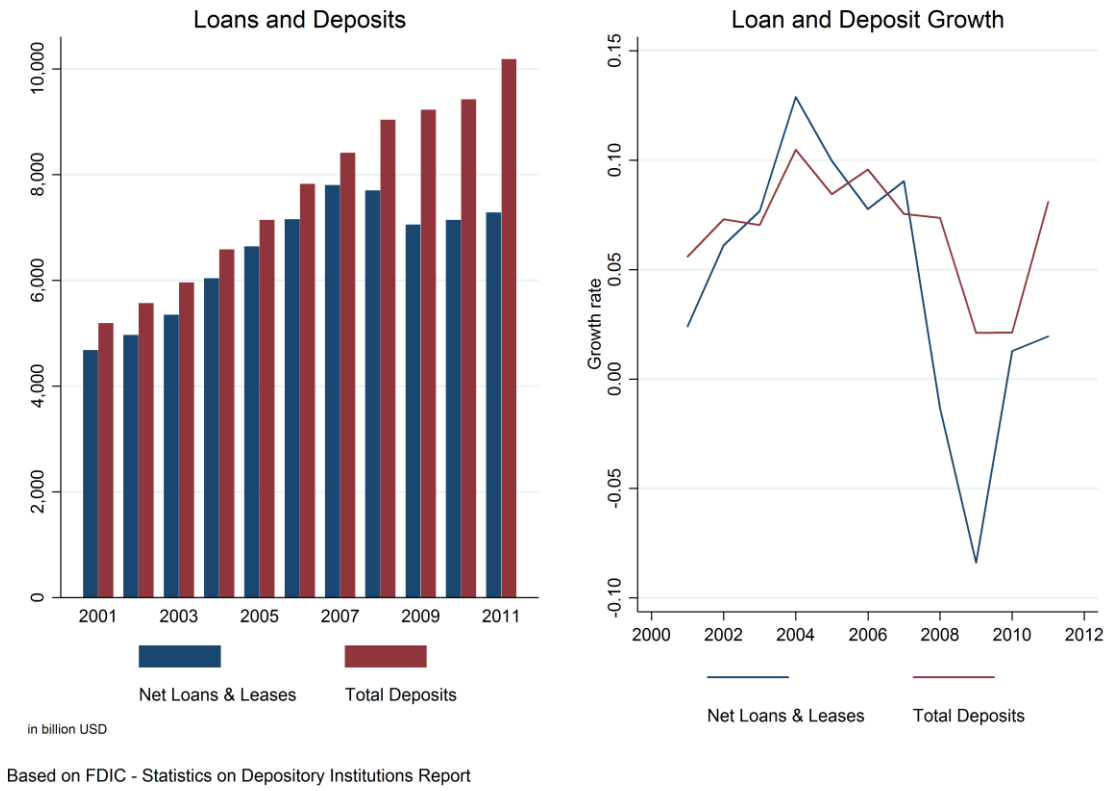
Figure 3: Overview of the US Financial Intermediaries Industry



Based on FDIC - Statistics on Depository Institutions Report

Figure 4 below illustrates the size and growth of deposits and loans during the study period. For deposit markets, a relatively stable growth pattern is visible from 2001 to 2011, even though after 2008 growth has slowed. The average growth rate over the study period was 6.4 percent peaking at 10.4 percent in 2004 and being at its lowest in 2009 (2.1 percent). For loan markets, the average growth from 2001 to 2011 was 4.3 percent. The growth pattern, however, is not as stable as in deposit markets with negative growth of 8.4 percent in 2009 and the highest growth at 12.9 percent in 2004. This pattern is also visible in the size of both deposit and loan markets as illustrated in Figure 4. The figure illustrates that during the study period both deposits and loans have grown significantly despite the negative effect of the global financial crisis of 2007-2008 on loan markets.

Figure 4: Overview of Deposits and Loans Markets in the US Financial Intermediaries Industry

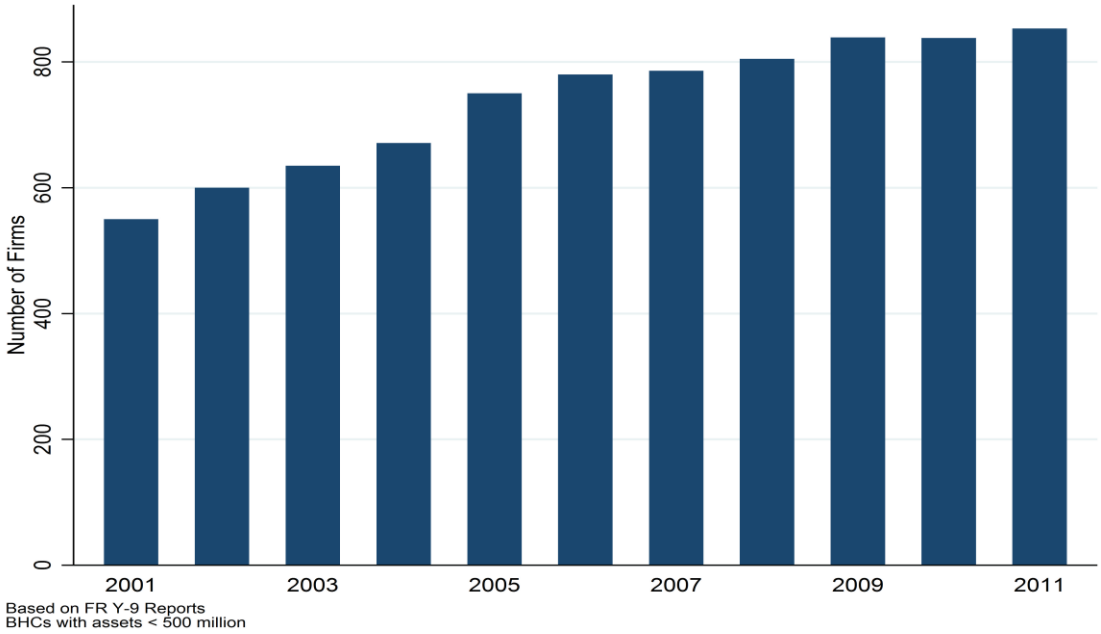


Based on FDIC - Statistics on Depository Institutions Report

The Bank Holding Company Act of 1956 and the 1970 amendments specifies and defines what exactly BHCs are. Summarising the definition, Spong (2000, p. 41) defines a BHC as "*any company, corporation or business entity that owns stock in a bank or controls the operation of a bank through other means*." Hence, BHCs are effectively a form of bank ownership. It enables ownership of more than one bank, allows firms to take ownership positions in other banks, to engage in a wider range of activities including non-banking activities and to consolidate the management and operations across all different activities. Engaging in non-banking activities, however, requires prior approval by the FRB and is mostly restricted to permissible activities under the Gramm-Leach-Bliley Act of 1999. Such activities can include restricted insurance and underwriting activities, mortgages, leasing, consumer finance, owning saving associations and securities brokerage. Figure 5 shows the number of BHC with assets of more than 500 million

USD at the end of the calendar year during the 2001 to 2011 period. This figure illustrates the steady growth of large BHCs in the industry. With a mere 549 large BHCs in 2001 the number of large BHCs has grown to 852, an increase of 64 percent.

Figure 5: Number of Large BHCs



This overview of the research setting highlights that financial intermediaries are an appropriate context in which to investigate the theoretical model proposed and gives a broad overview of the regulatory environment in which the firms that the study investigates operate. In doing so, it suggests that the regulatory environment has moved towards more prudential regulation. It also argues that even though the industry has seen significant regulatory shifts prior to and after the study period the regulatory environment did not change significantly during the study period.

CHAPTER 5
DATA AND METHODOLOGY

5 DATA AND METHODOLOGY

This chapter introduces the data and methodology used in the study. More specifically, it justifies why the particular research context has been chosen, it details the sample, it describes the operationalization of variables and, finally, it explains the analytical methods that have been used to test the theoretical predictions.

5.1 Research Context

The previous chapter presented financial intermediaries as the research setting to test the theoretical predictions made in this study. In order to test whether interdependencies in different types of markets have distinct implications for competitive behaviour and whether the relationship of interdependencies and competitive behaviour is moderated by the idiosyncratic competitive circumstances firms face, the study analyses how PMMC and FMMC influence competitive aggressiveness and how competitive intensity moderates this relationship. MMC refers to the situation in which firms simultaneously meet in multiple markets (Greve & Baum, 2001; Yu & Cannella, 2013). Accordingly, PMMC refers to the situation in which firms simultaneously meet in multiple product markets whereas FMMC refers to the situation in which firms simultaneously meet in multiple factor markets. As such PMMC and FMMC represent distinct types of interdependencies firms experience. Firms may respond to these distinct types of interdependencies in different ways (Anand *et al.*, 2009; Markman *et al.*, 2009). In general, firms tend to reduce competitive behaviour when they meet rivals in multiple markets (Yu & Cannella, 2013), however, given that firms meeting in factor markets may be less aware of their interdependencies (Markman *et al.*, 2009) and that competitive behaviour in product markets has implications for factor markets (Chatain, 2014), the effect of FMMC on competitive behaviour may be different from the effect of PMMC on competitive behaviour. What is more, firms' idiosyncratic competitive circumstances may also influence the incentives and abilities to engage in competitive behaviour (Bowers *et al.*, 2014; Karnani & Wernerfelt, 1985).

The focus on MMC among financial intermediaries is warranted because much of the MMC literature has analysed the service sector in general and financial intermediaries in particular (Yu & Cannella, 2013). A number of studies, for instance, have found that MMC among financial intermediaries influences performance (Haveman & Nonnemaker, 2000; Shipilov, 2009), prices (Hannan & Prager, 2004, 2009), and geographic market entry (Fuentelsaz & Gómez, 2006; Greve, 2000, 2006; Haveman & Nonnemaker, 2000). In addition, as outlined in the previous chapter, financial intermediaries meet the research requirements in terms of extended interdependencies, in terms of the availability of longitudinal data, in terms of clear market boundaries, in terms of the observability of competitive behaviour, and in terms of the possibility of intra-firm coordination. However, and more importantly, focusing on MMC among financial intermediaries allows the isolation the relationships hypothesised in this study. Since there is an emerging consensus that MMC considerations are, in fact, relevant among financial intermediaries (cf. the literature review chapter), the study can build on the understandings gained in previous work and focus on providing a more detailed account of how different types of interdependencies may affect competitive behaviour and on the role competitive intensity plays in these relationships.

In addition, even though financial intermediaries have been studied to some extent, the regulatory shifts of the 1990's have had a profound effect on the industry away from locally constrained markets towards a more homogenous national market in which MMC strategies are becoming increasingly prevalent (Hannan & Prager, 2004, 2009). These changes by themselves warrant novel attention to the effect of MMC in the industry. Moreover, the present study differs from existing studies in two important ways. First, the study focuses on MMC among corporate parent firms because decisions about mutual forbearance are likely to be taken at this level (Sengul & Gimeno, 2013). Others do not account for this when studying MMC at the subsidiary rather than at the corporate level (Hannan & Prager, 2004, 2009), thereby neglecting that some of the effect of MMC may not be observed at this level. Secondly, the study builds a sample from all large BHCs registered with the FRB whereas previous studies focused on subsets of BHCs (Alexander, 1985; Heggestad & Rhoades, 1978) or on financial intermediaries in a subset of markets (Barnett, 1993; Greve, 2000, 2006; Haveman & Nonnemaker, 2000; Mester, 1987). Focusing on subsets of markets has the drawback that the level of MMC may be underestimated

if interdependencies in markets that have not been included in the analysis influence competitive behaviour (Sengul & Gimeno, 2013). Considering that MMC is an important consideration for financial intermediaries, that financial intermediaries have experienced significant changes in the regulatory environment, and that previous studies have only focused on subsets of markets, it seems justified to explore how different types of MMC influence competitive behaviour and the moderating effect of competitive intensity in the context of BHCs.

5.2 Sample

The sample consists of BHCs with assets larger than 500 million USD headquartered in the US that are the top holder in the organisational hierarchy and had a least one branch in US territory in the period from 2001 to 2011. Data on firms in the sample was gathered from regulatory filings to the FRB, the FFIEC and the FDIC. In particular, the study uses FR Y-9 Reports, CALL Reports, Summary of Deposits Reports, Reports of Structure Changes, and the Federal Reserve Bank of St. Louis Economic Data Series (FRED). All large BHCs have to file FR Y-9 Reports with the FBR on a quarterly basis. The FR Y-9 Reports are used to assess and monitor financial conditions of BHCs. The FR Y-9 series of reports was initiated in 1978 as required by the Regulation Y and the Bank Holding Company Act of 1956. The CALL Reports are filed by all FDIC-insured institutions on a quarterly basis in accordance with the Federal Reserve Act of 1913. The FDIC's Summary of Deposits is an annual survey of branch office deposits for all FDIC-insured institutions mandated under the 1933 Banking Act and conducted since 1934. The FDIC's Reports on Structure Changes collect information on relevant structural changes such as mergers and acquisitions, liquidations, office opening and closings. These reports have been collected in different forms since the implementation of the Bank Holding Company Act of 1956. Virtually all studies on MMC among financial intermediaries in the US have relied on one or multiple of these sources, indicating that these are appropriate sources in the study of MMC among financial intermediaries. Top holders were identified as those firms at the top of the organisational hierarchy as reported by the FRB. All firms in which the top holder had a controlling interest (as indicated by a holding of more than 50%) were included in the hierarchy of the focal top holder rather than being observed as an independent entity. Only BHCs with assets larger

than 500 million USD were included in the final sample because smaller BHCs are not required to report some regulatory items necessary to construct the variables of interest. After removing observations with missing data on any of the variables included in the analysis the final sample consists of an unbalanced panel of 1,267 firms with 8,062 firm-year observations.

5.3 Operationalization of Variables

This section described the variables used in this study. First it explains the dependent variable, competitive aggressiveness, and how it is measured. Second, it explains the main independent variables analysed in this study, namely PMMC and FMMC and how they are measured. This is followed by an explanation of the moderating variable, competitive intensity. Finally, the control variables are explained.

5.3.1 Dependent Variable

The dependent variable used is *Competitive Aggressiveness*. The reduction of competition from MMC has been operationalized in a variety of ways. Studies in MMC literature that use industrial organisation logic, either explicitly or implicitly, approximate the reduction of competition without observing it directly under the SCP paradigm by observing outcome variables such as performance. MMC literature that draws on the competitive dynamics perspective operationalizes a decrease in competition more directly by observing competitive behaviour. Competitive behaviour in the competitive dynamics perspective tradition has been measured at a number of different levels and different levels of aggregation. For example, studies that focus on action-response dynamics among dyads offer insights into the fine-grained attacks and responses during specific competitive encounters (Smith *et al.*, 2001). Others have focused on the different types of actions that firms use (Miller & Chen, 1994; Miller & Chen, 1996b). This research relies on the characterization of competitive repertoires of firms in terms of simplicity or complexity (Ferrier, 2001; Ferrier *et al.*, 2002; Ferrier & Lyon, 2004; Miller & Chen, 1996b; Yu *et al.*, 2009) and in terms of conformity to norms or expectations (Miller & Chen, 1996a; Rindova *et al.*, 2010). Others again have focused on sequences of a variety of different types of actions over specific

periods to characterise aggressive behaviour (Ferrier, 2001; Ferrier *et al.*, 2002; Ferrier *et al.*, 1999) or to characterise consistent and inconsistent behaviour (Katila & Chen, 2008; Lamberg *et al.*, 2009; Rindova *et al.*, 2010). More recently, scholars have also begun to focus on analysing actions in terms of long-term competitive interaction histories (Kilduff, Elfenbein, & Staw, 2010).

Studies analysing MMC in this tradition have mainly focused on market entry and exit. Studies using market entry as the competitive action of interest have used various measures ranging from dichotomous variables of market entry or non-entry (Haveman & Nonnemaker, 2000), entries operationalized as founding events (Greve, 2000), probability-based measures of entry (Greve, 2006) to entry hazard models (Fuentelsaz & Gómez, 2006). Others in this tradition measure the impact of MMC on a broader range of competitive behaviour. More specifically, the impact of MMC on competitive behaviour has been measured in terms of (1) competitive attacks – measured as the percentage of all actions in a market – (Young *et al.*, 2000); (2) response times – measured as the yearly average days since the last move of a rival in the market – (Young *et al.*, 2000); (3) dyadic response speed – measured as the number of days between a firms' attack against a competitor and the response action of that competitor to the attack – (Yu & Cannella, 2007); (4) competitive aggressiveness – measured as a combination of total competitive activity and competitive complexity (Yu *et al.*, 2009).

As the theoretical arguments presented in this study treat competition as a firm level phenomenon, the study follows recent competitive dynamics research and uses competitive aggressiveness as the dependent variable. The concept of competitive aggressiveness has occupied a central position in competitive dynamics research and there is consistent empirical support for the positive relationship between action and reaction aggressiveness and performance (Smith *et al*., 2001). Young *et al*. (1996) conceptualise competitive aggressiveness based on total competitive activity where competitive activity is defined as: "*the total number of competitive actions a firm takes in a given year*" (p. 245). Ferrier *et al*. (1999) further develop these ideas by drawing on a range of competitive dynamics literature to incorporate not only the total number of competitive actions into their concept of competitive aggressiveness, but also the speed with which firms react to competitive attacks, the breath of actions and the novelty of actions. In addition, drawing mainly on the work of Miller and Chen (1996a, 1996b), Ferrier *et al*.

(1999) introduce the idea that a concept of competitive aggressiveness needs to incorporate competitive repertoires.

Building on these notions, Yu *et al*. (2009) define competitive aggressiveness as: "*the propensity of a firm to directly and intensely challenge rivals*" (p.135). In their model, competitive aggressiveness is based on a composite measure that draws on two underlying dimensions: competitive activity and competitive complexity. The main reasons for using a composite index are that both components, competitive activity and competitive complexity, have frequently been used as proxies for competitive aggressiveness, both are important aspects of competitive aggressiveness, either component alone does not capture the underlying construct and both are among the most robust measures in the competitive dynamics literature. In particular, total competitive activity or the total number of competitive actions have long been regarded as a fundamental indicator of aggressive behaviour (Ferrier, 2001). Total competitive activity is a good representation of competitive aggression as it represents the sequence of multiple competitive moves and competitive responses that are carried out over time (D'Aveni, 1994; Ferrier *et al.*, 2002). *Competitive Activity* is measured as:

$$CA_{it} = \sum_{0-max} A_{it}$$

where CA_{it} is the total number of competitive actions initiated by firm *i* at time *t* and A_{it} is the action firm *i* initiates at time *t.*

Competitive complexity is also a fundamental construct that has widely been used in competitive dynamics research (Ferrier, 2001; Ferrier *et al.*, 2002; Ferrier & Lyon, 2004; Miller & Chen, 1996b; Yu *et al.*, 2009). For example, when firms concentrate on a set of simple competitive actions this can harm their performance and their growth prospects in the long run (Miller & Chen, 1996b). *Competitive Complexity* is the extent to which a broad range of actions

(as compared to a narrow range of actions) is initiated by firm *i* at time *t*. This study measures competitive complexity as:

$$CC_{it} = {}^{1}/_{\sum_a (N_a/NT_{it})^2}$$

where CC_{it} is the competitive complexity of firm *i*'s actions at time *t*; NT_{it} is the total number of actions firm *i* initiates at time *t*, and N_a/NT_{it} is the ratio of competitive actions in the *a*th action category to the total number of actions.

Accordingly, *Competitive Aggressiveness*$_{it}$ is measured as:

$$Competitive\ Aggressiveness_{it} = zCA_{it} + zCC_{it}/2$$

where zCA_{it} is the standardised value of *competitive activity*$_{it}$ and zCC_{it} is the standardised value of *competitive complexity*$_{it}$.

Once the measure was computed, the study assessed the internal consistency using measures of unidimensionality and reliability. Unidimensionality was assessed using a principal component factor analysis and reliability was assessed using Cronbach's Alpha (Gimeno & Jeong, 2001; Yu *et al.*, 2009). Using the Kaiser criterion, the factor analysis led to a one-factor solution that explained 57% of the variance. Both components of the measure, competitive activity and competitive complexity, loaded strongly on the factor (above 0.7) indicating excellent fit (Hair, Anderson, Tatham, & Black, 2006). In addition, Cronbach's Alpha was above 0.7 indicating that the measure is reliable (Hair *et al.*, 2006). Taken together, these tests indicate that the measure is internally consistent and that both components of the measure represent the underlying variable, competitive aggressiveness, well.

Identifying competitive actions has been an integral part and one of the major challenges for competitive dynamics research (Chen & Miller, 2012; Ketchen *et al.*, 2004; Smith *et al.*, 2001; Yu *et al.*, 2009). Early competitive dynamics research has been dominated by structured content analysis of media reports to identify competitive activity (Smith *et al.*, 2001) and this approach is still being widely used (Chen & Miller, 2012; Ndofor *et al.*, 2011; Rindova *et al.*, 2010; Upson *et al.*, 2012). While this approach has advanced the field immensely, there are some shortcomings as well. For instance, media coverage and other secondary data sources may not be available in all contexts or may be incomplete in some contexts (Chen & Miller, 2012). Also, biases can arise from the source of information if the selected media outlet focuses on particular types of news. To avoid this shortcoming a number of studies have either selected a larger range of sources from media aggregation services such as LexisNexis (Ndofor *et al.*, 2011; Rindova *et al.*, 2010; Upson *et al.*, 2012) or have checked the consistency of the news reported in the sample against other media outlets (Yu & Cannella, 2007). The approach of using media reports to identify competitive behaviour is particularly amenable to settings with oligopolistic market structures as this ensures coverage of all firms (Young *et al.*, 2000). In settings with a large number of firms, however, there is a risk that media outlets will be focusing on relatively large firms, but neglect the competitive behaviour of relatively smaller firms. Another shortcoming is the subjectivity inherent in assigning news reports to competitive action categories even when using structured content analysis to guide the process. The percentage of correctly classified articles is often reported as substantial (Ndofor *et al.*, 2011; Rindova *et al.*, 2010; Upson *et al.*, 2012). However, this often relies on the agreement between two raters in terms of the percentage of articles correctly classified while modern approach to interrater reliability measures favour the use of multiple raters especially for more complex rating tasks with multiple categories as well as the use of specialised measures of interrater reliability such as weighted Cohens Kappa, among others (Shoukri, 2011).

With the shortcoming of relying solely on media outlets to identify competitive behaviours in mind, advances have been made in recent years by incorporating different methodologies to identify competitive behaviours. There is, for instance, an increasing focus on methodologies such as surveys (Chen *et al.*, 2010b; Chen *et al.*, 2007; DeSarbo, Grewal, & Wind, 2006; Marcel *et al.*, 2011; Tsai *et al.*, 2011), fine-grained qualitative approaches (Lamberg *et al.*, 2009), computer simulations (Chen, 2007), as well as a focus on different data sources to identify certain actions

such as new product introductions (Lee, Smith, & Grimm, 2003), acquisitions (Haleblian *et al.*, 2012; Keil, Laamanen, & McGrath, 2013) or foreign import and foreign direct investment competition (Hutzschenreuter & Gröne, 2009a; Hutzschenreuter & Gröne, 2009b). Notwithstanding, these recent methodological advances Chen and Miller (2012) suggest that there is a need to keep refining methodological approaches to capture all facets of competitive behaviours more precisely.

To address this call, the study develops a methodology for identifying competitive behaviours from regulatory filings and balance sheet information. In particular it uses information reported in the Reports on Structure Changes to identify expansion and reorganisation actions, and it uses expenditure patterns extracted from CALL Reports to identify marketing, legal and technology actions. Moreover, it uses reports on interest incomes and expenses extracted from CALL Reports to identify pricing actions. Expansion actions are recorded as the yearly number of actions for firm *i* at time *t*, when (1) firm *i* acquires another firm during time *t*; (2) firm *i* purchases an office from another firm during time *t*; (3) firm *i* opens a new office at time *t*. Reorganisation actions are recorded as the yearly number of actions for firm *i* at time *t*, when (1) firm *i* performs an interim merger for the purpose of reorganisation during time *t*; (2) firm *i* converts to a new charter type during time *t*; (3) firm *i* relocates an office during time *t*; (4) firm *i* closes an office during time *t*. Marketing actions are recorded as the yearly count of instances in which firm *i*'s quarterly marketing expenses exceed 20 percent of other non-interest expenses during time *t*. Technology actions are recorded as the yearly count of instances in which firm *i*'s quarterly technology expenses exceed 20 percent of other non-interest expenses during time *t*. Legal actions are recorded as the yearly count of instances in which firm *i*'s quarterly legal expenses exceed 20 percent of other non-interest expenses during time *t*.

In addition, pricing actions are important indicators of competitive behaviour. The study follows Hannan and Prager (2004) to construct pricing actions from quarterly CALL Reports. Pricing actions in product and factor markets are reflected in the interest rates they charge for loans and in the interest they pay to depositors. This study operationalizes pricing actions as large deviations from loan interest rates and deposit interest rates in a quarter. Due to data availability the following market categories are included to identify pricing actions in both product and factor

markets (1) Commercial And Industrial Loans; (2) Loans To Finance Agricultural Production And Other Loans To Farmers; (3) Loans Secured By Real Estate; (4) Loans To Individuals For Household, Family, And Other Personal Expenditures; (5) Loans To Foreign Governments And Official Institutions; (6) Other Loans; (7) Lease Financing Receivables; (8) Total Transaction Accounts; (9) Total Time Deposits Of $100,000 Or More; (10) Total Time Deposits Of Less Than $100,000. To construct pricing actions, the study computes quarterly interests for product and factor markets by dividing the quarterly loan income or deposit expenses by the average of the current quarter's and the previous quarter's end of quarter's account balance. The study then computes the annual geometric mean of loan and deposit interest rates. Pricing actions are recorded as the yearly count of instances in which firm *i*'s quarterly loan interest rate is lower than firm *i*'s yearly geometric mean loan interest rate minus one and a half standard deviations for any loan market in which firm *i* operates or firm *i*'s quarterly deposit interest rate is higher than firm *i*'s yearly geometric mean deposit interest rate minus one and a half standard deviations for any deposit market in which firm *i* operates. This measure assumes that both, very high (one and a half standard deviations above the annual geometric mean) interest paid to depositors as well as very low (one and a half standard deviations below the annual geometric mean) interest received on loans are indicative of a bank engaging in a pricing action.

Before performing these calculations, it was necessary to remove erroneous or implausible values because they would have an effect on actions being recorded. The data is screened in a number of ways to ensure the data did not contain erroneous or implausible values (see Hannan & Prager, 2004 for a similar approach). For all action categories based on CALL Reports, the following screening steps have been used. First, observations were removed where negative values were recorded because this represents reporting errors. Second, any observations were removed where only one period was observed in a given year because it is impossible to compute annual means and standard deviations for these observations and it implausible that a firm only operates for a single quarter. Thirdly, the data was screened for observations that report a value of less than 1% or more than 1000% of the previous quarter's value under the assumption that such drastic changes from quarter to quarter are a reporting error or a change in accounting practice. In addition, for pricing actions, after computing the annual geometric mean, all observations that had an annual geometric mean in the top percentile,

and the bottom percentile were dropped to eliminate potential outliers that do not represent pricing actions. Table 2 below summarises the competitive action definitions.

The approach to identifying competitive behaviours presented in this study is able to overcome some of the limitations outlined above such as biases in media reporting and subjectivity in assigning actions to categories, but it also has some notable limitations. Firstly, even though the main aim of the data cleaning procedures was to remove erroneous and implausible values, there is a risk that the approach was either too restrictive so that valuable information has been lost or not restrictive enough so that erroneous information has remained undetected. Secondly, while it seems reasonable to assume that the information from regulatory filings and balance sheets used in this study reflects competitive behaviours, the micro-foundations of how competitive behaviours translate into the information that has been used here remain unexplored. Thirdly, especially information contained in balance sheet items is prone to manipulation by the reporting firm since this information is used to make regulatory judgements about the reporting firm.

Table 2: Competitive Actions Definitions

Action category	Definition*	Data source
Expansion	The yearly number of actions for firm *i* at time *t*, when (1) firm *i* acquires another firm during time *t*; (2) firm *i* purchases an office from another firm during time *t*; (3) firm *i* opens a new office at time *t*.	Reports on Structure Changes
Reorganisations	The yearly number of actions for firm *i* at time *t*, when (1) a firm *i* performs an interim merger for the purpose of reorganisation during time *t*; (2) firm *i* converts to a new charter type during time *t*; (3) firm *i* relocates an office during time *t*; (4) firm *i* closes an office during time *t*.	Reports on Structure Changes
Marketing	The yearly count of instances in which firm *i*'s quarterly marketing expenses exceed 20 percent of other non-interest expenses during time *t*.	CALL Reports
Technology	The yearly count of instances in which firm *i*'s quarterly technology expenses exceed 20 percent of other non-interest expenses during time *t*.	CALL Reports
Legal	The yearly count of instances in which firm *i*'s quarterly legal expenses exceed 20 percent of other non-interest expenses during time *t*.	CALL Reports
Pricing	The yearly count of instances in which firm *i*'s quarterly loan/deposit interest rate is lower/higher than firm *i*'s yearly geometric mean loan/deposit interest rate minus 1 1/2 standard deviations for any loan/deposit market in which firm *i* operates.	CALL Reports

* See Appendix A for a complete list of regulatory item names/codes used in the calculations.

5.3.2 Independent Variables

The independent variables used in this study are *PMMC* and *FMMC*. MMC arises when firms simultaneously meet in multiple markets, that is to say that MMC is present when at least two firms share the same two markets. Even though this basic definition has the advantage of being simple, general and independent from other theoretical concepts, it has the drawback that it allows for a large range of operationalizations (Gimeno & Jeong, 2001). The most basic operationalizations of the concept simply capture when two firms are present in the same markets, while more complex operationalizations are driven by theoretical understandings indicating that the degree of overlap and the importance of markets should be considered and that MMC at difference levels may influence strategic choices (Gimeno & Jeong, 2001). Accordingly, measures of MMC differ regarding the level of measurement and analysis as well as along the weighting and scaling used to assign importance to different markets.

The various levels at which MMC has been assessed are the industry or market level, the firm-in-market level, the dyad level and the dyad-in-market level (Gimeno & Jeong, 2001). The dyad-in-market level is the degree to which two firms meet outside a focal market. While this level of analysis strictly flows from the definition of MMC, due to the difficulty in identifying competitive actions at this level of analysis this measure has seldom been used in empirical studies (Gimeno & Jeong, 2001). One of the very few studies that use this level of analysis is Scott (1982), who then aggregates the measure to the market level for empirical testing. Some argue that MMC is fundamentally a relational concept that needs to be assessed at the dyadic level (Baum & Korn, 1999; Chen, 1996; Yu & Cannella, 2007). Accordingly, these studies analysed MMC in all markets that firm dyads share. While this level of analysis may be the level that reflects the underlying assumptions about MMC most closely (Gimeno & Jeong, 2001), the two main drawbacks are that a focus on dyadic competitive interactions ignores the broader context of competitive activities (Chen & Miller, 2012) and it may be difficult to ascertain if a competitive action is exclusively aimed at a specific firm because many competitive actions have implications for a large number of firms (Gimeno & Jeong, 2001).

Scholars interested in competitive behaviours between a greater number of firms have placed more focus on the firm-in-market level of analysis based on the idea that the level of MMC

with all firms in the market influences competitive behaviours such as competitive actions and responses (Young *et al.*, 2000) or market entry and exit dynamics (Baum & Korn, 1996; Fuentelsaz & Gómez, 2006) and outcomes such as market share or price levels (Gimeno, 1999; Gimeno & Woo, 1999). These measures aggregate the dyad-in-market level measures by averaging or summing the focal firms MMC with each of the competitors in the focal market. While this approach provides a more fine-grained assessment of the interdependencies between firms than the market level of analysis, it involves aggregating data from different markets or competitive relationships and may obscure some details that may become apparent with more fine-grained measures such as the dyadic measures. Economics studies, being primarily interested in industry or market characteristics, have analysed MMC at the market level of analysis as an aggregation of all the dyadic contacts in a given market based on the notion that market level MMC has an influence on outcomes such as industry profitability (Evans & Kessides, 1994; Mester, 1987). Aggregation across levels has been done in a number of ways, ranging from simple averages over weighted averages to sums and weighted sums (Gimeno & Jeong, 2001).

Early MMC studies have relied on measures based on the count of contacts between competitors, even though these measures then were often aggregated to the market or firm-in-market level (Gimeno & Jeong, 2001). Count measures are often computed from indicator variables used to indicate the presence in or absence from a market conditional on the presence in another market (Heggestad & Rhoades, 1978; Rhoades & Heggestad, 1985; Sandler, 1988; Whitehead, 1978). While simple count measures are not often used anymore, they still represent the building blocks of most elaborate measures used in more recent MMC studies. Apart from measures that rely on the direct count of contacts, others have proposed probabilistic measures to account for the possibility that some degree of MMC may be due to chance (Korn & Baum, 1999; Scott, 1982). Scott (1982), for example, measures how likely it is that MMC is due to random market overlap rather than to purposeful MMC. Gimeno and Woo (1996) include potential entrants in the measure of MMC.

Simple count measures are not often used because they do not reflect most recent theorising about MMC. Simple count measures, for instance, do not give weightings to markets that reflect the importance of a given market to a focal firm even though some markets may be

more important than others (Gimeno, 1999). This is reflected in arguments that MMC theories are mostly concerned with “sales-at-risk” and MMC measures should reflect the degree to which sales are exposed to MMC competitors (Feinberg, 1985). Based on similar reasoning, Evans and Kessides (1994) construct a measure of revenue MMC that measures MMC in terms of the revenues firms derive from markets in which they meet their competitors, Hughes and Oughton (1993) weight MMC by the number of employees employed by competitors in overlapping markets and Singal (1996) constructs a complex ratio of market shares between rivals. Moreover, simple count measures do not reflect the asymmetric nature of MMC (Gimeno & Jeong, 2001). For example, by using a MMC measure based on a ratio of MMC to total markets served (Baum & Korn, 1996, 1999; Boeker *et al.*, 1997), the measure reflects more accurately that one point of contact for a firm present in many markets might not be as important to the firm as one point of contact for a firm present in only a few markets.

Various ways of weighting MMC have been proposed to reflect that much of the theoretical predictions about MMC (Bernheim & Whinston, 1990; Chen, 1996) and some empirical studies (Baum & Korn, 1999; Gimeno, 1999) suggest that asymmetry in the MMC between firms is a necessary condition for mutual forbearance to occur. The weighting approaches that have been used reflect that the importance of MMC may depend on the sales or market share of the focal firm (e.g. Singal, 1996), on sales or market share of competitors (e.g. Chen, 1996) or on sales or market share of both firms (e.g. Singal, 1996). Other approaches to weighting MMC included weightings based on market size (e.g. Singal, 1996), positional interests such as market dependence, market dominance, and resource centrality (e.g. Gimeno, 1999), market centrality (e.g. Baum & Korn, 1999), and similarity (Li & Greenwood, 2004). These differences in weighting factors imply that MMC is either regarded as symmetric or asymmetric. Simple count measures and measures that assign equal weighting to the focal firm and the competitor are inherently symmetric, while market dependence and market dominance measures are inherently asymmetric as they reflect the differences in importance of the market for the focal firm.

This study makes theoretical predictions about how different degrees of PMMC and FMMC at the firm level lead to greater or less competitive aggressiveness and that this relationship is moderated by the competitive intensity a firm faces. This implies that a firm-in-

market measurement aggregated to the firm level of analysis is the appropriate level of measurement for the independent variables. Empirically, the dependent variable of competitive aggressiveness and the moderating variable competitive intensity are both measured at the firm level rather than at the dyadic or market level. The study thus adopts a measure of MMC at the firm level of measurement by aggregating dyadic contacts to a firm-in-market level measurement and then aggregating this measure across different markets to the firm level (Boeker *et al.*, 1997; Gimeno & Jeong, 2001). To reflect the theoretical ideas about the asymmetry of competition, the measure uses asymmetric weightings based on the market dependence for the focal firm (Gimeno, 1999). More specifically, the focal market *n* in which firm *i* operates at time *t* is weighted according to the importance of market *n* for firm *i* as the percentage of firm *i*'s loans/deposits relative to firm *i*'s total loans/deposits.

Hence the two independent variables used in this study are *PMMC* and *FMMC* defined as follows:

$$MMC_{it} = \sum_{it} \frac{\sum_{jt \neq it} \left(I_{imt} \times I_{jmt} \times \frac{\sum_{tn} (I_{itn} \times I_{jtn})(W_{itn} \times W_{jtn})}{I_{itn}} \right)}{N_{Fmt} - 1} \Bigg/ N_{mit}$$

where MMC_{it} is the *PMMC* or *FMMC* of firm *i* at time *t*. I_{itn} is an indicator variable set to one if firm *i* is active in the focal market *n* at time *t* and to zero otherwise. I_{jtn} is an indicator variable set to one if firm *j* is active in the focal market *n* at time *t* and to zero otherwise. W_{itn} is the weighting of focal market *n* for the focal firm *i* at time *t*. W_{jtn} is the weighting of focal market *n* for the focal firm *j* at time *t.* I_{itm} is an indicator variable set to one if firm *i* is active in market *m* at time *t* and to zero otherwise. I_{jtm} is an indicator variable set to one if firm *j* is active in market *m* at time *t* and to zero otherwise. N_{Fmt} is the number of firms in market *m* at time *t,* and N_{mit} is the number of markets *m* in which firm *i* is active at time *t*.

From the discussion of the operations of financial intermediaries in the previous chapter, it becomes clear that financial intermediaries principally engage in the intermediation of funds from savers to borrowers (Berger & Humphrey, 1997; Sealey & Lindley, 1977). In particular, deposit liabilities that they take on are viewed as inputs in the production process of a financial intermediary whereas assets such as loans are the outputs of this process (Miller & Parkhe, 2002; Sealey & Lindley, 1977; VanHoose, 2010). This thesis defines product market competitors as "*firms operating in the same industry, offering similar products, and targeting similar customers*" (Chen, 1996, p. 104). Accordingly, PMMC is conceptualised as MMC in loan markets.

Loan market boundaries for this study are based on the definitions of loan market boundaries in FR Y-9 Reports. These include (1) Construction And Land Development Loans; (2) Real Estate Loans Secured By Farmland; (3) Real Estate Loans Secured By Multi-Family (five or more) Residential Properties; (4) Real Estate Loans Secured By Nonfarm Nonresidential Properties; (5) Loans To Finance Agricultural Production And Other Loans To Farmers; (6) Commercial And Industrial Loans; (7) Revolving, Open-End Loans Secured By 1-4 Family Residential Properties And Extended Under Lines Of Credit; (8) Loans To Individuals For Household, Family, And Other Personal Expenditures; (9) Loans To Foreign Governments And Official Institutions; (10) Lease Financing Receivables; (11) All Other Loans Secured By 1-4 Family Residential Properties: Secured By First Liens; (12) All Other Loans Secured By 1-4 Family Residential Properties: Secured By Junior Liens; and (13) Other Loans. Other interest bearing financial vehicles are not included. Firstly, because loans reflect direct customer demand for funds and thus the loan market reflects direct business-to-consumer relationships in which BHCs compete for customers. Other interest bearing financial products such as securities and other trading instruments are offered on open markets and purchased mainly by other financial intermediaries. Secondly, purchases of these financial vehicles are motivated by more objective criteria such as relative interest rates, ratings, maturity and marketability (Roussakis, 1997).

This study defines factor market competition in accordance with Markman *et al*., (2009, p. 423) as: "*competition over resource positions*" where resources are taken to mean factors, inputs, or factors of production. Factors of production for BHCs are physical inputs and financial inputs, where the former are labour and capital whereas the latter are deposits (Miller & Parkhe, 2002;

Sealey & Lindley, 1977; VanHoose, 2010). Factor market competition is particularly prone to emerge over resources that are highly versatile and mobile because such resources can be put to use in a variety of different activities (Markman *et al.*, 2009). Financial resources fulfil the condition of high versatility and mobility and as such they seem to be well suited for identifying the relationships proposed in this study. Hence, this study conceptualises factor markets as deposits markets. Deposit markets boundaries are based on the definition of deposit market boundaries used in FR Y-9 Reports. These cover (1) Total Demand Deposits; (2) Non-Transaction Savings Deposits; (3) Total Time Deposits Of $100,000 Or More; (4) Total Time Deposits Of Less Than $100,000; (5) Now, Ats And Other Transaction Accounts; and (6) Other Noninterest-Bearing Deposits.

5.3.3 Moderating Variable

The moderating variable used in this study is *Competitive Intensity*. As outlined in the literature review, competitive intensity reflects idiosyncratic competitive circumstances. Early studies in this tradition have focused on the constraining effect of competitive intensity based on purely environmental factors such as a crowding effects in the population (Hannan & Carroll, 1992; Hannan & Freeman, 1989). Here, the constraining effect has been operationalised as the sum of the number of competitors each firm faces that occupy the same resource space. Others, focusing on the constraining nature of limited resources, measure the concentration of resources (Carroll, 1985). Here, measures such as the GINI index of markets shares have been used. However, to account for the possibility that not all firms are constrained by all other firms in the population in the same way, subsequent approaches have adopted more elaborate ways of measuring competitive intensity.

Models of localised competition suggest that firms are more constrained by firms that are similar on certain strategic dimensions (Barnett, 1993; Baum & Mezias, 1992; Baum & Singh, 1994a, 1994b). Accordingly, scholars have measured competitive intensity as the Euclidean distance between two firms where the distance is based on size, price or geographical location (Baum & Mezias, 1992), as the density of multipoint and single point competitors (Barnett, 1993), or as the proportional density of firms serving similar clients groups in the same geographic

location (Baum & Singh, 1994a, 1994b). Building on these approaches, more recent studies have measured the competitive intensity firms face as proportional niche overlap density, where density is measured in terms of the number of firms in a niche and niches are defined in terms of technological characteristics of products (Dobrev, Kim, & Carroll, 2003; Dobrev, Kim, & Hannan, 2001), the simple count of firms whose niches overlap at least partly (Dobrev, 2007; Dobrev & Kim, 2006) or as the relative size, measured as the relative distance on a curve representing the inverse quadratic root of size if competition is size based (Dobrev & Carroll, 2003). Hence, in these approaches competitive intensity still originates from environmental factors only.

Barnett (1997), however, highlights that measuring competitive intensity based on environmental factors alone, even if adjusted for subpopulation variations, neglects that idiosyncratic competitive abilities contribute towards firm-specific competitive intensity. This is because competitive intensity is a function of both, environmental as well as firm-specific internal factors. Models of Red Queen competition reflect the need to account for idiosyncratic competitive abilities by operationalising competitive abilities according to the competitive experiences of firms as the average annual density faced by the firm in its local market over its history (Barnett *et al.*, 1994), as the sum of the ages of living firms (Barnett, 1997), as the sum of overlap density over the organisational history where overlap is measured according to similar technological classes (Barnett & McKendrick, 2004) or according to similar product classes (Barnett & Freeman, 2001). Others suggest that competitive abilities can also be embodied in the composition of product portfolios measured as the innovativeness of the portfolio in terms of proximity to the technology frontier (Khessina, 2006), in the ability to deploy institutional resources measured as the number of lawsuits (Mezias & Boyle, 2005), in the market share of firms based on the number of products (Mezias & Boyle, 2005) or based on sales (Ang, 2008).

Building on these understandings, the study extends a measure developed by Ang (2008). In doing so, the study constructs an idiosyncratic measure of competitive intensity for each firm that takes into account environmental as well as internal factors. Ang (2008) measures competitive intensity as the logarithm of the sum of the average competition a firm faces in all markets. The average competition each firm faces in each market is calculated by dividing the size of the market by the number of firms in each market. This study extends this measure in two

ways; first it incorporates the assets of a focal firm in a focal market. Second, it scales the focal firm's assets in a focal market by the overall efficiency of the firm. This reflects the firm's competitive abilities in terms of its competitive history because only successful firms will be able to grow in a market (Barnett, 1997). It also reflects that firms of different sizes face different levels of competitive pressure (Barnett, 1997; Barnett & McKendrick, 2004) and have different survival chances (Dobrev & Carroll, 2003). Scaling assets by efficiency also explicitly includes a focal firm's internal viability into the measure of competitive intensity and reflects that a focal firm's assets are derived from its use of resources and strategy. The use of efficiency to capture this aspect of competitive intensity is warranted since efficiency has long been regarded as an important determinant of competitive abilities of firms (D'Aveni & Ravenscraft, 1994) and financial intermediaries in particular (Berger & Humphrey, 1997; Berger & Mester, 1997; Miller & Parkhe, 2002). While a range of complex measures to capture efficiency has been used, this study measures firm efficiency following D'Aveni and Ravenscraft (1994) who test different costs to revenue ratios and find that the ratio of expenses to revenue is a good measure of efficiency because it reflects how much income is absorbed by overhead costs. Accordingly, competitive intensity for firm *i* at time *t* is calculated as:

$$CI_{it} = log \frac{\sum \left({}^{TS_{mt}}/_{N_{mt}} \right) / \left({}^{S_{itm}}/_{EF_{it}} \right)}{N_{it}}$$

where TS_{mt} is the total size of market *m* at time *t*, N_{mt} is the total number of firms in market *m* at time *t*, S_{itm} are the assets of firm *i* in market *m* at time *t*, EF_{it} is the efficiency ratio of firm *i* at time *t* calculated as the ratio of total non-interest expense to net interest income plus non-interest income, and N_{it} is the number of markets in which firm *i* is active at time *t*.

To illustrate the competitive intensity measure consider the stylised example presented in Table 3. While Table 3 does not report on actual observations in the dataset because the computations become increasingly complex with the number of markets, it provides an illustrative

example. As Table 3 illustrates, Firm A faces the lowest competitive intensity. The measure reflects that Firm A is relatively efficient (Efficiency Ratio = 0.2) and has a relatively strong position in Market 1, Market 3, Market 4, and Market 5. Its strong position can be seen when comparing its position with the average market share of all firms in the market (ratio of total market size to firms in the respective markets). Firm C, on the other hand, is less efficient (Efficiency Ratio = 0.8) and does not have a strong market position in any market. Again, this can be seen by comparing its market position with the average market share of each market. Hence, the measure reflects that competitive intensity is an idiosyncratic firm-level construct that depends on environmental, as well as internal factors. Table 4 summarises the dependent, independent, and moderating variables.

Table 3: Illustration of the Competitive Intensity Measure

	Efficiency Ratio	Market 1	Market 2	Market 3	Market 4	Market 5	Competitive Intensity
Firm A	0.2	6	2	6	5	4	-0.92
Firm B	0.5	5	5	4	10	8	0.13
Firm C	0.8	3	2	3	3	3	0.66
Total Market Size		100	200	300	400	500	
Number of Firms		50	60	80	100	200	
Average Market Share		2	3.33	3.75	4	2.5	

Table 4: Dependent, Independent, and Moderating Variables Definitions

Variable Name	Definition*	Data Sources
Competitive aggressiveness$_{it}$	$Competitive\ Aggressiveness_{it} = zCA_{it} + zCC_{it}/2$	Reports on Structure Changes/ CALL Reports
Competitive activity$_{it}$	$CA_{it} = \sum_{0-max} A_{it}$	
Competitive complexity$_{it}$.	$CC_{it} = {1}/{\sum_a (N_a/NT_{imt})^2}$	
Product/Factor Multimarket Contact$_{it}$	$MMC_{it} = \sum_{it} \frac{\sum_{jt \neq it} \left(I_{imt} \times I_{jmt} \times \frac{\sum_{tn} (I_{itn} \times I_{jtn})(W_{itn} \times W_{jtn})}{I_{int}} \right)}{N_{Fmt} - 1}}{N_{mit}}$	FR Y-9 Report
Competitive intensity$_{it}$	$CI_{it} = log \frac{\sum \left({TS_{mt}}/{N_{mt}} \right) / \left({S_{itm}}/{EF_{it}} \right)}{N_{it}}$	CALL Reports/ FR Y-9 Report

* See Appendix A for a complete list of regulatory item names/codes used in the calculations.

To illustrate the behaviours observed in this study and how the measures used reflect these behaviours consider the example of Firm A (this is an actual observation in the dataset). In 2005, Firm A executed eight competitive actions (one pricing action, three expansion actions and four reorganisation actions). This means it had a competitive complexity score of 2.46, and the associated competitive aggressiveness score was 0.544. Furthermore, it had a PMMC score of 0.193 (it was active in 12 loan markets), an FMMC score of 1.768 (it was active in 5 deposit markets) and a competitive intensity score of -5.516. These scores make it a firm that is relatively aggressive with the competitive aggressiveness score being between the 75 and 90 percentile. It has a rather small degree of PMMC (between the 10 and 25 percentile) and a medium degree of FMMC (the 50 percentile is 1.677). It also faces little competitive intensity (below the fifth

percentile). The expansion actions include two acquisitions, and one office opening (office openings and closings associated with the acquisitions are not counted). More specifically, it opened Branch 1 on 26-10-2005 and acquired Bank 1 on the 18-02-2005 and Bank 2 on the 07-10-2005. The reorganisation actions include three branch relocations and one office closing (again not counting any branching actions associated with the acquisitions). In particular, the Branch 2 was closed on 07-10-2005 and Branch 3, 4 and 5 were relocated. A pricing action was recorded for the last quarter of 2005 because Firm A had a total interest income for time deposits of more than 100,000 of $5.49 million USD with an interest rate of 0.013. In the same year, the mean interest for Firm A was 0.008 (the standard deviation was 0.002). In comparison, in the third quarter of 2005 Firm A only had a total interest income of $3.08 million and an interest rate of 0.007. Similarly in the first quarter of 2006 the total interest income was $3.52 million and the interest rate was 0.008. While this example only illustrates one firm in a particular year, it show how the measures used in this study capture competitive behaviour.

5.3.4 Control Variables

A number of variables have been found to either affect competitive behaviour or to moderate the relationship of MMC and competitive behaviour. In order to rule out alternative explanations that may arise from the omission of these variables, the study controls for a number of firm and market level variables.

5.3.4.1 Firm Size

Firms size has been identified as an important covariate of strategic behaviour in general (Barnett, 1997, 2008; Greve, 2008a) and of competitive behaviour in particular (Baum & Korn, 1999; Chen & Hambrick, 1995; Haleblian *et al.*, 2012; Miller & Chen, 1994; Miller & Chen, 1996b). Chen and Hambrick (1995), for instance, show that smaller firms are more active competitors initiating a larger number of actions and being faster to execute actions. They were also less likely to respond to and slower to execute responses to the actions of competitors while at the same time having more visible responses. In addition, firm size may be associated with competitive

inactivity due to inertial forces (Miller & Chen, 1994). On the other hand, larger firms may have more resources at their disposal to behave aggressively (Yu *et al.*, 2009), particularly when competitive behaviour requires significant resources commitments such as is the case in technological contests (Barnett & McKendrick, 2004), when resources can be directed towards aggressive firm growth (Haveman & Nonnemaker, 2000) or when firms can use their size advantage to break the competitive norms in an industry (Miller & Chen, 1996a). In terms of entry and exit dynamics, Baum and Korn (1999) show that the relative size of firms influences the inverted U-shaped relationship of MMC with market entry and exit.

To control for the effect that firm size has on competitive aggressiveness, *Firm Size* measured as the logarithm of total assets of firm *i* at time *t* is included in the analysis. Given the ambiguity in the literature about the effect of firm size on competitive behaviour it is, however, difficult to make a prediction about the direction of the expected effect. Yet, because the sample used in this study consists of relatively large firms inertial forces may be similar across all the firms in the sample. In addition, the particular dependent variable used in this study – competitive aggressiveness – has been shown to relate positively to firm size (Yu *et al.*, 2009). Hence, this study expects a positive relationship between firm size and competitive aggressiveness.

5.3.4.2 Firm Age

Firm age as a determinant of competitive behaviour has also received much attention in the literature (Hannan & Freeman, 1984). The literature on organisational inertia suggests that older firms are more inert and have less ability to change. These ideas are reflected in some competitive dynamics literature that shows that firm age has a positive association with competitive inertia (Miller & Chen, 1994). Firms accumulate competitive experiences that can also make them more inert if they do not learn from these experiences or if the competitive circumstances change (Barnett & Pontikes, 2008). At the same time, Red Queen models of competition argue that with firm age, firms accumulate competitive experiences making them more potent competitors as long as competitive circumstances remain stable (Barnett, 1997; Barnett & McKendrick, 2004).

In order to account for the potential effect of firm age on competitive behaviour, firm age is included in the analysis. *Firm Age* is measured as the number of years since firm *i* was established at time *t.* The year in which firm *i* was established was determined based on the year that the general ledger for the firm was opened for the first time with the FRB. Firm age is expected to be negatively associated with competitive aggressiveness.

5.3.4.3 Firm Past Performance

Firm past performance may also have important implications for competitive behaviour. For example, when firms perform well they have fewer incentives to engage in competitive behaviours because they experience less competitive pressure (Barnett, 1997; Barnett & Hansen, 1996). Competitive dynamics research, in particular, has found that firms that performed well in the past exhibit simpler repertoires of competitive actions that conform well to industry norms because it reduces the incentives to search for and try out alternative actions (Miller & Chen, 1996a, 1996b). Moreover, good past performance has also been shown to influence competitive attack duration (Ferrier, 2001) and competitive aggressiveness negatively (Ferrier *et al.*, 2002). Yet, poor past performance is positively associated with tactical competitive actions but does not influence strategic actions or policy reversals (Miller & Chen, 1994).

To account for year-on-year fluctuations in performance and because it may take time for decision makers to react to performance declines, past firm performance is measured by dividing net income by total assets for firm *i* at time *t* and then computing the average performance during time *t*-1 and *t*. It is expected that past performance is negatively related to competitive aggressiveness.

5.3.4.4 Firm Slack

Slack as a driver of firm behaviours has long been established in literature because slack can act as a buffer from risks and can provide the resources necessary to implement competitive behaviours (Bourgeois, 1981; Cyert & March, 1963). Competitive dynamics literature, in particular, has shown that slack resources increase nonconformity of competitive repertoires as

firms need additional resources to fund novel action repertoires (Miller & Chen, 1996b) and lead to a greater number of competitive moves (Young *et al.*, 1996). Slack resources enable firms to initiate and sustain aggressive patterns of actions in terms of attack volume and attack duration as well (Ferrier, 2001) and allow firms to participate in merger waves (Haleblian *et al.*, 2012). On the other hand, slack has also been shown to be negatively related to response imitation, response likelihood and time to respond indicating that firms may consider slack as a buffer for environmental changes rather than using it to respond to competitive activities of rivals (Smith *et al.*, 1991). Others again suggest that slack is mainly used to build capabilities that allow a balanced repertoire of competitive actions (Lamberg *et al.*, 2009).

To account for the potential effect of slack on competitive aggressiveness, *Firm Slack* measured as the ratio of total assets to total liabilities of firm *i* at time *t* is included in the analysis. As with firm size, the effect of firm slack on competitive behaviour is not clear cut. While slack provides the necessary resources to initiate competitive moves indicating a positive relationship (Young *et al.*, 1996), it may also be used as a buffer against uncertainty rather than being used in competitive battles indicating a negative relationship (Smith *et al.*, 1991). Following similar reasoning as above, because the sample consists of large firms, it is likely that these firms would be able to mobilise resources for competitive attacks without having to tap into strategic buffers to fund competitive behaviours. Accordingly, the study expects a negative relationship between slack and competitive aggressiveness.

5.3.4.5 Firm Complexity

Organisational structure as a determinant of firm behaviour has also received central attention (Chandler, 1962). For competitive activities, internal structural attributes are particularly important because they have a bearing on the information processing capabilities of the firm (Smith *et al.*, 1991). In particular, structural complexity is negatively related to responses likelihood and positively related to the order of responses. Moreover, more complex firms may have less awareness of opportunities to take action, accordingly Haleblian *et al.* (2012) find that more complex firms are later to participate in merger waves. What is more, mutual forbearance logic rests on the assumption that firms can coordinate activities across business units to enforce

compliance with mutual forbearance, but more complex organisations may have more difficulty doing so (Golden & Ma, 2003; Haveman & Nonnemaker, 2000; Jayachandran *et al.*, 1999; Strickland, 1985). Firms have been shown to be enforcing compliance with mutual forbearance by constraining resources flows (Sengul & Gimeno, 2013). However, this is more complicated in more complex firms.

To reflect that more complex firms may have more difficulties to coordinate activities, and this may have an effect on their competitive behaviour the study includes *Firm Complexity* as a control. Firm complexity is measured as an indicator variable set to 1 if firm *i* is classified as complex for supervisory purposes by the FRB at time *t* and to 0 otherwise. In accordance, with the arguments presented above, the study expects a positive relationship between complexity and competitive aggressiveness because more complex MMC firms have more difficulties in coordinating activities.

5.3.4.6 Firm Number of Banks

The arguments for including the firm complexity variable as a control variable point towards the need to control for the degree of internal coordination that can be achieved within the firm. While the classification for supervisory purposes may pick up some aspects of firm complexity, it may ignore others. More specifically, it reflects when firms engage in a variety of credit extending activities or have substantial debt outstanding and public debt, it also reflects when firms have significant non-banking activities and non-banking activities have a high-risk and finally when inter-company transactions and management practices are deemed complex. While all of these factors bear on the ability to coordinate internal activities, Sengul and Gimeno (2013) point out that the number and management of subsidiaries may have important implications for the ability to coordinate activities.

To reflect these arguments, the study includes an additional control variable to account for the possibility that firms with more subsidiaries may find it harder to coordinate competitive behaviour. Accordingly, the *Firm Number of Banks* variable is measured as the total number of US banking subsidiaries that are in the organisational structure of firm *i* at time *t*. The study

expects that the firm number of banks variable is positively associated with competitive aggressiveness because firms with more subsidiaries may find it harder to enforce forbearance norms.

5.3.4.7 Financial Holding Company

Some of the BHC in this sample may also have interests in non-banking activities as authorised under Gramm-Leach-Bliley Act and Section 4(k) of the Bank Holding Company Act. These firms may be able to cross-subsidise activities with revenues from their non-banking operations. Therefore, they may have fewer incentives to maintain mutual forbearance norms. At the same time, they may be more prone to seeing their businesses as a portfolio of independent investments rather than an integrated company structure. This may also make them less susceptible to MMC considerations in their competitive behaviour.

Thus, the study accounts for financial holding companies status by including it as a control in the analysis. Financial holding company status is measured as an indicator variable, *Financial Holding Company*, set to 1 if the firm *i* was registered as a financial holding company with the FRB at time *t* and to 0 otherwise. To the extent that financial holding companies are less susceptible to MMC considerations, it is expected that this variable has a positive association with competitive aggressiveness.

5.3.4.8 Firm is Listed

The sample used in this study includes publicly listed as well as privately held firms. Listed firms may differ from private firms on a number of strategic dimensions (Johnson, 1997). One of the main reasons for using capital markets is that the cost of capital is lower, however, not all firms chose this source of funding because it brings significant disclosure requirements and borrowing terms are harder to renegotiate after listing on public markets. On the other hand, listed firms may find it easier to raise capital through share offerings to fund competitive behaviours. These firms may also be under closer scrutiny from shareholders demanding strategic moves. Then again, shareholders may fear competitive escalation because it can affect performance and

dividend payouts. In private firms shareholdings may be more concentrated enabling more direct control and short-term performance fluctuations may be less of a concern. This indicates that publicly held firms may exhibit different competitive behaviours than privately held firms.

Hence, to control for the potential effect of the firm being listed, the study uses an indicator variable, *Firms is Listed*, set to 1 if firm *i* was registered with the Securities and Exchange Commission at time *t* and to 0 otherwise. Since differences in competitive behaviours between private and public firms have not been investigated this study has no a priori expectation about the direction of the effect of this variable.

5.3.4.9 Strategic Similarity

The influence of similarity on firm behaviour has also received sustained attention. Largely based on the idea that similar firms recognise their interdependencies and anticipate moves more accurately (Caves & Porter, 1977) a literature assessing similarity directly (Fuentelsaz & Gómez, 2006; Gimeno, 1999; Gimeno & Woo, 1996; Young *et al.*, 2000) or through the concept of strategic groups (Barnett, 1993; Guedri & McGuire, 2011; Más-Ruiz & Ruiz-Moreno, 2011) has emerged. Barnett (1993), for instance, finds that MMC reduces competitive behaviour within strategic groups, but not across them. Similarly, Guedri and McGuire (2011) only observe an effect of MMC within-groups when mobility barriers are high whereas in groups with low mobility barriers MMC has a positive effect. However, Más-Ruiz and Ruiz-Moreno (2011) show that in strategic groups defined by large firms MMC decreases competition. Focusing on strategic similarity directly, Gimeno and Woo (1996) show that while MMC reduces competition, similarity has the opposite effect. Young *et al.* (2000) find that action frequency and action speed increase when firms' resources are dissimilar. The effect of MMC on strategic action frequency is greatest when resources are dissimilar but the impact on time to move is greatest when resources are similar. Fuentelsaz and Gómez (2006) find that only with less MMC more similarity decreases competition while with great MMC similarity has a direct positive impact on competitive behaviour. Upson *et al.* (2012) show that resource similarity has a negative effect on the likelihood of a foothold attack and a foothold withdrawal.

To reflect that strategic similarity may influence competitive behaviour the study includes it as a control. The *Strategic Similarity* variable is measured by calculating the squared Mahalanobis distance score between all sample firms at time *t* (rescaled by 100 for reporting purposes). More specifically, the distance is measured based on the matrix product of the differences in a list of variables. The matrix is given by the inverse of the covariance matrix of the variables of interest and the differences are given between a tuple of reference values. Reference values for each observation are given by the market dependence calculated according to the percentage of loans and deposits relative to firm total loans and deposits in all the markets a firm operates. The absolute differences are then computed in relation to the mean value of variables. This measure reflects that strategically similar firms are likely to have a similar focus in terms their market profiles in both product and factor markets. Similar firms have a lower distance and thus a similar Mahalanobis distance score. In accordance with the original Caves-Porter hypothesis, this study expects a negative association with competitive aggressiveness.

5.3.4.10 Market Growth

The SCP paradigm makes predictions about the effect of market growth on competitive behaviour (Bain, 1956; Porter, 1980; Scherer & Ross, 1990). In this perspective, when markets grow fast incumbents have few incentives to compete intensely whereas slower growth gives more incentives to compete. Competitive dynamics research, however, paints a more differentiated picture of the effect of market growth. Market growth, for instance, is negatively related to competitive inertia in strategic actions but not in tactical actions (Miller & Chen, 1994). This suggests that growing markets can lead to significant resource commitments. Similarly, firms in high-growth markets that experience distress compete more aggressively (Ferrier *et al.*, 2002). On the other hand, market growth is positively related to simple action repertoires (Miller & Chen, 1996b), negatively related to attack unpredictability (Ferrier, 2001), negatively related to strategic aggressiveness and positively related to response times (Smith *et al.*, 2001).

To control for the effect of market growth, it is included in the analysis. *Market growth* is measured as the year-on-year market growth, measured as the size of market *m* at time *t* minus the size of market m at *t-1* divided by the size of market m at *t-1*. This is then averaged over all

markets *m* in which firm *i* is active at time *t*. Competitive dynamics literature provides somewhat ambiguous predictions about the effect of market growth. Since the majority of studies find a negative effect of market growth on strategic aggressiveness (Smith *et al.*, 2001), this study also expects that market growth is negatively associated with competitive aggressiveness.

5.3.4.11 Number of Competitors

Competitive market structures might influence the competitive behaviour of firms (Ferrier *et al.*, 2002; Porter, 1980; Scherer & Ross, 1990) and have been identified as a moderating variable in MMC studies (Baum & Korn, 1996; Fuentelsaz & Gómez, 2006; Jayachandran *et al.*, 1999; Mester, 1987; Prince & Simon, 2009). Market structural attributes as determinants of competition are firmly grounded in the SCP paradigm (Bain, 1956; Porter, 1980; Scherer & Ross, 1990) and arguments about the effect of competitor density on competitive behaviour are grounded in organisational ecology (Hannan & Carroll, 1992; Hannan & Freeman, 1989). Fewer competitors could be a signal of attractiveness inducing entry (Fuentelsaz & Gómez, 2006), but in markets with fewer competitors incumbents could work together to set up barriers to entry (Scherer & Ross, 1990). In organisational ecology, markets with higher density are regarded as more competitive (Hannan & Carroll, 1992; Hannan & Freeman, 1989). Competitive dynamics research has shown that firms in concentrated markets initiate fewer competitive moves (Young *et al.*, 1996) but compete more aggressively when they experience poor performance (Ferrier *et al.*, 2002). In addition, concentration is negatively related to attack complexity and attack unpredictability (Ferrier, 2001). In MMC studies, a number of scholars have analysed the moderating effect of concentration albeit with inconclusive results (Alexander, 1985; Baum & Korn, 1996; De Bonis & Ferrando, 2000; Feinberg, 1985; Fernández & Marín, 1998; Fuentelsaz & Gómez, 2006; Greve, 2008b; Mester, 1987; Prince & Simon, 2009; Scott, 1982, 1991). Given the importance that has been ascribed to the number of firms in a market for the relationship between MMC and competitive behaviour, it is necessary to control for this effect. The study uses the number of competitors rather than other measures such as Herfindahl or concentration indices that have also frequently been used to capture market level competition because this measure is frequently used in studies using an ecological perspective (Barnett & McKendrick, 2004).

Therefore, the study controls for the *Number of Competitors* measured as number of firms, firm *i* encounters in each market in which it is active at time *t* divided by the total number of markets in which it is active at time *t* (rescaled by 100 for reporting purposes). This is then averaged over all markets *m* in which firm *i* is active at time *t*. In accordance with the arguments presented above, the study has no clear expectations about the association of the number of competitors with competitive aggressiveness.

5.3.4.12 Interbank Cost of Borrowing

Even though financial intermediaries obtain most of their financial resources from deposit liabilities (Berger & Humphrey, 1997), they also use interbank markets to gain access to financial resources. These transactions are motivated mainly by relative interest rates, ratings, maturity and marketability (Roussakis, 1997). Financial intermediaries also use interbank borrowing as a substitute for deposits when they need to buffer exogenous shocks or when they make intertemporal adjustments in their loan and deposit holdings (Dia, 2013; Freixas, Parigi, & Rochet, 2000). This suggests that borrowing costs on interbank markets may influence competitive behaviour. For example, when the interbank cost of borrowing is low, firms may take advantage of this source of financial resources an honour forbearance norms rather than engaging in competitive behaviour. When the interbank cost of borrowing is high, however, this may give incentives to compete more aggressively to secure access to resources. Moreover, when interbank costs of borrowing are either higher or lower than expected over extended periods, banks may need to adjust their strategies (Dia, 2013).

To account for the possibility that the interbank cost of borrowing influences the relationships analysed, the study controls for *Interbank Cost of Borrowing*. The measure is taken at time *t* and is derived as the annual average of the daily not seasonally adjusted interbank cost of borrowing as reported by FRED where it is calculated as the difference between the 3-month London Interbank Offered Rate and the Federal Funds Rate. In accordance with the arguments presented above it is expected that the interbank cost of borrowing is positively related to competitive aggressiveness as firms might be more aggressive if it becomes more difficult to gain access to resources on interbank markets.

5.3.4.13 Gross Domestic Product Growth

The economic environment and possible trends in the economic environment have the potential to influence competitive behaviours. Changes in the economic environment, for instance, may require adaptation of competitive strategies (Lamberg *et al.*, 2009). If economic growth is depressed over an extended period, this could require financial intermediaries to take action to compensate. An example of how the economic environment may affect the behaviour of financial intermediaries is the global financial crisis 2007-2008. The crisis imposed financial constraints on many firms that led to cancelled or postponed investments (Campello, Graham, & Harvey, 2010). In response, the lending behaviour of financial intermediaries changed, especially if their access to deposits was constrained (Kosak, Li, Loncarski, & Marinc, 2015). At the same time, as discussed in the previous chapter, financial intermediaries have experienced significant deregulation that has led to an adjustment of MMC strategies (Hannan & Prager, 2004) and competitive behaviour can surge following changes in the external environment such as deregulations as firms reposition themselves, establish new spheres of influence and new interdependencies (Fuentelsaz & Gómez, 2006).

To account for the effect of economic conditions and the effect of trends in the economic environment, the study includes the year-on-year GDP Growth rate, *GDP growth*, measured as GDP at time *t* minus GDP at time *t-1* divided by GDP at time *t-1* as a control variable. This variable is derived from the annual average of the quarterly seasonally adjusted real GDP in billions of chained 2009 USD. GDP growth could have a positive effect on competitive aggressiveness if the financial crisis produced a significant exogenous shock. Table 5 summarises the control variable definitions.

Table 5: Control Variable Definitions

Variable name	Definition*	Data Source
Firm size	The logarithm of total assets of firm *i* at time *t*.	FR Y-9 Report
Firm age	The number of years firm *i* has existed at time *t.*	FR Y-9 Report
Firm past performance	The net income divided by total assets for firm *i* at time *t* averaged over time *t*-1 and *t*.	FR Y-9 Report
Firm slack	The ratio of total assets to total liabilities of firm *i* at time *t*.	FR Y-9 Report
Firm complexity	Indicator variable set to 1 if firm *i* is classified as complex at time *t* and to 0 otherwise.	FR Y-9 Report
Firm number of banks	The total number of US banking subsidiaries that are in the organisational structure of firm *i* at time *t*.	FR Y-9 Report
Financial holding company	Indicator variable set to 1 if firm *i* was registered as a financial holding company with the FRB at time *t* and to 0 otherwise.	FR Y-9 Report
Firm is listed	Indicator variable set to 1 if firm *i* was registered with the Securities and Exchange Commission at time *t* and to 0 otherwise.	FR Y-9 Report
Strategic similarity	Mahalanobis distance score between all sample firms at time *t* based on market dependence (rescaled by 100 for reporting purposes).	FR Y-9 Report
Market growth	The year-on-year growth measured as the size of market *m* at time *t* minus the size of market m at *t-1* divided by the size of market m at *t-1* averaged over all markets in which firm *i* is active at time *t*.	CALL Reports

Variable name	Definition*	Data Source
Number of competitors	The number of firms firm *i* encounters in each market in which it is active at time *t* divided by the total number of markets in which it is active at time *t* (rescaled by 100 for reporting purposes).	CALL Reports
Interbank cost of borrowing	The annual average of the daily not seasonally adjusted Interbank Cost of Borrowing at time *t.*	FRED
GDP growth	The year-on-year growth measured as GDP at time *t* minus GDP at time *t-1* divided by GDP at time *t-1* derived from the annual average of the quarterly seasonally adjusted real GDP in billions of chained 2009 USD at time *t.*	FRED

* See Appendix A for a complete list of regulatory item names/codes used in the calculations.

5.4 Analytical Methods

The sample used to test the theoretical predictions made in this study consists of cross-sectional time series data also referred to as panel data. Since not all firms are observed in all years, the panel of firms used in the analysis is unbalanced. Panel data structures often violate the assumptions of Ordinary Least Squares Regression (OLS) analysis because the error terms may not be independent across time or within panels (Greene, 2003; Wooldridge, 2002). This may occur, for instance, when firms differ systematically in their ability to implement competitive actions over time. An alternative to OLS-based estimation techniques that could be used is maximum-likelihood estimation (Wooldrige, 2002). While maximum-likelihood estimators are generally regarded as more efficient, they are also generally regarded as less robust to violations of assumptions and misspecification. In particular, if the assumption of independence of errors holds, and if errors are multivariate normally distributed, maximum-likelihood estimation techniques are regarded as more efficient, but if these assumptions are violated maximum-likelihood estimators produce inconsistent results. In addition, maximum-likelihood estimators

require that a joint probability function be assumed while OLS estimation requires no such assumption. What is more, even though corrections for violations of assumptions and misspecification are possible, these are more difficult to implement. The study uses Wooldridge's (2002) test for serial correlation in the idiosyncratic errors that is suitable for the panel data to test whether autocorrelation would produce biased estimates. This test was implemented using the *xtserial* command (Drukker, 2003) in Stata 13 (all estimations discussed subsequently were performed in Stata 13 unless indicated otherwise). This test reveals that autocorrelation is present in the data ($F(1, 1014) = 1106.84$, $p < 0.001$). In addition to autocorrelation, panel data models often experience heteroscedasticity (Greene, 2003; Wooldridge, 2002). To test for groupwise heteroscedasticity, the study follows the approach outlined in Greene (2003) using a modified Wald test. Again, this test reveals that heteroscedasticity is present in the data (Wald $\chi^2(1267) = 2.2e+07$, $p < 0.001$). Since maximum-likelihood estimators are more sensitive to violations of assumptions and corrections can be implemented more easily in OLS-based estimation techniques, this study uses OLS-based estimation.

To address issues of autocorrelation and heteroscedasticity in OLS-based estimation, firm fixed- or random-effects with heteroscedasticity corrected standard errors may be used (Greene, 2003). The choice of estimation technique should be informed by the specific panel data structure (Beck & Katz, 1995; Hsiao, 1986). In the present sample the average number of periods, T, is 6.36 years (min = 1, max = 11) and the number of panels, N, is 1,267. With this type of data structure, fixed-effects general least square specifications may not generate consistent estimates since T << N (Hsiao, 1986; Kennedy, 1998). In addition, fixed-effect specifications do not perform well when explanatory variables exhibit more between panel variation than within panel variation and when there is little change in the explanatory variables over the study period (Allison, 2009). Allison (2009) suggests that fixed-effects standard errors are often substantially larger for variables that exhibit little variation over time. The study compares the standard error for the coefficient of the main explanatory variables when estimated with fixed- and random-effects and AR(1) disturbances to assess if there is enough variation in the independent variables of interest. The standard errors for fixed-effects specifications are between 1.54 to 2.94 times larger, indicating that there may not be sufficient variation over time in the independent variables. The same pattern is observed when analysing the between panel variation as compared to the within

panel variation of the independent variables. The limited variation of the independent variables in combination with the T << N data structure indicate that the fixed-effects specification may not be appropriate for this sample. Beck and Katz (1995) further suggest that with T << N panel data feasible generalised least square regression produces inaccurate standard error estimates. They suggest that in order to deal with this type of data structure autocorrelation corrected OLS regression with heteroscedasticity-corrected standard errors produces accurate standard errors since it accounts for autocorrelation and heteroscedasticity. Accordingly, the study uses a Prais-Winsten regression to generate point estimates that are robust to AR(1) autocorrelation (Greene, 2003; Prais & Winsten, 1954) and heteroscedasticity-corrected standard errors (Beck & Katz, 1995). All models were estimated using the *xtpcse* command and the option *correlation(ar1)* and *hetonly*.

CHAPTER 6
RESULTS

6 RESULTS

This chapter reports the results of the study. It presents and discusses the descriptive statistics and correlation analysis. It reports the results of the hypotheses testing, the results concerning control variables and presents the results tables. It also reports on the robustness checks that have been undertaken to verify these results.

6.1 Descriptive Statistics and Correlation Analysis

The means, standard deviations, minima, maxima and correlations are presented in Table 6. As can be seen, the highest correlation is between firm size and competitive intensity (r = -0.77, $p<0.001$). There are also other reasonably large correlations between the first-order explanatory variables. In addition, correlation diagnostics including the interaction terms show that significant correlations between first-order variables and the interaction terms exist. Since all these variables are included in the models simultaneously, multicollinearity concerns may arise. To address these concerns, this study has mean-centred the main independent variables before computing the interaction terms at the annual means of variables (see Shipilov, 2009 for a similar approach). Also, the study conducts collinearity diagnostics using variance inflation factor (VIF) analysis on the full model including all independent and interaction variables (Kennedy, 1998). In general, an individual VIF larger than 10 is considered a threshold value for serious multicollinearity (Kennedy, 1998). Others, however, argue that individual VIFs larger than five already indicate concerns about multicollinearity (Hair *et al.*, 2006). The average VIF in the full model including all interaction terms is 1.78, and the highest individual value is 3.85. This is well below the most commonly used critical value of 10 but also below a more cautious value of five. Thus, this study does not consider multicollinearity to be a concern (the full results of the VIF analysis can be seen in Appendix B). However, given the high correlation between firm size and competitive intensity, the study conducts additional sensitivity tests as described below in the robustness checks section.

Table 6: Descriptive Statistics and Correlations

	Variable	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Competitive Aggressiveness	0.00	0.76	-1.10	12.14	1.00																
(2)	Factor MMC	1.75	0.46	1.14	11.55	-0.07	1.00															
(3)	Product MMC	0.24	0.08	0.13	1.68	-0.14	0.49	1.00														
(4)	Competitive Intensity	-3.15	1.50	-10.87	4.27	-0.50	0.14	0.32	1.00													
(5)	Firm Size	14.22	1.24	13.12	21.54	0.54	-0.06	-0.04	-0.77	1.00												
(6)	Firm Age	19.07	11.70	0.00	160.00	0.26	0.07	0.01	-0.34	0.38	1.00											
(7)	Firm Past Performance	0.01	0.01	-0.13	0.28	0.02	-0.10	-0.15	-0.21	0.04	0.07	1.00										
(8)	Firm Slack	1.11	0.11	0.95	4.80	-0.01	0.08	0.04	-0.03	0.07	0.02	0.46	1.00									
(9)	Firm Complexity	0.17	0.37	0.00	1.00	0.29	-0.02	-0.10	-0.43	0.50	0.19	0.08	0.12	1.00								
(10)	Firm Number of Banks	1.82	2.69	1.00	57.00	0.30	-0.06	-0.14	-0.29	0.23	0.15	0.04	0.02	0.26	1.00							
(11)	Financial Holding Company	0.28	0.45	0.00	1.00	0.22	-0.03	-0.10	-0.30	0.34	0.17	0.10	0.09	0.23	0.11	1.00						
(12)	Firm is Listed	0.20	0.40	0.00	1.00	0.04	-0.29	-0.34	-0.24	0.14	-0.07	0.11	0.01	0.16	0.06	0.10	1.00					
(13)	Strategic Similarity	0.18	0.37	0.00	9.18	-0.02	0.16	0.18	-0.02	0.19	0.07	0.09	0.11	0.09	-0.01	0.06	0.00	1.00				
(14)	Market Growth	0.07	0.07	-0.42	0.19	-0.01	-0.28	-0.32	-0.11	0.00	-0.08	0.23	0.02	0.03	0.04	0.05	0.13	-0.02	1.00			

Variable	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(15) Number of Competitors	55.90	3.12	46.73	72.96	-0.19	-0.42	-0.11	0.13	-0.19	-0.29	0.10	0.00	-0.07	-0.07	-0.06	0.22	0.00	0.41	1.00		
(16) Interbank Cost of Borrowing	1.32	0.61	0.25	2.39	0.00	-0.01	-0.02	0.04	0.00	-0.01	-0.09	-0.03	-0.05	-0.01	0.02	-0.25	-0.01	0.31	0.19	1.00	
(17) GDP Growth	0.02	0.02	-0.03	0.04	0.00	-0.14	-0.18	-0.15	0.00	-0.05	0.28	0.02	0.05	0.03	0.04	0.20	0.00	0.41	0.14	-0.27	1.00

| r | > 0.063 – p< 0.10; | r | > 0.073 – p< 0.05; | r | > 0.103 – p< 0.01; | r | > 0.123 – p< 0.001

N = 8,062

6.2 Hypotheses Testing

This subsection reports the results of the hypotheses testing and presents the results tables. It highlights that some hypotheses are supported by the statistical tests.

6.2.1 Hypothesis 1, 2 and 3

The results of the analyses are presented in Table 7 and 8. All models exhibit good fit with highly significant Wald statistics ($p < 0.001$). Model 1 presents the baseline model in which all control variables are regressed on the dependent variable, competitive aggressiveness. Hypothesis 1 suggests that as PMMC increases, competitive aggressiveness decreases. Model 2 includes the independent variable PMMC. The coefficient of PMMC is negative and significant ($\beta = -0.982$, $p < 0.001$). A Wald test for the significance of the effect of PMMC (Wald $\chi^2(1) = 80.88$, $p < 0.001$) provides preliminary support for Hypothesis 1. This suggests that firms with greater PMMC exhibit less aggressive competitive behaviour.

Hypothesis 2 argues that as FMMC increases, competitive aggressiveness decreases. Accordingly, Model 3 adds the independent variable FMMC. The coefficient of FMMC is negative and significant ($\beta = -0.093$, $p < 0.001$). A Wald test for the significance of the effect of FMMC (Wald $\chi^2(1) = 18.40$, $p < 0.001$) provides preliminary support for Hypothesis 2. This suggests that firms with greater FMMC exhibit less aggressive competitive behaviour. To test the relationship further, Model 4 adds both variables, FMMC and PMMC. Interestingly, the coefficient of PMMC remains negative and significant ($\beta = -0.925$, $p < 0.001$) while the coefficient of FMMC remains negative but is now insignificant. A Wald test for the inclusion of both FMMC and PMMC (Wald $\chi^2(2) = 84.57$, $p < 0.001$) suggests that the joint effect is significant. This provides further support for Hypothesis 1 but casts doubt on the support for Hypothesis 2. Thus, to investigate further whether the effect of either variable is significant in Model 4 the study conducts further Wald tests. For PMMC the Wald statistic is significant (Wald $\chi^2(1) = 61.42$, $p < 0.001$) while for FMMC the Wald statistic is not significant (Wald $\chi^2(1) = 1.69$, $p > 0.1$). Thus, support for Hypothesis 1 is confirmed, while Hypothesis 2 is not supported in this model. These results indicate that, firms experiencing greater MMC in both types of markets may exhibit less aggressive competitive

behaviour, but the effect of FMMC, in particular, may be overestimated if PMMC is not controlled for.

Hypothesis 3 argues that the negative association between MMC and competitive aggressiveness is stronger for PMMC than for FMMC. To test this hypothesis, the study conducts a z-test for the difference in coefficients. This test indicates that PMMC has a stronger negative effect on competitive aggressiveness than FMMC (β = -0.901, z = -7.13, p < 0.001), thus supporting Hypothesis 3 (even though it needs to be noted that the coefficient for FMMC was not significant). In sum, these results provide support for the idea that different types of MMC have distinct implications for the competitive behaviour. In particular, these results indicate that not all interdependencies contribute towards reducing competitive behaviour to the same extent.

6.2.2 Hypothesis 4

Hypothesis 4 suggests that as competitive intensity increases, competitive aggressiveness decreases. Accordingly, it predicts a negative association between competitive intensity and competitive aggressiveness. Model 5 of Table 8 adds competitive intensity. The coefficient is negative and significant (β = -0.054, p < 0.001) and the Wald statistic is also significant (Wald $\chi^2(1)$ = 22.42, p < 0.001). Hence, Hypothesis 4 is supported. Interestingly, the main effect of FMMC on competitive aggressiveness also becomes significant (β = -0.040, p < 0.05; Wald $\chi^2(1)$ = 4.52, p < 0.05) after controlling for the effect of competitive intensity on competitive aggressiveness indicating that in this model Hypothesis 2 is conditionally supported.

6.2.3 Hypothesis 5 and 6

Hypothesis 5 argues that with greater competitive intensity the negative association between PMMC and competitive aggressiveness becomes weaker. Hence, it predicts that there is a positive association between the interaction of PMMC and competitive intensity and competitive aggressiveness. Model 6 of Table 8 adds the interaction of PMMC and competitive intensity. The coefficient is positive and significant (β = 0.649, p < 0.001). The Wald statistic for the inclusion of

the interaction of PMMC and competitive intensity is significant (Wald $\chi^2(1) = 31.25$, $p < 0.001$) indicating that Hypothesis 5 is supported. This means that with greater competitive intensity the negative effect of PMMC on competitive aggressiveness is weaker.

Hypothesis 6 argues that with greater competitive intensity the negative association between FMMC and competitive aggressiveness is stronger. Accordingly, it predicts that there is a negative association between the interaction of FMMC and competitive intensity and competitive aggressiveness. Model 7 of Table 8 adds the interaction of FMMC and competitive intensity. The coefficient is positive but not significant. The Wald statistic is not significant either. This indicates that Hypothesis 6 is not supported in this model. To test the relationship further, Model 8 presents the full model including all independent variables and interaction terms. As expected, the coefficient of the interaction of PMMC and competitive intensity remains positive and significant ($\beta = 0.720$, $p < 0.001$), but now the interaction of FMMC and competitive intensity is negative and marginally significant ($\beta = -0.041$, $p < 0.1$). A Wald test for the inclusion of both interaction terms (Wald $\chi^2(2) = 35.57$, $p < 0.001$) suggests that the joint effect is significant. To investigate further whether this is mainly due to the effect of the interaction of PMMC and competitive intensity the study conducts further Wald tests on the effects of the individual interaction terms in Model 8. For the interaction term of PMMC and competitive intensity the Wald statistic is significant (Wald $\chi^2(1) = 35.57$, $p < 0.001$) but the Wald statistic for the interaction term of FMMC and competitive intensity (Wald $\chi^2(1) = 3.81$, $p < 0.1$) is only marginally significant. Given the power of the test, it is determined that even though a marginally significant interaction effect of FMMC and competitive intensity on competitive aggressiveness exists, Hypothesis 6 is not supported. The study further conducts Wald tests for all the other independent variables in the full model. The Wald statistic for PMMC is significant (Wald $\chi^2(1) = 45.35$, $p < 0.001$) as it the Wald statistic for FMMC (Wald $\chi^2(1) = 6.32$, $p < 0.001$) and the Wald statistic for competitive intensity (Wald $\chi^2(1) = 24.55$, $p < 0.001$). In combination, these tests provide support for Hypothesis 1, 3, 4, and 5 but only conditional support for Hypothesis 2 and no support for Hypothesis 6. Table 9 gives a summary of the findings.

Table 7: Prais-Winsten Regression Results of PMMC and FMMC on Competitive Aggressiveness

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Constant	-3.143***	-3.009***	-2.650***	-2.891***
	(0.301)	(0.297)	(0.326)	(0.321)
Firm Size	0.302***	0.305***	0.297***	0.303***
	(0.017)	(0.017)	(0.017)	(0.017)
Firm Age	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Firm Past Performance	1.690**	1.079†	1.461*	1.056
	(0.645)	(0.643)	(0.645)	(0.643)
Firm Slack	-0.353***	-0.288***	-0.311***	-0.281***
	(0.065)	(0.066)	(0.064)	(0.065)
Firm Complexity	-0.005	-0.015	-0.000	-0.013
	(0.023)	(0.023)	(0.023)	(0.023)
Firm Number of Banks	0.047***	0.044***	0.046***	0.044***
	(0.005)	(0.005)	(0.005)	(0.005)
Financial Holding Company	0.062***	0.052**	0.062***	0.053**
	(0.017)	(0.017)	(0.017)	(0.017)
Firm is Listed	-0.047*	-0.103***	-0.064**	-0.104***
	(0.022)	(0.022)	(0.022)	(0.022)
Strategic Similarity	-0.217***	-0.187***	-0.201***	-0.185***
	(0.035)	(0.034)	(0.036)	(0.035)
Market Growth	-0.053	-0.259*	-0.099	-0.259*
	(0.124)	(0.125)	(0.124)	(0.125)
Number of Competitors	-0.015***	-0.015***	-0.021***	-0.016***
	(0.003)	(0.003)	(0.003)	(0.003)

Variables	Model (1)	Model (2)	Model (3)	Model (4)
Interbank Cost of Borrowing	0.012	0.007	0.015	0.008
	(0.014)	(0.013)	(0.014)	(0.013)
GDP Growth	0.273	0.282	0.296	0.287
	(0.435)	(0.433)	(0.435)	(0.433)
Product MMC		-0.982***		-0.925***
		(0.109)		(0.118)
Factor MMC			-0.093***	-0.024
			(0.022)	(0.018)
Wald χ^2 (*d.f.*)	644.95(*13*)***	716.72(*14*)***	680.20(*14*)***	734.44(*15*)***
Explanatory Variable χ^2 (*d.f.*)		80.88(*1*)***	18.40(*1*)***	84.57(*2*)***
Number of Observations	8,062	8,062	8,062	8,062
Number of Firms	1,267	1,267	1,267	1,267

Standard errors in parentheses robust to heteroscedasticity and autocorrelation.

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

Table 8: Prais-Winsten Regression Results of Competitive Intensity and Competitive Intensity and PMMC and FMMC on Competitive Aggressiveness

Variables	Model (5)	Model (6)	Model (7)	Model (8)
Constant	-2.442***	-1.909***	-2.425***	-1.893***
	(0.340)	(0.331)	(0.337)	(0.332)
Firm Size	0.255***	0.243***	0.254***	0.244***
	(0.020)	(0.019)	(0.020)	(0.019)
Firm Age	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Firm Past Performance	-0.006	-0.140	0.001	-0.174
	(0.680)	(0.678)	(0.680)	(0.677)
Firm Slack	-0.215**	-0.254***	-0.225***	-0.233***
	(0.066)	(0.066)	(0.067)	(0.064)
Firm Complexity	-0.015	-0.017	-0.015	-0.017
	(0.023)	(0.023)	(0.023)	(0.023)
Firm Number of Banks	0.042***	0.040***	0.042***	0.040***
	(0.005)	(0.005)	(0.005)	(0.005)
Financial Holding Company	0.053**	0.050**	0.053**	0.050**
	(0.017)	(0.017)	(0.017)	(0.017)
Firm is Listed	-0.112***	-0.132***	-0.113***	-0.131***
	(0.022)	(0.023)	(0.022)	(0.023)
Strategic Similarity	-0.165***	-0.160***	-0.165***	-0.160***
	(0.034)	(0.033)	(0.034)	(0.033)
Market Growth	-0.216†	-0.283*	-0.221†	-0.276*
	(0.125)	(0.126)	(0.126)	(0.126)
Number of Competitors	-0.017***	-0.020***	-0.016***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.003)

Variables	Model (5)	Model (6)	Model (7)	Model (8)
Interbank Cost of Borrowing	0.007	0.009	0.007	0.009
	(0.013)	(0.013)	(0.013)	(0.013)
GDP Growth	0.012	0.016	0.006	0.032
	(0.438)	(0.436)	(0.438)	(0.436)
Product MMC	-0.654***	-1.105***	-0.685***	-1.074***
	(0.123)	(0.158)	(0.138)	(0.159)
Factor MMC	-0.040*	-0.043*	-0.035†	-0.056*
	(0.019)	(0.019)	(0.021)	(0.022)
Competitive Intensity	-0.054***	-0.056***	-0.054***	-0.056***
	(0.011)	(0.012)	(0.011)	(0.011)
Product MMC X Competitive		0.649***		0.720***
Intensity		(0.116)		(0.121)
Factor MMC X Competitive			0.016	-0.041†
Intensity			(0.019)	(0.021)
Wald χ^2 (*d.f.*)	752.00(*16*)***	741.90(*17*)***	801.42(*17*)***	768.16(*18*)***
Explanatory Variable χ^2 (*d.f.*)	22.42(*1*)***	31.25(*1*)***	0.74(*1*)	35.57(*2*)***
Number of Observations	8,062	8,062	8,062	8,062
Number of Firms	1,267	1,267	1,267	1,267

Standard errors in parentheses robust to heteroscedasticity and autocorrelation.

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

Table 9: Summary of Hypotheses and Findings

Hypothesis	Wording	Expected Sign	Finding
Hypothesis 1	As PMMC increases, competitive aggressiveness decreases.	-	Supported
Hypothesis 2	As FMMC increases, competitive aggressiveness decreases.	-	Conditionally Supported
Hypothesis 3	The negative association between PMMC and competitive aggressiveness is stronger than the negative association between FMMC and competitive aggressiveness.	-	Supported
Hypothesis 4	As competitive intensity increases, competitive aggressiveness decreases.	-	Supported
Hypothesis 5	The greater the competitive intensity, the weaker the negative association between PMMC and competitive aggressiveness.	+	Supported
Hypothesis 6	The greater the competitive intensity, the stronger the negative association between FMMC and competitive aggressiveness.	-	Not Supported

6.3 Control Variable Results

The results of the control variables are mostly consistent with expectations and prior research. As expected and consistent with prior literature (Yu *et al.*, 2009), the coefficient for firm size is positive and significant ($p < 0.001$) in all models, indicating that larger firms exhibit more aggressive competitive behaviour. In contrast, the study expected firm age to be negatively associated with competitive aggressiveness, but it finds no association ($p > 0.1$). The expectation of a negative association was based on the idea that older firms may be more inert and, therefore, may engage in less aggressive behaviour. However, the regulatory changes and the global

financial crisis that firms experienced before and during the study period may have counteracted inertial forces to some extent since firms will have had to respond to these changes. The insignificant result for firm age is also consistent with other studies that have included firm age as a control and did not find a significant association (Ndofor *et al.*, 2011).

The relationship between past performance and competitive aggressiveness is positive and significant ($p < 0.01$) in the baseline model but loses significance after both PMMC and FMMC are included. The loss of significance after including the MMC variables may be explained by the fact that prior studies about the relationship between past performance and competitive behaviour did not include MMC as a covariate (see Ferrier *et al.*, 2002 for example) and thereby may have overestimated the effect of past performance on competitive aggressiveness. Moreover, the positive effect in the baseline model may be because most previous research has focused on a narrower set of actions while this study considers a broader range of actions including strategic and tactical actions. The positive association is consistent with other studies that focus on a broader set of actions and find a positive effect for some types of actions (Miller & Chen, 1994). It also needs to be noted that the coefficient of past performance changes sign in some models (but remains insignificant) after the inclusion of the competitive intensity variable. This is addressed further in the robustness check section below. Firm slack has a negative significant association with competitive aggressiveness ($p < 0.001$ and $p < 0.01$) in all models. As expected, this indicates that sample firms, rather than using slack to fund competitive behaviours use it as a buffer against environmental uncertainty (Smith *et al.*, 1991) or to build organisational capabilities (Lamberg *et al.*, 2009).

The study included two control variables to assess the degree to which internal coordination influences competitive behaviour, namely complexity and number of firms. Contrary to expectations, the complexity variable is not associated with competitive aggressiveness ($p > 0.1$) but in agreement with expectations the variable reflecting the number of banks in the BHC has a positive significant association with competitive aggressiveness ($p < 0.001$) in all models. This indicates that the competitive complexity variable, while used for supervisory assessment, may not capture all aspects of internal coordination. On the other hand, in accordance with prior literature (Haleblian *et al.*, 2012; Sengul & Gimeno, 2013), firms with more units may find it more

difficult to coordinate activities and to enforce adherence to mutual forbearance. Again, as expected, financial holding companies are more aggressive as indicated by the significant positive association with competitive aggressiveness ($p < 0.001$ and $p < 0.01$). This suggests that financial holding companies are less susceptible to mutual forbearance considerations. The study had no a priori expectations about the effect of a firm being public or private but it finds a significant negative association in all models ($p < 0.05$ to $p < 0.001$). This suggests that public firms are less aggressive than private firms in the sample studied. As expected and found in other recent studies (Fuentelsaz & Gómez, 2006), strategic similarity has a significant negative association with competitive aggressiveness ($p < 0.001$). This indicates that, as originally proposed by Caves and Porter (1977), similar firms may be less aggressive.

Of the market level control variables, market growth did not have an association with competitive aggressiveness ($p > 0.1$) in the baseline model and in Model 3 but had a significant negative association in the remaining models ($p < 0.1$ to $p < 0.05$). As has been discussed before, studies about the effect of market growth on competitive aggressiveness have shown a variety of results but the majority of studies find a negative effect of market growth on strategic aggressiveness (Smith *et al.*, 2001). Since the significance level changes in different models, further sensitivity testing is conducted as described in the robustness checks section below. Interestingly, the number of competitors has a significant negative association with competitive aggressiveness ($p < 0.001$). This indicates that firms facing a larger number of competitors compete less aggressively while firms facing fewer competitors compete more aggressively in this sample. Contrary to expectations, the interbank cost of borrowing variable remains insignificant in all models ($p > 0.1$) suggesting that firms do not compete more aggressively when it becomes more difficult to gain access to resources on interbank markets. These two sources of funding may be alternatives rather than substitutes (Roussakis, 1997) for the firms in the sample. The control variable for the general economic environment, GDP growth, has no association ($p > 0.1$), suggesting that factors in the general economic environment did not influence competitive behaviours during the sample period, even though significant changes had taken place in the industry and the industry did experience an exogenous shock.

6.4 Robustness Checks

Even though the VIF analysis indicates that multicollinearity is not present in the data, the study performs a number of robustness checks to ascertain that the high correlation between size and competitive intensity does not influence the results. More specifically, all models are re-estimated dropping the size variable, with the size and competitive intensity variables orthogonalized, and with ridge regression (Greene, 2003). While all these models suffer shortcomings and are not reported, they provide similar results. The results presented here are preferred to the results of these robustness checks for a number of reasons. First, dropping size leads to omitted variable bias because size has a significant effect on the dependent variable (Greene, 2003). Omitting size leads to biased estimates if some of the included variables are correlated with size since these variables pick up some of the effects of size when it is omitted. While orthogonalizing size and competitive intensity increase the mathematical accuracy of the estimates and allow isolating the effect of a particular variable, the transformation makes the interpretation of results difficult since they no longer represent the effect of size or competitive intensity on the dependent variable (Greene, 2003). Ridge regression is the most commonly used method to test sensitivity to multicollinearity and correct for it (Greene, 2003). However, this technique comes at the cost of slightly biased coefficient estimates (Greene, 2003) and sensitivity to the choice of ridge parameters (Cule & De Iorio, 2013). The study performs ridge regression with automatic ridge selection (Cule & De Iorio, 2013) (automatically selected ridge parameters ranged from 0.004 to 0.006 in different models) and arbitrarily chosen ridge parameters of 0, 0.01 and 0.1 and finds that coefficients are relatively stable and significance levels are virtually the same across specifications (these computations were performed using the 'ridge' package (Cule, 2014) in the R statistical software (R Core Team, 2014)).

This study measures the dependent variable, competitive aggressiveness, at time *t* (see Yu *et al.*, 2009 for a similar approach). The main reason for measuring competitive aggressiveness at the same time as the explanatory variables is that a reduction of competitive aggressiveness may be an immediate result of interdependencies. In fact, it has been shown that under conditions of MMC competitors are very fast to respond to competitive aggressions (Young *et al.*, 2000). By lagging the measurement of competitive aggressiveness, some of these rapid

exchanges might be lost. On the other hand, some competitive actions might take longer to implement and even when the implementation does not cause delays, management might need longer to decide if actions should be taken. A point in case are some expansion actions such as acquisitions that may take a significant time to plan and execute (Haleblian *et al.*, 2012). This points towards the possibility that some actions may not be observed when measuring competitive aggressiveness at time *t*. To account for this possibility the study re-estimates all models using competitive aggressiveness at time *t+1* as the dependent variable. The results for these models are shown in Appendix C. It can be seen that these findings are similar to the results presented above. In particular, all the main explanatory variables studied retain the expected directions and their significance levels while a few control variables lose significance in this specification. These results further confirm the findings of this study. It needs to be noted that neither of the results is preferred over the other since there is no clear theoretical rationale for preferring one over the other. These results also highlight the stabilising effect that interdependencies have by showing that interdependencies do not only reduce competitive behaviour in the present period but also in future periods. As such, it is no surprising that there was not sufficient variation over time in the independent variables of interest.

To identify competitive actions and calculate the competitive aggressiveness variable the study counts – among other things – the instances in which quarterly marketing, technology and legal expenses exceed 20 percent of other non-interest expenses and in which the quarterly interest rate is higher/lower than the yearly geometric mean interest rates minus/plus one and a half standard deviations. While it seems reasonable to assume that such extraordinary expenses constitute competitive actions the results may be sensitive to the choice of the cut-off points used. To probe this sensitivity, the study re-calculates competitive aggressiveness using different cut-off points for the underlying actions and re-estimates all models. Specifically, it changes the cut-off for marketing, technology, and legal expenses to 3 percent of other expenses and lowers the threshold for pricing actions to one and a quarter standard deviations. These different cut-off points do not alter the results presented here.

The coefficient of firm past performance changes signs (but remains insignificant) after including the competitive intensity variable. The ridge regression described above accounts for

multicollinearity concerns between firm past performance and competitive intensity as well and confirms that this does not seem to drive the findings presented here. Nevertheless, the study further investigates if the results obtained for the competitive intensity variable are in any way driven by the firm past performance variable. To do this, the study drops the firm past performance variable and re-estimates all models. The results of these estimations are virtually identical to the results presented here. The results presented here are preferred, however, since strong theoretical arguments indicate that firm past performance should be controlled for. The study also further investigates the effect of the market growth variable. The variable exhibits a negative sign, but significance levels vary in the different models. Ridge regression results alleviate concerns about multicollinearity. Furthermore, all models are re-estimated dropping the market growth variable. Results are very similar even though the PMMC effect sizes are slightly smaller (significance level remain the same as reported here).

To further test robustness, the study uses a subset of control variables only to test if the extensive specification is influencing the result. In particular, all models are re-estimated dropping the following variables: firm age (since it is not significant in any model), firm past performance (since it loses significance), firm complexity (since it may be covered by the firm number of banks variable), firm is listed (since the theoretical rationale for including it is not very strong), market growth (since it changes significance), interbank cost of borrowing (since it is not significant in any model) and GDP growth (since it is not significant in any model). The results are similar to the results presented here. The main difference is that the FMMC variable is only marginally significant ($p<0.1$) in model 5, it is not significant in model 6, marginally significant ($p<0.1$) in Model 7 and significant ($p<0.05$) in Model 8. In addition, the interaction term of FMMC and competitive intensity is significant in Model 8 ($p<0.05$). Hence, the results reported here (using an extensively specified model) represent a more conservative test of the relationships that have been proposed.

Finally, as can be seen from the descriptive statistics presented in Table 6 the dependent variable, competitive aggressiveness is right skewed (mean = 0.00, standard deviation = 0.76, minimum =-1.10, maximum = 12.14). Since skew in the dependent variable can lead to violations of the parametric assumptions (Russell & Dean, 2000) and hence make significance testing

invalid it is important to test if the skew in the dependent variable influences results. Russell and Dean (2000) suggest that bootstrapped standard errors can effectively deal with skew in the dependent variable. They also suggest that if transformations be used, linear transformations rather than non-linear transformations should be preferred. To assess how skew in the dependent variable influences results this study first re-estimates all models with a winsorized dependent variable where 0.01 percent of the observations at the upper bound of the variable are winsorized (mean = -0.02, standard deviation = 0.63, minimum = -1.10, maximum = 2.23). As can be seen by the descriptive statistics this variable is much less right skewed. The results remain the same as the results presented above but significance levels are higher. Secondly, all models are re-estimated using bootstrapped standard errors for significance testing (1000 bootstrapping replications with replications taking into account clustering on the firm). The results remain the same again while exhibiting higher significance levels (based on bias-corrected confidence intervals). This indicates that the results obtained with the skewed dependent variable represent a more conservative test of the proposed relationships.

CHAPTER 7
DISCUSSION

7 DISCUSSION

The objective of this study is to theorise and test how different types of interdependencies influence competitive behaviour and how idiosyncratic competitive circumstances influence the relationship between those interdependencies and competitive behaviour. Specifically, drawing on MMC and factor market competition literature this study analyses how PMMC and FMMC are associated with competitive aggressiveness and if there is a distinct effect for PMMC and FMMC. In support of the theoretical arguments, the study finds that both PMMC and FMMC have a negative association with competitive aggressiveness. Moreover, the study finds that the negative association between PMMC on competitive aggressiveness is stronger for PMMC than FMMC. Building on the ecological concept of competitive intensity the study also analyses how competitive intensity influences competitive aggressiveness and how the relationship between PMMC and FMMC and competitive aggressiveness is influenced by competitive intensity. Again supporting the theoretical arguments presented, the study finds that competitive intensity has a negative association with competitive aggressiveness and competitive intensity attenuates the negative association between PMMC and competitive aggressiveness. On the other hand, it accentuates the negative association between FMMC and competitive aggressiveness. The following sections discuss the main findings in light of existing literature as well as other findings in light of literature and offer some practical implications of these findings.

7.1 Main Findings and Implications for Theory

There has been an increasing focus on gaining a better understanding of how different types of interdependencies influence competitive behaviour. Theories about the role of MMC have highlighted that while some interdependencies may lead to a reduction in competitive behaviour others may have the opposite effect (Anand *et al.*, 2009). Others again have pointed out that firms simultaneously experience interdependencies along different stages of the value chain and that such interdependencies may have implications for competitive behaviour (Markman *et al.*, 2009). In addition, game-theoretic models have shown that production interdependencies can influence competitive outcomes (Chen & Ross, 2007). Apart from the insights gained in these studies,

extant MMC literature has predominantly focused on interdependencies in downstream activities such as product or geographic markets when explaining competitive behaviour. As a result, limited attention has been paid to the possibility that different types of interdependencies may have distinct effects on competitive behaviour. By systematically analysing how PMMC and FMMC influence competitive behaviour, the study advances a more refined understanding of how different types of interdependencies shape competitive behaviour. In doing so, the study relaxes an implicit assumption in MMC literature that different types of contact have a similar effect on competitive behaviour. Indeed, the study has shown that while interdependencies in product markets contribute to reducing competitive behaviour, this effect is weaker in the case of factor markets.

The idea that not all types of interdependencies have a similar effect on competitive behaviour is particularly important as it allows scholars interested in understanding interdependencies a more nuanced analysis of the dynamics involved. In particular, the study suggests that different types of interdependencies may have distinct effects on familiarity and deterrence, the two primary mechanisms leading to a reduction of competitive behaviour. In extant MMC literature familiarity develops from repeated interaction over extended periods since this allows firms to learn about the behaviour of competitors (Boeker *et al.*, 1997) and to gather competitive intelligence (Jayachandran *et al.*, 1999). With some types of contact this process may, however, be slower because firms may be less aware of their interdependencies, and it might be more difficult to monitor competitors. In factor markets where the links between competitive behaviour and outcomes are more ambiguous (Barney, 1986a; Chen, 1996) it might be harder to develop an awareness of interdependencies and to monitor competitors. Furthermore, this study explains that deterrence may also be less effective with certain interdependencies if the basic condition for deterrence – a credible threat of retaliation (Bernheim & Whinston, 1990) – is compromised. This may be the case in factor markets since only firms with the right mix of existing resources (Adegbesan, 2009; Schmidt & Keil, 2013) can credibly threaten to retaliate in these markets. Recognising that certain interdependencies may contribute more to the development of familiarity and may be more effective at deterring competitive behaviour than others is important for further theoretical development about the role of interdependencies in shaping competitive behaviour.

Similarly, in organisational ecology scholars have started to pay closer attention to how both competition and mutualism coexist (Dobrev, 2007; Dobrev & Kim, 2006). These approaches highlight that firms do not only exhibit mutualism in the formation stages of an organisational population but continually construct shared identities. At the same time, competitive pressures can lead firms to abandon such identities. The present study suggests a possible additional factor that facilitates the construction of such shared identities, namely MMC. Firstly, Dobrev (2007) suggests that firms construct share identities by observing ecologically proximate peers. When firms experience MMC, however, they also become more familiar with each other and they are better able to observe competitors' behaviour making it easier for share identities to develop. Secondly, Dobrev (2007) points out that intense competition may counteract the construction of share identities since firms are less likely to imitate those with whom they compete intensely. Since firms refrain from competing aggressively when they experience MMC, MMC should further contribute to strengthening the development of shared identities. Hence, while integrating MMC literature with ecological ideas of mutualism and competition has not been the focus of this study, it suggests that such theoretical integration could generate interesting insights for either literature.

There is also a growing literature that points towards the need to gain a deeper understanding of factor markets. More specifically, scholars have begun to analyse different properties of factor markets such as the extent of market frictions (Barney, 1986a; Denrell *et al.*, 2003; Mahoney & Qian, 2013) and the degree of uncertainty (Anand *et al.*, 2009; Markman *et al.*, 2009; Sirmon *et al.*, 2007). Others have focused on the dynamic linkages between product and factor markets using game-theoretic models (Asmussen, 2015; Chatain, 2014) or on the dynamics between buyers and sellers (Chatain, 2011). Others again analyse the competitive dynamics among factor market buyers (Capron & Chatain, 2008; Gardner, 2005; Markman *et al.*, 2009) and how these dynamics affect firm behaviour and outcomes (Adegbesan, 2009; Schmidt & Keil, 2013). The literature on competitive dynamics in factor markets, in particular, has made significant theoretical as well as some empirical advances but has not systematically examined how interdependencies on these markets affect competitive behaviour.

By analysing how interdependencies among buyers in factor markets influence competitive behaviour, the study adds to the literature on competitive dynamics among factor market buyers

in particular. Specifically, the study builds on and extends the ideas of Markman *et al.* (2009) and Capron and Chatain (2008), among others. Their works assume that factor markets are relatively homogenous without paying much attention to the differences that exist between types of factor markets. This study clarifies that when factor markets differ in terms of, for example, uncertainty or efficiency, this may have distinct implications for competitive behaviour. More specifically, while firms change competitive logics despite interdependencies in highly uncertain factor markets (Anand *et al.*, 2009), the study highlights that firms may not do so in factor markets characterised by less uncertainty and greater efficiency. It is important to note at this point, that the literature on factor markets in general and on competitive behaviour in factor markets as well as how factor and product market competition independently or jointly shape firm behaviour is still in a developmental stage. As implied in this study, there is a need for further theoretical refinement regarding the properties of factor markets and how different types of factor markets influence behaviour. While this literature has begun to explain such differences, understanding them further is essential so more nuanced answers about the role interdependencies play in factor markets can be obtained.

In addition, while Markman *et al.* (2009) focus on how asymmetries in contact between factor and product market can lead to differing levels of awareness, this study shows that it is also important to consider the situation when contact between factor and product markets is more symmetric. Markman *et al.* (2009, p. 433 original italics in bold) suggest that "*the vast overlap in **both** product and factor markets makes rivals easily recognizable*." Yet, the present study suggests that product and factor markets differ on important dimensions and these differences may be sufficient to create asymmetric awareness – a suggestion supported by the results obtained in this study. From this it follows that with highly asymmetric contact in product and factor markets, the propensity to take actions may be even higher than expected when considering the Markman *et al.* (2009) model because even in the absence of vast resource dissimilarity the very properties of factor markets reduce awareness. Hence, the study suggests that close attention needs to be paid to the types of interdependencies under consideration when analysing how interdependencies influence competitive behaviour.

Understanding boundary conditions has become of central importance for advancing MMC literature (Yu & Cannella, 2013; Yu *et al.*, 2009). In this respect, a number of firm-specific (Boeker *et al.*, 1997; Gimeno & Woo, 1999; Sengul & Gimeno, 2013), dyadic (Baum & Korn, 1996; Bernheim & Whinston, 1990; Fu, 2003; Fuentelsaz & Gómez, 2006; Gimeno, 1999; Gimeno & Woo, 1996; Upson *et al.*, 2012), and environmental (Yu *et al.*, 2009) factors have been analysed. As discussed before, competition has received particular attention but results have remained inconclusive. In addition, there is an increasing recognition that idiosyncratic competitive circumstances need to be taken into account when analysing firm behaviour in general (Barnett, 1997, 2008; Barnett & McKendrick, 2004; Baum & Singh, 1994b; Chen, 1996; Chen & Miller, 2012; Chen *et al.*, 2007) and the effects of MMC in particular (Bowers *et al.*, 2014). The role of idiosyncratic competitive circumstances is, however, only beginning to be understood in this context. By taking an ecological perspective to analysing how competitive intensity influences the relationship between MMC and competitive aggressiveness the study contributes to both MMC and ecological theories of competition.

In particular, the study provides further support for and extends the idea that competitive parity is an important condition for mutual forbearance (Bowers *et al.*, 2014). Bowers *et al.* (2014) show that when exogenous shocks restore competitive parity forbearance logics are triggered. The present study extends these insights by explaining why competitive parity is a critical condition. More specifically, firms facing greater competitive intensity in combination with greater PMMC have incentives to disrupt forbearance while the opposite may be true with greater FMMC. This may be because firms facing greater competitive intensity are less likely to benefit from the current situation and, therefore, may have incentives to act when they experience PMMC while these firms may lack the ability to act with FMMC. These findings suggest that competitive parity conditions are important because especially firms facing greater competitive intensity have strong incentives to disrupt forbearance equilibria in product markets. In doing so, the study points towards the importance of considering idiosyncratic competitive circumstances when analysing how MMC influences competitive behaviour.

In highlighting the importance of considering firm-specific competitive circumstances this study also brings the discussion back to early theoretical arguments about the effect of MMC that

stress the importance of individual firms' awareness, motivations and capabilities (Chen, 1996; Karnani & Wernerfelt, 1985; McGrath *et al.*, 1998). While these early arguments had begun to explain the role of idiosyncratic incentives to maintain and disrupt forbearance the focus of subsequent work has mostly been on how increasing awareness with MMC results in less competitive behaviour, while less subsequent work has analysed and tested the effects of firm-specific motivations and abilities to disrupt forbearance. In particular, the incentives for and constraints on competitive behaviour that result from ecological competition have not been assessed. A notable exception is Barnett (1993) who suggests that MMC may reduce some of the ecological pressures firms face resulting in higher than expected survival rates. The present study adds to these insights by suggesting that even when firms benefit from MMC firms facing greater competitive intensity may still have incentives to disrupt forbearance with PMMC but less so with FMMC. These arguments also align with recent works on ecological competition that highlight how mutualistic tendencies are contingent on competitive pressures (Dobrev, 2007) and that firms facing greater competitive pressures are more willing to abandon share identities (Dobrev, 2007; Dobrev & Kim, 2006). In sum, the results indicate that interesting insights can be gained by considering ecological arguments when analysing how individual firms' competitive circumstances influence competitive behaviour.

The study also makes an empirical contribution to MMC literature. The study confirms the competition reducing effect of PMMC in a novel empirical setting that has experienced significant regulatory shifts. The results are particularly relevant as they show that MMC is not only a consideration among individual financial intermediaries (Hannan & Prager, 2004, 2009) but also among BHCs. Arguably forbearance decisions are taken at the corporate level (Sengul & Gimeno, 2013) making it essential to confirm the findings of subsidiary level studies at the corporate level. The study also measures competitive behaviour more directly using a broader range of competitive activities than has been done previously in the context of financial intermediaries. In doing so, the study shows that the predictions of the mutual forbearance hypothesis hold for financial intermediaries even when different measurements are used to assess competitive behaviour. Taken together, these results further corroborate the main ideas of the mutual forbearance hypothesis.

7.2 Additional Findings and Implications for Theory

In addition to the main contributions outlined in the previous section, the study makes a few minor contributions. Few studies have integrated theories of organisational ecology with the competitive dynamics perspective even though both focus on competition at the firm-level. In drawing on the work of Barnett (1997) and Barnett and McKendrick (2004), among others, the study shows that competitive intensity is an important determinant of competitive aggressiveness. In doing so, the study adds to the stream in competitive dynamics literature that is increasingly focusing on how competitive circumstances influence competitive behaviour (Chen & Miller, 2012). While some studies have begun to explain how perceptions of competitive tensions (Chen *et al.*, 2007) and competitor orientation (Tsai *et al.*, 2011) influence competitive behaviour, few have integrated ecological ideas about competition. An exception is Derfus *et al.* (2008) who analyse the patterns of competitive behaviour among leading firms in a broad range of industries. They show that action sequences follow patterns of Red Queen competition where actions result in better performance but also increase the number and speed of rival responses which in turn depresses performance. However, they do not analyse the role of idiosyncratic competitive circumstances. In focusing on competitive intensity from an ecological perspective, this study highlights the importance of considering the role of competitive incentives and constraints emanating from idiosyncratic competitive circumstances when analysing competitive behaviour. By explaining and showing that competitive intensity is associated with competitive aggressiveness, the study offers a pathway for further integrating the two perspectives.

In focusing on ecological theories of competition to show how competitive intensity can have significant implications for competitive behaviour, the study also responds to calls for integrating behavioural consequences into theories of Red Queen competition (Swaminathan, 2009). Ecological literature of competition has made some advances in understanding how competitive pressure can trigger competitive moves between markets segments (Dobrev, 2007) and may result in firms abandoning their segments (Dobrev & Kim, 2006). This literature, however, has only focused on competitive crowding of resources spaces without considering that competitive intensity is a function of both, competitive crowding as well as the ability to withstand such pressures (Barnett, 1997). While these models have mostly treated competitive behaviour

as a coincidental outcome (Barnett & Pontikes, 2005), the present study adds to this literature by giving a more fine-grained analysis of how competitive intensity may influence competitive behaviour. Methodologically it also advances this literature by extending the Ang (2008) measure to incorporate firm characteristics into the measurement of competitive intensity. In showing that competitive intensity is indeed associated with competitive aggressiveness, the study illuminates some behavioural consequences and suggests that such outcomes may be systematically related to competitive intensity. In doing so, the study suggests an approach for analysing the behavioural consequences of competitive intensity while taking into account crowding as well as competitive abilities. This may open up avenues for dwelling deeper into how Red Queen processes may result in competitive behaviour.

MMC literature has also scrutinised the influence of similarity on competitive behaviour in some depth. The main idea in this literature is that similar firms may be better at recognising interdependencies (Caves & Porter, 1977) and at gaining information about each other (Young *et al.*, 2000). MMC literature has paid particular attention to resource similarity (Chen, 1996; Gimeno, 1999; Gimeno & Woo, 1996), yet it still is not quite clear if similarity actually reduces competitive behaviour or not (Fuentelsaz & Gómez, 2006). The present study adds depth to this discussion by pointing to the importance of considering factor market contact as well. More specifically, resources positions are likely, at least in part, to be the result of factor markets activities. Also, similar firms are likely to experience greater factor market contact as well as greater FMMC since they need access to similar resources. The study argues that these contacts may lead to familiarity that in turn could result in a recognition of interdependencies. Hence, the study elucidates a possible mechanism through which similar firms may become aware of interdependencies, namely through their contact in factor markets.

Interestingly, the results show that the effect of FMMC becomes insignificant after including PMMC and only regains significance after including competitive intensity. In this respect, the study has the potential to reconcile some of the mixed results that have been found in regards to the influence of MMC in the context of financial intermediaries. In particular, early studies found no effects or even positive effects (Alexander, 1985; Rhoades & Heggestad, 1985; Whitehead, 1978). These studies did not distinguish between deposit and loan markets but have often mixed

both in the analysis. This study highlights that interdependencies in deposit and loan markets are conceptually distinct and need to be treated as such. This is particularly important because as this study argues theoretically and shows empirically, the competitive implications of interdependencies in these markets differ. It needs to be kept in mind that familiarity may develop more readily and deterrence may be easier in loan markets than in deposit markets and hence interdependencies in both types of markets may have distinct implications for competitive behaviour. To point this out, the study highlights the importance of paying close attention to the types of interdependencies under study in general and for financial intermediaries in particular.

The study also has methodological implications for competitive dynamics research by constructing a competitive aggressiveness measure directly from balance sheet items and regulatory filings. In doing so, it avoids some of the shortcomings associated with using structured content analysis of media outlets to identify competitive activity that has dominated competitive dynamics research (Chen & Miller, 2012). Identifying competitive actions has been an integral part and one of the major challenges for competitive dynamics research (Chen & Miller, 2012; Ketchen *et al.*, 2004; Smith *et al.*, 2001; Yu *et al.*, 2009). While advances have been made in recent years by incorporating different methodologies such as surveys (Chen *et al.*, 2007; Tsai *et al.*, 2011), fine-grained qualitative approaches (Lamberg *et al.*, 2009), computer simulations (Chen, 2007), and by focusing on different types of actions such as new product introduction (Lee *et al.*, 2003) or acquisitions (Haleblian *et al.*, 2012), there is still a need to keep refining methodological approaches in order to capture competitive dynamics more precisely (Chen & Miller, 2012). Relying on balance sheet items and required regulatory filings allows the identification of a larger range of actions while also covering a wider range of firms, thereby reducing the possibility that actions are not being reported. It also reduces the selection bias inherent in extracting newspaper articles from selected publications and the subjectivity inherent in assigning newspaper articles into action categories when constructing competitive dynamics datasets. By integrating competitive activities from multiple data sources, the study also highlights the value of drawing on a number of sources of information when identifying competitive behaviours since one source alone may not capture the different types of actions firms employ.

7.3 Practical Implications

In addition to the theoretical contributions outlined above, the study offers some practical insights for both managers and public policy makers. The results of the study point towards the need to consider interdependencies at various stages of the value chain when making strategic decisions. Managers should be aware that interdependencies matter in product markets and factor markets, but that each of these interdependencies is likely to have distinct implications for competitors' behaviours. In particular, even if managers are used to accommodative behaviour in product markets, they should not quickly jump to the conclusion that they can expect the same behaviour in factor markets because competitors may be less aware of interdependencies in these markets. The study also indicates that paying particularly close attention to factor markets when monitoring competitors' adherence to forbearance norms is necessary since these are the markets in which defection is most likely to occur. In addition, managers need to begin to consider how to devise effective retaliatory actions in factor markets, given that it is inherently difficult to implement these actions. Hence, the study alerts managers that more monitoring efforts should be directed to factor markets and the focus of existing competitive intelligence strategies may need to be adjusted.

What is more, especially managers of firms facing greater competitive intensity need to be aware of the constraints this imposes. By being conscious of the possibility that competitive circumstances restrict the types of competitive activities they are likely to resort to and the access to resources necessary to carry out such activities, managers can strive to take a more active role in devising competitive activities. As Katila and Chen (2008) suggest, these firms may want to devise their own innovate repertoires so as to ameliorate their competitive circumstances. While the value of engaging in active management to be able to leverage competitive behaviour is increasingly being recognised (Sirmon *et al.*, 2008; Sirmon *et al.*, 2007), this study informs managers of firms facing strong competition that it might be very important for them to engage in these processes. A final implication for managers of firms facing greater competitive intensity is that they need to be aware of their tendency to focus on competitive behaviour in product markets, while firms facing relatively less competition seem to concentrate their efforts more in factor markets. Since establishing strong positions in factor markets is a precursor to success in

product markets (Barney, 1986a), managers may need to reconsider this focus, especially if they want to sustain themselves against the competition they face.

The influence of MMC on competitive behaviour has been of interest to policy makers from the very beginning (Edwards, 1955). This study highlights that in addition to product market considerations, policymakers should pay attention to factor market overlaps. In particular, while it is becoming increasingly clear that PMMC should be considered in crafting and implementing competition policy (Solomon, 1970), it is still not clear how FMMC should be treated. This study indicates that PMMC is a key concern but that FMMC may play a less important role in reducing competition. The study, however, still shows that interdependencies in certain types of factor markets may be associated with a reduction of competitive behaviour. This points to the need to consider carefully the different types of interdependencies that exist between firms from a public policy perspective. It may also be important to analyse the relative competitive strength of firms when making public policy decisions especially in light of interdependencies. It is necessary to be cognizant of the possibility that firms with PMMC facing less competitive intensity forbear even more when deciding on competition policy. Hence, when assessing the effect of proposed mergers and acquisitions, for instance, it may be necessary to incorporate measures of relative competitive fitness when deciding how such business combinations may influence competition. On the other hand, this study also gives some tentative suggestions that policymakers may want to ensure factor market contact of firms facing less competitive intensity as these firms may direct their competitive efforts to these markets.

Taken together, these discussions suggest that it is important to understand how different types of interdependencies have distinct effects on competitive behaviour and how idiosyncratic competitive circumstances influence these relationships. Accordingly, it is suggested that these findings have important implications for MMC literature, the emerging literature on factor market competition as well as for ecological literature of competitive intensity, and competitive dynamics literature.

CHAPTER 8
CONCLUSION

8 CONCLUSION

This chapter wraps up the study with a discussion of the limitations and avenues for future research and with some concluding remarks.

8.1 Limitations and Future Research

The results reported in this study offer important insights into the behavioural consequences of different types of interdependencies and the role of idiosyncratic competitive circumstances in these relationships, yet this study has a number of limitations. First, this study has only focused on two types of interdependencies, namely PMMC and FMMC. However, there are other types of interdependencies that have not been considered but that may have implications for competitive behaviour. Firms may, for instance, have interdependencies in political markets as well (Capron & Chatain, 2008). In addition, Markman *et al.* (2009) discuss the implications of asymmetric FMMC while the emphasis in the present study is on more symmetric FMMC. Moreover, as discussed earlier, even within factor markets variations exist in terms of uncertainty and efficiency of these markets. While there is no reason to believe that the theoretical predictions may not hold for other interdependencies – at least for those with similar properties to the ones discussed in this study – future research is encouraged to validate the findings reported here by replicating the results with other types of interdependencies, by considering an even broader range of interdependencies and by considering more asymmetric interdependencies in factor markets.

Second, the study aggregates idiosyncratic competitive circumstance and competitive behaviour at the firm level. This seems like a reasonable level of analysis to test the framework presented in this study, especially because this level of analysis has widely been adopted in the strands of literature this study intends to contribute to. Nonetheless, a more detailed picture of the relationships presented here may be obtained by further disaggregating the effects. Competitive intensity, for instance, may differ between markets as may competitive aggressiveness. More specifically, firms may experience relatively greater competitive intensity in product markets than in factor markets or vice versa imposing different incentives and constraints in each of these types

of markets. Similarly, firms may respond with competitive behaviour that is exclusive to one type of market or only in a limited number of markets. Karnani and Wernerfelt (1985), in particular, point to the possibility that firms may limit competitive engagements to certain areas to prevent an all-out war. When aggregating, some of these nuances may be lost in the process. Hence, it may prove interesting to analyse the relationships presented in this framework at a more granular level. Future research should thus endeavour to understand how competitive intensity and competitive behaviour may be distinct at different levels of analysis.

Third, while the study focuses on the independent effects of different types of interdependencies on competitive behaviour and compares their relative strength, it is also possible that interactive effects exist. Markman *et al.* (2009), for example, suggest that firms may forbear even when attacked in product markets because they want to maintain forbearance in factor markets or vice versa indicating the forbearance in one type of market may be contingent on the level of contact in another type of market. Greve (2008b) shows that the interactive effect of firm-level and market-level MMC helps to refine predictions about how MMC influences defections from forbearance norms. The study believes that it is important to understand the independent effects first, but future research is encouraged to analyse if interactive effects can help in refining the framework presented in this study. For example, it may be fruitful to explore if reductions in competitive aggressiveness are stronger when both PMMC and FMMC are greater or if three-way interactive effects between PMMC, FMMC and competitive intensity exist.

Fourth, for analytical purposes the study has focused on a particular empirical context and a specific type of factor markets (i.e. markets for deposit). While the study argues that interesting insights can be gained by focusing on this particular context it may also be interesting to test the framework in different empirical contexts using different measures of factor market contact. Among financial intermediaries, for example, labour and physical resources are two other crucial factors of production. It may be informative to analyse contact on labour markets or markets for physical resources to validate the findings presented here. Alternatively, it may be interesting to probe whether the framework holds in different empirical contexts especially since factor markets characterised by high uncertainty have been shown to have different effects (Anand *et al.*, 2009).

This also points to another interesting avenue for future research; namely it may be interesting to investigate at which level of uncertainty in factor markets firms change their competitive logics.

8.2 Conclusion

The two main objectives of this study are to explain theoretically and examine empirically how different types of MMC influence competitive aggressiveness and how these relationships are moderated by competitive intensity. More specifically, the study asks two interrelated research questions (1) *how PMMC and FMMC affect competitive aggressiveness* and (2) *how the competitive intensity firms face influences the relationship of PMMC and FMMC and competitive aggressiveness.* These questions have been addressed by drawing on MMC literature, competitive dynamics literature, factor market competition literature and ecological ideas of competitive intensity and by testing the theoretical predictions on a sample of BHCs operating in the US in the period from 2001 to 2011.

Addressing the first question and consistent with the theoretical predictions, the study shows that both PMMC and FMMC have a negative association with competitive aggressiveness but that this association is stronger for PMMC than for FMMC. In particular, the results of the empirical testing show that there is a significant negative association between PMMC and competitive aggressiveness, that there is a significant negative association between FMMC and competitive aggressiveness – only in the fully specified model – and that the negative association between PMMC and competitive aggressiveness is significantly stronger than in the case of FMMC. Addressing the second question and consistent with the theoretical predictions, the study shows that when firms face greater competitive intensity, competitive aggressiveness decreases. The study also shows that when firms face greater competitive intensity this attenuates the negative relationship between PMMC and competitive aggressiveness while it accentuates it in the case of FMMC. More specifically, the results of the empirical testing show that the negative association between PMMC and competitive aggressiveness is positively moderated by competitive intensity while the negative association between FMMC and competitive aggressiveness is negatively moderated by competitive intensity.

These findings provide support for the argument that different types of interdependencies have distinct effects on competitive behaviour and that firms' idiosyncratic competitive circumstances are an important contingency in these relationships. In answering these questions, the study provides important insights into how interdependencies influence competitive behaviour, and the role idiosyncratic competitive circumstances play in these relationships. In conclusion, the study paves the way for a line of investigation that pays closer attention to the role different types of interdependencies play for competitive behaviour and for considering firm-level competitive incentives and constraints in theories of interdependencies.

Reference List

Adams, R. M., Brevoort, K. P., & Kiser, E. K. (2007). Who competes with whom? The case of depository institutions. *The Journal of Industrial Economics, 55*(1), 141-167.

Adegbesan, A. J. (2009). On the origins of competitive advantage: Strategic factor markets and heterogeneous resource complementarity. *Academy of Management Review, 34*(3), 463-476.

Ahuja, G., Coff, R. W., & Lee, P. M. (2005). Managerial foresight and attempted rent appropriation: Insider trading on knowledge of imminent breakthroughs. *Strategic Management Journal, 26*(9), 791-808.

Aime, F., Johnson, S., Ridge, J. W., & Hill, A. D. (2010). The routine may be stable but the advantage is not: Competitive implications of key employee mobility. *Strategic Management Journal, 31*(1), 75-87.

Alchian, A. A. (1950). Uncertainty, evolution, and economic theory. *Journal of Political Economy, 58*(3), 211-221.

Alexander, D. L. (1985). An empirical test of the mutual forbearance hypothesis: The case of bank holding companies. *Southern Economic Journal, 52*(1), 122-140.

Allison, P. D. (2009). *Fixed effects regression models*. Thousand Oaks, CA: SAGE Publications, Inc.

Amburgey, T. L., Dacin, T., & Kelly, D. (1994). Disruptive selection and population segmentation: Interpopulation competition as a segregating process. In J. A. C. Baum & J. V. Singh (Eds.), *Evolutionary dynamics of organizations* (pp. 240-254). New York: Oxford University Press.

Anand, J., Mesquita, L. F., & Vassolo, R. S. (2009). The dynamics of multimarket competition in exploration and exploitation activities. *Academy of Management Journal, 52*(4), 802-821.

Ang, S. H. (2008). Competitive intensity and collaboration: Impact on firm growth across technological environments. *Strategic Management Journal, 29*(10), 1057-1075.

Asmussen, C. G. (2010). *Chicken, stag, or rabbit? Strategic factor markets and the moderating role of downstream competition*. Paper presented at the Atlanta Competitive Advantage Conference 2010 Atlanta. http://ssrn.com/abstract=1550727

Asmussen, C. G. (2015). Strategic factor markets, scale free resources, and economic performance: The impact of product market rivalry. *Strategic Management Journal*, *36*(12), 1826-1844.

Audia, P. G., Sorenson, O., & Hage, J. (2001). Tradeoffs in the organization of production: Multiunit firms, geographic dispersion and organizational learning. In J. A. C. Baum & H. R. Greve (Eds.), *Multiunit organization and multimarket strategy* (Vol. 18, Advances in strategic management, pp. 75-105). New York: Emerald Group Publishing Limited.

Bain, J. S. (1956). *Barriers to new competition: Their character and consequences in manufacturing industries*. Cambridge, MA: Harvard University Press.

Barnett, W. P. (1993). Strategic deterrence among multipoint competitors. *Industrial and Corporate Change, 2*(2), 249-278.

Barnett, W. P. (1997). The dynamics of competitive intensity. *Administrative Science Quarterly, 42*(1), 128-160.

Barnett, W. P. (2008). *The Red Queen among organizations: How competitiveness evolves*. Princeton, NJ: Princeton University Press.

Barnett, W. P., & Burgelman, R. A. (1996). Evolutionary perspectives on strategy. *Strategic Management Journal, 17*(Summer Special Issue), 5-19.

Barnett, W. P., & Carroll, G. R. (1987). Competition and mutualism among early telephone companies. *Administrative Science Quarterly, 32*(3), 400-421.

Barnett, W. P., & Freeman, J. (2001). Too much of a good thing? Product proliferation and organizational failure. *Organization Science, 12*(5), 539-558.

Barnett, W. P., Greve, H. R., & Park, D. Y. (1994). An evolutionary model of organizational performance. *Strategic Management Journal, 15*(1), 11-28.

Barnett, W. P., & Hansen, M. T. (1996). The Red Queen in organizational evolution. *Strategic Management Journal, 17*(Summer Special Issue), 139-157.

Barnett, W. P., & McKendrick, D. G. (2004). Why are some organizations more competitive than others? Evidence from a changing global market. *Administrative Science Quarterly, 49*(4), 535-571.

Barnett, W. P., & Pontikes, E. G. (2005). The Red Queen: History-dependent competition among organizations. In B. M. Straw & R. M. Kramer (Eds.), *Research in organizational behavior: An annual series of analytical essays and critical reviews* (Vol. 26, pp. 351-371). New York: Jai-Elsevier.

Barnett, W. P., & Pontikes, E. G. (2008). The Red Queen, success bias, and organizational inertia. *Management Science, 54*(7), 1237–1251.

Barnett, W. P., & Sorenson, O. (2002). The Red Queen in organizational creation and development. *Industrial and Corporate Change, 11*(2), 289-325.

Barney, J. B. (1986a). Strategic factor markets: Expectations, luck, and business strategy. *Management Science, 32*(10), 1231-1241.

Barney, J. B. (1986b). Types of competition and the theory of strategy: Toward an integrative framework. *Academy of Management Review, 11*(4), 791-800.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Barney, J. B., Ketchen, D. J., & Wright, M. (2011). The future of resource-based theory: Revitalization or decline? *Journal of Management, 37*(5), 1299-1315.

Barron, D. N. (1999). The structuring of organizational populations. *American Sociological Review, 64*(3), 421-445.

Barron, D. N., West, E., & Hannan, M. T. (1994). A time to grow and a time to die: Growth and mortality of credit unions in New York City, 1914-1990. *American Journal of Sociology, 100*(2), 381-421.

Barth, J. R., Caprio, G., & Levine, R. (2006). *Rethinking bank regulation: Till angels govern*. New York: Cambridge University Press.

Basdeo, D. K., Smith, K. G., Grimm, C. M., Rindova, V. P., & Derfus, P. J. (2006). The impact of market actions on firm reputation. *Strategic Management Journal, 27*(12), 1205-1219.

Basel Committee on Banking Supervision. (2014). A brief history of the Basel Committee: Bank for International Settlements.

Baum, J. A. C., & Korn, H. J. (1996). Competitive dynamics of interfirm rivalry. *Academy of Management Journal, 39*(2), 255-291.

Baum, J. A. C., & Korn, H. J. (1999). Dynamics of dyadic competitive interaction. *Strategic Management Journal, 20*(3), 251-278.

Baum, J. A. C., & Mezias, S. J. (1992). Localized competition and organizational failure in the Manhattan hotel industry, 1898-1990. *Administrative Science Quarterly, 37*(4), 580-604.

Baum, J. A. C., & Singh, J. V. (1994a). Organizational niches and the dynamics of organizational founding. *Organization Science, 5*(4), 483-501.

Baum, J. A. C., & Singh, J. V. (1994b). Organizational niches and the dynamics of organizational mortality. *American Journal of Sociology, 100*(2), 346-380.

Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *The American Political Science Review, 89*(3), 634-647.

Bergen, M. E., & Peteraf, M. A. (2002). Competitor identification and competitor analysis: A broad-based managerial approach. *Managerial and Decision Economics, 23*(4-5), 157-169.

Berger, A. N., & Humphrey, D. B. (1991). The dominance of inefficiencies over scale and product mix economies in banking. *Journal of Monetary Economics, 28*(1), 117-148.

Berger, A. N., & Humphrey, D. B. (1997). Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research, 98*(2), 175-212.

Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance, 21*(7), 895-947.

Bernheim, D. B., & Whinston, M. D. (1990). Multimarket contact and collusive behaviour. *RAND Journal of Economics, 21*(1), 1-26.

Boeker, W., Goodstein, J., Stephan, J., & Murmann, J. P. (1997). Competition in a multimarket environment: The case of market exit. *Organization Science, 8*(2), 126-142.

Bourgeois, L. J. (1981). On the measurement of organizational slack. *Academy of Management Review, 6*(1), 29-39.

Bowers, A. H., Greve, H. R., Mitsuhashi, H., & Baum, J. A. C. (2014). Competitive parity, status disparity, and mutual forbearance: Securities analysts' competition for investor attention. *Academy of Management Journal, 57*(1), 38-62.

Boyd, J. L., & Bresser, R. K. F. (2008). Performance implications of delayed competitive responses: Evidence from the U.S. retail industry. *Strategic Management Journal, 29*(10), 1077-1096.

Bricker, J., Bucks, B., Kennickell, A., Mach, T., & Moore, K. (2011). Surveying the aftermath of the storm: Changes in family finances from 2007 to 2009. *Finance and Economics Discussion Series,* Retrieved from http://www.federalreserve.gov/pubs/feds/2011/201117/201117pap.pdf

Brymer, R. A., Molloy, J. C., & Gilbert, B. A. (2014). Human capital pipelines: Competitive implications of repeated interorganizational hiring. *Journal of Management, 40*(2), 483-508.

Bulow, J. I., Geanakoplos, J. D., & Klemperer, P. D. (1985). Multimarket oligopoly: Strategic substitutes and complements. *Journal of Political Economy, 93*(3), 488-511.

Burt, R. S. (1987). Social contagion and innovation: Cohesion versus structural equivalence. *American Journal of Sociology, 92*(6), 1287-1335.

Burt, R. S. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard University Press.

Busse, M. R. (2000). Multimarket contact and price coordination in the cellular telephone industry. *Journal of Economics & Management Strategy, 9*(3), 287-320.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics, 97*(3), 470-487.

Capron, L., & Chatain, O. (2008). Competitors' resource-oriented strategies: Acting on competitors' resources through interventions in factor markets and political markets. *Academy of Management Review, 33*(1), 97-121.

Carletti, E. (2008). Competition and regulation in banking. In A. V. Thakor & A. W. A. Boot (Eds.), *Handbook of financial intermediation and banking* (pp. 449-482). San Diego, CA: Elsevier.

Carnahan, S., & Somaya, D. (2013). Alumni effects and relational advantage: The impact on outsourcing when a buyer hires employees from a supplier's competitors. *Academy of Management Journal, 56*(6), 1578-1600.

Carroll, G. R. (1985). Concentration and specialization: Dynamics of niche width in populations of organizations. *American Journal of Sociology, 90*(6), 1262-1283.

Caves, R. E., & Porter, M. E. (1977). From entry barriers to mobility barriers: Conjectural decisions and contrived deterrence to new competition *Quarterly Journal of Economics, 91*(2), 241-261.

Chamberlin, E. H. (1933). *The theory of monopolistic competition*. Cambridge, MA: Harvard University Press.

Chandler, A. D. J. (1962). *Strategy and structure: Chapters in the history of the industrial enterprise*. Cambridge, MA: The MIT Press.

Chatain, O. (2011). Value creation, competition, and performance in buyer-supplier relationships. *Strategic Management Journal, 32*(1), 76-102.

Chatain, O. (2014). How do strategic factor markets respond to rivalry in the product market? *Strategic Management Journal, 35*(13), 1952-1971.

Chatain, O., & Zemsky, P. (2009). Frictions, rivalry and the emergence of heterogeneity. *Academy of Management Annual Meeting Proceedings*, 1-6.

Chen, E. L. (2007). *Strategy as competitive moves: Extending competitive dynamics research to new markets and new moves.* (Ph.D. dissertation), Stanford University, Stanford.

Chen, E. L., Katila, R., McDonald, R., & Eisenhardt, K. M. (2010a). Life in the fast lane: Origins of competitive interaction in new vs. established markets. *Strategic Management Journal, 31*(13), 1527-1547.

Chen, M.-J. (1996). Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review, 21*(1), 100-134.

Chen, M.-J., & Hambrick, D. C. (1995). Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal, 38*(2), 453-482.

Chen, M.-J., Lin, H.-C., & Michel, J. G. (2010b). Navigating in a hypercompetitive environment: The roles of action aggressiveness and TMT integration. *Strategic Management Journal, 31*(13), 1410-1430.

Chen, M.-J., & MacMillan, I. C. (1992). Nonresponse and delayed response to competitive moves: The roles of competitor dependence and action irreversibility. *Academy of Management Journal, 35*(3), 539-570.

Chen, M.-J., & Miller, D. (2012). Competitive dynamics: Themes, trends, and a prospective research platform. *Academy of Management Annals, 6*, 135-210.

Chen, M.-J., Su, K.-H., & Tsai, W. (2007). Competitive tension: The awareness-motivation-capability perspective. *Academy of Management Journal, 50*(1), 101-118.

Chen, Z., & Ross, T. W. (2007). Markets linked by rising marginal costs: Implications for multimarket contact, recoupment, and retaliatory entry. *Review of Industrial Organization, 31*(1), 1-21.

Chintagunta, P. C., & Desiraju, R. (2005). Strategic pricing and detailing behavior in international markets. *Marketing Science, 24*(1), 67-80.

Clarkson, G., & Toh, P. K. (2010). 'Keep out' signs: The role of deterrence in the competition for resources. *Strategic Management Journal, 31*(11), 1202-1225.

Coccorese, P., & Pellecchia, A. (2009). Multimarket contact and profitability in banking: Evidence from Italy. *Journal of Financial Services Research, 35*(3), 245-271.

Coccorese, P., & Pellecchia, A. (2013). Multimarket contact, competition and pricing in banking. *Journal of International Money and Finance, 37*(0), 187-214.

Connelly, B. L., Tihanyi, L., Certo, S. T., & Hitt, M. A. (2010). Marching to the beat of different drummers: The influence of institutional owners on competitive actions. *Academy of Management Journal, 53*(4), 723-742.

Cotterill, R. W., & Haller, L. E. (1992). Barrier and queue effects: A study of leading US supermarket chain entry patterns. *Journal of Industrial Economics, 40*(4), 427-440.

Cule, E. (2014). ridge: Ridge regression with automatic selection of the penalty parameter (Version 2.1-3). Retrieved from http://CRAN.R-project.org/package=ridge

Cule, E., & De Iorio, M. (2013). Ridge regression in prediction problems: Automatic choice of the ridge parameter. *Genetic Epidemiology, 37*(7), 704-714.

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.

D'Aveni, R. A. (1994). *Hypercompetition: Managing the dynamics of strategic maneuvering*. New York: Free Press.

D'Aveni, R. A., Dagnino, G. B., & Smith, K. G. (2010). The age of temporary advantage. *Strategic Management Journal, 31*(13), 1371-1385.

D'Aveni, R. A., & Ravenscraft, D. J. (1994). Economies of integration versus bureaucracy costs: Does vertical integration improve performance? *Academy of Management Journal, 37*(5), 1167-1206.

De Bonis, R., & Ferrando, A. (2000). The Italian banking structure in the 1990s: Testing the multimarket contact hypothesis. *Economic Notes, 29*(2), 215-241.

Denrell, J., Fang, C., & Winter, S. G. (2003). The economics of strategic opportunity. *Strategic Management Journal, 24*(10), 977-990.

Derfus, P. J., Maggitti, P. G., Grimm, C. M., & Smith, K. G. (2008). The Red Queen effect: Competitive actions and firm performance. *Academy of Management Journal, 51*(1), 61-80.

DeSarbo, W. S., Grewal, R., & Wind, J. (2006). Who competes with whom? A demand-based perspective for identifying and representing asymmetric competition. *Strategic Management Journal, 27*(2), 101-129.

Dewatripont, M., & Tirole, J. (1994). *The prudential regulation of banks*. Cambridge, MA: The MIT Press.

Dia, E. (2013). How do banks respond to shocks? A dynamic model of deposit-taking institutions. *Journal of Banking & Finance, 37*(9), 3623-3638.

Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science, 35*(12), 1504-1511.

Dobrev, S. D. (2007). Competing in the looking-glass market: Imitation, resources, and crowding. *Strategic Management Journal, 28*(13), 1267-1289.

Dobrev, S. D., & Carroll, G. R. (2003). Size (and competition) among organizations: Modeling scale-based selection among automobile producers in four major countries, 1885-1981. *Strategic Management Journal, 24*(6), 541-558.

Dobrev, S. D., & Kim, T.-Y. (2006). Positioning among organizations in a population: Moves between market segments and the evolution of industry structure. *Administrative Science Quarterly, 51*(2), 230-261.

Dobrev, S. D., Kim, T.-Y., & Carroll, G. R. (2003). Shifting gears, shifting niches: Organizational inertia and change in the evolution of the U.S. automobile industry, 1885–1981. *Organization Science, 14*(3), 264-282.

Dobrev, S. D., Kim, T.-Y., & Hannan, M. T. (2001). Dynamics of niche width and resource partitioning. *American Journal of Sociology, 106*(5), 1299-1337.

Drukker, D. M. (2003). Testing for serial correlation in linear panel-data models. *Stata Journal, 3*(2), 168-177.

Edwards, C. D. (1955). Conglomerate bigness as a source of power. In G. Stigler (Ed.), *Business concentration and price policy* (pp. 329 - 358). Princeton, NJ: Princeton University Press.

Ethiraj, S. K., & Zhu, D. H. (2008). Performance effects of imitative entry. *Strategic Management Journal, 29*(8), 797-817.

Evans, W. N., & Kessides, I. N. (1994). Living by the "golden rule": Multimarket contact in the U.S. airline industry. *Quarterly Journal of Economics, 109*(2), 341-366.

Feinberg, R. M. (1985). 'Sales-at-risk': A test of the mutual forbearance theory of conglomerate behavior. *The Journal of Business, 58*(2), 225-242.

Fernández, N., & Marín, P. L. (1998). Market power and multimarket contact: Some evidence from the Spanish hotel industry. *Journal of Industrial Economics, 46*(3), 301-315.

Ferrier, W. J. (2000). Playing to win: The role of competitive disruption and aggressiveness. In R. K. F. Bresser, M. A. Hitt, D. Heuskel & R. Nixon (Eds.), *Winning strategies in a deconstructing world* (pp. 163–189). Chichester, England: Wiley.

Ferrier, W. J. (2001). Navigating the competitive landscape: The drivers and consequences of competitive aggressiveness. *Academy of Management Journal, 44*(4), 858-877.

Ferrier, W. J., Fhionnlaoich, C. M., Smith, K. G., & Grimm, C. M. (2002). The impact of performance distress on aggressive competitive behavior: A reconciliation of conflicting views. *Managerial and Decision Economics, 23*(4-5), 301-316.

Ferrier, W. J., & Lyon, D. W. (2004). Competitive repertoire simplicity and firm performance: The moderating role of top management team heterogeneity. *Managerial and Decision Economics, 25*(6-7), 317-327.

Ferrier, W. J., Smith, K. G., & Grimm, C. M. (1999). The role of competitive action in market share erosion and industry dethronement: A study of industry leaders and challengers. *Academy of Management Journal, 42*(4), 372-388.

Freixas, X., Parigi, B. M., & Rochet, J. C. (2000). Systemic risk, interbank relations, and liquidity provision by the Central Bank. *Journal of Money Credit and Banking, 32*(3), 611-638.

Frynas, J. G., Mellahi, K., & Pigman, G. A. (2006). First mover advantages in international business and firm-specific political resources. *Strategic Management Journal, 27*(4), 321-345.

Fu, W. W. (2003). Multimarket contact of US newspaper chains: Circulation competition and market coordination. *Information Economics and Policy, 15*(4), 501-519.

Fuentelsaz, L., & Gómez, J. (2006). Multipoint competition, strategic similarity and entry into geographic markets. *Strategic Management Journal, 27*(5), 477-499.

Fuentelsaz, L., Gómez, J., & Polo, Y. (2002). Followers' entry timing: Evidence from the Spanish banking sector after deregulation. *Strategic Management Journal, 23*(3), 245-264.

Fulmer, I. S., & Ployhart, R. E. (2014). “Our most important asset”: A multidisciplinary/multilevel review of human capital valuation for research and practice. *Journal of Management, 40*(1), 161-192.

Gardner, T. M. (2005). Interfirm competition for human resources: Evidence from the software industry. *Academy of Management Journal, 48*(2), 237-256.

Ghemawat, P., & Thomas, C. (2008). Strategic interaction across countries and multinational agglomeration: An application to the cement industry. *Management Science, 54*(12), 1980-1996.

Gimeno, J. (1999). Reciprocal threats in multimarket rivalry: Staking out 'spheres of influence' in the U.S. airline industry. *Strategic Management Journal, 20*(2), 101-128.

Gimeno, J. (2002). The performance effects of unintended and purposive multimarket contact. *Managerial and Decision Economics, 23*(4-5), 209-224.

Gimeno, J., Chen, M.-J., & Bae, J. (2006). Dynamics of competitive repositioning: A multidimensional approach. In J. A. C. Baum, S. D. Dobrev & A. V. Witteloostuijn (Eds.), *Ecology and strategy* (Vol. 23, Advances in strategic management, pp. 399-441). New York: Emerald Group Publishing Limited.

Gimeno, J., & Jeong, E. (2001). Multimarket contact: Meaning and measurement at multiple levels of analysis. In J. A. C. Baum & H. R. Greve (Eds.), *Multiunit organization and multimarket strategy* (Vol. 18, Advances in strategic management, pp. 357-408). New York: Emerald Group Publishing Limited.

Gimeno, J., & Woo, C. Y. (1996). Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation. *Organization Science, 7*(3), 322-341.

Gimeno, J., & Woo, C. Y. (1999). Multimarket contact, economies of scope, and firm performance. *Academy of Management Journal, 42*(3), 239-259.

Gnyawali, D. R., He, J., & Madhavan, R. (2006). Impact of co-opetition on firm competitive behavior: An empirical examination. *Journal of Management, 32*(4), 507-530.

Gnyawali, D. R., & Madhavan, R. (2001). Cooperative networks and competitive dynamics: A structural embeddedness perspective. *Academy of Management Review, 26*(3), 431-445.

Golden, B. R., & Ma, H. (2003). Mutual forbearance: The role of intrafirm integration and rewards. *Academy of Management Review, 28*(3), 479-493.

Greene, W. H. (2003). *Econometric analysis* (5 ed.). Upper Saddle River, NJ: Pearson/Prentice Hall.

Greve, H. R. (2000). Market niche entry decisions: Competition, learning, and strategy in Tokyo banking, 1894-1936. *Academy of Management Journal, 43*(5), 816-836.

Greve, H. R. (2006). The intent and extent of multimarket contact. *Strategic Organization, 4*(3), 249-274.

Greve, H. R. (2008a). A behavioral theory of firm growth: Sequential attention to size and performance goals. *Academy of Management Journal, 51*(3), 476-494.

Greve, H. R. (2008b). Multimarket contact and sales growth: Evidence from insurance. *Strategic Management Journal, 29*(3), 229-249.

Greve, H. R., & Baum, J. A. C. (2001). Introduction: A multiunit, multimarket world. In J. A. C. Baum & H. R. Greve (Eds.), *Multiunit organization and multimarket strategy* (Vol. 18, Advances in strategic management, pp. 1-28). New York: Emerald Group Publishing Limited.

Grimm, C. M., Lee, H., & Smith, K. G. (2006). *Strategy as action: Competitive dynamics and competitive advantage*. New York: Oxford University Press.

Grimpe, C., & Hussinger, K. (2014). Resource complementarity and value capture in firm acquisitions: The role of intellectual property rights. *Strategic Management Journal, 35*(12), 1762-1780.

Guedri, Z., & McGuire, J. (2011). Multimarket competition, mobility barriers, and firm performance. *Journal of Management Studies, 48*(4), 857-890.

Gupta, S. (2001). The effect of bid rigging on prices: A study of the highway construction industry. *Review of Industrial Organization, 19*(4), 453-467.

Hair, J. F., Anderson, R., Tatham, R. L., & Black, W. C. (2006). *Multivariate data analysis* (6 ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Haleblian, J., McNamara, G., Kolev, K., & Dykes, B. J. (2012). Exploring firm characteristics that differentiate leaders from followers in industry merger waves: A competitive dynamics perspective. *Strategic Management Journal, 33*(9), 1037-1052.

Hambrick, D. C., Cho, T. S., & Chen, M.-J. (1996). The influence of top management team heterogeneity on firms' competitive moves. *Administrative Science Quarterly, 41*(4), 659-684.

Hancock, D. (1985). The financial firm: Production with monetary and nonmonetary goods. *Journal of Political Economy, 93*(5), 859-880.

Hannan, M. T., & Carroll, G. R. (1992). *Dynamics of organizational populations: Density, legitimation, and competition*. New York: Oxford University Press.

Hannan, M. T., & Freeman, J. (1977). The population ecology of organizations. *American Journal of Sociology, 82*(5), 929-964.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review, 49*(2), 149-164.

Hannan, M. T., & Freeman, J. (1989). *Organizational ecology*. Cambridge, MA: Harvard University Press.

Hannan, M. T., Pólos, L., & Carroll, G. R. (2007). *Logics of organization theory: Audiences, codes, and ecologies*. Princeton, NJ: Princeton University Press.

Hannan, T. H., & Prager, R. A. (2004). The competitive implications of multimarket bank branching. *Journal of Banking and Finance, 28*(8), 1889-1914.

Hannan, T. H., & Prager, R. A. (2009). The profitability of small single-market banks in an era of multi-market banking. *Journal of Banking and Finance, 33*(2), 263-271.

Haveman, H. A., & Nonnemaker, L. (2000). Competition in multiple geographic markets: The impact on growth and market entry. *Administrative Science Quarterly, 45*(2), 232-267.

Hawley, A. H. (1950). *Human ecology: A theory of community structure*. New York: Ronald Press Co.

Heggestad, A. A., & Rhoades, S. A. (1978). Multi-market interdependence and local market competition in banking. *The Review of Economics and Statistics, 60*(4), 523-532.

Hermelo, F. D., & Vassolo, R. (2010). Institutional development and hypercompetition in emerging economies. *Strategic Management Journal, 31*(13), 1457-1473.

Hsiao, C. (1986). *Analysis of panel data*. Cambridge, England: Cambridge University Press.

Hughes, K., & Oughton, C. (1993). Diversification, multi-market contact and profitability. *Economica, 60*(238), 203-224.

Hutzschenreuter, T., & Gröne, F. (2009a). Changing vertical integration strategies under pressure from foreign competition: The case of US and German multinationals. *Journal of Management Studies, 46*(2), 269-307.

Hutzschenreuter, T., & Gröne, F. (2009b). Product and geographic scope changes of multinational enterprises in response to international competition. *Journal of International Business Studies, 40*(7), 1149-1170.

Jans, I., & Rosenbaum, D. I. (1997). Multimarket contact and pricing: Evidence from the U.S. cement industry. *International Journal of Industrial Organization, 15*(3), 391-412.

Jayachandran, S., Gimeno, J., & Varadarajan, P. R. (1999). The theory of multimarket competition: A synthesis and implications for marketing strategy. *Journal of Marketing, 63*(3), 49-66.

Johnson, S. A. (1997). An empirical analysis of the determinants of corporate debt ownership structure. *Journal of Financial and Quantitative Analysis, 32*(1), 47-69.

Kalnins, A. (2004). Divisional multimarket contact within and between multiunit organizations. *Academy of Management Journal, 47*(1), 117-128.

Kang, W., Bayus, B. L., & Balasubramanian, S. (2010). The strategic effects of multimarket contact: Mutual forbearance and competitive response in the personal computer industry. *Journal of Marketing Research, 47*(3), 415-427.

Kapoor, R., & Furr, N. R. (2015). Complementarities and competition: Unpacking the drivers of entrants' technology choices in the solar photovoltaic industry. *Strategic Management Journal, 36*(3), 416-436.

Karnani, A., & Wernerfelt, B. (1985). Multiple point competition *Strategic Management Journal, 6*(1), 87-96.

Katila, R., & Chen, E. L. (2008). Effects of search timing on innovation: The value of not being in sync with rivals. *Administrative Science Quarterly, 53*(4), 593-625.

Keil, T., Laamanen, T., & McGrath, R. G. (2013). Is a counterattack the best defense? Competitive dynamics through acquisitions. *Long Range Planning, 46*(3), 195-215.

Kennedy, P. (1998). *A guide to econometrics* (3 ed.). Cambridge, MA: The MIT Press.

Ketchen, D. J. J., Snow, C. C., & Hoover, V. L. (2004). Research on competitive dynamics: Recent accomplishments and future challenges. *Journal of Management, 30*(6), 779-804.

Khessina, O. M. (2006). Direct and indirect effects of product portfolio on firm survival in the worldwide optical disk drive industry, 1983–1999. In J. A. C. Baum, S. D. Dobrev & A. V. Witteloostuijn (Eds.), *Ecology and strategy* (Vol. 23, Advances in strategic management, pp. 591-630). New York: Emerald Group Publishing Limited.

Khessina, O. M., & Carroll, G. R. (2008). Product demography of de novo and de alio firms in the optical disk drive industry, 1983-1999. *Organization Science, 19*(1), 25-38.

Kilduff, G. J., Elfenbein, H. A., & Staw, B. M. (2010). The psychology of rivalry: A relationally dependent analysis of competition. *Academy of Management Journal, 53*(5), 943-969.

Kim, C., & Bettis, R. A. (2014). Cash is surprisingly valuable as a strategic asset. *Strategic Management Journal, 35*(13), 2053-2063.

Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago: University of Chicago Press.

Klein, M. A. (1971). A theory of the banking firm. *Journal of Money, Credit & Banking, 3*(2), 205-218.

Knott, A. M. (2003). The organizational routines factor market paradox. *Strategic Management Journal, 24*(10), 929-943.

Korn, H. J., & Baum, J. A. C. (1999). Chance, imitative, and strategic antecedents to multimarket contact. *Academy of Management Journal, 42*(2), 171-193.

Kosak, M., Li, S. F., Loncarski, I., & Marinc, M. (2015). Quality of bank capital and bank lending behavior during the global financial crisis. *International Review of Financial Analysis, 37*, 168-183.

Lamberg, J.-A., Tikkanen, H., Nokelainen, T., & Suur-Inkeroinen, H. (2009). Competitive dynamics, strategic consistency, and organizational survival. *Strategic Management Journal, 30*(1), 45-60.

Lee, C.-H., Venkatraman, N., Tanriverdi, H., & Iyer, B. (2010). Complementarity-based hypercompetition in the software industry: Theory and empirical test, 1990–2002. *Strategic Management Journal, 31*(13), 1431-1456.

Lee, H., Smith, K. G., & Grimm, C. M. (2003). The effect of new product radicality and scope on the extent and speed of innovation diffusion. *Journal of Management, 29*(5), 753-768.

Lerner, J., Tirole, J., & Strojwas, M. (2003). Cooperative marketing agreements between competitors: Evidence from patent pools *Working paper No. 9680*. Cambridge, MA: National Bureau Of Economic Research

Li, S. X., & Greenwood, R. (2004). The effect of within-industry diversification on firm performance: Synergy creation, multi-market contact and market structuration. *Strategic Management Journal, 25*(12), 1131-1153.

Lippman, S. A., & Rumelt, R. P. (2003). A bargaining perspective on resource advantage. *Strategic Management Journal, 24*(11), 1069-1086.

Livengood, R. S., & Reger, R. K. (2010). That's our turf! Identity domains and competitive dynamics. *Academy of Management Review, 35*(1), 48-66.

Mahoney, J. T., & Qian, L. (2013). Market frictions as building blocks of an organizational economics approach to strategic management. *Strategic Management Journal, 34*(9), 1019-1041.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal, 22*(5), 387-401.

Makadok, R. (2003). Doing the right thing and knowing the right thing to do: Why the whole is greater than the sum of the parts. *Strategic Management Journal, 24*(10), 1043-1055.

Marcel, J. J., Barr, P. S., & Duhaime, I. M. (2011). The influence of executive cognition on competitive dynamics. *Strategic Management Journal, 32*(2), 115-138.

March, J. G. (1988). *Decisions and organizations*. Cambridge, MA: Basil Blackwell.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*(1), 71-87.

March, J. G., & Simon, H. A. (1958). *Organizations*. New York: Wiley.

Markman, G. D., Gianiodis, P. T., & Buchholtz, A. K. (2009). Factor-market rivalry. *Academy of Management Review, 34*(3), 423-441.

Martinez, J. E. (1990). The linked oligopoly concept: Recent evidence from banking. *Journal of Economic Issues, 24*(2), 589-595.

Más-Ruiz, F. J., Nicolau-Gonzálbez, J. L., & Ruiz-Moreno, F. (2005). Asymmetric rivalry between strategic groups: Response, speed of response and ex ante vs. ex post competitive interaction in the Spanish bank deposit market. *Strategic Management Journal, 26*(8), 713-745.

Más-Ruiz, F. J., & Ruiz-Moreno, F. (2011). Rivalry within strategic groups and consequences for performance: The firm-size effects. *Strategic Management Journal, 32*(12), 1286–1308.

Más-Ruiz, F. J., Ruiz-Moreno, F., & Ladrón de Guevara Martínez, A. (2014). Asymmetric rivalry within and between strategic groups. *Strategic Management Journal, 35*(3), 419-439.

Matsushima, H. (2001). Multimarket contact, imperfect monitoring, and implicit collusion. *Journal of Economic Theory, 98*(1), 158-178.

McCann, B. T., & Vroom, G. (2010). Pricing response to entry and agglomeration effects. *Strategic Management Journal, 31*(3), 284-305.

McGrath, R. G., Chen, M.-J., & MacMillan, I. C. (1998). Multimarket manoeuvring in uncertain spheres of influence: Resource diversion strategies. *Academy of Management Review, 23*(4), 724-740.

McNamara, G. M., Deephouse, D. L., & Luce, R. A. (2003). Competitive positioning within and across a strategic group structure: The performance of core, secondary, and solitary firms. *Strategic Management Journal, 24*(2), 161-181.

McNamara, G. M., Haleblian, J., & Dykes, B. J. (2008). The performance implications of participating in an acquisition wave: Early mover advantages, bandwagon effects, and the moderating influence of industry characteristics and acquirer tactics. *Academy of Management Journal, 51*(1), 113-130.

McPherson, M. (1983). An ecology of affiliation. *American Sociological Review, 48*(4), 519-532.

Mester, L. J. (1987). Multiple market contact between savings and loans. *Journal of Money, Credit & Banking, 19*(4), 538-549.

Mester, L. J. (1992). Perpetual signalling with imperfectly correlated costs. *RAND Journal of Economics, 23*(4), 548-563.

Mezias, S. J., & Boyle, E. (2005). Blind trust: Market control, legal environments, and the dynamics of competitive intensity in the early American film industry, 1893-1920. *Administrative Science Quarterly, 50*(1), 1-34.

Mezias, S. J., & Lant, T. K. (1994). Mimetic learning and the evolution of organizational populations. In J. A. C. Baum & J. V. Singh (Eds.), *Evolutionary dynamics of organizations* (pp. 179-198). New York: Oxford University Press.

Miller, D., & Chen, M.-J. (1994). Sources and consequences of competitive inertia: A study of the U.S. airline industry. *Administrative Science Quarterly, 39*(1), 1-23.

Miller, D., & Chen, M.-J. (1996a). Nonconformity in competitive repertoires: A sociological view of markets. *Social Forces, 74*(4), 1209-1234.

Miller, D., & Chen, M.-J. (1996b). The simplicity of competitive repertoires: An empirical analysis. *Strategic Management Journal, 17*(6), 419-439.

Miller, S. R., & Parkhe, A. (2002). Is there a liability of foreignness in global banking? An empirical test of banks' X-efficiency. *Strategic Management Journal, 23*(1), 55-75.

Moliterno, T. P., & Wiersema, M. F. (2007). Firm performance, rent appropriation, and the strategic resource divestment capability. *Strategic Management Journal, 28*(11), 1065-1087.

Molnar, J., Violi, R., & Zhou, X. (2013). Multimarket contact in Italian retail banking: Competition and welfare. *International Journal of Industrial Organization, 31*(5), 368-381.

Murakami, H., & Asahi, R. (2011). An empirical analysis of the effect of multimarket contacts on US air carriers' pricing behaviors. *Singapore Economic Review, 56*(4), 593-600.

Nadkarni, S., & Barr, P. S. (2008). Environmental context, managerial cognition, and strategic action: An integrated view. *Strategic Management Journal, 29*(13), 1395-1427.

Nair, A., & Filer, L. (2003). Cointegration of firm strategies within groups: A long-run analysis of firm behavior in the Japanese steel industry. *Strategic Management Journal, 24*(2), 145-159.

Ndofor, H. A., Sirmon, D. G., & He, X. (2011). Firm resources, competitive actions and performance: Investigating a mediated model with evidence from the in-vitro diagnostics industry. *Strategic Management Journal, 32*(6), 640-657.

Nelson, R. R., & Winter, S. G. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press of Harvard University Press.

Pacheco-de-Almeida, G. (2010). Erosion, time compression, and self-displacement of leaders in hypercompetitive environments. *Strategic Management Journal, 31*(13), 1498-1526.

Parker, P. M., & Röller, L.-H. (1997). Collusive conduct in duopolies: Multimarket contact and cross-ownership in the mobile telephone industry. *RAND Journal of Economics, 28*(2), 304-322.

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal, 14*(3), 179-191.

Peteraf, M. A., & Bergen, M. E. (2003). Scanning dynamic competitive landscapes: A market-based and resource-based framework. *Strategic Management Journal, 24*(10), 1027-1041.

Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective*. New York: Harper & Row.

Phillips, D. J. (2002). A genealogical approach to organizational life chances: The parent-progeny transfer among Silicon Valley law firms, 1946-1996. *Administrative Science Quarterly, 47*(3), 474-506.

Pilloff, S. J. (1999). Multimarket contact in banking. *Review of Industrial Organization, 14*(2), 163-182.

Ployhart, R. E., Nyberg, A. J., Reilly, G., & Maltarich, M. A. (2014). Human capital is dead; long live human capital resources! *Journal of Management, 40*(2), 371-398.

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.

Prais, S. J., & Winsten, C. B. (1954). Trend estimators and serial correlation *Cowles Commission Discussion Paper 383*. New Haven, CT: Cowles Foundation.

Prince, J. T., & Simon, D. H. (2009). Multimarket contact and service quality: Evidence from on-time performance in the U.S. airline industry. *Academy of Management Journal, 52*(2), 336-354.

R Core Team. (2014). R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from http://www.R-project.org/

Ranger-Moore, J. (1997). Bigger may be better, but is older wiser? Organizational age and size in the New York life insurance industry. *American Sociological Review, 62*(6), 903-920.

Rhoades, S. A., & Heggestad, A. A. (1985). Multimarket interdependence and performance in banking: Two tests. *The Antitrust Bulletin*(Winter)*, 30*, 975-995.

Ricardo, D. (1817). *On the principles of political economy and taxation*. London: John Murray.

Ricketts, M. J. (1988). *Neoclassical microeconomics*. Brookfield, WI: E. Elgar.

Rindova, V., Ferrier, W. J., & Wiltbank, R. (2010). Value from gestalt: How sequences of competitive actions create advantage for firms in nascent markets. *Strategic Management Journal, 31*(13), 1474-1497.

Rose, E., & Ito, K. (2009). Past interactions and new foreign direct investment location decisions: Firm-specific analysis in the global tire industry. *Management International Review, 49*(5), 641-669.

Ross, D. G. (2012). On evaluation costs in strategic factor markets: The implications for competition and organizational design. *Management Science, 58*(4), 791-804.

Roussakis, E. N. (1997). *Commercial banking in an era of deregulation* (3 ed.). Westport, CT: Praeger.

Russell, C. J., & Dean, M. A. (2000). To log or not to log: Bootstrap as an alternative to the parametric estimation of moderation effects in the presence of skewed dependent variables. *Organizational Research Methods, 3*(2), 166-185

Sandler, R. D. (1988). Market share instability in commercial airline markets and the impact of deregulation. *Journal of Industrial Economics, 36*(3), 327-335.

Santos, J. A. C. (2001). Bank capital regulation in contemporary banking theory: A review of the literature. *Financial Markets, Institutions & Instruments, 10*(2), 41-84.

Scherer, F. M., & Ross, D. (1990). *Industrial market structure and economic performance* (3 ed.). Boston, MA: Houghton Mifflin.

Schmidt, J., & Keil, T. (2013). What makes a resource valuable? Identifying the drivers of firm-idiosyncratic resource value. *Academy of Management Review, 38*(2), 206-228.

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press.

Scott, J. T. (1982). Multimarket contact and economic performance. *The Review of Economics and Statistics, 64*(3), 368-375.

Scott, J. T. (1991). Multimarket contact among diversified oligopolists. *International Journal of Industrial Organization, 9*(2), 225-238.

Scott, J. T. (2001). Designing multimarket-contact hypothesis tests: Patent citations and multimarket contact in the product and innovation markets of the chemicals industry. In J. A. C. Baum & H. R. Greve (Eds.), *Multiunit organization and multimarket strategy* (Vol. 18, Advances in strategic management, pp. 175-202). New York: Emerald Group Publishing Limited.

Sealey, J. C. W., & Lindley, J. T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance, 32*(4), 1251-1266.

Semadeni, M., & Anderson, B. S. (2010). The follower's dilemma: Innovation and imitation in the professional services industry. *Academy of Management Journal, 53*(5), 1175-1193.

Sengul, M., & Gimeno, J. (2013). Constrained delegation: Limiting subsidiaries' decision rights and resources in firms that compete across multiple industries. *Administrative Science Quarterly, 58*(3), 420-471.

Shakun, M. F. (1965). Advertising expenditures in coupled markets - A game-theory approach. *Management Science, 11*(4), B42-B47.

Shakun, M. F. (1966). A dynamic model for competitive marketing in coupled markets. *Management Science, 12*(12), B525-B530.

Shamsie, J., Phelps, C., & Kuperman, J. (2004). Better late than never: A study of late entrants in household electrical equipment. *Strategic Management Journal, 25*(1), 69-84.

Shankar, V. (1999). New product introduction and incumbent response strategies: Their interrelationship and the role of multimarket contact. *Journal of Marketing Research, 36*(3), 327-344.

Shipilov, A. V. (2009). Firm scope experience, historic multimarket contact with partners, centrality, and the relationship between structural holes and performance. *Organization Science, 20*(1), 85-106.

Shoukri, M. M. (2011). *Measures of interobserver agreement and reliability* (2 ed.). Boca Raton, FL: CRC Press.

Silverman, B. S., & Baum, J. A. C. (2002). Alliance-based competitive dynamics. *Academy of Management Journal, 45*(4), 791-806.

Simmel, G. (1950). *The sociology of Georg Simmel* (K. H. Wolff, Trans.). Glencoe, IL: Free Press.

Simon, D. H. (2005). Incumbent pricing responses to entry. *Strategic Management Journal, 26*(13), 1229-1248.

Singal, V. (1996). Airline mergers and multimarket contact. *Managerial and Decision Economics, 17*(6), 559-574.

Sirmon, D. G., Gove, S., & Hitt, M. A. (2008). Resource management in dyadic competitive rivalry: The effects of resource bundling and deployment. *Academy of Management Journal, 51*(5), 919-935.

Sirmon, D. G., & Hitt, M. A. (2009). Contingencies within dynamic managerial capabilities: Interdependent effects of resource investment and deployment on firm performance. *Strategic Management Journal, 30*(13), 1375-1394.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review, 32*(1), 273-292.

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource orchestration to create competitive advantage. *Journal of Management, 37*(5), 1390-1412.

Skilton, P. F., & Bernardes, E. (2015). Competition network structure and product market entry. *Strategic Management Journal*, *36*(11), 1688-1696.

Smith, K. G., Ferrier, W. J., & Ndofor, H. (2001). Competitive dynamics research: Critique and future directions. In M. A. Hitt, R. E. Freeman & J. S. Harrison (Eds.), *The Blackwell handbook of strategic management* (pp. 315-361). Malden, MA: Blackwell Publishing Ltd.

Smith, K. G., Grimm, C. M., Gannon, M. J., & Chen, M.-J. (1991). Organizational information processing, competitive responses, and performance in the U.S. domestic airline industry *Academy of Management Journal, 34*(1), 60-85.

Smith, K. G., Grimm, C. M., Young, G., & Wally, S. (1997). Strategic groups and rivalrous firm behavior: Towards a reconciliation. *Strategic Management Journal, 18*(2), 149-157.

Solomon, E. H. (1970). Bank merger policy and problems: A linkage theory of oligopoly. *Journal of Money, Credit and Banking, 2*(3), 323-336.

Soltis, S. M., Sterling, C. M., Borgatti, S. P., & Ferrier, W. J. (2010). College football recruiting: A test of factor market competition theory. *Academy of Management Annual Meeting Proceedings*, 1-6.

Sorenson, T. L. (2007). Credible collusion in multimarket oligopoly. *Managerial and Decision Economics, 28*(2), 115-128.

Spagnolo, G. (1999). On interdependent supergames: Multimarket contact, concavity, and collusion. *Journal of Economic Theory, 89*(1), 127-139.

Spong, K. (2000). *Banking regulation: Its purposes, implementation, and effects* (5 ed.). Kansas City, MI: Division of Supervision and Risk Management Federal Reserve Bank of Kansas City.

Stephan, J., & Boeker, W. (2001). Getting to multimarket competition: How multimarket contact affects firms' market entry decisions. In J. A. C. Baum & H. R. Greve (Eds.), *Multiunit organization and multimarket strategy* (Vol. 18, Advances in strategic management, pp. 229-261). New York: Emerald Group Publishing Limited.

Stephan, J., Murmann, J. P., Boeker, W., & Goodstein, J. (2003). Bringing managers into theories of multimarket competition: CEOs and the determinants of market entry. *Organization Science, 14*(4), 403-421.

Stigler, G. J. (1964). A theory of oligopoly. *Journal of Political Economy, 72*(1), 44-61.

Stigler, G. J. (2008). Competition. In S. N. Durlauf & L. E. Blume (Eds.), *The New Palgrave dictionary of economics*. Basingstoke, NH: Palgrave Macmillan.

Strickland, A. D. (1985). Conglomerate mergers, mutual forbearance behaviour and price competition. *Managerial and Decision Economics, 6*(3), 153-159.

Swaminathan, A. (2009). The Red Queen among organizations: How competitiveness evolves. *Administrative Science Quarterly, 54*(4), 689-691.

Thomas, C. J., & Willig, R. D. (2006). The risk of contagion from multimarket contact. *International Journal of Industrial Organization, 24*(6), 1157-1184.

Tsai, W., Su, K.-H., & Chen, M.-J. (2011). Seeing through the eyes of a rival: Competitor acumen based on rival-centric perceptions. *Academy of Management Journal, 54*(4), 761-778.

U.S. Bureau of Economic Analysis. (2011). Industry economic accounts. Retrieved from http://www.bea.gov/industry/

U.S. Census Bureau. (2007). North American industry classification system. Retrieved from http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart_code=52&search=2007%20NAICS%20Search

U.S. Census Bureau. (2009). Statistics of US businesses. Retrieved from http://www.census.gov/econ/susb/

U.S. Census Bureau. (2011). Annual & quarterly services. Retrieved from http://www.census.gov/services/index.html

U.S. Department of the Treasury Office of the Comptroller of the Currency, Federal Reserve System, & Federal Deposit Insurance Corporation. (2012). *Risk-based capital guidelines: Market risk.* Federal Register.

Upson, J. W., Ketchen, J. D. J., Connelly, B. L., & Ranft, A. L. (2012). Competitor analysis and foothold moves. *Academy of Management Journal, 55*(1), 93-110.

VanHoose, D. (2010). *The industrial organization of banking*. Berlin, Germany: Springer-Verlag.

Voss, G. B., & Voss, Z. G. (2008). Competitive density and the customer acquisition-retention trade-off. *Journal of Marketing, 72*(6), 3-18.

Weigelt, C., & Miller, D. J. (2013). Implications of internal organization structure for firm boundaries. *Strategic Management Journal, 34*(12), 1411-1434.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171-180.

Wernerfelt, B. (2011). The use of resources in resource acquisition. *Journal of Management, 37*(5), 1369-1373.

Whalen, G. W. (1996). Nonlocal concentration, multimarket linkages, and interstate banking. *Antitrust Bulletin, 41*(2), 365.

Whitehead, D. D. (1978). *An empirical test of the linked oligopoly theory: An analysis of Florida holding companies.* Paper presented at the Conference on Bank Structure and Competition, Chicago IL.

Wholey, D. R., Christianson, J. B., & Sanchez, S. M. (1992). Organization size and failure among health maintenance organizations. *American Sociological Review, 57*(6), 829-842.

Wooldridge, J. A. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: The MIT Press.

Young, G., Smith, K. G., & Grimm, C. M. (1996). "Austrian" and industrial organization perspectives on firm-level competitive activity and performance. *Organization Science, 7*(3), 243-254.

Young, G., Smith, K. G., Grimm, C. M., & Simon, D. (2000). Multimarket contact and resource dissimilarity: A competitive dynamics perspective. *Journal of Management, 26*(6), 1217-1236.

Yu, T., & Cannella, A. A. J. (2007). Rivalry between multinational enterprises: An event history approach. *Academy of Management Journal, 50*(3), 665-686.

Yu, T., & Cannella, A. A. J. (2013). A comprehensive review of multimarket competition research. *Journal of Management, 39*(1), 76-109.

Yu, T., Subramaniam, M., & Cannella, A. A. J. (2009). Rivalry deterrence in international markets: Contingencies governing the mutual forbearance hypothesis. *Academy of Management Journal, 52*(1), 127-147.

Ziedonis, R. H. (2004). Don't fence me in: Fragmented markets for technology and the patent acquisition strategies of firms. *Management Science, 50*(6), 804-820.

Zou, L., Dresner, M., & Windle, R. (2011). Many fields of battle: How cost structure affects competition across multiple markets. *Journal of Transport Economics & Policy, 45*(1), 21-40.

Zou, L., Yu, C., & Dresner, M. (2012). Multimarket contact, alliance membership, and prices in international airline markets. *Transportation Research Part E: Logistics and Transportation Review, 48*(2), 555-565.

Appendices

Appendix A: List of Regulatory Item Names/Codes used in the Calculations

Names	Regulatory item names/codes	Source
Acquisitions	211; 221; 222; 223	Reports on Structure Changes
All other loans secured by 1-4 family residential properties: secured by first liens	BHDM5367	FR Y-9 Report
All other loans secured by 1-4 family residential properties: secured by junior liens	BHDM5368	FR Y-9 Report
Charter conversions	310; 320; 330; 340; 410; 420; 430; 440; 470; 610	Reports on Structure Changes
Commercial and industrial loans	RCON1761	CALL Reports
Commercial and industrial loans	BHDM1766	FR Y-9 Report
Construction and land development loans	BHDM1415	FR Y-9 Report
Federal funds rate	FEDFUNDS	FRED
Financial holding company	RSSD9016	FR Y-9 Report
Firm age	RSSD9950	FR Y-9 Report
Firm complexity	RSSD9057	FR Y-9 Report
Firm is listed	RSSD9056	FR Y-9

Names	Regulatory item names/codes	Source
		Report
Firm number of banks	RSSD9146	FR Y-9 Report
Firm past performance	BHCK4340; BHCK2170	FR Y-9 Report
Firm size	BHCK2170	FR Y-9 Report
Firm slack	BHCK2170; BHCK2948	FR Y-9 Report
GDP Growth	GDPC1	FRED
Interbank cost of borrowing	IBCOBD678FRBCLE	FRED
Interest expenses on total time deposits of $100,000 or more	RIADA517	CALL Reports
Interest expenses on total time deposits of less than $100,000	RIADA518	CALL Reports
Interest expenses on total transaction accounts	RIAD4508	CALL Reports
Interest income from commercial and industrial loans	RIAD4012	CALL Reports
Interest income from lease financing receivables	RIAD4065	CALL Reports
Interest income from loans secured by real estate	RIAD4011	CALL Reports
Interest income from loans to finance agricultural production and other loans to farmers	RIAD4024	CALL Reports
Interest income from loans to foreign governments and official institutions	RIAD4056	CALL Reports
Interest income from loans to individuals for household, family, and other personal expenditures	RIAD4055	CALL Reports
Interest income from other loans	RIAD4058	CALL Reports
Lease financing receivables	RCON2165	CALL Reports

Names	Regulatory item names/codes	Source
Lease financing receivables	BHDM2165	FR Y-9 Report
Legal expenses	RIAD4141	CALL Reports
Loans secured by real estate	RCON1410	CALL Reports
Loans to finance agricultural production and other loans to farmers	RCON1590	CALL Reports
Loans to finance agricultural production and other loans to farmers	BHDM1590	FR Y-9 Report
Loans to foreign governments and official institutions	RCON2081	CALL Reports
Loans to foreign governments and official institutions	BHDM2081	FR Y-9 Report
Loans to individuals for household, family, and other personal expenditures	RCON1975	CALL Reports
Loans to individuals for household, family, and other personal expenditures	BHDM1975	FR Y-9 Report
Market growth	See market definitions	CALL Reports
Marketing expenses	RIAD0497	CALL Reports
Net interest income	BHCK4074	FR Y-9 Report
Non-transaction savings deposits	BHCB2389	FR Y-9 Report
Now, ats and other transaction accounts	BHCB3187	FR Y-9 Report
Number of competitors	See market definitions	CALL Reports
Office closings	721	Reports on

Names	Regulatory item names/codes	Source
		Structure Changes
Office openings	711	Reports on Structure Changes
Office purchases	712	Reports on Structure Changes
Office relocations	520	Reports on Structure Changes
Other loans	RCON1564	CALL Reports
Other loans	BHDM1635; BHDM1564; BHDMJ451	FR Y-9 Report
Other noninterest expense	RIAD4092	CALL Reports
Other noninterest-bearing deposits	BHDM6631; BHCB2210	FR Y-9 Report
Real estate loans secured by farmland	BHDM1420	FR Y-9 Report
Real estate loans secured by multi-family (five or more) residential properties	BHDM1460	FR Y-9 Report
Real estate loans secured by nonfarm nonresidential properties	BHDM1480	FR Y-9 Report
Regulatory high holder 1	RSSD9349	FR Y-9 Report
Regulatory high holder 2	RSSD9352	FR Y-9

Names	Regulatory item names/codes	Source
		Report
Regulatory high holder 3	RSSD9356	FR Y-9 Report
Regulatory high holder 4	RSSD9359	FR Y-9 Report
Reorganisations	820	Reports on Structure Changes
Revolving, open-end loans secured by 1-4 family residential properties and extended under lines of credit	BHDM1797	FR Y-9 Report
Strategic similarity	See market definitions	FR Y-9 Report
Technology expenses	RIADC017	CALL Reports
Total demand deposits	BHCB2210	FR Y-9 Report
Total noninterest expense	BHCK4093	FR Y-9 Report
Total noninterest income	BHCK4079	FR Y-9 Report
Total time deposits of $100,000 or more	RCON2604	CALL Reports
Total time deposits of $100,000 or more	BHCB2604	FR Y-9 Report
Total time deposits of less than $100,000	RCON6648	CALL Reports
Total time deposits of less than $100,000	BHCB6648	FR Y-9 Report
Total transaction accounts	RCON2215	CALL Reports

Appendix B: Collinearity Diagnostics

Variable	VIF	Square Root VIF
Factor MMC	1.90	1.38
Product MMC	2.21	1.49
Competitive Intensity	3.69	1.92
Factor MMC X Competitive Intensity[a]	1.39	1.18
Product MMC X Competitive Intensity[a]	1.57	1.25
Firm Size	3.85	1.96
Firm Age	1.29	1.14
Firm Past Performance	1.62	1.27
Firm Slack	1.41	1.19
Firm Complexity	1.42	1.19
Firm Number of Banks	1.14	1.07
Financial Holding Company	1.16	1.08
Firm is Listed	1.41	1.19
Strategic Similarity	1.15	1.07
Market Growth	1.95	1.40
Number of Competitors	1.79	1.34
Interbank Cost of Borrowing	1.57	1.25
GDP growth	1.59	1.26
Mean VIF	1.78	

[a] Variables centred on annual mean before computation.

N = 8,062

Appendix C: Prais-Winsten Regression Results on Competitive Aggressiveness t+1

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
Constant	-3.226***	-3.066***	-2.703***	-2.938***	-2.402***	-1.887***	-2.401***	-1.854***
	(0.327)	(0.321)	(0.351)	(0.346)	(0.366)	(0.356)	(0.364)	(0.358)
Firm Size	0.308***	0.312***	0.303***	0.310***	0.253***	0.239***	0.253***	0.241***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.022)	(0.021)	(0.022)	(0.021)
Firm Age	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm Past Performance	2.136**	1.458*	1.884**	1.431*	0.208	-0.017	0.207	-0.039
	(0.721)	(0.720)	(0.725)	(0.721)	(0.748)	(0.747)	(0.748)	(0.747)
Firm Slack	-0.382***	-0.320***	-0.341***	-0.313***	-0.236***	-0.231**	-0.237**	-0.220**
	(0.072)	(0.072)	(0.071)	(0.072)	(0.072)	(0.071)	(0.072)	(0.071)
Firm Complexity	0.006	-0.004	0.011	-0.002	-0.004	-0.005	-0.004	-0.005
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.023)	(0.024)	(0.023)
Firm Number of Banks	0.055***	0.052***	0.054***	0.052***	0.049***	0.047***	0.049***	0.047***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
Financial Holding Company	0.050**	0.040*	0.050**	0.041*	0.042*	0.039*	0.042*	0.040*
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Firm is listed	-0.038†	-0.098***	-0.056*	-0.099***	-0.109***	-0.129***	-0.109***	-0.129***
	(0.023)	(0.024)	(0.023)	(0.024)	(0.023)	(0.024)	(0.024)	(0.024)
Strategic Similarity	-0.142***	-0.114**	-0.126**	-0.111**	-0.090*	-0.083*	-0.090*	-0.084*
	(0.040)	(0.040)	(0.041)	(0.040)	(0.038)	(0.038)	(0.038)	(0.038)
Market Growth	0.047	-0.170	-0.002	-0.170	-0.123	-0.190	-0.124	-0.181
	(0.129)	(0.130)	(0.129)	(0.130)	(0.130)	(0.131)	(0.131)	(0.131)
Number of Competitors	-0.016***	-0.015***	-0.021***	-0.017***	-0.017***	-0.021***	-0.017***	-0.022***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Interbank Cost of Borrowing	0.015	0.009	0.017	0.010	0.009	0.011	0.009	0.011
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
GDP growth	0.184	0.193	0.211	0.199	-0.115	-0.105	-0.116	-0.087
	(0.452)	(0.450)	(0.452)	(0.450)	(0.454)	(0.452)	(0.454)	(0.452)
Product MMC		-1.039***		-0.978***	-0.658***	-1.142***	-0.662***	-1.098***
		(0.114)		(0.121)	(0.125)	(0.168)	(0.142)	(0.170)

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
Factor MMC			-0.097***	-0.026	-0.045*	-0.046*	-0.044*	-0.063**
			(0.022)	(0.018)	(0.018)	(0.019)	(0.021)	(0.023)
Competitive Intensity					-0.064***	-0.066***	-0.064***	-0.066***
					(0.012)	(0.013)	(0.012)	(0.012)
Product MMC X						0.683***		0.764***
Competitive Intensity						(0.131)		(0.136)
Factor MMC X							0.002	-0.052*
Competitive Intensity							(0.021)	(0.024)
Wald χ2 (*d.f.*)	617.80(*13*)***	692.05(*14*)***	649.69(*14*)***	704.53(*15*)***	728.23(*16*)***	713.58(*17*)***	782.23(*17*)***	746.44(*18*)***
Explanatory variable χ2 (*d.f.*)		83.51(1)***	20.26(1)***	86.97(2)***	26.61(1)***	27.01(1)***	0.01(1)	31.75(2)***
Number of Observations	7,591	7,591	7,591	7,591	7,591	7,591	7,591	7,591
Number of Firms	1,189	1,189	1,189	1,189	1,189	1,189	1,189	1,189

Standard errors in parentheses robust to heteroscedasticity and autocorrelation.

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