Three Essays on Internal Capital Markets

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Thesis presented to Faculdade de Economia da Universidade do Porto in fulfillment of the requirements for the degree of Doctor of Philosophy in Management Studies – Specialization in Finance

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2020

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To Lourenço, Vicente, Simão and Marlene

ACKNOWLEDGEMENTS

The successful conclusion of this thesis would not have been possible without the support of many professors, colleagues, family and friends. I would like to express my sincere gratitude to all those who have kindly contributed to this thesis. However, my debt to some people is far too great not to be formally and explicitly acknowledged. I would like to apologize to all those who have contributed to this thesis in some way, but whom I have inevitably, but unintentionally, omitted.

First and foremost, I am truly grateful to my supervisor Professor Mário Coutinho dos Santos, who encouraged me to select this thesis topic and whose knowledge and guidance were essential. Professor Mário, I am profoundly grateful for your continuous encouragement, patience, help and true friendship. Without your endless support, I would not have completed this project.

Also, an enormous thank you is owed to Professor Gary Emery, who together with Professor Mário, made it possible for me to attend Price College of Business, University of Oklahoma, for a semester as a research assistant, giving me the opportunity to benefit from and be exposed to a different academic reality, with other resources, and with other professors and colleagues. Furthermore, to Professors Wayne B. Thomas, Scott C. Linn, and William L. Megginson, whose classes I attended at Oklahoma.

During this project, I received several useful suggestions and comments from a wide range of people. I would like to acknowledge the help provided by Veljko Fotak, João Pinto, Aníbal Santos, and João Cabral dos Santos for the time they took to make comments and suggestions, all of which greatly improved the contents of this thesis.

Additionally, I would also like to extend my thanks to Heitor Almeida, Murillo Campello, Chris Harris, López de Silanes, Andrew Karolyi, Rui Pascoal, John Hall, Gilberto Loureiro, Florinda Silva, and Maria Céu Cortez, for the interactions at conferences where this research was presented, and for their valuable comments and suggestions.

The completion of this thesis would not have been possible without the support of the University of Aveiro, especially my colleagues in the Department of Economics, Management, Industrial Engineering and Tourism for welcoming me as an assistant for the past 10 years, the Director, Professor Carlos Costa, as well as my colleagues Antonio

Carrizo Moreira, Victor Moutinho, Rui Costa, Mara Madaleno and Pedro Macedo for all their support and encouragement.

Also a word of appreciation is owed to my colleagues in the Faculty of Economics of the University of Porto for giving me the opportunity to join the PhD in Management, specializing in Finance, and for the opportunity to be in contact with excellent professors and researchers, such as Ana Paula Serra, Carlos Alves, Carlos Cabral Cardoso, Elísio Brandão, Francisco Vitorino Martins, João Francisco Ribeiro, and Jorge Farinha.

A special word of thanks is due to Bvd for providing me with access to Amadeus database, and to João Pinto for providing me with access to data in relation to the euro area sovereign treasury bills.

A special mention to my PhD colleagues. Our interaction proved to be very enriching and important for my work. I want to express my utmost gratitude to all of them Veljko Fotak, Kateryna Holland, Vikas Raman, Luis Marques, João Ribeiro, Gonçalo Faria, Fang Lin, Sridhar Gogineni, Lisa Yang and Ashley Newton.

Throughout this journey, I have received contributions from many people. I would like to express my sincere gratitude to all of them. Rebecca Patterson was a very effective and patient proofreader.

Words alone are not enough to describe how much I am indebted to my family for their immense love, understanding, support and encouragement throughout this PhD program, which undoubtedly was a long and challenging journey for them as well. To Marlene, Simão, Vincente and Lourenço, who have somehow always understood my absences and my lack of time, I want them to know how much I feel blessed to have such a wonderful family.

Finally, I would like to thank my parents and parents-in-law for all their love and support. They were always there for me whenever I needed their support, and always will be.

ABSTRACT

This thesis examines, at both the theoretical and empirical levels, the financing and investment behavior of firms operating within diversified firms, to explain the allocative implications in terms of economic performance.

We departed from the standard neoclassical, firm and transaction cost theories to conditions prevailing in real-world economies, to develop a theoretical framework able to support the formulation of testable hypotheses.

To perform the empirical study of the allocative efficiency of diversified firms' investment and financing behavior, in contrast with comparable single-industry firms, we estimated dynamic panel data models on two subsamples of euro area unlisted firms, one of internal capital market (ICM) members, and another of comparable stand-alone firms. Data for both subsamples were drawn from Bureau van Dijk's Amadeus database. To perform the empirical study of the impact of diversified business organizations on their economic performance, we also estimated dynamic panel data models using a sample of diversified firms, data also drawn from Bureau van Dijk's Amadeus database.

Empirical evidence on firms' financing behavior document that both ICM participants and single-segment firms have preferred target capital structures, that firms affiliated with ICMs are significantly more leveraged and exhibit a significantly lower cost of capital than their comparable cohorts, and that stand-alone firms adjust to their preferred leverage ratios at a higher speed than ICM members which provides significant support for dynamic trade-off capital structure theory. These findings suggest that ICM membership mitigates incentive and informational problems.

Findings on the diversified firms' investment behavior support that ICM affiliates and single-segment firms exhibit a positive effect of available internal funds on investment, and that this effect is lower for ICM members than for their comparable stand-alone peers. Results also document that ICM affiliates exhibit both a lower degree of underinvestment and overinvestment, than comparable unaffiliated firms. Findings suggest that headquarters' monitoring and managerial discretion, cost of capital, financial flexibility, informational asymmetries and asset lumpiness appear to be significant determinants of investment behavior.

Evidence on the impact of firms' diversification levels on economic performance document that sampled firms exhibit a positive relationship between diversification,

either overall, unrelated or related, and performance, and that asset plasticity levels exhibit a positive effect on performance level of unrelated diversified firms.

Overall, our empirical findings are consistent with conventional wisdom that affiliation with a diversified firm does matter for economic performance, and for the efficiency of both financing and investment behavior.

The thesis is organized as follows: Chapter 1 introduces the overall background, motivation, purpose, object, scope, research questions, data, empirical implementation, results, contributions to the literature of this research. Chapter 2 examines the relevant theoretical literature on the efficiency of a firm's financing policy, laying the foundations for formulating the hypotheses submitted to empirical testing. Chapter 3 discusses the relevant theoretical literature on the efficiency of a firm's investment policy, laying the foundations for formulating the hypotheses submitted to empirical testing. Chapter 4 discusses the relevant theoretical literature on the performance of conglomerate firms, laying the foundations for formulating the hypotheses submitted to empirical testing, and testing the influence of ICMs on their performance. Chapter 5 summarizes the main findings and concludes the thesis.

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1. Introduction

1.1. Background

Rational economic agents allocate their resources intertemporally, aiming at maximizing the expected utility of consumption over time, and consequently of terminal wealth. Therefore, allocating scarce resources to their highest value usage, should be a primary objective of rational individuals, firms, and governments alike (e.g., Wurgler 2000; Dow and Gorton 1997; Fama and Miller 1972; Jorgenson 1963).[1] In this framework, it has been shown that allocative efficiency promotes the maximization of the total surplus received by the overall society (see, Jensen 2010; Mankiw 2007).

It is widely acknowledged that in exchange economies and under conditions of perfectly competitive markets, prices promote efficient resource allocation. In this context, it has been demonstrated that agents' allocative choices are made in a manner consistent with the decision-maker's wealth maximization principle, and resources will be allocated to those uses where their value is greatest (e.g., Martin et al. 1988).

At the firm level, and under conditions of perfect and complete certainty, rational resource allocation «can be costlessly compelled to make owner-utility-maximizing (present-value-maximizing) investment and financing decisions» (Martin et al. 1988, 73). Under this neoclassical framework, and as predicted by Modigliani and Miller (1958), firms' investment and financing policies are irrelevant for their valuation, and internal and external capital markets are perfect substitutes.

In market economies endowed with complete sets of perfectly competitive markets, resource allocation efficiency is a matter of indifference regarding the ownership rights over the resources. Market incompleteness, imperfections, and frictions of different nature, and incomplete contracting may induce distortionary inefficient effects in resource allocation (Stein 2003).

[1] According to Brennan (2003, 169), «[t]he allocation of capital to its highest value use is one of the most important roles of capital markets, and the investment policy of corporations is a major element of the allocation process».

Coase's (1937) seminal theoretical insight suggests that firm boundaries can be rationalized in terms of allocative efficiency considerations (e.g., Hart and Holmström 2010; Mullainathan and Scharfstein 2001; Holmström and Roberts 1998).[2]

Standard neoclassical and transaction cost theories use alternative production coordination technologies – markets or hierarchies – as modes of organizing economic activity (e.g., Milgrom and Roberts 1992). «Economists [are mostly concerned] with resource allocation across organizational boundaries mediated through contracts or markets» (Gertner and Scharfstein 2013, 655).

Under these theoretical frameworks, firms emerge as a result of a balance between the costs of using the price system and the costs of using a hierarchical management system (e.g., Demsetz 1997).

There is widespread evidence that a significant fraction of the resource deployment across contemporaneous economies, takes place within business organizations (e.g, Admati 2017; Gertner and Scharfstein 2013; and Lafontaine and Slade 2007). As documented in Montgomery (1994), two-thirds of the Fortune 500 firms were actively involved in, at least, five distinct lines of product markets, and were accountable for more than 50 percent of total production in the U.S. (e.g., Maksimovic and Phillips 2007). Asian chaebols accounted for 59 percent of the total market cap of firms listed on the Korean Stock Exchange (Kim et al. 2004). A similar pattern has been observed in Europe (e.g., Luffman and Reed 1984), and more specifically in the euro area (e.g., La Rocca et al. 2018), and in the emerging economies of Asia and Latin America (e.g., Kim et al. 2004; Khanna and Palepu 2000).[3]

1.2. Motivation, Purpose and Objective of the Investigation

There is a broad consensus that accumulated internal capital market (hereafter ICM) and diversification literatures do not provide an unambiguous validation of extant

[2] For comprehensive discussions on firm boundaries see also, e.g., Demsetz (1997) and Williamson (1975), and references cited therein.

[3] According to Rumelt, by 1974, 86 percent of the Fortune 500 firms operated as diversified businesses and only 14 percent operated as single businesses (see also, Montgomery 1994; Datta et al.1991). Other studies documented similar historical trends in Europe (e.g., Goudie and Meeks 1982), in the UK (e.g., Utton 1977), in Japan (e.g., Goto 1981), and in Canada (e.g., Caves et al. 1980). During the decades of the 1970s and 80s, U.S. firms tended to focus on their core businesses and to moderate their trend for diversification (e.g., Markides 1995; Davis et al. 1994).

theories.[4] In addition, in certain cases, there are non-negligible inconsistencies and contradictions between anecdotal evidence, stylized facts and theoretical predictions (Dewaelheyns and Van Hulle 2012; George and Kabir 2012; George et al. 2011; Byoun 2008; Singh et al. 2007; Shin and Park 1999). It is also widely agreed that empirical research in corporate financial economics at large, often appears showing relative dependence from research design, either in terms of sample building, sampling period definition, or empirical modeling, variables specification, and estimation procedures.

Overall, it seems undisputable that despite the significant contributions towards a better understanding of diversified firms' financing and investment behavior and its impact on performance, we still lack a widely agreed body of theoretical and empirically-based arguments to shed light on real-world firm diversification dynamics.

As argued in Almeida et al. (2015, 2539), a significant part of this literature «focuses mostly on multisegment firms (conglomerates), which are common in the United States». Therefore, the generalization of those results to other geographic areas characterized by (sometimes) remarkably dissimilar economic, financial, and institutional conditions, may reveal inappropriate or even imprudent. In these instances, additional research may contribute to broadening the explicative and predictive relevance of extant theories.

In this study, we contribute to mitigating the problems typically present in corporate finance cross-country empirical research, due to the diversity in economic, financial, legal and institutional characteristics, which may undermine the generalization power of the empirical findings.[5]

We examine firm-level financing, investment and diversification behavior of ICM members with their headquarters located in the euro area, which provides a 'level playing field' in terms of the economic, financial, legal and institutional environment. This framework, arguably, may be helpful in mitigating the kind of 'geographical bias' typically associated with non-negligible variance in institutional features across space,

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[4] Throughout this thesis, we have adopted the conventional procedure of using the following terms interchangeably, diversified firm, multi-segment firm, business group, and conglomerate firm, as organizational structures operating under internal capital markets. Similarly, we also use stand-alone firm, and single-segment firm interchangeably.

[5] Among those factors that may influence financing and investment allocative efficiency are included, the origin of the legal system, bankruptcy, fiscal and investor protection laws, architecture of the financial system and the regulatory jurisdictions, and the accepted accounting principles and practices.

time, and industry, observed in multi-country research. Additionally, it enhances our understanding of the effects and implications of the significant disparities in the institutional, environmental and behavioral idiosyncratic factors, in relation to the economic and financial performance of diversified firms (e.g., Saá-Requejo 1996; Rajan and Zingales 1995).

Furthermore, focusing our empirical investigation on the financing and investment behavior of both small and large unlisted firms, in contrast to mainstream literature, which typically focuses on large public companies, usually associated with the U.S. and other countries endowed with market-based financial systems, may alleviate this kind of 'size bias'.

Resource allocative efficiency of market- and bank-based domestic financial systems is an ongoing source of academic debate (e.g., Chakraborty and Ray 2006; Demirgüç-Kunt and Maksimovic 2002; Allen and Gale 1999).[6] However, a non-negligible part of this empirical literature appears to lean somewhat towards market-based financial systems. As the empirical component of this research is focused on the examination of data sets of firms belonging exclusively to European bank-based countries, our findings are not 'contaminated' by this potential problem.

1.3. Object, Scope and Research Questions

This thesis investigates the generic research question, whether or not, resource usage within the boundaries of diversified organization, is more efficient than through contracting with independent single industry firms. More specifically, the thesis examines the research questions of: (i) The allocative efficiency effects of the financing behavior of diversified firms with active ICMs, in "Does Internal Capital Market Membership Matter for Financing Behavior? Evidence from the Euro Area" (Essay I); (ii) The allocative efficiency effects of the investment behavior of diversified firms with active ICMs, in "Does Internal Capital Market Affiliation Matter for Capital Allocation? An Empirical Analysis" (Essay II); and (iii) The effects of financing and investing behavior on the relationship between diversification and economic performance, in "Firm

[6] The comparative allocative merits of the competing bank- and market-based domestic financial systems are a source of long debate among academics, policy makers, and market participants alike. One side of the literature emphasizes the advantages of bank-based systems (e.g., Chakrabortya and Ray 2006; Mizen and Vermeulen 2005; Bond et al. 2003). The other praises the superiority of market-based systems (e.g., Bats and Houben 2017; Weinstein and Yafeh 1998).

Diversification and Performance: An Empirical Examination" (Essay III).[7]

1.3.1. The Financial Economic Foundations of Firm Diversification

In the presence of perfectly competitive, complete, and frictionless capital markets, it is a matter of irrelevance whether corporate resources are allocated under an internal or an external capital market (Thakor 1993; Modigliani and Miller 1958). Under this theoretical framework, investment and financing policies are irrelevant for firm valuation, and consequently, those policies are independent, and internal and external capital markets are perfect substitutes.

However, as insightfully pointed out by Williamson (1975), diversified firms operating under active ICMs may exhibit resource allocative efficiency advantages over a portfolio of comparable counterparts funded externally (see also Liebeskind 2000; and Stein 1997; Myers and Majluf 1984).

According to the neoclassical standard valuation framework, the economic performance of diversified firms with active ICMs is related to the allocative efficiency of both their investment and financing behavior (e.g., Gonenc et al. 2007). Therefore, the key value-drivers of corporate diversification are the free cash flow, and the risk adjusted opportunity cost of capital (e.g., Grant 2016; Morin and Jarrell 2000; Modigliani and Miller 1958).

However, market incompleteness, imperfections and frictions of different nature, and incomplete contracting features induce the emergence of potential distortionary effects in resource allocation (e.g., Morellec and Schürhoff 2011; Childs et al. 2005; Stein 2003; Mauer and Triantis 1994).[8]

Extant literature on the allocative efficiency of diversified firms, can be advantageously systematized across two competing perspectives (e.g., Gertner and Scharfstein 2013). One perspective supporting the diversification allocative efficiency viewpoint, popularized as the 'bright side' of diversification and suggesting that resource allocation by diversified firms is value-enhancing (e.g., Khanna and Tice 2001; Sapienza 2001).The other perspective, prevalent in another stream of the literature and popularized as the 'dark side' of diversification, suggests that the benefits of ICMs may be more than

[7] Henceforth, we use interchangeably: essay I and chapter 2; essay II and chapter 3; and essay III and chapter 4.

[8] According to Liebeskind (2000, 58) «[…] the value of diversification will depend, inter alia, on whether internal capital markets are relatively efficient or inefficient».

offset by their costs (e.g., Agarwal et al. 2011; Ozbas and Scharfstein 2010; Scharfstein and Stein 2000; Rajan et al. 2000).

Prior research on the financing efficiency of firms affiliated with ICMs, has devoted more attention to testing hypotheses related to the cost of capital, leverage level, target leverage ratio, and capital structure speed of adjustment (e.g., Hann et al. 2013; Fier et al. 2013; Dewaelheyns and Van Hulle 2012; Hovakimian and Li 2011; Byoun 2008; Flannery and Rangan 2006; Ozkan 2001). This research is, to a large extent, focused on examining data in relation to the United States (U.S.) corporate world. To the best of our knowledge, Dewaelheyns and Van Hulle (2012) and Ozkan (2001) are examples of the few recent exceptions.

Empirical research on the investment efficiency of ICM members has predominantly focused on examining the impact of a firm internal funding, financial flexibility, financial constraints on its capital expenditure, capital allocation, and investment inefficiencies (e.g., Ağca and Mozumdar 2017; Almeida et al. 2015; Buchuk et al. 2014; Chen and Chen 2012; George et al. 2011; Hovakimian 2009; Cleary et al. 2007; Shin and Park 1999; and Hoshi et al. 1991). This research focus, to a large extent, on the U.S. and Asian public firms. To the best of our knowledge, Ferrando et al. (2017), Santioni et al. (2017), Mulier et al. (2016), Marchica and Mura (2010), Bond et al. (2003), and Goergen and Renneboog (2001) are examples of few European exceptions.

Prior empirical research on the relationship between corporate diversification and economic performance denotes a particular interest in the examination of the valuation effects of specific forms of diversification, such as the related and the unrelated (e.g., La Rocca et al. 2018; Singh et al. 2007; Villalonga 2004a, 2004b; Campa and Kedia 2002; Palich et al. 2000; Lang and Stulz 1994). This ambiguity is also documented in studies of non-U.S. firm samples, mostly Asian (e.g., Bae et al. 2011; Wade and Gravill 2003), and European (e.g., La Rocca et al. 2018; Luffman and Reed 1984).

The different methodological empirical approaches to diversification research, are prone to conspicuous methodological problems, such as the control of the endogeneity associated with the dynamics of panel data models. To mitigate the endogeneity of the group membership ubiquitous problem, we used instrumental variables and a matching procedure to create a control group of stand-alone firms as an ‘image’ of a treatment group of ICM members, with both groups of firms reporting similar characteristics.

1.3.2. Does Internal Capital Market Membership Matter for Financing Behavior? Evidence from the Euro Area (Essay I)

Under complete, perfectly competitive, and frictionless capital markets, the mix of securities a firm should optimally issue, as well as its debt maturity and placement structures are a matter of indifference (Modigliani and Miller 1958).

However, corporate finance literature provides abundant, compelling, and convincing evidence that financial structure does matter for firm valuation (e.g., Hart 2001; Myers 2001; and Stiglitz 1969).

Under imperfect, incomplete and frictional capital markets, the financing behavior of rational value-maximizing firms, typically, aims at minimizing the opportunity cost of capital of the available alternative funding options (e.g., Fier et al. 2013; Gatchev et al. 2009; Peyer and Shivdasani 2001; Fama and French 1999).

Extant literature documents several stylized facts and empirical regularities related to the determinants and the valuation effects of firms' financing behavior, and their hypothesized relationships with corporate organizational form, namely, in terms of the cost of capital (e.g., Hann et al. 2013; Leary and Roberts 2005; Lang and Stulz 1994; and DeAngelo and Masulis 1980). Moreover, this literature also documents that members of active ICMs and stand-alone firms exhibit different financing behavior (e.g., Hann et al. 2013; Dewaelheyns and Van Hulle 2012). However, and despite the research devoted to the topic, evidence on the relationship between the corporate organizational form, capital structure, and the cost of capital is relatively scarce, and mostly focused on the U.S. and Asian public parent firms (e.g., Almeida et al. 2015; Buchuk et al. 2014; Fier et al. 2013; Hann et al. 2013; Byoun 2008; Shin and Park 1999).

In this essay, we examine the financing behavior of samples of unlisted subsidiaries and stand-alone comparable firms from the euro area, contributing to mitigating the problems typically associated with countrywide differences in economic, financial, legal and institutional characteristics and features, in multi-country research with a similar object. Additionally, our work also aims at contributing for lessening the size bias usually present in samples including mostly listed firms.[9]

[9] Generalization of empirical findings gathered from sample data of environments exhibiting different economic, financial, institutional, environmental and behavioral characteristics, should be cautiously done.

Broadening and deepening our understanding of diversified firms' financing behavior is the major research focus of the work, and was assumed as the generic research question for essay I. Specifically, we investigate capital structure and financial leverage model preferences, the cost of capital, and the speed of adjustment to the preferred leverage ratios, of both ICM participants and their comparable stand-alone cohorts.

1.3.3. Does Internal Capital Market Affiliation Matter for Capital Allocation? An Empirical Analysis (Essay II)

Despite the extensive body of theoretical research on the optimality of capital allocation at the firm level, we still lack satisfactorily convincing answers to several important questions, including: (i) «to what extent does capital get allocated to the right investment projects?» (Stein 2003, 112); (ii) «does firm diversity result in an efficient or inefficient allocation of capital?» (Agarwal et al. 2011, 162); and (iii) «do units with better investment opportunities receive larger capital allocations and invest more?» (Glaser et. al. 2013, 1577).

Under the standard conditions of perfect and frictionless capital markets, there is no role for capital rationing, implying that, all positive expected net present value projects can be undertaken, achieving Pareto optimal intertemporal resource allocation (e.g., Brennan 2003).

In this framework, it has been shown that whenever firms' capital investment choices are congruent with the wealth maximization principle, «[…] resources will be allocated to those uses where their value is greatest» (Martin et al. 1988, 12).

With equal access to perfect and frictionless capital markets, it does not matter whether firms' capital allocation is made «[…] in a centralized or decentralized capital budgeting environment» (Thakor 1993, 135).

Under uncertainty, rational capital allocation aims to maximize the expected intertemporal utility of terminal wealth (e.g., Hubbard 1998; Fama and Miller 1972; and Jorgenson 1963). However, in an incomplete and imperfectly competitive capital markets setting, and with conditions of contract incompleteness, value maximizing capital allocations may be Pareto suboptimal (e.g., Brennan 2003; Grossman and Stiglitz 1977; Nielsen 1976).

Incomplete contracting and separation of managerial decision-making functions from residual risk-bearing, allow uneven distribution of information among agents. This framework raises incentives for potential inefficient allocative behavior, creating a 'separating equilibrium' between internal and external capital allocations (Morellec and Schürhoff 2011; Childs et al. 2005; Mauer and Triantis 1994; and Jensen and Meckling 1976).

It is well-acknowledged that institutional factors, such as the law origin, the legal system, and the financial system level of development may, arguably, affect the efficiency of firms' investment behavior (e.g., Almeida et al. 2015; Buchuk et al. 2014; Belenzon et al. 2013; Liebeskind 2000; La Porta et. al. 2000; Thakor 1993). However, because the firms included in our samples, operate under legal systems with the same origins and under well integrated and similarly developed financial systems, we did not included these determinants in our empirical specifications.

Centralized capital budgeting systems present in diversified firms may be helpful in mitigating the deadweight costs of principal-agent conflicts of interest, and incentive and informational problems associated with investment behavior (e.g., Sautner and Villalonga 2010; Maksimovic and Phillips 2002; Stein 1997; Myers and Majluf 1984; Williamson 1975).

Therefore, broadening and deepening the knowledge about different dimensions of diversified firms' investment behavior, is one of the research objects of this study, and was assumed as the generic research question for essay II. Specifically, we study for both ICM affiliates and comparable single-segment peers, the investment-internal funding sensitivity, and capital expenditure relationships with growth opportunities, asset lumpiness and financial flexibility. We also test for suboptimal investment allocation, and for the potential impact of asset lumpiness on investing behavior.

1.3.4. Firm Diversification and Performance: Theory and Evidence (Essay III)

Does firm diversification matter? Or, as questioned by Maksimovic and Phillips (2007), «[…] does corporate diversification affect firm value?». The answers to these queries seem intimately linked to where firm boundaries are actually set, and therefore, to the efficiency of the type and extent of the diversification behavior (Williamson 1975).[10]

[10] As suggested by Maksimovic and Phillips (2007), «for corporate diversification to be of interest, it must be that the cost of carrying out transactions within the firm are affected if it contains more than one industry within its boundaries».

A plethora of theoretical and empirically based arguments indicate that diversification may have ambivalent effects on value (e.g., Campa and Kedia 2002).

The economic performance of a diversified firm affiliated with an active ICM is related to the allocative efficiency of its investment and financing behavior (e.g., Gonenc et al. 2007).[11] Furthermore, as already suggested by Williamson (1975), «"internal capital markets" in diversified firms can allocate capital more efficiently than external capital markets can, and that they can reduce wasteful investment at lower cost» (Liebeskind 2000).

Mainstream literature on the performance effects of diversification can be advantageously systematized under two competing perspectives. One, supporting the diversification allocative efficiency viewpoint, popularized as the 'bright side' of diversification, suggesting a positive relationship between diversification and performance (e.g., Khanna and Tice 2001; Sapienza 2001); and the other, popularized as the 'dark side' of diversification, hypothesizes an inverse relationship between diversification and performance (e.g., Ozbas and Scharfstein 2010; Scharfstein and Stein 2000; Rajan et al. 2000).[12]

Therefore, deepening our understanding of the impact of diversified business organizations on their economic performance is of great practical relevance and is assumed as the generic research question for essay III. Specifically, we examine the relationship between firms' diversification, either overall, unrelated and related, using both accounting and market-based performance measures. We also study the potential effect of 'plastic' assets redeployment for the performance level of unrelated diversified firms.

1.4. Data and Empirical Implementation

Similarly to other studies with a related object (e.g., Ferrando et al. 2017; Mulier et al. 2016; Gugler et al. 2013; Dewaelheyns and Van Hulle 2012; Mizen and Vermeulen 2005), the data sets used in our empirical testing were also drawn from Bureau van Dijk's

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[11] According to Thakor (1993), in an «idyllic setting», it is irrelevant whether allocative decisions are made: «in a centralized or decentralized capital budgeting environment [regardless of] whether the project is included as part of the firm's portfolio of assets or organized *outside* the firm, i.e., incorporated as a subsidiary with a legal delineation from the firm's existing assets [and] how the project is financed».

[12] For a more in-depth analysis of this topic see , e.g., Maksimovic and Phillips (2013), Stein (2003), Martin and Sayrak (2003), and Gertner et al. (1994).

Amadeus database, which provides financial firm-level data on European countries. Data on the yields of sovereign securities were gathered from Bloomberg.

From Amadeus database we draw a subsample of 900 subsidiary firms operating within ICMs, and a subsample of 3,764 comparable stand-alone firms. After applying the matching procedure described in appendix 1, we end up with two subsamples of 636 firms each in a total of 17,808 testable firm-years.

Specifically, in essay I, we used two balanced panel data sets of 636 euro area unlisted firms each, spanning the 2004-2017 sampling period, one for subsidiary firms and the other for comparable stand-alone firms. In essay II, we used two balanced panel data sets of 636 euro area unlisted firms each, covering the 2004-2017 sampling period, one for diversified firms' affiliates and the other for comparable single-segment peers. In essay III, we used a panel data set of 2,396 euro area diversified firms, over the 2010-2017 sampling period.

In Essays I and II, following recent simulation results reported in empirical research, besides including on our empirical implementations the usually conducted static and dynamic panel data models, we also used bias-corrected panel data estimators that, as suggested, e.g., in Bazdresch et al. (2018), Dang et al. (2015), Zhou et al. (2014), are less biased.

To address the concerns about self-selection and endogeneity of group membership problems, we developed and applied a tailor-made matching procedure, ensuring comparability in terms of industry and size (e.g., Hund et al. 2019; Villalonga 2004b).[13] Additionally, we applied Heckman's (1979) two-stage model, to strengthen the robustness of our matching procedure (e.g., Villalonga 2004b; Campa and Kedia 2002).

To control for the endogenous relationship between the level of diversification and firm performance in Essay III, we estimated dynamic panel data models using instrumental variables applied in generalized method of moments (e.g., Kahn and Whited 2018; Roberts and Whited 2013; Graham et al. 2002; and Lang and Stulz 1994).

1.5. Main Results and Contributions to the Literature

The main empirical findings of essay I document that: (i) both the subsidiaries of diversified firms and their comparable single-segment cohorts have the industry median

[13] Please refer to Appendix 1 to Chapter 2, page 52, for a description of the matching procedure.

debt ratio as their preferred target capital structures, results consistent with previous research, and is evidence supporting the static trade-off capital structure theory (e.g., Fier et al. 2013; Byoun 2008; Flannery and Rangan 2006); (ii) business group affiliates are, on average, significantly more leveraged and exhibit a significantly lower cost of capital than their comparable cohorts, findings aligned with recent empirical research, such as, a work with similar scope to ours for samples of subsidiary and stand-alone Belgian firms (Dewaelheyns and Van Hulle 2012) and a sample of listed U.S. firms (Hann et al. 2013), and survey-based research (Gatzer et al. 2014); (iii) stand-alone firms, on average, adjust their capital structure to their preferred leverage ratios at a higher speed than ICM members, providing statistically significant support for the dynamic trade-off capital structure theory (e.g., Fier et al. 2013; Dewaelheyns and Van Hulle 2012; Hovakimian and Li 2011).

Additionally, findings of essay II document: (i) a positive and statistically significant relationship between internal funding and investment expenditures, for both ICM participants and single-segment firms, findings consistent with previous evidence focusing predominantly on U.S. and Asian public firms (e.g., Arslan-Ayaydin et al. 2014; George et al. 2011; Goergen and Renneboog 2001; Shin and Park 1999; Hoshi et al. 1991; and Fazzari et al. 1988); (ii) corporate investment expenditure exhibits a dynamic pattern, as suggested, e.g., in Eberly et al. (2012); (iii) ICM members, on average, exhibit lower degree of investment behavior suboptimality, either in the form of underinvestment or overinvestment, than comparable stand-alone firms, which may be interpreted has the potential benefit associated to ICM membership, due to headquarters' managerial discretion on resource allocation, monitoring efforts and informational advantages; and (iv) because of factors, such as, asset technological characteristics and roller-coaster growth, capital expenditure intertemporal dynamics, seem affected by the degree of asset lumpiness, exhibiting periods of investment spikes and inactivity, results suggesting that a failure to control for this variable may be a source of misspecification problems, and biased estimators (e.g., Brigham and Ehrhardt 2017; Verona 2014; Del Boca et al. 2008; Cooper and Haltiwanger 2006).

Finally, our findings of essay III indicate that: (i) sampled diversified firms exhibit a positive and statistically significant relationship between diversification, either overall, unrelated or related, and performance, results consistent with the findings of prior research, predominantly focused of U.S. and Asian data, therefore contributing for enhancing the generalization of the propositions submitted to testing (e.g., La Rocca et al. 2018; Giachetti 2012; Wan and Hoskisson 2003; Palich et al. 2000; Palepu 1985; Bettis 1981); (ii) a positive statistically significant relation between the different types of diversification and a market-based performance; and (iii) a statistically significant positive elasticity between asset plasticity and the performance level of unrelated diversified firms, providing support for the proposition that asset plasticity may be an instrumental factor for performance through diversification behavior, which is consistent with arguments of prior research (e.g., Kim and Kung 2017; Montgomery 1994; Shleifer and Vishny 1992; Williamson 1988).

Although, it may share its research object with previous research, the work conducted in this thesis distinguishes itself from extant diversification literature, in a number of aspects, contributing in several dimensions to that literature.

Methodologically, the design and implementation of our empirical investigation follows recent literature on dynamic panel estimators, which are recognizably associated with non-negligible improvements in terms of estimation efficiency. Moreover, by controlling in our empirical models for asset lumpiness and asset plasticity, we contribute to minimize model's potential identification and misspecification problems, which had been, to the best of our knowledge, neglected in studies with similar scope.

The organizational and behavioral characteristics of our samples provide an opportunity for enhancing the generalization power of the inferences drawn from results, through the mitigation of the traditional geographical, ownership and size bias usually associated with research focused on countries with market-centered financial systems.

Findings of the empirical investigations conducted in the thesis contribute to enhancing our understanding on some relevant dimensions of: (i) the financing behavior of firms operating within internal capital markets; (ii) the dynamics of the investment behavior of diversified firm subsidiaries; and (iii) the relationship between diversification and performance, and (iii) the sensitivity of the performance level of unrelated diversified firms on asset plasticity.

1.6. Summary and Conclusions

This section summarizes and discusses the main results of this thesis, provides some conclusive remarks, and offers suggestions for future research.

The thesis assumed as its generic research question, whether or not, resource usage within the boundaries of diversified organizations, is more efficient than through contracting with independent firms. More specifically, the thesis examines the research questions of: (i) The allocative efficiency effects of the financing behavior of diversified firms with active ICMs, in Essay I; (ii) The allocative efficiency effects of the investment behavior of diversified firms with active ICMs, in Essay II; and (iii) The effects of financing and investing behavior on the relationship between diversification and economic performance, in Essay III.

The empirical analyses conducted in Essays I, II and III aimed at examining the financing and investment behavior of firms operating within diversified firms, to shed light on the allocative implications in terms of firm's economic performance.

Our findings on the diversified firms' financing behavior may be interpreted as supportive of the dynamic trade-off capital structure theory. Additionally, our evidence also suggests that financing behavior of firms integrating ICMs is potentially more efficient, gauged by the cost of capital yardstick, than comparable stand-alone firms.

Our results on the diversified firms' investment behavior, documenting a lower dependence of ICM affiliates on internal funding for investment expenditures, may be interpreted in favor of a conjecture that ICM membership may mitigate the deadweight costs associated with informational and incentive frictions. Additionally, our findings also provide support for the prediction that ICM affiliates may have access to intra-group resource cross-allocation and to headquarters' debt capacity, exhibiting a lower sensitivity to its own financial flexibility for investment purposes, when compared with unaffiliated firms. The importance of including a proxy for the degree of asset lumpiness in the specification of corporate investment functions is also suggested.

Our evidence on the impact of diversified business organizations on their economic performance suggests that both operating and financial synergies, associated with related and unrelated diversification, respectively, may have an important and positive effect on a firm's performance level. Additionally, our findings also suggest that the higher the degree of asset ‘plasticity’, the larger the opportunity set for reallocating those assets to other business opportunities with positive value creation prospects.

Overall, our empirical findings are consistent with conventional wisdom that affiliation with a diversified firm does matter for economic performance, and for the efficiency of both financing and investment behavior. This result is robust to different empirical specifications.

Findings documented in this thesis, despite shedding some light on several research questions concerning the relation between financing and investment behavior, and economic performance of firms affiliated with ICMs, left a number of important issues to be answered. Therefore, more research in this area is needed.

The contrast in the economic performance of non-financial and financial diversified firms, and in the efficiency of both financing and investment behavior of non-financial and financial firms affiliated with a diversified firm represent research opportunities that should be further developed in the future (e.g., Pelletier 2018; Holod 2012; Haas and Lelyveld 2010; Campello 2002).

Further theoretical and empirical research on the relationship between asset lumpiness and asset plasticity in relation to capital allocative efficiency and diversification performance are promising avenues for further research on the topic.

Lastly, future research can also be expanded to include recent and auspicious lines of research related to the impact of ICMs on managerial incentives (e.g., Motta 2003), governance and control limits (e.g., Hoskisson and Turk 1990).

1.7. Organization of the Thesis

The remainder of the document is organized as follows: Chapter 2 examines the relevant theoretical literature on the efficiency of a firm’s financing policy, laying the foundations for formulating the hypotheses submitted to empirical testing. Chapter 3 discusses the relevant theoretical literature on the efficiency of a firm’s investment policy, laying the foundations for formulating the hypotheses submitted to empirical testing. Chapter 4 discusses the relevant theoretical literature on the performance of conglomerate firms, laying the foundations for formulating the hypotheses submitted to empirical testing, and testing the influence of ICMs on their performance. Chapter 5 summarizes the main findings and concludes the thesis.

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2. Does Internal Capital Market Membership Matter for Financing Behavior? Evidence from the Euro Area

2.1. Introduction

It is well-known that under complete, perfectly competitive, and frictionless capital markets, the mix of securities a firm should optimally issue is a matter of indifference (Modigliani and Miller 1958).

However, corporate finance literature provides abundant, compelling, and convincing evidence that firms' financial structure does matter for their valuation (e.g., Hart 2001; Myers 2001; Miller 1988; and Stiglitz 1969). Therefore, in an imperfect, incomplete and frictional capital market framework, the financing behavior of value maximizing firms aim at the minimization of the opportunity cost of capital of available financing alternatives.[1]

Extant literature has documented several stylized facts and empirical regularities related with the determinants and the valuation effects of firms' financing structures, and their hypothesized relationships with corporate organizational form, namely, in terms of the cost of capital (e.g., Hann et al. 2013; Lee et al. 2009; Leary and Roberts 2005; Fama and French 2002; Berger and Ofek 1995; Comment and Jarrell 1995; Lang and Stulz 1994; Bradley et al. 1984; Bowen et al. 1982; and DeAngelo and Masulis 1980).

Empirical findings from prior research suggest that firms' financing structure determinants may dissimilarly affect stand-alone firms and diversified firms operating within active ICMs (e.g., Dewaelheyns and Van Hulle 2012).

Despite the ongoing academic debate and professional interest, empirical evidence on the relationship between the corporate organizational form, capital structure, and the cost of capital is relatively scarce and it mostly focuses on the U.S. and Asian public parent firms (e.g., Almeida et al. 2015; Buchuk et al. 2014; Fier et al. 2013; Hann et al. 2013; Byoun 2008; Shin and Park 1999; Hoshi et al. 1991).

In this essay we investigate the financing behavior of privately held firms affiliated with diversified business organizations from the euro area, aiming at contributing to

[1] It is standard practice in corporate finance practice to gauge the efficiency of a firm's capital structure through its impact on its opportunity cost of capital (e.g., Fier et al. 2013; Gong and Huang 2008; Schwartz 2005; Peyer and Shivdasani 2001; and Fama and French 1999). See, Jensen (2001), for further discussion.

mitigate the problems typically associated with the differences in economic, financial, legal and institutional contexts innate to multi-country research.[2]

We examine different dimensions of firms' financing behavior using two balanced panel data sets of 636 unlisted firms each, over the 2004–2017 period, in a total of 17,808 testable firm-years. Specifically, we analyze for ICM affiliates and their comparable stand-alone peers, capital structure policy preferences, levels of financial leverage, the cost of capital, and the speed of adjustment to their preferred leverage ratios.

This chapter contributes to the literature providing evidence that: (i) Consistent with prior research, both ICM members and single-segment comparable firms have preferred target capital structures, proxied by industry's leverage ratio median (e.g., Fier et al. 2013; Byoun 2008; Flannery and Rangan 2006); (ii) Subsidiary firms, as predicted by agency and asymmetric information theories are, on average, 6.07 percent significantly more leveraged than their comparable counterparts; (iii) Subsidiaries of diversified firms operating within ICMs exhibit, on average, 2.80 percent lower cost of capital than their comparable stand-alone firms, which is consistent with the findings of prior empirical research (e.g., Gatzer et al. 2014; Hann et al. 2013; Dewaelheyns and Van Hulle 2012); and (iv) Both samples of firms adjust dynamically their capital structures; moreover it is documented that stand-alone firms adjust capital structures to their preferred leverage ratios at a 8.71 percent higher speed than ICM members do (e.g., Flannery and Hankins 2013; Dewaelheyns and Van Hulle 2012; Hovakimian and Li 2011; Flannery and Rangan 2006; Leary and Roberts 2005).

The remainder of this chapter is structured as follows. Section 2.2 discusses the relevant theoretical and empirical literature and formulates the hypotheses. Section 2.3 describes the data and the modeling specification. Section 2.4 presents and analyzes univariate statistics and the econometric results. Section 2.5 summarizes and provides concluding remarks.

[2] The generalization of empirical findings estimated from data sets of environments exhibiting different economic, financial, institutional, environmental and behavioral characteristics, may reveal inappropriate or even imprudent (e.g., Saá-Requejo 1996; and Rajan and Zingales 1995).

2.2. Theoretical and Empirical Background, and Hypotheses

2.2.1. Corporate Leverage Theory and Industry Affiliation Effect

According to corporate finance standard literature, under complete, frictionless, and perfectly competitive markets, firm valuation is unaffected by the debt-equity mix choice.[3] Unsurprisingly, the theory is in sharp contrast with the observation of real-world firms' financing evidence.

Under most tax codes, debt interest expenses, unlike dividend distribution to equityholders, are deductible for income taxation purposes. This absence of neutrality in relation to equity and debt financing, creates an incentive for, under specific circumstances, a preference for debt financing, and for leveraging up capital structures, and consequently increasing default risk, and expected bankruptcy costs. Therefore, according to the theory, firms will adjust their leverage ratios to their preferred targets, trading-off the marginal costs and benefits of debt financing, aiming at maximizing their market valuation.[4] The theory predicts the emergence of an optimal capital structure at the point those costs and benefits of leverage equate.

Additionally, the dynamic version of the trade-off theory predicts that firms adjust their leverage ratios towards their preferred financial levels over time (e.g., Leary and Roberts 2005; Ross 2005; Fama and French 2002; De Miguel and Pindado 2001; and Fischer et al. 1989).[5]

It is well-established that, whenever in a binding contract the parties are unevenly informed, the superiorly informed party has an incentive to behave opportunistically at the expense of the counterpart, who will incur in non-negligible deadweight informational costs.

The pecking order theory of financing was formalized under this theoretical framework (Myers 1984; Myers and Majluf 1984). According to the theory, whenever a firm needs to raise financial capital in external capital markets, it tends to follow a pecking order in using and exhausting its available financing sources, aiming at minimizing potential adverse selection deadweight costs in the form of a 'lemons premium'.

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[3] For reviews of this academic literature see, among others, Frydenberg (2011), Graham and Leary (2011), Myers (2003), Santos (2003), Harris and Raviv (1991), Masulis (1988).

[4] According to the static trade-off theory, capital structure results from a trade-off between the costs and benefits of the different financing sources. For further details, please refer to Chen (1979), Kim (1978), Scott (1976), Kraus and Litzenberger (1973), Baxter (1967), and references therein.

[5] In this context, we use target and preferred capital structure interchangeably.

Prior research on corporate financing, provides compelling evidence supporting the hypothesis that industry affiliation is an important factor for a firm's financing structure (e.g., MacKay and Phillips 2005; Titman and Wessels 1988; Campbell and Bradley 1986; Boquist and Moore 1984; Bradley et al. 1984; Bowen et al. 1982; DeAngelo and Masulis 1980; Scott and Martin 1975; Lev 1969; Schwartz and Aronson 1967; and Solomon 1963).[6]

This literature, also documents that leverage ratios at firm-level tend to revert towards industry mean / median statistics, providing empirical support for the proposition that intra-industry mean / median leverage ratios are potential useful surrogates for firms' target / preferred capital structure (Lee et al. 2009; Ghosh and Cai 1999; Bowen et al. 1982; Lev 1969).[7]

An important implication of the static trade-off model is that market imperfections and frictions establish a link between leverage and firm value, as managers perceive non-negligible value leverage effects in not readjusting to the firm's preferred target financial leverage ratio. Prior research provides evidence documenting that leverage ratios tend to be mean reverting, as firms raise external capital to keep financing structures at or close to their perceived preferred target, because of the value implications of deviations (e.g., Chen and Zhao 2007; Kayhan and Titman 2007; Graham and Harvey 2001).

2.2.2. Financing Structure and Cost of Capital in an Internal Capital Market Framework

It is well-acknowledged that value maximizing firms should make their financing choices by aiming at minimizing their opportunity costs of capital. However, it is debatable whether a participant in an active ICM shares a similar objective function, because of the allocative incentives associated to the headquarters – subsidiaries agency relationship.

Therefore, whether or not, the financing policies of ICM participants and of stand-alone firms affect their valuation identically, still remains an empirical question.

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[6] Harris and Raviv (1991) point out that firms in a given industry tend to have similar leverage ratios while financial leverage ratios vary across industries. For further details please refer to capital structure surveys by Graham and Leary (2011), Megginson (1997), Santos (2003), Masulis (1988), and references therein.

[7] As argued in Solomon (1963, 98), «industry groups appear to use leverage as if there is some optimum range appropriate to each group [, w]hile significant intercompany differences in debt ratios exist within each industry the average usage of leverage by broad industry groups tend to follow patterns over time». These patterns may be associated with the «valuation consequences of a change in a firm's leverage ratio […] related to the direction and magnitude of the change relative to the firm's industry» (Campbell and Bradley 1986, 2).

Agency and informational theoretical arguments are powerful in explaining the relationship between organizational form, financing structure and cost of capital (e.g., Maksimovic and Phillips 2002; Scharfstein and Stein 2000; Stein 1997). Debt financing can be viewed as a useful governance device in mitigating conflicts of interest between equityholders and managers, through the alignment of their objective functions. Debt financing, similarly to dividends, is also an influential mechanism to mitigate the agency costs of free cash flow, which may be a deterrent for managers adopting inefficient financing and investment policies (e.g., Stulz 1990; Jensen 1986).

Empirical literature documents that diversified firms are more leveraged than comparable non-diversified firms (e.g., Li and Li 1996; and Riahi-Belkaoui and Bannister 1994). Comment and Jarrell (1995) report that the debt-to-liabilities ratio varies on a range of 33-34 percent for single-segment firms, and in a range of 38-40 percent for affiliates of diversified firms.

Summarizing, it seems there is a consensus in the literature that: (i) several specific factors, such as corporate diversification level and the industry, that may influence the financing structure and the cost of capital; and (ii) agency and informational problems may affect stand-alone and ICM members' cost of capital differently.

2.2.3 Hypotheses Development

Among the factors that, arguably, may influence firms' financing behavior are included, the adverse-selection problems (e.g., Myers 1984; and Myers and Majluf 1984), moral hazard behavior (e.g., Goel and Thakor 2003; Townsend 1979; Galai and Masulis 1976), and agency conflicts (e.g., Maksimovic and Phillips 2002; Scharfstein and Stein 2000; Stein 1997).

Affiliation with an active ICM may be helpful in mitigating the effects of adverse selection problems, and consequently in lowering a firm's cost of capital (e.g., Stein 2003; Greenwald et al. 1984). In this context, a subsidiary's financing strategy is typically coordinated by the headquarters, which have the ability and the incentive to monitor the realization of cash flows, lessening informational problems, and therefore reducing the subsidiary's cost of capital (e.g., Myers and Majluf 1984; Townsend 1979).[8]

[8] As argued in Hann et al. (2013, 1962), «diversified firms have a lower cost of capital than comparable portfolios of stand-alone firms». In the same vein, Gatzer et al. (2014) provide survey evidence documenting that the surveyed CFOs associate internal capital markets with lower cost of capital and larger financial slack. See also Belenzon et al. (2013), Khanna and Palepu (2000).

An ICM environment may also give rise to agency problems between the headquarters and divisional / subsidiary managers, which may induce inefficient resources allocations (e.g., Scharfstein and Stein 2000). Rational financial claimholders, have the ability and the incentive to anticipate costly headquarters – subsidiaries agency conflicts, and require commensurate premia to cover their exposure to the risk levels they perceive, inducing potential increases in the cost of capital.[9]

According to Lev (1969) and Bowen et al. (1982), among others, the financing behavior of firms displays a general tendency to adjust towards their industry mean leverage ratio, which is often used as a surrogate for their preferred leverage target ratio (see also, Lee et al. 2009; Byoun 2008; Kayhan and Titman 2007; Flannery and Rangan 2006; Leary and Roberts 2005; Ghosh and Cai 1999). This literature provides empirical support for the proposition that industry average leverage ratios are a conspicuous surrogate for firms' target intra-industry capital structure.

Under this framework, we hypothesize that both ICM members and their stand-alone peers, have preferred leverage targets − Hypothesis 1.a (H1.a).

It is well-acknowledged, that under semi-strong informationally efficient capital markets, the announcement of leverage decreases may be perceived, everything else constant, as 'bad news' by market participants (e.g., Klein et al. 2002). This signaling effect tends to increase the required 'lemons premium', and ultimately to raise the cost of capital. Therefore, we hypothesize that ICM members exhibit a higher leverage ratio than comparable stand-alone counterparts − Hypothesis 1.b (H1.b).

Based on the argument that the minimization of the cost of capital is a useful yardstick for gauging the efficiency of a firm's financing behavior (e.g., Schwartz 2005), we hypothesize that ICM members exhibit a lower cost of capital than their comparable stand-alone cohorts − Hypothesis (H2).

The speed of capital structure adjustment is a relevant dimension of firms' financing behavior because of its valuation implications. This literature suggests that firms' trade-off the benefits and the costs of adjusting their leverage levels (e.g., Byoun 2008; Wanzenried 2006; Lev and Pekelman 1975).

Dewaelheyns and Van Hulle (2012) argue that ICM participants «may face relatively low adjustment costs because of their access to both internal and external

[9] For more on the benefits and costs of diversification see, e.g., Ekkayokkaya and Paudyal (2015).

capital markets and the beneficial reputation effects of belonging to a group» (Ibid, 1275). For this motive, they may adjust their capital structure more frequently than comparable stand-alone firms because of potential economies in issuing costs, and of the potential 'socialistic financing behavior' of the internal capital market they are affiliated with. However, since affiliates of diversified firms may exhibit a financial ratio below and closer to their preferred leverage level, potentially lowering the marginal benefits of leverage adjustment, this may lead ICM affiliates to not adjust so frequently.

Stand-alone firms may adjust more rapidly because they, arguably, are more likely to bear higher financial costs of being out of their preferred leverage level, than their subsidiary peers. Additionally, adjusting more 'vigorously', may be helpful in lessening fixed issuance costs (e.g., Marsh 1982; Taggart 1977; Kraus and Litzenberger 1973).

Therefore, we hypothesize that stand-alone firms adjust at a higher speed to their preferred leverage ratios from a target than comparable ICM participants − Hypothesis 3 (H3).

2.3. Data Description and Empirical Implementation

2.3.1. ICM members and Stand-alone Firms: Sample Selection and Data Description

For this empirical analysis we developed two subsamples, one of ICM participants, and another of comparable stand-alone firms. Data for both subsamples were drawn from Bureau van Dijk's Amadeus database, for a sampling period spanning from 2004 to 2017.[10]

For the purposes of the empirical investigation conducted in this essay, we adopted the business group definition proposed in Khanna and Rivkin (2001), as a set of diversified and legally independent firms bound together by a set of formal and informal ties, and that are run through coordinated action, i.e., a network of business and financial relationships of varying degrees and kinds. This approach is consistent with much academic work related to the European context (e.g., Belenzon et al. 2013; Smagns 2006; Gautier and Hamadi 2005; Faccio and Lang 2002; Deloff 1998).

[10] Like other studies with similar focus, which also used the Amadeus database, e.g., Ferrando et al. (2017), Gugler et al. (2013), Dewaelheyns and Van Hulle (2012), data for the ICM members subsample do not include segment data reported on 'behalf' of the 'parent' firm. Most studies on ICMs use firm segment data (US conglomerates information) that may introduce measurement errors in variables. See Gugler et al. (2013) and Whited (2001) for more details.

To be included in our ICM members subsample, a firm has to comply with the following criteria: (i) to be ultimately owned (co-owned) by an industrial Global Ultimate Owner (GUO) − a non-financial corporation and/or non-individual investor GUO −, a known equityholder that holds, directly or indirectly, a minimum ownership of 50.01 percent of the subsidiary, and owns two or more subsidiaries;[11] (ii) to be established in the euro area, to ensure harmonized financial, monetary and fiscal conditions; (iii) to be active for the entire sampling period, with at least 12 to 14 years of data for all the used variables, to obtain a balanced panel data;[12] (iv) to have annual sales revenue higher than 5 million Euros.[13] All financial services firms, education and regulated utilities were excluded from the data sample.[14]

Using the above described criteria, we end up with a sample of 900 subsidiary firms, and a sample of 3,764 stand-alone firms.

To ensure comparability in terms of industry and size, we conducted a tailor-made matching procedure (see Appendix 1 for a description), to select a one-to-one sample of ICM participants that matches, to a maximum of 10 percent variance, the industry and the size of comparable stand-alone firms (Hund et al. 2019).

After applying the matching procedure, we end up with two subsamples of 636 firms each, and a total of 17,808 testable firm-years.

Compared with previous studies with similar scope, our subsamples, include a larger number of diversified firm subsidiaries, and covers a longer sampling period (e.g., Dewaelheyns and Van Hulle 2012; Apostu 2010; La Rocca et al. 2009; Byoun 2008; Flannery and Rangan 2006; Anderson et al. 2000; Kochhar and Hitt 1998; Lowe et al. 1994; Barton and Gordon 1988).

[11] This classification criterion is based on a strong definition of ownership, which enables us to observe situations in which the parent firm has enough authority to control the financing choices of its subsidiaries (see also Gautier and Hamadi 2005).

[12] There are similar studies in the literature, which included in their samples only firms that had data available for the whole period (e.g., Singh et al. 2003; Kwok and Reeb 2000), or for, at least, six consecutive years (e.g., Dewaelheyns and Van Hulle 2012; La Rocca et al. 2009).

[13] Following Belenzon et al. (2013), among others, we excluded very small firms from our subsamples, because of missing ownership and financial data.

[14] For subsample 2, we defined the following sampling criteria: (i) including firms that were not owned (co-owned) by a GUO, or by another diversified firm, or not even a GUO; (ii) that own (co-own) any subsidiaries; and (iii) that were not the ultimate owner. These changes ensure that the firms are stand-alone in the market, i.e., they do not belong to a diversified firm and they themselves are not a diversified firm owning subsidiaries.

2.3.2. Implementation Design and Testing

This subsection describes the specification of the empirical models, the variables and the methodological issues associated with the statistical and econometric procedures applied in hypotheses testing.

To test hypothesis 1.a, if both, subsidiary firms and their comparable stand-alone counterparts have a preferred leverage ratio target (H1.a), we follow the empirical procedures of, e.g., Fier et al. (2013), Flannery and Rangan (2006), and De Miguel and Pindado (2001).

The regression model was specified as:

$$\left[{}^{D}\!/\!_{A}\right]_{it} = \beta_0 + \beta_1 IndMed_{it} + \beta_2 Size_{it} + \beta_3 Tang_{it} + \beta_4 Profi_{it} + \beta_5 MtoB_{it} + \\ + \beta_6 Risk_{it} + \beta_7 DTS_{it} + \beta_8 NDTS_{it} + \varepsilon_{it} \quad (2.1)$$

where $\left[{}^{D}\!/\!_{A}\right]$ denotes the firm total debt ratio; *IndMed*, industry median debt ratio; *Size*, firm size; *Tang*, tangibility of assets; *Profi*, firm profitability; *MtoB*, market-to-book ratio, as a proxy for growth opportunities; *Risk*, firm's equity systematic risk coefficient; *DTS*, debt tax shields proxied by the firm effective tax rate; *NDTS*, firm non-debt tax shields; subscripts refer to firm *i* at time *t*; and, ε_{it} is the error term with zero mean and constant variance.

We specified the total debt ratio variable, $\left[{}^{D}\!/\!_{A}\right]$, as the ratio of long-term debt plus short-term debt net of cash holdings, to total assets.

The industry's debt ratio median, *IndMed*, was estimated for a 'portfolio' of subsidiaries and single-segment firms, sharing similar characteristics in terms of standard industry classification code (US SIC/NACE) and size.

Proxies for size, *Size*, and assets tangibility, *Tang*, were estimated as the natural logarithm of total assets, and as the ratio of tangible fixed assets to total assets, respectively. Firms which asset bases exhibit higher levels of asset tangibility, tend to have more asset collateralization potential, and lower asset opaqueness and deadweight costs of asymmetric information. Additionally, asset collateralization should also lower lenders' credit risk, and ultimately their expected rates of return. However, DeAngelo and Masulis (1980) show that under income tax deductibility of depreciations, firms with high levels of asset tangibility, have a commensurate tax shield, and therefore a 'natural' substitute for cost of debt tax shields. Therefore, they predict an inverse relation between debt and investment-related tax shields.

The profitability variable was specified, *Profi*, as the ratio of operating income to total assets. According to the pecking-order hypothesis prediction, we should expect an inverse relation between profitability and the leverage (e.g., Fier et al. 2013; La Rocca et al. 2009; Antoniou et al. 2008; Byoun 2008).

To control for growth opportunities, we used the market-to-book ratio, *MtoB*, specified as firm's equity market value to its book value, both referred to time *t*.[15] Under efficient capital markets, a firm's share price, and therefore its market capitalization, reflect both the market value of firm's assets-in-place and future growth opportunities. Therefore, we opted for using the market-to-book ratio instead of the Tobin's *q*, as used in some studies (e.g., De Miguel and Pindado 2001), to avoid the measurement problem associated to its numerator including the firm's market value of debt, which reflects the time value of money and the premia determined by the debt exposure to risk, and therefore being unrelated to the market value of the future growth opportunities (see also, e.g., Eberly et al 2012; Whited 2001). The equity market value was estimated as the expected equity fair value as described in the subsection *3.3.2.* of the chapter 3 of the thesis. It was also assumed that the book value of debt is an unbiased estimator of its market value. Findings from prior research document an inverse relationship between growth opportunities and leverage (e.g., La Rocca et al. 2009; Antoniou et al. 2008; Byoun 2008; Menéndez-Alonso 2003; Myers 1977).

Equity systematic risk coefficient, *Risk*, estimated as described in *2.3.2.1.1.* below, was used to control for systematic risk, the risk component that cannot be eliminated through diversification.

To control for firm's debt tax shields, *DTS*, and for non-debt tax shields, *NDTS*, we specified the ratio of annual income tax to earnings before tax (effective tax rate), and the ratio of annual depreciation to total operating costs, respectively.

The expected and estimated coefficient signs for the variables used in the hypothesis 1.a empirical testing are detailed in table 2.1.

[Insert Table 2.1 here]

[15] For further details on market-to-book see, e.g., Lev and Sougiannis (1999).

To test hypothesis H2, the risk-adjusted opportunity cost of capital was estimated following the standard weighted average cost of capital (WACC) model, and the computational procedures specified below.[16]

2.3.2.1. Estimation of the Cost of Equity

It is accepted among academics and practitioners alike, that two approaches can be usefully used in estimating the cost of capital components: the risk-premium and the discounted-cash-flow (DCF) approaches. Among the former approach, the Capital Asset Pricing Model (CAPM) is the most widely used (Brotherson et al. 2013; Graham and Harvey 2002, 2001).[17]

Despite the stringent set of assumptions underlying the CAPM, «its tractability and the evident appeal of the linear relation between return, E_i , and risk, β_i, [...] have ensured its popularity» (Ross 1976, 342).[18]

2.3.2.1.1. Equity Systematic Risk Coefficient

Because our two subsamples include only unlisted firms, their equity betas cannot be estimated by statistical or econometric methods, we applied the 'bottom-up' approach in their estimation (e.g., Damodaran 2011; Beneda 2003).[19]

The asset beta (β_A), was estimated as the coefficient of variation of the firm's operating cash flow (e.g., Kale et al. 1991).

Underlying this procedure is the conjecture that firms in the same industry tend to exhibit similar business risk levels (e.g., He and Kryzanowski 2007; Kaplan and Peterson 1998; Alexander et al. 1996). Accordingly, the firms in our two subsamples were grouped according to their NACE code, and for each industry an asset beta was estimated as the weighted, by total net assets, average of the individual business risks. Asset betas were adjusted for firms' specific financial leverage, using Hamada's (1972) procedure.

[16] For comprehensive reviews of the academic literature related to the cost of capital see, among others, Brotherson et al. (2013), Conroy and Harris (2011), Pratt and Grabowski (2008), Rao and Stevens (2007), Armitage (2005), Patterson (1995), and Ehrhardt (1994).

[17] See, among others, Fama and French (2004) and Perold (2004) and references therein for discussions on the CAPM.

[18] Franks et al. (2008, 8) «consider that the DCF and Fama-French methods should not be the primary evidence in estimating firms' cost of equity». However, Wright et al. (2003, 76) argue that «there is no one clear successor to the CAPM for practical cost of capital estimation».

[19] The 'pure play' approach to beta estimation could not be followed because we were unable to find strictly comparable listed firms for our two subsample members.

2.3.2.1.2. The Market Risk Premium

We estimated the market risk premia for the different domestic capital markets included in our subsamples as the difference between the average rates of return on equities from 16 European countries and country's risk free rates relative to long-term government bonds drawn from Dimson et al. (2017).[20]

2.3.2.1.3. Risk-free Rate

According to the European Central Bank (2008, 100), a «government bond yield curve can be considered as a risk-free yield curve if the default risk of government bonds is assumed to be negligible. This assumption is especially reasonable for a curve based on AAA-rated bonds».

An adequate proxy for the risk-free rate should exhibit, among others, a negligible level of credit and liquidity risk and no reinvestment risk.

However, because of the monetary policies adopted by most central banks in the aftermath of the 2008 financial crisis, the yields of sovereign treasuries went, for most issuers, down to negative territory. In these instances, we considered the sovereign bonds to be the more appropriate proxy for the risk-free rate (e.g., Armitage 2005). Accordingly, we estimated the risk-free rates as the sum of the annual average yield of a portfolio of AAA rating 10-years maturity sovereign bonds and a country risk premium.[21]

The country risk premium was estimated as the difference between the central point of a 95 percent confidence interval for each annual average yield of 10-years maturity sovereign treasury bond, and the annual average yield of the portfolio of AAA rating 10-years maturity sovereign treasury bonds.

2.3.2.2. Estimation of the Cost of Debt

The literature suggests different methodological procedures to estimate the cost of debt. However, there are a number of common caveats that limit the applicability of some

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[20] The empirical estimation of the market risk premium is a complex endeavor because it is not a directly observable forward-looking measure. The literature refers different methods for estimating the market risk premium. Among them: (i) the historical method; (ii) the supply-side models – implied premium and the dividend growth model (e.g., Campbell 2008; Wetherilt and Weeken 2002); (iii) the demand-side models (e.g., Mehra and Prescott 1985); and (iv) surveys and Delphi methods to elicit expert opinions (Song 2007; and Ibbotson and Chen 2003). Fernandez et al. (2014), Graham and Harvey (2005), Arnott and Ryan (2001) and Welch (2000) conducted surveys to financial professionals and academics. For methodological details on the different approach estimation processes, see, among others, Dimson et al. (2008), Mehra (2008).

[21] To estimate the portfolio of AAA rating sovereign treasury bonds, and following S&P and Moody's ratings, we used data from: Germany, Finland and Belgium for the period 2004-2017, the countries with AAA rating over the all sampling period; and, France and Austria for the period 2004-2012.

of those methods in estimating the cost of debt, due to: (i) the unavailability of market prices; (ii) the coexistence of fixed and floating rate debt; (iii) some debt instruments having embedded option features; (iv) most of the corporate debt being non-rated; and (v) the existence of leasing and other forms of off-balance sheet financing.

When debt securities do not have mark-to-market prices, one can resort, to the following procedures to estimate the cost of debt, namely: (i) using the yields on strictly comparable rated bonds for maturities that closely match that of the company's existing debt (the debt-rating approach); (ii) using the average of the book value fiscal year-on-year stock of outstanding debt, and of interest expenses; and (iii) resorting to the CAPM to estimate the debtholders' required rate of return on debt financing.

Firms' average annual cost of outstanding debt (k_D), was estimated using their year-on-year debt book values and interest expenses.

2.3.2.3. Capital Structure Estimation

It is a standard procedure of corporate finance textbooks to mark-to-market the weights of the different sources of funding for WACC computation purposes. However, since our two subsamples include only unlisted firms, we assumed debt and equity book values as unbiased estimators of their market values (e.g., Hern et al. 2009; Franks et al. 2008). The amount of outstanding debt was estimated as the average book value of debt at the beginning and at the end of each time period.[22]

To test the effect of a set of explanatory variables on the cost of capital (H2), we regressed them against the cost of capital estimated for the two subsampled firms.

The regression model was specified as:

$$\begin{aligned} Kc_{it} &= \beta_1 EquityBetaDecile1_{it} + ... + \beta_{10} EquityBetaDecile10_{it} + \beta_{11} BG_{it} + \beta_{12} Size_{it} + \\ &+ \beta_{13} Tang_{it} + \beta_{14} DTS_{it} + \beta_{15} \left[D/A \right]_{it} + \varepsilon_{it} \end{aligned} \quad (2.2)$$

where k_C denotes the firm cost of capital; $EquityBetaDecile1$ to 10, information asymmetry dummies; *BG*, agency problems dummy; *Size*, firm size; and *Tang*, firm asset tangibility; *DTS*, debt tax shields proxied by the firm effective tax rate; and $\left[D/A \right]$, firm financial leverage.

[22] The year-on-year debt book value is estimated as the sum of non-current liabilities (NCLI) and current liabilities (CULI), in terms of the Amadeus database nomenclature.

Ibbotson et al. (2016, 2-6) document that, over the 1926-2015 period, U.S. small caps exhibit an average + 4.5 percent excess annual total return over large caps, and 12 percent excess risk, measured by the standard deviation of stock returns (see also Fama and French 1992). This empirical regularity suggests that firm size may play a role in explaining risk – return positive relationship. The larger the firm, the larger the magnitude of the investors' risk exposure and their commensurate stock return.

Greater cash flow volatility − larger risk − leads, *ceteris paribus*, to higher asset betas, and therefore, keeping everything else constant, to higher equity betas, and to informational advantages for better informed insiders over less informed outsiders (Goel and Thakor 2003). Therefore, we conjecture that a firm equity beta may be an indicator of the level of asymmetric information.

In a world with asymmetric information, cash flow realizations can only be observed *ex post* at a cost (e.g., Goel and Thakor's 2003; Townsend 1979). Additionally, as shown in Myers (1984) and Myers and Majluf (1984), in a binding contract there is an adverse selection problem if, *ex ante*, one of the parties is less informed about the true risk and return characteristics of the project. In these instances, the party poorly informed will require a commensurate compensation, a 'lemons premium', for her exposure to that asymmetric information problem.

Grouping our subsamples by deciles using firms' equity beta means and classifying each decile as a dummy variable allows us to test if firms with the higher equity beta level (*Equity Beta Decile 1*) exhibit a higher cost of capital.

We specified the equity beta decile variable, *EquityBetaDecile*, a proxy for asymmetric information problems, as dummy variables that distinguish between the firms in the highest decile according to the equity beta level (classified with the value 1 in the *EquityBetaDecile 1* dummy variable), and the firms in the lowest decile according to the equity beta level (classified with the value 1 in the *Equity Beta Decile 10* dummy variable) (e.g., Bharath et al. 2009; and Clarke and Shastri 2000).

We specified, *BG*, a proxy for agency conflicts, as a dummy variable that distinguishes between subsidiaries (with the value 1 in the *BG* dummy variable) and stand-alone (with the value 0 in the *BG* dummy variable). Prior research on the agency problems of firms' financing, suggest that more concentrated ownership structure may be helpful in lowering the agency and informational problems, when compared with the more diffuse ownership structure of stand-alone firms (e.g., Chakraborty 2015; Goel and Thakor 2003).

Findings from prior research document: (i) an inverse relationship between both size and asset tangibility, and the cost of capital (e.g., Hann et al. 2013; Hughes et al. 2009; Gode and Mohanram 2003; Gebhardt et al. 2001); (ii) that an increase in the effective tax rate variable raises the tax savings, having consequently a negative impact on the cost of capital (e.g., Graham 1999; McKenzie and Mintz 1992; and Mackie-Mason 1990); (iii) an inverse relationship between leverage and the cost of capital (e.g., Hann et al. 2013; Hughes et al. 2009; Gode and Mohanram 2003; Gebhardt et al. 2001).

See table 2.2 for expected and estimated coefficient signs for the variables used in hypothesis 2 empirical testing.

[Insert Table 2.2 here]

To test if subsidiary firms integrated in an ICM framework, adjust their financial leverage ratios towards their preferred targets, at different speeds than their stand-alone peers (H3), we implemented, in line with prior research, a procedure to estimate the speed of adjustment (see, e.g., Byoun 2008; De Miguel and Pindado 2001; and Ozkan 2001).[23] This process can be estimated through an incomplete (partial) adjustment model specified as (e.g., Fier et al. 2013; Byoun 2008; Flannery and Rangan 2006; De Miguel and Pindado 2001; and Ozkan 2001):

$$\left[D/A\right]_{it} = \gamma\left(D/A\right)^{*}_{it-1} + (1-\gamma)\left[D/A\right]_{it-1} + \varepsilon_{it} \;\Leftrightarrow\; \left[D/A\right]_{it} = (\gamma\beta)X_{it-1} + (1-\gamma)\left[D/A\right]_{it-1} + \varepsilon_{it} \qquad (2.3)$$

where D_{it} denotes the total debt, A_{it} the total assets, $\left[D/A\right]^{*}_{it-1}$ the financial leverage target ratio for firms *i* at time *t-1*, X_{it-1} denotes a vector of firm and industry characteristics, and γ the target adjustment coefficient.

The speed of adjustment SOA (γ), was estimated as (1 - λ), with λ as the coefficient of the lagged dependent variable.

[23] In this implementation, we used second generation of dynamic panel data estimators, because they are, arguably, the more accurate and efficient SOA estimators in the likely presence of the equation's disturbance term being correlated with the lagged dependent variable, autocorrelation, fractional and highly persistent debt ratios as dependent variables, and unsuitable instrumental variables used in system GMM (Dang et al. 2015; De Vos et al. 2015; Zhou et al. 2014; Flannery and Hankins 2013; Bazdresch et al. 2018; and Strebulaev and Whited 2012).

2.3.2.4. Endogeneity Problems

The estimation of ICM's effect on cost of capital is an example of the general problem of estimating treatment effects in observational studies. The problem is that the simple average difference in firms' characteristics between treatment (as a subsidiary of a diversified firm) and control group (a non-treated group of firms – stand-alone firms) is only an unbiased estimate of the treatment effect when units are randomly assigned to the treatment (Campa and Kedia 2002).

A stream of empirical literature (e.g., Berger and Ofek 1995; Lang and Stulz 1994), uses matching procedures that implicitly assume that firms become part of a diversified firm randomly.

For this purpose, we developed and applied a tailor-made matching procedure (see Appendix 1 for a description) aiming at mitigating the self-selection of the group membership problem. The matching process comprises of building a control group as an 'image' of the treatment group, which reports similar characteristics (variables),[24] given the idea that the treatment does not justify significant differences between the two subsamples.

Unless there are differences between the two subsamples on the effects of diversification on the cost of capital, occurring only under random assignment, a selection bias in an ordinary least squares (OLS) estimate arises due to the correlation between the propensity to diversify and the error term.

A class of estimators that allow the sample selection bias to be mitigated and the treatment effect on the treated group to be identified in a non-experimental context, is Heckman's (1979) two-stage model.[25]

The results of the application of Heckman's procedure to our regression analysis to strengthen the robustness of the matching process, following, e.g., Villalonga (2004) and Campa and Kedia (2002), are reported in subsection *2.4.2*.

[24] In traditional matching methods the control group is formed matching units based on one or more characteristics. However, studies of diversification decision show that the two groups of firms also differ in other characteristics. Therefore, and given that there are many possible reasons why firms diversify, partial matches based on only one or two characteristics may not yield the most relevant group for comparison (Villalonga 2004).

[25] Because the details on Heckman's procedure can be found in econometric textbooks, or in Villalonga (2004), Campa and Kedia (2002) as applied to diversification, we deliberately omitted them here.

An endogeneity problem results from the equation's disturbance term being correlated with the lagged dependent variable in dynamic panel data models. To control for this potentiality, Roberts and Whited (2013), among others, suggest that when performing a regression analysis in dynamic panel data models, the generalized method of moments (GMM) estimators should be applied, instead of the OLS.

According to a non-negligible stream of the empirical literature, instrumental variables (IV) applied in GMM estimators may help to mitigate endogeneity problems (e.g., Roberts and Whited 2013). However, to the best of our knowledge, simulation results reported by, e.g., Dang et al. (2015) and Zhou et al. (2014) indicate that the second generation of dynamic panel data estimators, such as, the least squares dummy variable correction (LSDVC) (Kiviet 1995) and, the bootstrap-based correction procedure (BCFE) (Everaert and Pozzi 2007) are the more accurate estimators (see also, Bazdresch et al. 2018; Flannery and Hankins 2013; and Strebulaev and Whited 2012).

2.4. Results

2.4.1. Univariate Statistics Analysis

Table 2.3 presents subsample characteristics in terms of data distribution by industry and country.

[Insert Table 2.3 here]

Panel A of table 2.3 shows that all major non-financial industries are represented in the subsamples, with an emphasis on wholesale and retail trade and manufacturing, which represent 66.35 percent of the subsamples.

Panel B presents the details concerning the distribution of the 636 firms (in each of the two subsamples) by country, for the sampling period. The distribution, by country, which is very similar for the two subsamples, with Spain, France and Italy having the highest representations (representing 80.7 percent of the total of sampled firms in subsample 1 and 78.4 percent of all the firms in subsample 2), while Austria, Finland, Greece, Luxemburg and Portugal exhibit the lowest representations in the two subsamples, accounting for 3.8 percent of the total of sampled firms in subsample 1 and 8.1 percent of all the firms in subsample 2.

Table 2.4 reports the summary statistics for the variables used to test H1.a, for both subsamples. As documented, ICM members exhibit higher level of total debt ratio, total assets, equity systematic risk, growth opportunities, profitability, debt tax shields, and non-debt tax shields.

[Insert Table 2.4 here]

Pearson correlation coefficients between total debt ratio and the determinants of the capital structure employed in the regression model used to test H1.a are reported in table 2.5. A correlation matrix shows that asset tangibility, profitability and non-debt tax shield variables are negatively correlated with leverage, while asset base size, growth opportunities, equity systematic risk and debt tax shields variables are positively correlated with leverage, all at the 1 percent level of statistical significance for the two subsamples.

[Insert Table 2.5 here]

Table 2.6 reports the summary statistics of the variables used to test H1.b and H2 for the 2004-2017 sampling period, for the ICM members subsample (Panel A) and comparable stand-alone subsample (Panel B).

[Insert Table 2.6 here]

To test for differences in means and medians of the variables included in the empirical model, we conducted parametric tests for the equality of means, and Wilcoxon-Mann-Whitney tests for the equality of medians.[26] Table 2.7 reports the means (on top) and medians (at the bottom) of those variables in subsamples 1 and 2, and the statistics for equality tests across samples.

[Insert Table 2.7 here]

A striking difference between the two sets of firms is that ICM members exhibit a significantly higher ratio of debt-to-total assets at the 1 and 5 percent levels, as reported in table 2.7. This is consistent with our H1.b, and with empirical literature, e.g., Dewaelheyns and Van Hulle (2012), Li and Li (1996), Comment and Jarrell (1995) and Riahi-Belkaoui and Bannister (1994) for a sample of affiliates of private Belgian business groups and comparable stand-alone firms.

Using accounting information and several empirically tested analytical accounting-based procedures to estimate the components of the cost of capital, we find that the results of the estimation of the cost of capital components are consistent with H2, documenting

[26] The *t-test* is a robust test for the normality assumption. Although the difference in subsample size is smaller than 1.5, we conducted the Wilcoxon-Mann-Whitney U test. This test is a non-parametric test that does not require the assumption of normality.

that the cost of capital of firms integrated in an ICM (subsample 1) is significantly lower than comparable stand-alone firms (subsample 2), at the 1 and 5 percent levels of statistical significance.

The means for the cost of equity and the cost of debt, exhibit statistically significant differences at the 1 percent level, for both subsample 1 and 2. These findings are consistent with our hypotheses.

The results of the Wilcoxon-Mann-Whitney test, in table 2.7, provide additional support for our parametric testing, both in terms of statistical significance at the 1 percent level and hypothesized differences in means and medians.

Overall, the results of the univariate analysis indicate differences in the cost of capital between subsample 1 and subsample 2. Our estimates indicate that the mean and the median of the cost of capital of ICM member firms are, respectively, 2.80 and 2.22 percent lower, and statistically significant at the 1 and 5 percent levels, than their stand-alone peers. These findings are consistent with extant empirical literature (e.g., Gatzer et al. 2014; and Hann et al. 2013).

2.4.2. Regression Analysis

We estimated a panel data regression on the determinants of leverage ratio, to determine if ICM and stand-alone firms have target leverage ratios (H1.a). The results are reported in table 2.8.

[Insert Table 2.8 here]

Estimation results show that the industry median debt ratio is positively related with firms' leverage ratios at the 1 percent level of statistical significance, which is consistent with prior research, e.g., Byoun (2008) and Flannery and Rangan (2006).

Size (for the ICM members subsample), asset tangibility (for the stand-alone firm subsample), and growth opportunities variables exhibit a positive relationship with the leverage ratio, all statistically significant at the 1 percent level. Our evidence suggests that leverage increases with increases in firm size which is consistent with Fier et al. (2013), and Flannery and Rangan (2006).

Consistent with prior research, coefficient estimates on profitability, debt tax shields, and non-debt tax shields are statistically significant at the 1 percent level, suggesting that these variables are important factors for a firm's financing structure.[27]

Regression results, included in table 2.8, suggest that ICM and stand-alone firms both have target leverage ratios, proxied by industry's leverage ratio median, supporting that industry affiliation is a relevant factor for a firm's capital structure and the dynamic trade-off capital structure theory (e.g., Fier et al. 2013; Byoun 2008; Flannery and Rangan 2006).[28]

We regressed our proxies for information asymmetry, agency conflicts, tangibility, size, profitability, debt tax shields, and financial leverage ratio on the cost of capital for the two subsamples (H2).

Regression results reported in table 2.9, indicate that: (i) the coefficient of the proxy for informational asymmetries is positive and statistically significant at the 1 percent level for the two subsamples, suggesting that asymmetric information problems are likely to impact the firms overall cost of capital - the firms with higher equity betas (*EquityBetaDecile* 1) exhibit higher coefficients for the information asymmetry proxies; (ii) the negative coefficient of the *BG* variable indicates an inverse relationship between the cost of capital of ICM firms and stand-alone firms, suggesting that a more diffuse ownership structure may yield higher agency and informational problems with impact on a firm's cost of capital;[29] (iii) the negative and statistically significant coefficients for the size (for the stand-alone firms subsample) and tangibility variables, at the 1 to 10 percent levels, suggest that firms exhibiting higher levels of asset tangibility tend to have more asset collateralization potential, lowering asset opaqueness and costs of asymmetric information, and lowering their cost of capital; (iv) the 1 percent significantly negative coefficient for the variable debt tax shields, for both subsamples, indicates that an increase in income taxation, at the firm level, due to an increase in the effective tax rate as consequently a negative impact on the cost of capital; (v) the positive and statistically

[27] Following Fier et al. (2013), Flannery and Rangan (2006), we also checked the robustness of the results using the empirical results of panel data fixed effects estimation, reported in table 2.10.
[28] As robustness checks, we estimated the model presented in Table 2.8 with: (i) the independent variables lagged one period (according to Fier et al. 2013; and Flannery and Rangan 2006); (ii) growth opportunities, *GrowthOp*, estimated using an alternative specification as the growth rate of annual sales (sales growth); and documented consistent results.
[29] See table 2.9, columns 3 and 4, for further details on coefficients for the *BG* variable.

significant coefficient at the 1 and 5 percent levels for the financial leverage variable indicate that the higher the firm financial leverage, the higher the higher the default risk and consequently the higher the cost of capital.

Results of the application of the Heckman's (1979) two-stage model (reported in column 4 of table 2.9) show that the estimator signs of the explanatory variables are: (i) consistent with the predicted signs; and (ii) are statistically significant at the usual standard levels; confirming the OLS estimation results. Consistent with prior research, these findings strengthen the robustness of our matching process (e.g., Villalonga 2004; and Campa and Kedia 2002).

[Insert Table 2.9 here]

Overall, our empirical findings on determinants of the cost of capital suggest that ICM members may experience lower deadweight costs of asymmetric information and agency problems associated with its organizational form, which may be helpful in reducing ICM affiliates cost of capital. These findings are consistent with prior empirical research, e.g., Hann et al. (2013), Dewaelheyns and Van Hulle (2012), Graham and Leary (2011), and Harris and Raviv (1991).[30, 31]

Equation (2.3) tests if ICM firms adjust at different speeds their financial leverage ratios towards their preferred targets, when compared to their stand-alone peers (H3).

In estimating equation (2.3) we used a dynamic target adjustment panel data model, based on the assumption of a constant partial adjustment speed, and controlling for the major determinants of capital structure suggested in the literature.

Table 2.10 reports the estimation results of equation (2.3). Applying the pooled OLS, the estimates for the speed of adjustment ($\gamma = 1 - \lambda$) will be biased downwards, while FE models are likely to suffer from finite-sample (short panel) bias and lead to upward biased estimates of γ (these are the models presented in the first two columns of table 2.10).

[30] During the sampling period, some countries in the subsamples, like Greece and Portugal, were under financial assistance from International Institutions, which may have had an impact, namely, on the financing cost of firms operating in these countries. As a robustness check, we excluded from the subsamples the firms located in those countries and results still exhibit a cost of capital significantly lower for ICM firms, than for comparable stand-alone firms.

[31] Additionally, we conducted parametric tests for mean comparison in the variables used to test H2, between the two subsamples, grouped by industry. All the industry groups exhibit similar patterns of significant differences between subsample 1 and subsample 2 firms, with the cost of capital significantly lower for ICM firms, than for comparable stand-alone firms.

Given the properties and assumptions of the IV/GMM estimators (Blundell and Bond 1998; Arellano and Bond 1991; and Anderson and Hsiao 1981), and the reference made by Flannery and Hankins (2013) that the system GMM estimates for γ are typically between those of OLS and FE, we reported (in table 2.10, column 3) the results of the Blundell and Bond (1998) estimators (SYS-GMM).

[Insert Table 2.10 here]

The regression results indicate that the SOA varies, depending on the estimation method performed. The OLS and FE estimates are 14.81 and 47.16 percent, respectively, in the ICM firms' subsample, and 15.10 and 49.45 percent, in the comparable stand-alone subsample. The SYS-GMM estimate of the SOA is 26.95 percent for subsample 1 and 34.45 percent for subsample 2, which fall, as expected, for the two subsamples, into the range between the OLS and FE estimates.[32] These findings are consistent with previous evidence in the literature in terms of coefficient signs, magnitude, and statistical significance (e.g., Flannery and Hankins 2013; Dewaelheyns and Van Hulle 2012).

As the null hypothesis of the Hansen test was rejected, Hansen test results are evidence against the suitability of instruments. As argued by Dang et al. (2015) and Zhou et al. (2014), SYS-GMM estimators may produce unreliable estimates of the SOA, whenever their fundamental assumption of valid instruments is violated. Therefore, bias-corrected estimators, LSDVC and BCFE, were performed and reported in columns 4 and 5 of table 2.10, respectively. Results for bias-corrected estimators document similar adjustment speeds of 37.47 and 39.65 percent for subsample 1, and 40.02 and 43.82 percent for subsample 2. This evidence is consistent with findings from prior research (e.g., Dang et al. 2015; Zhou et al. 2014).

Given that the SOAs estimated by LSDVC and BCFE vary in a relatively narrow range both in subsample 1 and in subsample 2, we conjecture that these estimates are closest to the true SOA for our ICM members and comparable stand-alone subsamples. Based on these ranges of adjustment speeds and on the 14-year sampling period duration, we estimate that stand-alone firms adjust toward their preferred target leverage in 1.28

[32] We used the second lag of the financial leverage ratio as instruments for the first lag of the leverage ratio in our SYS-GMM estimations.

years, and ICM member firms in 1.42 years (with the difference statistically significant at the 1 percent level).[33]

Overall, using a second generation of dynamic panel data estimators to address endogeneity and model misspecification problems typically associated with design, specification and implementation of this class of econometric models, we provide evidence that both ICM members and single-segment firms dynamically adjust their financial leverage towards their preferred targets, with stand-alone peers adjusting at a statistically significant higher speed (at the 1 percent level) to that of ICM, which is consistent with our H3. These results are consistent with the empirical evidence reported by, e.g., Fier et al. (2013), Hovakimian and Li (2011), Byoun (2008), Flannery and Rangan (2006), documenting evidence for generalized samples of large U.S. listed firms using OLS and GMM estimators; Dewaelheyns and Van Hulle (2012), for a sample of private Belgian firms using OLS and GMM estimators; and Dang et al. (2015) and Zhou et al. (2014). This evidence is interpreted as supportive of the dynamic trade-off capital structure theory.

[33] According to Dang et al. (2015, 94) «The ''half-life'' represents the number of years it takes a company to move halfway toward its target leverage after a leverage shock. Formally, it is calculated as ln 0.5 / ln (1- [γ])».

2.5. Conclusions

This chapter empirically examined the different dimensions of a firm's financing behavior. Firstly, we analyzed the proposition that ICM members, likewise comparable stand-alone firms, both have a preferred target capital structure, and whether the former display a higher financial leverage ratio than the latter. Secondly, we examined whether factors like the industry effect, asymmetric information and agency problems affect the cost of capital of ICM participants and their stand-alone peers differently. Finally, we studied whether firms integrating active ICMs adjust capital structures to their preferred leverage ratios, at different speeds than their stand-alone peers.

Consistent with the results of prior research, our empirical findings provide evidence of the presence of a significant industry effect on firms' capital structure, supporting the hypothesis that firms, irrespective of their organizational form, have preferred target capital structures.

Regression results provide significant evidence documenting that both, ICM members and stand-alone firms, have preferred target leverage ratios. Additionally, findings also indicate that, the former exhibit, as expected, significant 6.07 and 7.06 percent mean / median higher leverage than the latter.

Results from univariate parametric and non-parametric testing document that ICM member firms exhibit significant 2.80 and 2.22 percent lower mean / median costs of capital than comparable stand-alone firms, therefore, providing support to hypothesis 2.

Additionally, regression results provide evidence documenting that the cost of capital of ICM participants is, as expected, significantly lower than single segment firms, and significantly impacted by factors related to asymmetrical information problems and agency conflicts. Moreover, coefficients for asset base tangibility, size, effective tax rate, and financial leverage, exhibit statistical significance at the usual levels, and exhibit the expected signs.

These empirical findings provide evidence consistent with the predictions that a participant in an active ICM may experience benefits associated with its organizational form, in the form, among others, of lower deadweight costs of asymmetric information and agency problems, which may be helpful in reducing ICM firm members' cost of capital.[34]

Results of empirical testing also provide evidence supporting the hypothesis that firms dynamically readjust their capital structures. Bias-corrected estimators (LSDVC and BCFE), indicate that firms integrating active ICM narrow the gap between their actual and their preferred level of financial leverage at speeds between 37.47 to 39.65 percent per year, while stand-alone firms adjust at speeds between 40.02 to 43.82 percent per year. This evidence is interpreted as supportive of the dynamic trade-off capital structure theory.

To conclude, this chapter provides statistically significant findings indicating that: (i) both types of organizational form firms have preferred target capital structures; (ii) ICM members exhibit, on average, higher financial leverage than their comparable stand-alone counterparts; (iii) the financing behavior of firms integrating the ICMs through which diversified firms allocate capital, is potentially more efficient, gauged by the cost of capital yardstick, than comparable stand-alone firms; and (iv) whenever ICM members and stand-alone firms alike deviate from their preferred capital structure, stand-alone peers dynamically adjust their financial leverage towards the preferred target at a higher speed.

[34] Both our parametric and non-parametric testing and the regression results are robust to alternative specifications of the variables involved in the estimation of the cost of capital.

Appendix 1: Matching Procedure

The Amadeus database automatically classifies each firm as belonging to a 'peer group'. Each peer group has a code,[35] which includes firms that operate in the same industry,[36] are in the same size (total assets) group,[37] but which may have differentiated ownership structures (e.g., subsidiary firms or stand-alone firms), among other individual firm characteristics that differentiate them.

To select a one-to-one subsample of stand-alone firms that matches the industry and the size of firms in subsample 1, as closely as possible, we developed a VBA (Visual Basic for Applications) macro. The first matching step – ensuring that a firm in subsample 1, a comparable firm, belonging to the same industry, exists in subsample 2 – was guaranteed by the 'peer group' variable. To accomplish this first step, the excel macro had to be: given a firm in subsample 1, find only firms in subsample 2 that belonged to the same 'peer group'. To perform the second step of the matching procedure, the excel routine had to, among firms previously selected in subsample 2 and which belonged to the same peer group, find the firm with the best match (as closely as possible) in terms of total assets and sales, during the entire sampling period. For subsample 2, the necessary financial firm-level information, for all the used variables, belonged to firms with the best matching procedure as described above.

[35] For example, 2,712 VL, where the numeric part of the code corresponds to the 4-digit NACE classification code and the letters in the code (VL) correspond to a classification for the size of the firm.
[36] The industry matching is based on a 4-digit NACE classification code, 3-digit US SIC classification core code, and on the NACE Rev. main section.
[37] The firms were classified according to four possible size groups: VL – Very Large Firms; LA – Large firms; ME – Medium sized firms; and SM – Small firms.

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Tables

Table 2.1. Capital structure determinants: expected and estimated variable coefficient signs

Variables	Expected Sign	Estimated Sign
Industry Median (IndMed)	+	+
Size	+/-	+[a]
Tangibility of Assets (Tang)	+/-	+[b]
Profitability (Profi)	-	-
Growth Opportunities (MtoB)	-	+
Equity Systematic Risk (Risk)	-	+
Debt Tax Shield (DTS)	+	+
Non-Debt Tax Shield (NDTS)	-	-

Note: [a] Coefficient sign only statistically significant for the ICM members subsample
[b] Coefficient sign only statistically significant for the comparable stand-alone subsample

Table 2.2. Cost of capital: expected and estimated variable coefficient signs

Variables	Expected Sign	Estimated Sign
Equity Beta Decile 1 to 10	+	+
Subsidiaries of Business Groups (BG)	-	-
Size and Tangibility (Tang)	-	-
Debt Tax Shield (DTS)	-	-
Financial Leverage Ratio (FinLev)	-/+	+

Table 2.3. Characteristics of the subsamples
The industry classification was based on the NACE Rev. 2's main section.

Panel A: Industry composition		
Industry	Number of firms in subsample 1 and subsample 2	%
Wholesale and Retail Trade	245	38.52%
Manufacturing	177	27.83%
Construction	44	6.92%
Information and Communications	30	4.72%
Transportation and Storage	29	4.56%
Professional, Scientific and Technical Activities	28	4.40%
Electricity, Gas, Steam and Air Conditioning Supply	22	3.46%
Administrative and Support Service Activities	17	2.67%
Water Supply; Sewerage, Waste Management and Remediation Activities	14	2.20%
Accommodation and Food Service Activities	9	1.42%
Human Health and Social Work Activities	7	1.10%
Mining and Quarrying	5	0.79%
Arts, Entertainment and Recreation	5	0.79%
Agriculture, Forestry and Fishing	4	0.63%
	636	

Panel B: Country composition				
Country	Number of firms in subsample 1	%	Number of firms in subsample 2	%
Austria	2	0.3%	1	0.2%
Belgium	62	9.7%	47	7.4%
Finland	6	0.9%	1	0.2%
France	157	24.7%	151	23.7%
Germany	37	5.8%	39	6.1%
Greece	5	0.8%	34	5.3%
Italy	169	26.6%	137	21.5%
Luxembourg	1	0.2%	3	0.5%
Portugal	10	1.6%	12	1.9%
Spain	187	29.4%	211	33.2%
	636		636	

Table 2.4. Summary statistics of the variables used to test H1.a.

The ICM members subsample consists of 8,904 firm-year observations from the 2004 to 2017 Amadeus files. This table reports the number of observations (N), mean, median, standard deviation (Std. Dev.), coefficient of variation (cv), minimum (Min), maximum (Max) of the variables considered in the empirical applications to test H1.a. The variables used to test H1.a were described in detail in subsection *2.3.2*. The dependent variable, total debt ratio (book leverage) is measured by the ratio of total debt, including debt of both long-term and short-term maturities net of cash holdings, to total assets. The independent variables are: industry median debt ratio (*IndMed*); *Size*; tangibility of assets (*Tang*); profitability (*Profi*); growth opportunities (*MtoB*); equity systematic risk (*Risk*); debt tax shields (*DTS*); and non-debt tax shields (*NDTS*).

Panel A: Summary statistics – ICM members subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max
Total debt ratio	6541	0.4944	0.5095	0.2322	0.4697	0.0002	3.3599
IndMed	8904	0.3574	0.4082	0.1776	0.4969	0.0000	0.7103
Size	8316	9.4736	9.3692	1.1925	0.1259	4.5726	15.9435
Tang	8316	0.2714	0.2092	0.2347	0.8649	0.0000	0.9844
Profi	8315	0.1035	0.0802	0.1078	1.0412	-0.6040	1.0855
MtoB	6155	7.0159	10.0000	3.7075	0.5284	0.0003	10.0000
Risk	8904	1.2871	1.0745	0.9225	0.7167	0.0000	24.7202
DTS	8304	0.3251	0.3181	0.1520	0.4676	0.0000	1.0000
NDTS	8277	0.0366	0.0155	0.0621	1.6965	0.0000	1.1834

The comparable stand-alone firms subsample consists of 8,904 firm-year observations from the 2004 to 2017 Amadeus files.

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max
Total debt ratio	6214	0.4661	0.4759	0.2318	0.4974	0.0004	1.0460
IndMed	8904	0.3574	0.4082	0.1776	0.4969	0.0000	0.7103
Size	8229	9.1720	9.1628	1.0348	0.1128	3.1997	12.8487
Tang	8229	0.2789	0.2198	0.2280	0.8174	0.0000	0.9771
Profi	8228	0.0906	0.0696	0.0904	0.9972	-0.3529	1.6630
MtoB	6335	6.5809	9.2863	3.8194	0.5804	0.0016	10.0000
Risk	8904	1.2225	0.9061	1.0515	0.8601	0.2260	14.8290
DTS	8215	0.3206	0.3090	0.1502	0.4683	0.0000	1.0000
NDTS	8148	0.0364	0.0161	0.0636	1.7472	0.0000	1.3384

Table 2.5. Pearson correlation coefficients between variables

This table reports the Pearson correlation coefficients (and their statistical significance) between the variables used to test H1.a. Definitions of the variables are listed in table 2.4 and in subsection *2.3.2*. *, ** and *** indicate significance of the coefficients at the 10%, 5% and 1% level, respectively.

Panel A: Correlations – ICM members subsample

	1	2	3	4	5	6	7	8
	Total debt ratio	*Size*	*Tang*	*Profi*	*MtoB*	*Risk*	*DTS*	*NDTS*
1	1							
2	0.0450***	1						
3	-0.0848***	0.2137***	1					
4	-0.2384***	-0.0967***	-0.0065	1				
5	0.1312***	-0.1308***	-0.0584***	0.3125***	1			
6	0.0711***	0.0449***	-0.0417***	-0.0366***	-0.2743***	1		
7	0.0789***	0.0089	-0.0650***	0.0414***	-0.1110***	-0.0293***	1	
8	-0.1126***	0.1917***	0.5356***	0.0347***	-0.0088	-0.0494***	0.0274**	1

Panel B: Correlations - comparable stand-alone subsample

	1	2	3	4	5	6	7	8
	Total debt ratio	*Size*	*Tang*	*Profi*	*MtoB*	*Risk*	*DTS*	*NDTS*
1	1							
2	-0.0287**	1						
3	0.0336***	0.2723***	1					
4	-0.1979***	-0.1180***	-0.1093***	1				
5	0.0672***	-0.0533***	-0.0869***	0.3351***	1			
6	0.5479***	-0.1590***	-0.2019***	-0.1185***	0.0964***	1		
7	0.1132***	0.0106	-0.0442***	0.0167	-0.0883***	-0.0135	1	
8	-0.0464***	0.3132***	0.5338***	-0.0323***	0.0226*	-0.1387***	-0.0036	1

Table 2.6. Summary statistics of the variables used to test H1.b and H2

The ICM members and comparable stand-alone firms' subsamples consist of 8,904 firm-year observations from the 2004 to 2017 Amadeus files. This table reports the number of observations (N), mean, median, standard deviation (Std. Dev.), coefficient of variation (cv), minimum (Min), maximum (Max) of the variables considered in the empirical applications to test H1.b and H2. Variables were winsorized at the top and bottom 1% percentile of their distributions.

Panel A: Summary statistics – ICM members subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max
Asset beta (industry)	8904	0.5320	0.5320	0.4700	0.8836	0.2260	1.5450
Debt to equity ratio	7999	2.4608	1.4539	2.9657	1.2051	0.0000	15.0000
Tax rate	8545	0.3072	0.3128	0.1660	0.5402	0.0000	1.0000
Equity beta	8545	1.2959	1.0904	0.9244	0.7133	0.0000	24.7202
Equity to total Assets	8033	0.4233	0.4064	0.2151	0.5081	0.0003	0.9901
Debt to total Assets	8034	0.5766	0.5936	0.2152	0.3731	0.0000	0.9997
ERP	8545	0.0202	0.0270	0.0144	0.7102	0.0010	0.0740
Rf	8532	0.0341	0.0379	0.0156	0.4578	0.0014	0.2399
Cost of equity	8532	0.0610	0.0534	0.0376	0.6164	0.0037	0.4702
Cost of debt	3613	0.0609	0.0475	0.0462	0.7573	0.0050	0.1998
Cost of capital	3605	0.0500	0.0450	0.0278	0.5554	0.0014	0.2337

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max
Asset beta (industry)	8904	0.5320	0.5320	0.4700	0.8836	0.2260	1.5450
Debt to equity ratio	7853	2.3163	1.4304	2.7407	1.1832	0.0145	23.7753
Tax rate	8545	0.2933	0.3002	0.1664	0.5675	0.0000	1.0000
Equity beta	8545	1.2280	0.9114	1.0596	0.8628	0.2260	14.8290
Equity to total Assets	7869	0.4332	0.4111	0.2162	0.4991	0.0006	0.9857
Debt to total Assets	7869	0.5668	0.5889	0.2162	0.3815	0.0143	0.9994
ERP	8545	0.0237	0.0270	0.0185	0.7800	0.0010	0.0740
Rf	8503	0.0370	0.0382	0.0226	0.6106	0.0014	0.2399
Cost of equity	8503	0.0655	0.0574	0.0486	0.7420	0.0043	0.6521
Cost of debt	3597	0.0671	0.0552	0.0455	0.6771	0.0050	0.2000
Cost of capital	3580	0.0514	0.0460	0.0275	0.5343	0.0033	0.2485

Table 2.7. Parametric tests for equality of means and non-parametric tests for equality of medians between the variables used to test H1.b and H2 in the ICM members and stand-alone subsamples

The variables used to test H1.b and H2 were described in detail in subsection *2.3.2.* All variables were estimated for all firms for which information was available. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. A statistically significant difference, upward or downward, can be proved through the one-sided t-test for mean comparison of two independent subsamples, and assuming unequal variances: diff > 0*** representing a difference between the mean of the two groups that is statistically significantly greater than zero, i.e., we have a variable that has a statistically significant higher mean for ICM members when compared with stand-alone firms; diff < 0*** representing a difference between the mean of the two groups that is statistically significantly less than zero, i.e., that we have a variable that has a statistically significant higher mean for stand-alone firms when compared with ICM members.

	Mean			
	ICM members subsample	Stand-alone subsample	Two-sided t-test	One-sided t-test
Asset beta (industry)	0.5320	0.5320	0.0000	
Debt to equity ratio	2.4608	2.3163	3.1885***	diff > 0***
Tax rate	0.3072	0.2933	5.4917***	diff > 0***
Equity beta	1.2959	1.2280	4.4640***	diff >0***
Equity to total Assets	0.4233	0.4332	-2.9009***	diff < 0***
Debt to total Assets	0.5766	0.5668	12.8894***	diff > 0***
ERP	0.0202	0.0237	-13.5937***	diff < 0***
Rf	0.0341	0.0370	-9.6417***	diff < 0***
Cost of equity	0.0610	0.0655	-6.6833***	diff < 0***
Cost of debt	0.0609	0.0671	-5.6929***	diff < 0***
Cost of capital	0.0500	0.0514	-2.0227**	diff < 0**

	Median			
	ICM members subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test (Stand-alone median of variable x == ICM members median of variable x)	Wilcoxon-Mann-Whitney test - probability that a random draw from the first population (stand-alone) is larger than a random draw from the second population
Asset beta (industry)	0.5320	0.5320	0.000	0.500
Debt to equity ratio	1.4539	1.4304	-2.243**	0.490
Tax rate	0.3128	0.3002	-7.925***	0.465
Equity beta	1.0904	0.9114	-11.619***	0.449
Equity to total Assets	0.4064	0.4111	2.504**	0.511
Debt to total Assets	0.5936	0.5889	-2.491**	0.489
ERP	0.0270	0.0270	11.758***	0.550
Rf	0.0379	0.0382	5.631***	0.525
Cost of equity	0.0534	0.0574	2.840***	0.513
Cost of debt	0.0475	0.0552	7.544***	0.551
Cost of capital	0.0450	0.0460	2.581***	0.518

Table 2.8. Parameter estimates from panel data regression on the determinants of target debt ratio – H1.a.

This table reports the results obtained from estimating Eq. (2.1). Panel data regression coefficients are presented. The data are drawn from the 2004 to 2017 Amadeus files. Definitions of the variables are listed in table 2.4 and in subsection *2.3.2*. Values enclosed in parentheses are the *t* statistics for coefficients. Standard errors are clustered by industry and year. *, ** and *** indicate significance of the coefficients at the 10%, 5% and 1% level, respectively.

Panel A: Parameter estimates from panel data regression on the determinants of target debt ratio – ICM members subsample	
Independent Variable	
Constant	-0.1135***
	(-3.29)
IndMed	0.5109***
	(16.41)
Size	0.0212***
	(7.40)
Tang	0.0272
	(1.62)
Profi	-0.8129***
	(-25.68)
MtoB	0.0206***
	(21.80)
Risk	0.0429***
	(10.96)
DTS	0.2130***
	(8.43)
NDTS	-0.5331***
	(-8.95)
N	4970
F-Statistic	165.24***
R-squared	0.21

Panel B: Parameter estimates from panel data regression on the determinants of target debt ratio - comparable stand-alone subsample	
Independent Variable	
Constant	0.3106***
	(9.40)
IndMed	0.3106***
	(9.40)
Size	-0.0019
	(-0.50)
Tang	0.2665***
	(14.53)
Profi	-0.5021***
	(-12.04)
Mtob	0.0053***
	(5.42)
Risk	0.1946***
	(43.47)
DTS	0.3237***
	(13.03)
NDTS	-0.2636***
	(-3.90)
N	5084
F-Statistic	388.02***
R-squared	0.38

Table 2.9. Regression on the ‘determinants’ of the cost of capital – H2

This table reports the results obtained from estimating Eq. (2.2). Panel data regression coefficients are presented. The data were draw from the 2004 to 2017 Amadeus files. Definitions of the variables are presented in subsection *2.3.2*. Values enclosed in parentheses are the *t* statistics for the coefficients. *, ** and *** indicate significance of the coefficients at the 10%, 5% and 1% level, respectively.

Parameter estimates from a regression on the ‘determinants’ of the cost of capital				
Independent Variable	Subsample 1	Subsample 2	Subsample 1 and Subsample 2	Subsample 1 and Subsample 2, applying the Heckman's procedure
EquityBetaDecile1	0.0563***	0.0696***	0.0600***	0.10261***
	(13.40)	(14.46)	(18.80)	(12.51)
EquityBetaDecile2	0.0596***	0.0672***	0.0591***	0.09891***
	(13.73)	(14.70)	(18.67)	(12.38)
EquityBetaDecile3	0.0522***	0.0722***	0.0.553***	0.10126***
	(12.10)	(15.79)	(17.73)	(15.19)
EquityBetaDecile4	0.0423***	0.0747***	0.0514***	0.08923***
	(10.25)	(16.15)	(16.66)	(12.50)
EquityBetaDecile5	0.0449***	0.0755***	0.0523***	0.09110***
	(11.30)	(16.46)	(17.45)	(11.91)
EquityBetaDecile6	0.0390***	0.0670***	0.0440***	0.09791***
	(10.27)	(14.64)	(15.09)	(13.05)
EquityBetaDecile7	0.0363***	0.0791***	0.0498***	0.09001***
	(9.54)	(16.87)	(16.68)	(11.56)
EquityBetaDecile8	0.0390***	0.0725***	0.0462***	0.09105***
	(9.64)	(16.27)	(15.60)	(13.04)
EquityBetaDecile9	0.0341***	0.0827***	0.0480***	0.09428***
	(8.51)	(17.10)	(15.60)	(13.25)
EquityBetaDecile10	0.0299***	0.0692***	0.0396***	0.08985***
	(6.76)	(12.76)	(11.56)	(12.17)
BG			-0.0002	-0.00148
			(-0.28)	(-1.04)
Size	0.0014***	-0.0019***	0.0010***	-0.00229***
	(3.54)	(-3.85)	(3.23)	(-3.08)
Tang	-0.0008	-0.0067***	-0.0024*	-0.01173***
	(-0.46)	(-2.98)	(-1.66)	(-3.95)
DTS	-0.0299***	-0.0524***	-0.0389***	-0.06580***
	(-10.03)	(-15.12)	(-17.12)	(-7.79)
$\left[{}^{D}\!/\!{}_{A}\right]_{it}$	0.0050**	0.0271***	0.0063***	0.00374
	(2.18)	(10.38)	(3.74)	(1.00)
N	3419	3592	7011	7011
F-Statistic	1044.32***	1067.95***	1856.49***	1838.36***
R-squared	0.801	0.783	0.7833	0.7827

Table 2.10. Parameter estimates from panel regressions on the determinants of target debt ratio – Eq. (2.3) - H3

This table summarizes SOA estimations generated by the five single estimation methods: (1) OLS; (2) standard fixed effects estimation; (3) Blundell and Bond (1998) system GMM; (4) Bruno (2005) and Kiviet (1995) least squares dummy variable correction LSDVC (since the differences in the initial estimators have only a marginal impact on the LSDVC estimates, we used the AH Anderson and Hsiao (1981) initialization); and, (5) Everaert and Pozzi (2007) and De Vos et al.'s (2015) bootstrap-based bias-corrected FE (BCFE) with 'wboot' resampling scheme performing a wild bootstrap that allows for general heteroscedasticity. The data are draw from the 2004 to 2017 Amadeus files. The first pair of rows provides estimated coefficients for λ, (and *t* statistic), relating to lagged dependent variable - leverage ratio (except for the model OLS and FE where the lagged dependent variable is provided in the third row), where the speed of adjustment is γ = 1 - λ. The following 8 pairs of rows provide estimated coefficients (and associated *t* or *z* statistics, depending on the estimated model) for the firm characteristic variables. Definitions of variables are listed in table 2.4. The final two pairs of rows report results for the Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions) and AR(2) test for the null hypothesis of no second-order serial correlation. *, ** and *** indicate significance at the 10%, 5% and 1%, respectively. Values enclosed in parentheses are the *t* or *z* statistics for coefficients, and values in square brackets are the *p*-values for test statistics.

Panel A: Parameter estimates from panel regressions on the determinants of target debt ratio – ICM members subsample

Independent Variable	Pooled OLS	Panel Data Fixed Effects Model	Blundell & Bond			LSDVC	xtbcfe
				95%			Wboot
Constant	-0.0553***	-0.1972***					
	(-3.24)	(-3.93)					
Leverage $_{(t-1)}$	0.8519***	0.5284***	0.7305***	0.6652	0.7958	0.6253***	0.6035***
	(121.58)	(41.92)	(21.98)			(33.08)	(18.93)
IndMed	0.0605***	0.1227***	0.1249***			0.1159**	0.1511***
	(2.97)	(3.96)	(3.28)			(2.55)	(3.27)
Size	0.0066***	0.0312***	0.0093***			0.0278***	0.0242
	(5.31)	(6.16)	(4.12)			(4.14)	(1.58)
Tang	0.0027	0.0904***	0.0033			0.0758***	0.0982**
	(0.37)	(5.23)	(0.24)			(2.79)	(2.53)
Profi	-0.2537***	-0.3878***	-0.3662***			-0.3773***	-0.3737***
	(-16.68)	(-16.44)	(-7.52)			(-13.38)	(-6.24)
GrowthOp	0.0076***	0.0089***	0.0096***			0.0089***	0.0084***
	(17.25)	(16.18)	(13.21)			(11.75)	(10.38)
Risk	0.0085***	0.0126***	0.0122***			0.0122***	0.0134**
	(4.98)	(5.53)	(4.19)			(4.28)	(2.41)
DTS	0.0447***	0.0323**	0.0537***			0.0299*	0.0264
	(3.98)	(2.34)	(3.62)			(1.65)	(1.34)
NDTS	-0.1456***	-0.2343***	-0.1928***			-0.2240***	-0.2044
	(-5.49)	(-5.38)	(-4.31)			(-4.27)	(-1.58)
Adj. Speed (SOA)	14.81%	47.16%	26.95%			37.47%	39.65%
Observations	4215	4215	4215			3237	3179
F-Statistic	1080.93	156.71	2404.25				
	[0.000]	[0.000]	[0.000]				
R-squared	0.8296	0.7488					
Wald-Statistic		7519.84					
		[0.000]					
Hansen			75.62				
			[0.099]				
AR(2) test			2.33				
			[0.020]				
Year dummies	Yes	Yes	Yes			Yes	Yes

Table 2.10. Parameter estimates from panel regressions on the determinants of target debt ratio – Eq. (2.3) - H3 (cont.)

Panel B: Parameter estimates from panel regressions on the determinants of target debt ratio - comparable stand-alone subsample							
Independent Variable	Pooled OLS	Panel Data Fixed Effects Model	Blundell & Bond			LSDVC	xtbcfe
				95%			Wboot
Constant	-0.1009***	-0.2400***					
	(-5.76)	(-4.18)					
Leverage $_{(t-1)}$	0.8490***	0.5055***	0.6555***	0.5798	0.7311	0.5998***	0.5618***
	(112.40)	(38.46)	(17.02)			(24.36)	(17.42)
IndMed	0.0431**	0.1143***	0.0713**			0.1023**	0.1014***
	(2.27)	(3.83)	(2.24)			(2.53)	(2.94)
Size	0.0089***	0.0302***	0.0153***			0.0226**	0.0242**
	(5.88)	(4.90)	(5.58)			(2.27)	(2.21)
Tang	0.0101	0.0924***	0.0283**			0.0756**	0.1321***
	(1.36)	(4.38)	(2.12)			(2.02)	(2.90)
Profi	-0.2262***	-0.2916***	-0.2631***			-0.3031***	-0.2892***
	(-11.97)	(-10.79)	(-4.89)			(-7.13)	(-5.77)
GrowthOp	0.0052***	0.0052***	0.0061***			0.0056***	0.0055***
	(12.72)	(10.37)	(9.08)			(7.93)	(8.22)
Risk	0.0313***	0.0633***	0.0618***			0.0577***	0.0655***
	(14.40)	(18.08)	(9.08)			(12.72)	(7.71)
DTS	0.0610***	0.0417***	0.0519***			0.0443**	0.0163
	(6.08)	(3.30)	(3.63)			(2.15)	(0.81)
NDTS	-0.0478*	-0.0744	-0.0743*			-0.1149	-0.1535
	(-1.75)	(-1.23)	(-1.65)			(-1.24)	(-1.42)
Adj. Speed (SOA)	15.10%	49.45%	34.45%			40.02%	43.82%
Observations	4024	4024	4024			2998	2936
F-Statistic	1270.41	227.89	1773.34				
	[0.000]	[0.000]	[0.000]				
R-squared	0.8577	0.7943					
Wald-Statistic		9123.82					
		[0.000]					
Hansen			105.34				
			[0.000]				
AR(2) test			2.57				
			[0.010]				
Year dummies	Yes	Yes	Yes			Yes	Yes

3. Does Internal Capital Market Affiliation Matter for Capital Allocation? An Empirical Analysis

3.1. Introduction

Despite the extensive body of theoretical literature on the optimality of firms' capital allocation behavior (e.g., Arrow 1964; Jorgenson 1963; Hirshleifer 1958; Malinvaud 1953; and Fisher 1930), we still lack widely accepted answers to several important questions, including: (i) «to what extent does capital get allocated to the right investment projects?» (Stein 2003, 112); (ii) «does firm diversity result in an efficient or inefficient allocation of capital?» (Agarwal et al. 2011, 162); and (iii) «do units with better investment opportunities receive larger capital allocations and invest more?» (Glaser et. al. 2013, 1577).

Under the standard conditions of perfect capital markets, including, no borrowing / lending restrictions, unique deterministic equilibrium riskless interest rate for both lenders and borrowers, and contractual completeness, there is no role for capital rationing. Therefore, all positive net present value (hereafter abbreviated as NPV) projects can be undertaken, achieving Pareto optimal intertemporal resource allocation (e.g., Brennan 2003).[1, 2]

Under this neoclassical framework, a firm's capital expenditure behavior is ultimately determined by its investment opportunity set. Hence, at the firm-level, wealth-maximizing owners would allocate capital to all the investment projects that maximize the expected NPV of their cash flow streams (e.g., Martin et al. 1988; Auerbach 1979; and Litzenberger and Joy 1975).[3]

With equal access to perfect and frictionless capital markets, firms' investment behavior is independent from its financing (e.g., Brennan 2003; Modigliani and Miller

[1] According to Brennan (2003, fn#6, 171), «a Pareto-optimal allocation will be achieved in a competitive market if the market is complete or if there exists a riskless security and the conditions for two-fund separation are met».
[2] The principle of share value maximization promotes «the optimal allocation of resources in the economy» (Martin et al. 1988, fn#13, 12). See also Nielsen (1976).
[3] As argued in Gould (1967, 911), under certainty, the action of «a rationally managed firm acting to maximize the present value of its net cash flows […], is equivalent to maximizing the market value of the firm since its securities represent the total of all claims to the cash flows».

1958), and it is a matter of irrelevancy whether capital allocation is made «[…] in a centralized or decentralized capital budgeting environment» (Thakor 1993, 135).

Under uncertainty, conditions prevailing in real-world economies, rational capital allocation aims at maximizing the expected intertemporal utility of terminal wealth (e.g., Hubbard 1998; Fama and Miller 1972; and Jorgenson 1963).

However, it is widely accepted among academics that under imperfect and frictional markets, and contracting incompleteness, managerial decision-making functions are separated from residual risk-bearing and information is unevenly distributed among market participants, preventing the formation of homogeneous expectations, and inducing incentives for potentially inefficient asset allocative behavior. These instances create incentives for the superiorly informed party to behave opportunistically, taking advantage of their informational superiority, potentially affecting, among others: (i) firms' investment behavior; and (ii) the cost, of both, internal and external financing; therefore creating a link not only between capital investment behavior and the wealth of the firms' claimholders, but also between internal and external capital allocations.[4]

Additionally, the corporate institutional environment, namely, the law and legal origin (e.g., Alves and Ferreira 2011; de Jong et al. 2008; La Porta *et. al.* 2008; Demirgüç-Kunt and Levine 2005; Demirgüç-Kunt and Maksimovic 1998; La Porta *et. al.* 1998), the financial system's level of development (e.g., Belenzon et al. 2013; Pang and Wu 2009; Love 2003; and Wurgler 2000), the firm's ownership structure (e.g., Gedajlovic et al. 2005; Cho 1998; Shleifer and Vishny 1997), and the firm's organizational structure (e.g., Almeida et al. 2015; Buchuk et al. 2014; Ozbas and Scharfstein 2010; Stein 2003; Liebeskind 2000; Thakor 1993), arguably, may also affect the firm's investment behavior, namely, capital allocative efficiency.

Whenever a firm has to decide allocating capital to a new project, it must also choose which organizational structure to use for implementing it: either undertaking the

[4] In this framework, firms should undertake all capital allocations that yield expected positive adjusted net present values.

project within an existing entity – firm or business group – or, otherwise, organizing the project as a distinct and legally independent organization.[5]

In real-world market economies, diversified firms are a ubiquitous form of economic organization (Belenzon et al. 2013; Smangs 2006; Faccio and Lang 2002; Goto 1982), and the study of internal capital markets through which diversified firms direct investment flows, have been in the recent decades a focus of intense research interest (e.g., Almeida et al. 2015; Buchuk et al. 2014; Gugler et al. 2013).

Centralized capital budgeting systems may be helpful in mitigating informational and incentive deadweight costs associated with investment behavior. However, whether, and to what extent, ICM may be helpful in mitigating agency and informational problems still remains an empirical question (e.g., Sautner and Villalonga 2010; Maksimovic and Phillips 2002; Stein 1997; Myers and Majluf 1984; Williamson 1975).

In this chapter, we contrast the capital allocative behavior of firms integrated in ICMs with comparable single-segment firms. Specifically, we examine the impact of the availability of internal funding on a firm's capital expenditure and its relationship with factors, such as, growth opportunities, asset lumpiness, financial flexibility. Additionally, we test the suboptimality of corporate investment expenditures, either in the form of underinvestment and overinvestment, using a matched sample design of two comparable panel data sets of euro area ICM affiliates and stand-alone firms, including 636 firms each, over the 2004–2017 period, in a total of 17,808 testable firm-years.

This investigation distinguishes from prior research in different ways. Firstly, by examining the investment behavior of unlisted European firms, which have received relatively little attention in prior research, otherwise focusing predominantly on U.S. and Asian public firms. By examining the different typologies of firms, we contribute to mitigating the problems typically associated with differences in economic, financial, legal and institutional features frequently present in multi-country research, and to enhancing the generalization power of the inferences drawn from empirical findings.

[5] The discussion concerning a firm's organizational form and firm boundaries was initiated by Coase (1937), questioning why so much economic activity happens inside a firm's organizational structures when markets should be the most powerful and effective mechanisms for allocating resources in the economy (see also Liebeskind 2000; Holmstrom and Roberts 1998). Additionally, as argued in Williamson (1975), diversification fundamentally transforms the organizational arrangements that govern capital allocation by internalizing functions that otherwise are carried out by banks and other financial intermediaries.

Secondly, by focusing on both small and large firms, in contrast to mainstream literature, we potentially contribute to mitigating the size bias, usually, associated to U.S. and Asian-based empirical literature.

Thirdly, by empirically analyzing the relatively unexplored topic of asset lumpiness, and its relationship with corporate investment behavior, we aim to contribute to mitigating misspecification problems typically associated with the omission of a potentially relevant independent variable from the empirical model.

Our main findings document that: (i) the impact of available internal funding on investment is positive, statistically significant, and larger for stand-alone firms, than for ICM affiliates, suggesting that the latter use ICMs as a complement for financial slack, which is consistent with previous evidence focusing predominantly on U.S. and Asian public firms (e.g., Arslan-Ayaydin et al. 2014; George et al. 2011; Goergen and Renneboog 2001; Shin and Park 1999; Hoshi et al. 1991; and Fazzari et al. 1988); (ii) corporate investment expenditure exhibits a dynamic pattern, as suggested, e.g., in Eberly et al. (2012); (iii) ICM participants, on average, exhibit both a lower degree of underinvestment and overinvestment, than their comparable stand-alone peers, suggesting more efficient capital allocation; and (iv) the inclusion of asset lumpiness in the empirical modeling specification, as a determinant of corporate investment behavior, may be beneficial for lessening potential bias due to misspecification, consistent with evidence documented in prior research (e.g., Gomes 2001; Dixit and Pindyck 1994).

The remainder of the chapter is structured as follows: Section 3.2 discusses the relevant theoretical and empirical literature and formulates the hypotheses. Section 3.3 describes the data and the empirical implementation. Section 3.4 presents and analyzes univariate statistics and the econometric estimation results. Section 3.5 documents robustness check results. Section 3.6 summarizes and provides concluding remarks.

3.2. Theoretical and Empirical Background, and Hypotheses

This section examines and discusses prior relevant theoretical and empirical literature on the determinants of capital allocation behavior of ICM affiliates and comparable unaffiliated firms.

3.2.1. Introduction

It is widely acknowledged that under frictional, imperfect and incomplete capital market conditions, contracting incompleteness, and when ownership is separated from control, there is a potential for principal-agent conflicts of interest and incentives for opportunistic behavior associated with informational asymmetries, between corporate insiders and the firm's claimholders.

These costly problems may constrain and distort capital allocative behavior, potentially leading to suboptimal capital allocation in the form of capital rationing, underinvestment, overinvestment or asset substitution (e.g., Love 2003; Stein 2003; Rajan et al. 2000; Hubbard 1998; Harris and Raviv 1996; Bebchuk and Stole 1993; Thakor 1993, 1990; Brennan and Kraus 1987; Green and Talmor 1986; Jensen 1986; and Myers 1977).

3.2.2. Agency and Informational Problems in Capital Allocation

Whenever the assumption of perfect capital markets is abandoned, agency and asymmetric information problems, innate to the separation of ownership and management functions, become relevant for capital allocation behavior (e.g., Myers and Majluf 1984; Fama and Jensen 1983a, 1983b; Jensen and Meckling 1976).

Extant literature has identified differences in time horizons, in risk preferences between principals and agents, agents' self-interest behavior, and asymmetric distribution of information, as potentially relevant sources of costly agency and informational problems related to capital allocation (e.g., Cadman and Sunder 2014; Stein 2003; Hubbard 1998; Hubbard et al. 1995; Lewellen et al. 1989). Typically, firms exhibit longer time horizons than their managers, whose personal tenures are usually shorter. In these instances, managerial insiders may prefer to adopt investment projects with shorter maturities than outsider investors would optimally prefer, affecting investment behavior. Particularly, because of the potential incentive for managers to forego the expected positive NPV investment opportunities with longer maturities, causing suboptimal capital allocation (e.g., Cadman and Sunder 2014; Giannetti 2011; Ghosh et al. 2007; Byrd et al. 1998; Narayanan 1996; Dechow and Sloan 1991; Walsh and Seward 1990).

Differences in principal-agent risk preferences are also a potential source of suboptimal investment allocation. Under separation of managerial decision-making functions from residual risk-bearing, inefficiently diversified rational managers, in terms of firm-specific human capital, tend to exhibit specific risk averse behavior, as a consequence of having so much of their wealth tied up to the business' organization performance. In contrast, well-diversified rational residual claimants tend to have specific risk neutral preferences.[6]

Under this framework, differences in specific risk preferences, of both principals and agents, may cause suboptimal distortionary effects preventing the adoption of optimal investment behavior, such as, undertaking inefficient projects instead of returning free cash flow to owners (e.g., Tanaka and Sawada 2015; Ghosh et al. 2007; Byrd et al. 1998; Hubbard 1998; Hoshi et al. 1991; Walsh and Seward 1990; Lewellen et al. 1989; Holmstrom and Costa 1986; Jensen 1986).

Agents' self-interest behavior is also a potential source of inefficiency in a firm's capital allocation, stemming from a gap between agents' decision-making behavior and its congruity with owners' objective function. Agents may pursue their own objective function, acting in their own self-interest instead of the principals' best interest (e.g., Stein 2003; Brennan 1994; Jensen 1994). Additionally, as argued in Jensen (1986, 323), «managers have incentives to cause their firms to grow beyond the optimal size», to capture private benefits, namely, in the form of increases, in both, managerial compensation from controlling a larger pool of firm assets, and from reputational capital gains in the managerial external labor market (Avery et al. 1998; Gibbons and Murphy 1992; and Murphy 1985).

Whenever managers are budgetarily unconstrained and fully aligned with principals' interests, capital investment allocation will follow an optimal pattern. However, when a firm needs to raise investment funding in external capital markets, there is always the likelihood that, either the amount or the cost of the funding, «can lead to credit rationing, whereby firms are simply unable to obtain all the […] financing they would like at the prevailing market interest rate» (Stein 2003, 115).[7] In this framework, capital rationing arises, whenever the cost of internal capital exhibits a cost advantage over external capital, and consequently not all investment projects with positive expected NPV can be undertaken.

[6] See, e.g., Amihud and Lev (1981) and Fama (1980), and references therein, for further details.
[7] See, among others, Stiglitz and Weiss (1981), Jaffee and Russell (1976) for further details.

As argued in Myers and Majluf (1984), adverse selection problems can potentially be associated with suboptimal capital allocation.[8] For example, firms unable to credibly convey the risk-return characteristics of their projects to capital market participants, may experience underinvestment if adverse selection problems induce, «firms to forego investment opportunities that would otherwise be profitable» (Brennan and Kraus 1987, 1225).

Post contractual asymmetric information problems, in the form, for example, of moral hazard opportunistic behavior, may also affect the efficiency of corporate capital allocation because of risk shifting and suboptimal investment choices (see Morellec and Schurhoff 2011; Stein 2003; Thakor 1993; Green and Talmor 1986; Gavish and Kalay 1983; and Galai and Masulis 1976).

Highly financially constrained firms have an incentive to underinvest, if existing debtholders were unavailable or unwilling to provide funding to new positive NPV investment opportunities which, if undertaken, would be fully financed by existing equityholders. In these instances, any increase in firm value determined by the profitability of new projects, will lower the firm's overall financial risk, and consequently benefit existing debtholders at the expense of existing equityholders (e.g., Hovakimian and Hovakimian 2009; Cleary et al. 2007; Cleary 1999; Myers 1977, 1974).

Debt financing may also be associated with debt overhang, i.e., a post contractual opportunistic behavior that can affect capital allocation efficiency. For example, residual claimants of firms with outstanding risky debt have an incentive to forego profitable investment opportunities, if a non-negligible portion of the new projects' created value accrues to debtholders, while project financing is borne by equityholders (e.g., Myers 1984).

According to Berkovitch and Kim (1990, fn#5, 766) overinvestment can be conceptualized «as any situation in which a firm undertakes a negative NPV project». Under imperfect capital markets, atomistic ownership and limited liability «firms tend to overinvest, not because external capital is too expensive, but because internal capital is too inexpensive» (Wei and Zhang 2008, 119; Stulz 1990; and Jensen 1986).

[8] See Myers (1984) and Myers and Majluf (1984) for more details on the impact of adverse selection problems on the cost of external finance.

Asset substitution is a ubiquitous form of post contractual opportunistic behavior caused by asymmetric information that can also induce investment behavior distortions. Asset substitution arises whenever managerial insiders increase firm's business risk, replacing less risky assets by riskier ones, at the expense of outside investors (e.g., Jensen and Smith 1985; Galai and Masulis 1976; and Jensen and Meckling 1976).[9]

In an ICM framework, a subsidiary's investment choices are, typically, made at the level of headquarters (e.g., Scharfstein and Stein 2000). This centralized capital budgeting system may promote the efficiency of corporate investment decisions, possibly mitigating the deadweight costs of potential agency and informational problems, due to knowledge held by the headquarters on the risk and return characteristics of the investment opportunities of ICM affiliates (e.g., Charness and Sutter 2012; Thakor 1990).

3.2.3. Investment Behavior and Financial Flexibility

Myers and Majluf (1984) show that, because of costly adverse selection problems, external financing is costlier than internal funding, and may affect both the availability and the cost of financial capital. In these instances, firms' investment and financing decisions become interdependent, which may affect investment behavior (Morellec and Schürhoff 2011; Childs et al. 2005; Mauer and Triantis 1994; and Jensen and Meckling 1976).

Under this framework, financial flexibility becomes important to sustain internal funding constrained firms' ability to undertake profitable investment opportunities (e.g., Ferrando et al. 2017; Arslan-Ayaydin et al. 2014; Boutin et al. 2013; de Jong et al. 2012; Sheu and Lee 2012; Almeida and Campello 2010; Marchica and Mura 2010; and Fazzari et al. 1988).[10]

Financial flexibility is mostly related to the level of excess cash holdings and the debt capacity availability, which may provide an efficient source of corporate financing

[9] Residual claimants hold a call option on the firm's assets (e.g., Black and Scholes (1973). Therefore, they have an incentive to raise the volatility of the underlying asset, either by increasing the firm's business risk and / or financial risk, in order to increase the value of their call (e.g., Galai and Masulis 1976).

[10] From the standard corporate finance textbook standpoint, a firm «having financial slack [or financial flexibility] means having cash, marketable securities, readily salable real assets, and ready access to debt markets or to bank financing» (Brealey et al. 2017, 483). On the other hand, a financially constrained firm may be limited in its ability to raise the necessary funds to finance positive NPV projects (e.g., Riaz et al. 2016; Scheuten 2014; Silva and Carreira 2012, 2010; Caggese 2007; Kaplan and Zingales 1997; Fazzari et al. 1988). Therefore, hereafter we use financial flexibility and financial constraint as 'mirrors' of each other.

to minimize underinvestment (e.g., Ferrando et al. 2017; Arslan-Ayaydin et al. 2014; Gamba and Triantis 2008).[11]

Capital investment deployment within diversified firms integrating active ICMs, may benefit from the centralization of cross-generated cash flow, which is allocated at the headquarters' discretion (e.g., Scharfstein and Stein 2000). As suggested, among others, in Das and Tulin (2017), subsidiaries of diversified firms may, arguably, have larger financial slack than their comparable single industry peers, because they may have access, not only to intra-group resource cross-allocation, but also to headquarters' debt capacity.

However, and despite considerable contributions from prior research, the question of, whether or not, financial flexibility is equally relevant in terms of investment behavior for ICM affiliates than for stand-alone firms, still remains an insufficiently answered empirical question (e.g., Arslan-Ayaydin et al. 2014).

3.2.4. Law Origin, Legal System, Financial System Development and Ownership Structure

According to mainstream literature, country-specific dimensions of the national institutional financial environments, may affect firms' investment allocative behavior. Among those features are: (i) the legal system and law origins (La Porta *et. al.* 2008; Demirgüç-Kunt and Levine 2005; Demirgüç-Kunt and Maksimovic 1998); (ii) the level of financial development (Belenzon et al. 2013; Pang and Wu 2009; Love 2003; and Wurgler 2000); and (iii) firms' ownership structures (Gedajlovic et al. 2005; Cho 1998; Shleifer and Vishny 1997).

3.2.4.1. Law Origin and the Legal System

Prior research has documented a link between the origin of the national legal system, and firm investment behavior and performance (e.g., Alves and Ferreira 2011; de Jong et al. 2008; La Porta *et. al.* 2008; Demirgüç-Kunt and Levine 2005; Demirgüç-Kunt and Maksimovic 1998; La Porta *et. al.* 1998).[12]

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[11] For more details on the relation between cash holdings and corporate investment, see among others, Sheu and Lee (2012), Denis and Sibilkov (2010), Harford et al. (2008), Pinkowitz and Williamson (2007), Faulkender and Wang (2006), and Almeida et al. (2004), and references therein.

[12] In Europe, La Porta et al. (2008, 288) identify two legal traditions: the common law and the civil law; and «several subtraditions – French, German, socialist, and Scandinavian – within civil law».

A useful starting point for the analysis of this issue, is the question: what are the «consequences of legal rules and regulations, many of which are related to legal origins, for resource allocation [?]» (La Porta et al. 2008, 300). The answer to this question lies primarily in the identification of the legal and financial system dimensions, such as, their structure and effectiveness, that may constrain firms' investment behavior (e.g., Love 2003; Demirgüç-Kunt and Maksimovic 1998).[13]

As argued in La Porta et al. (2000, 4), the «efficiency of investment allocation appear[s] to be explained both conceptually and empirically by how well the laws in these countries protect outside investors».[14]

In terms of the legal protection of investors, common law countries are usually considered as providing the strongest level of protection, and civil law countries the weakest (e.g., La Porta et al. 2000; 1997).

In terms of the level of law enforcement, the Civil law regimes «present the highest quality in terms of law enforcement, followed by Common law-based countries» (Alves and Ferreira 2011, 124).[15]

Overall, whether or not the law origin and the legal regime matter to corporate capital allocation, remains an empirical question which seems equally important for both internal and external capital market participants.

However, the empirical testing of samples of firms operating under legal systems with the same origins, which is the case in this study, may yield a loss of a degree of freedom without enhancing the estimation explanatory power, making the econometric analysis inefficient. Therefore, we did not include this potential determinant in our empirical specification. Additionally, we did not include the level of investors' protection as a potential determinant in our panel data empirical specification because the commonly used index of effective investor rights, as specified in Spamann's (2010), Wurgler (2000), and La Porta's et al. (1998), is time invariant.

[13] As argued in La Porta et al. (2008, 287) «[…] the protection of shareholders and creditors by the legal system is central to understanding the patterns of corporate finance in different countries».
[14] Empirical evidence in Wurgler (2000, 187), documents that «the efficiency of capital allocation is positively correlated with the legal protection of minority investors».
[15] See La Porta et al. (1998) for further details.

3.2.4.2. Financial System Development

A stream of the literature documents the impact of financial system development on capital allocation behavior, suggesting that the former affects allocative behavior, by easing financing constraints (e.g., Love 2003; Wurgler 2000).

Well-established financial systems tend to promote the efficiency of capital allocation through the relief of asymmetric information problems, namely, the screening out of bad projects and providing incentive-compatible monitoring (e.g., Pang and Wu 2009; Greenwood and Jovanovic 1990).[16]

The presence of well-developed and active financial markets and intermediaries are effective mechanisms that lessen asymmetric information problems in financial markets, potentially promoting easier access to financial capital.[17]

However, whenever there is little variance in the level of development across national financial systems, as is the case in the euro area, there is no conceptual or empirical justification for testing its hypothetical relationship with corporate investment allocation.

3.2.4.3. Ownership Structure

According to a significant branch of the literature, ownership structure, arguably, may influence firms' investment behavior (Wei and Zhang 2008; Gedajlovic et al. 2005; Goergen and Renneboog 2001; López-Iturriaga and Rodríguez-Sanz 2001; Cho 1998; Shleifer and Vishny 1997; Hoshi et al. 1991).[18]

Managerial ownership and monitoring of large outside equityholders, such as institutional investors, can also play an instrumental role in alleviating costly agency and informational problems among the firm's claimholders. Consequently, having an impact on the capital allocative efficiency (e.g., Goergen and Renneboog 2001).[19]

Large corporations, typically, exhibit concentrated ownership. Shareholders in these types of firms, because of the size of their ownership holdings, have the incentive

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[16] For more details on the incentive-compatible mechanism please refer to, e.g., Mas-Colell et al. (1995).

[17] According to Wurgler (2000, 187) capital allocation efficiency is «positively correlated with the amount of firm-specific information in domestic stock returns». See, e.g., Crespi and Scellato (2007), Devereux and Schiantarelli (1990) for empirical evidence from Europe.

[18] Despite the fact that ownership structure varies across countries, one can identify prominent 'clusters', such as relatively dispersed ownership in the U.S., the U.K. and other common law countries, and relatively highly concentrated ownership in Continental European countries (Faccio and Lang 2002; La Porta et al. 1999; Shleifer and Vishny 1997).

[19] As managerial behavior is not easily, readily, directly, and costlessly observable, monitoring may be an effective mechanism for promoting capital allocation efficiency.

and resources to engage in producing information privately, and in monitoring managerial behavior. In contrast, individual atomistic investors lack the incentive and the resources, to become involved in the production of costly private information. Therefore, those less informed investors may free-ride institutional investors' behavior, attempting to benefit from their informational advantage (e.g., Klein et al. 2002).

Wei and Zhang (2008), Crespi and Scellato (2007), and Pawlina and Renneboog (2005) hypothesize that a non-monotonic investment-ownership structure relationship could lead, at moderate to high levels of ownership, to large shareholders becoming entrenched and pursuing their own interests, thus, leading to suboptimal investment behavior.

The empirical literature provides evidence documenting that ownership concentration or the nature of equityholders, can potentially mitigate costly agency and asymmetric information problems with an impact on the capital allocation process. Additionally, the literature also documents the impact of ownership structures on firms' investment behavior in Europe, and more specifically in the euro area (e.g., Andres 2011; Pindado et al. 2011; Crespi and Scellato 2007; Pawlina and Renneboog 2005; López-Iturriaga and Rodríguez-Sanz 2001).

However, the specification of an empirical model to study the investment behavior of samples of firms integrated in ICMs, typically exhibiting concentrated ownership structures, and of unlisted SME stand-alone firms, typically diffusely held, will induce not only misspecification errors, but also an inefficient estimation. Therefore, we did not include this theoretical determinant in our empirical specification.

3.2.5. Organizational Structure

In a perfect market framework, the return and risk characteristics of an investment project, regardless of how it is organizationally structured, either within a firm integrating a business group, or in a stand-alone firm, should be similarly valued, as these two organizational structures are identically efficient in terms of their capital allocation processes. Therefore, we have to depart from the perfect markets paradigm to find an economic role for the organizational strategies underlying internal capital markets.

In a real-world economic framework, market frictions and imperfections affect both the level of information and incentives, which may influence corporate capital expenditures differently, depending on how the projects are incorporated or organized (e.g., Almeida et al. 2015; Buchuk et al. 2014; Ozbas and Scharfstein 2010; Stein 2003; Liebeskind 2000; Flannery et al. 1993; Solt 1993; and Thakor 1993). Under this framework, whether investment decisions are made in a centralized or decentralized capital budgeting setting, is not a matter of irrelevancy (e.g., Stein 2003; and Thakor 1993). Arguably, it does matter, whether an investment project is organized as a stand-alone firm or included as part of a firm's portfolio of assets, which can also be organized 'outside' the firm, as a subsidiary legally independent from other firms in the business group.[20]

The allocative efficiency of a firm's investment behavior is a major focus of the literature on internal capital markets, which can be, advantageously, systematized across two broad categories: the allocative efficiency and inefficiency of internal capital markets.

The 'efficient view' argues that when the control rights are held at the level of headquarters, its monitoring incentives rise, and improve the information quality (e.g., Khanna and Tice 2001; Sapienza 2001; Gertner et al. 1994; Hart and Moore 1990; Williamson 1975; Alchian 1969).[21]

The branch of literature that espouses the inefficient perspective of ICMs shows how a conflict of interest between division managers and headquarters may lead to inefficiency, in terms of cross-subsidizing inefficient projects ('corporate socialism') through internal allocations of capital (Ozbas and Scharfstein 2010; Wulf 2009; Yan 2006; Rajan et al. 2000; Scharfstein and Stein 2000; Lins and Servaes 1999; Rajan and Zingales 1998; Shin and Stulz 1998; Lamont 1997; Berger and Ofek 1995; Jensen 1986).[22]

In summary, we cannot assert if internal capital markets are uniformly beneficial or detrimental for capital allocation behavior.

3.2.6. Investment Dynamics

Mostly due to the technological considerations, the functions of aggregate investment expenditure for specific industries exhibit a discrete dynamic pattern, as is the case of the cement and steel industries. It is widely accepted that either new growth

[20] See also Sautner and Villalonga (2010) and Maksimovic and Phillips (2002).
[21] However, this effect may lower the divisionary manager entrepreneurial incentives (Aghion and Tirole 1997).
[22] The so-called 'conglomerate discount' reported, among others, in Lang and Stulz (1994) and Berger and Ofek (1995), is mostly associated with potential failures of ICMs' financing and investment policies.

opportunity projects, or investment in organic incremental capacity expansions may occur in discrete units because of technological, cost, or efficiency considerations (e.g., Gomes 2001; Dixit and Pindyck 1994).

Despite the relative success of standard investment models, such as the neoclassical model, the sales accelerator model, the Tobin's *q* model, the Euler-equation model, in replicating a gradual adjustment of the actual capital stocks to their desired long-run levels, recent developments in investment research highlight the importance of fixed costs, irreversibility and indivisibility of investment projects in the adjustment of capital stock at the firm level (e.g., Doms and Dunne 1998).

Prior research provides empirical evidence documenting that capital expenditure adjustments at the firm level may be episodic and lumpy, because of economies of scale or excess capacity in assets usage, or roller-coaster growth, rather than smooth and continuous, exhibiting periods of inactivity (zero or near zero investment), followed by periods of significant spikes in capital expenditure (e.g., Brigham and Ehrhardt 2017; Verona 2014; Del Boca et al. 2008; Cooper and Haltiwanger 2006). Therefore, the continuous pattern implied in standard investment models seems inadequate to capture the dynamics of the investment behavior observed in real-world corporate data, because of potential measurement and model misspecification problems.

3.2.7. Hypotheses Development

Under the standard neoclassical framework, investment efficiency is obtained when resources are allocated to those usages where their value is greatest, and investment and financing choices are independent. In these circumstances, the level of capital expenditure is unaffected by cash flow generation but determined by the investment opportunity set.

Real-world conditions of imperfect and incomplete markets, specialization in managerial decision-making and residual risk-bearing functions, and incomplete contracting may constrain and distort capital allocative behavior (e.g., Stein 2003; Rajan et al. 2000; Hubbard 1998; Harris and Raviv 1996; Bebchuk and Stole 1993).

Moreover, investment and financing become interdependent, and both the availability of internal funding and debt capacity, do matter for capital expenditure (e.g., Sheu and Lee 2012; and Almeida and Campello 2010).[23]

[23] For more details on the relationship between financial flexibility and corporate investment see, e.g., Ferrando et al. (2017), Arslan-Ayaydin et al. (2014), Marchica and Mura (2010), and Fazzari et al. (1988).

Less financially flexible firms prone to potential volatile cash flow retention, may become more sensitive to the availability of internal funding for capital expenditure purposes. A non-negligible body of prior research specifies investment models assuming available internal funding as a determinant of capital expenditures, documenting that investment behavior of less financially flexible firms, exhibits a positive and strong relationship with the available internal funding (e.g., Ferrando et al. 2017; George et al. 2011; Cleary et al. 2007; Bond et al. 2003; Goergen and Renneboog 2001; and Shin and Park 1999; Fazzari et al. 1988).

However, Kaplan and Zingales (1997), Cleary (1999), among others, argue that more financially flexible firms also exhibit a positive and significant relationship between investment and internal funding (e.g., Cleary et al. 2007; Kaplan and Zingales 2000; Fazzari et al. 1988).

Different capital budgeting organizational environments, arguably, may affect the availability and cost of internal and external funding sources. ICM affiliates, besides enjoying their own internal funding and financial flexibility, may also benefit from the internal financing 'socialistic behavior' of their headquarters, which leads to capital being moved across ICM members (e.g., Das and Tulin 2017; Wulf 2009; Bernardo et al. 2006; and Scharfstein and Stein 2000). We should not expect comparable unaffiliated firms to exhibit similar levels of financial flexibility.

Therefore, to test the proposition that available internal funding may have differentiated impacts on capital expenditures, depending on capital allocation organizational arrangements enjoying different levels of financial flexibility, we hypothesize that the investment-internal funding relationship for stand-alone firms is positive and stronger than for ICM affiliates, because the latter may resort to an internal capital market, either as a substitute for its own financial slack, or cumulatively − Hypothesis 1 (H1).

Under the assumptions of adverse selection, semi-strong efficient capital markets and residual dividend policy, capital allocation of informationally opaque business organizations is potentially prone to suboptimality, either in the form of under or overinvestment. The former, materializing when the value of the growth opportunity set exceeds the aggregated value of the internal funding and the financial slack; and the latter, whenever the aggregated capital spending exceeds the available portfolio of positive NPV projects (e.g., Brealey et al. 2017).

In ICM settings, headquarters' managerial discretion associated to ICM's capital budgeting and financial management, creates a potential for cross-subsidizing inefficient projects, and therefore may lead to the suboptimal allocation of capital (e.g., Bolton and Scharfstein 1998). Hence, we hypothesize that ICM affiliates should experience lower underinvestment problems than their comparable unaffiliated cohorts − Hypothesis 2 (H2).

However, subsidiaries of diversified firms are more likely to enjoy a higher degree of financial flexibility, than their comparable peers, therefore creating the potential for overinvesting (e.g., Scharfstein and Stein 2000). Hence, we hypothesize that under an ICM framework, ICM affiliates should experience higher overinvestment problems than their comparable unaffiliated cohorts − Hypothesis 3 (H3).

3.3. Data Description and Empirical Specification

In this section, we describe the procedures for building the samples used to test our hypotheses, and the methodological procedures followed in conducting empirical testing.

3.3.1. Sample Selection and Data Description

Our data set includes two balanced panels of 636 firms each – one including ICM participants, and the other consisting of comparable stand-alone firms – drawn from Bureau van Dijk's Amadeus database, which provides financial firm-level data for firms from European countries. The sampling period spans over 2004-2017, in a total of 17,808 testable firm-years.[24]

For further details on the criteria used for subsamples construction and on the matching procedure description, please refer to chapter 2, subsection 2.3.1 of the Thesis.

The specification of the firm-specific variables is presented in subsection 3.3.2. In order to mitigate the potential influence of extreme observations, data were censored according to the following rules: a value of '2' was assigned whenever investment to fixed assets ratio was greater than 2, a value of '1' ('-1') if cash flow to fixed assets ratio was greater (lower) than 1 (-1), a value of '10' if market-to-book ratio was greater than 10, a value of '2' ('-2') if debt to fixed assets ratio was greater (lower) than 2 (-2), and

[24] The data sets for the two subsamples are the same as those used in chapter 2.

excluded firms with negative earnings before interest and taxes (EBIT) (George et al. 2011; La Porta et al. 2000; and Cleary 1999).

3.3.2. Implementation Design and Testing

This subsection describes the specification of the empirical model, the variables and the methodology applied in our empirical testing.

Prior research on the determinants of investment modeling can be, usefully, categorized into the neoclassical model, the sales accelerator model, the Tobin's *q* model, and the Euler-equation model (see, e.g., Goergen and Renneboog 2001; Fazzari et al. 1988).[25]

The neoclassical model specification commonly combines measures of the firm's cost of capital and cash flow, as determinants of corporate investment. According to the sales accelerator model specification, fluctuations in firm sales and cash flows are emphasized as the main determinants of changes in corporate capital spending (e.g., Abel and Blanchard 1986). Although the actual level of corporate investment should be determined based on the firm's backward-looking outputs, such as sales and cash flows, it should also reflect the expectations about the firm's growth potential.[26] According to Goergen and Renneboog (2001), Fazzari et al. (1988), among others, not including expectational (forward-looking) control variables in an investment model specification is a drawback of both, the neoclassical and the sales accelerator models.[27]

As an attempt to circumvent the limitations of the neoclassical and sales accelerator models of firm's investment, which do not include forward-looking variables, the Tobin's *q* model seeks to capture expectations about future profitability through a forward-looking stock market valuation of the firm's assets. The Tobin's *q* relates a firm's market value, the sum of debt and equity market values, to its asset's replacement cost, suffering, for this purpose, of a notorious shortcoming. In a world of rational expectations, the market value of firm's growth opportunities is reflected on its share price, and therefore

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[25] For further discussion on the specification of models to test aggregate and micro level investment behavior refer to, e.g., Caggese (2007), Moyen (2004), Cooper and Ejarque (2003), Holt (2003), Gomes (2001), Erickson and Whited (2000), Caballero (1999), Caballero and Engel (1999), Gilchrist and Himmelberg (1995).

[26] According to Fazzari et al. (1988, 173), «a common criticism of the sales accelerator model is that it does not incorporate the […] price of capital or capital services in the empirical specification».

[27] As discussed, among others, in Goergen and Renneboog (2001), an implicit assumption of the two aforementioned models is that a positive relationship between investment and cash flow is assumed to reflect the importance of internal funding for investment purposes due to liquidity constraints. However, the same positive cash flow coefficient could instead indicate higher future profitability prospects.

in the market value of equity. However, the market value of debt, reflects the time value of money and the premia determined by the debt exposure to risk, and is unrelated to the market value of the growth opportunity set. In addition, as suggested, among others, in Eberly et al. (2012) and Whited (2001), Tobin's *q*, because of the measurement errors it may be associated with, is a problematic proxy for investment opportunities, thus we did not select it in our empirical design.[28]

The Euler-equation model aims at mitigating the shortcomings of both the neoclassical and Tobin's *q* models (Bond and Meghir 1994a, 1994b). The model controls for the influence of expected future profitability on investment spending, whilst no explicit measure of expectation about future profitability is required, as future unobservable values are approximated by instrumental values. For this study, we adopted the Euler-equation model as discussed in Fazzari et al. (1988).

Therefore, we specified the baseline investment model for our tests, incorporating the acceleration principle, as in the Euler-equation model, and including a variable measuring the forward-looking cost of capital.

To test hypothesis 1, we estimated a dynamic version of the empirical investment model specified below:[29]

$$\left(I/FA\right)_{it} = \beta_1 \left(I/FA\right)_{it-1} + \beta_2 \left(CF/FA\right)_{it} + \beta_3 MtoB_{it} + \beta_4 CK_{it} + \beta_5 FF_{it} + \beta_6 Spike_{it} + \beta_7 Inact_{it} + \varepsilon_{it} \tag{3.1}$$

where *I* denotes capital expenditures; *FA*, fixed assets; *CF*, operating cash flow, as a proxy for the availability of internal funding for investment; *MtoB*, market-to-book ratio, as a proxy for growth opportunities; *CK*, cost of capital; *FF*, a proxy for financial flexibility; *Spike*, a dummy variable for investment spike periods; *Inact*, a dummy variable for near-zero-capital expenditure periods; subscripts refer to firm *i* at time *t*; and, ε_{it} is the error term with zero mean and constant variance.[30] See table 3.1 for expected and estimated variable coefficient signs.

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[28] See Goergen and Renneboog (2001), Whited (1998, 1994), Fazzari et al. (1988), among others, for more details.

[29] Following, e.g., Eberly et al. (2012), who empirically documented lagged corporate investment as a determinant of current investment at the firm level. When establishing investment budget for ICM affiliates, headquarters may consider in their decision the level of the previous year's capital budget. See also, Flannery and Hankins (2013).

[30] For similar specifications see, among others, Mulier et al. (2016), Hovakimian and Hovakimian (2009), Bond et al. (2003), Goergen and Renneboog (2001), Cleary (1999), Shin and Park (1999), Ramirez (1995).

We specified the capital expenditure variable, *I*, as the change in fixed assets between time *t* and *t*-1, plus depreciation in period *t* (e.g., Ağca and Mozumdar 2017; Hovakimian and Titman 2006; Fazzari et al. 1988).

We specified operating cash flow, *CF*, as the sum of operating income and depreciation both in time *t* (e.g., George et al. 2011; Hovakimian and Hovakimian 2009; Mizen and Vermeulen 2005).[31]

To control for growth opportunities, we used the market-to-book ratio, *MtoB* (e.g., George et al. 2011; Wei and Zhang 2008; Hoshi et al. 1991). We estimated the market-to-book ratio as the equity market value to its book value both in time *t* (e.g., Arslan-Ayaydin et al. 2014; Alam 2010; Hovakimian and Hovakimian 2009; Hovakimian and Titman 2006; Shin and Park 1999). The equity market value was estimated as the expected equity fair value as described below. For this purpose, we also assumed that the book value of debt is an unbiased proxy of its market value.[32]

To mitigate the effects of size, the variables should be scaled by the firm's capital stock. We estimated capital stock as the beginning-of-period fixed assets, *FA*, in time *t*-1 (e.g., Mulier et al. 2016; Riaz et al. 2016; George et al. 2011; Goergen and Renneboog 2001).

Another control variable is the cost of capital, *CK*, estimated as the standard weighted average cost of capital, where D_{ebt} denotes the amount of outstanding net debt,[33] E_{quity}, the expected equity fair value, k_D, the expected cost of debt capital, k_E the expected cost of equity capital, and t_{ax}, the expected income tax rate (e.g., Goergen and Renneboog 2001; and Fazzari et al. 1988).[34]

The equity fair value of firm *i* at time *t*, E_{quity}, was estimated using the standard steady-state Gordon model,[35] where CF_E denotes the expected cash flow for equityholders, *g* the expected growth rate of CF_E, and k_E the firm's *i* cost of equity in time *t*. Equity cash flows, CF_E, were estimated as the algebraic sum of the EBIT of period *t*,

[31] The Amadeus database reports data for cash flow, computed as the sum of 'Profit or Loss' and 'Depreciation', a specification that incorporates, among other unrelated operating cash flow items, interest expense and extraordinary items.
[32] For further details on market-to-book see, e.g., Lev and Sougiannis (1999).
[33] The amount of outstanding net debt was estimated as the difference of the averages of the non-current liabilities in periods *t* and *t*-1 and the averages of the cash holdings of periods *t* and *t*-1.
[34] Empirical literature provides evidence documenting a relationship between investment and the cost of funds as a determinant of corporate investment (e.g., Goergen and Renneboog 2001; Fazzari et al. 1988; Jorgenson 1971; Resek 1966).
[35] For a derivation of the Gordon dividend model see, e.g., Titman and Martin (2011) and Benninga (2008).

depreciation of period *t*, net interest expense of period *t*, change in net capital expenditures between time *t* and *t*-1, change in outstanding net debt between time *t* and *t*-1, change in working capital between time *t* and *t*-1, and taxes of period *t*.[36]

We estimated the expected constant growth rates of cash flow for equityholders, *g*, as the product of the industry median reinvestment rate over the sampling period by the return on assets for period *t* and firm *i* (see, e.g., Damodaran 2011).[37] Reinvestment rates at the firm level can be negative, reflecting temporary phenomena of lumpy capital expenditures, or volatile working capital allocations. Under the presumption of stable industry's technological conditions, industry medians of the components of industry reinvestment rates should be fairly stationary. Therefore, equity cash flow growth rates were estimated using the historical medians of industry reinvestment rates. Reinvestment rate medians were winsorized at the top and bottom 1% percentile of their distributions.

The expected cost of debt capital, k_D, was estimated as the sum of the risk-free rate, r_F,[38] with a *spread* proxying the market risk of debt.[39] Firm-level debt spreads estimations were based on the debt rating notations and their associated spreads, computed using Damodaran's (2011) synthetic rating model.[40] The expected costs of equity capital, k_E, were the ones previously estimated in Chapter 2.

To control for financial flexibility, *FF*, conceptualized as the sum of abnormal cash holdings and debt capacity, the variable was specified as the difference between a firm´s leverage ratio and its industry median. This specification assumes invariant firm's excess cash holdings and is based on the empirical regularity documented on prior research, that

[36] In terms of the Amadeus database nomenclature: Operating cash flow (EBIT) minus income taxes (TAXA - Taxation), interest expenses (INTE - Interest Paid), net capital expenditures [(variation in fixed assets (FIAS)], change in noncash working capital (WKCA), plus depreciation (DEPR), and net debt change [debt additions minus debt repayments – change in LOAN – Loans (Bond borrowing + Participating bond borrowing + Debits to credit institutions + Other borrowing)].
[37] In terms of the Amadeus database nomenclature: reinvestment rate = net capital expenditures [(variation in fixed assets - depreciation (FIAS) + change in noncash working capital (WKCA)] divided by net of taxes operating profit / loss [EBIT (Earnings Before Interest and Taxes) x (1 - income tax rate)]; and the return on assets = operating profit divided by invested capital; and income tax rate = TAXA (Taxation) divided by PLBT (Profit /Loss before Taxation).
[38] For further details on the risk-free rates estimation, see subsection *2.3.2.1.3.* of the chapter 2 of the thesis.
[39] To estimate the after-tax cost of debt, the expected income tax rate, for firm *i* at time *t*, was estimated as the median of the income tax rate over the sampling period.
[40] The model uses the operating income (EBIT) and the net interest expense as inputs to estimate the interest coverage ratio, which is extensively used by two leading international rating agencies, Standard and Poor's and Moody's. Since our subsamples include only euro area firms, we used the Bank of America Merrill Lynch Euro Non-Financial Index, which tracks the performance of non-financial EUR denominated investment grade corporate debt publicly issued in the euro area domestic markets, to collect data on ratings and default spreads.

leverage ratios at firm-level tend to revert towards industry mean / median (e.g., Lee et al. 2009; Ghosh and Cai 1999; Bowen et al. 1982; Lev 1969).[41]

We specified an investment spike variable, *Spike*, as a dummy assuming the value 1 when occurs an adjustment in the capital expenditures to total net assets exceeding 35 percent, to control for lumpy asset investment dynamics. The investment inactivity variable, *Inact*, was specified as a dummy variable assuming the value 1 when occurs near-zero-capital expenditure period, with near-zero being defined as an 8 percent ratio of capital expenditures to total net assets (e.g., Bazdresch 2013; Görtz et al. 2017).

As hypothesized, we expect the investment expenditure of ICM affiliates to exhibit lower sensitivity to available internal funding than ICM unaffiliated firms (H1).

In an ICM setting, the suboptimality of corporate investment expenditures may be lowered based on headquarters' managerial discretion and informational advantages.

To test if ICM affiliates experience lower levels of underinvestment than unaffiliated firms (H2), we examined whether the difference between the level of growth opportunities – natural logarithm of the difference between equity market and book values – and the amount of funding sources – natural logarithm of the retained cash flow and debt capacity (estimated as the product of the debt-to-equity ratio in time *t* and the change in firm's amount of equity in time *t*) – is closer to zero for ICM affiliates when compared with stand-alone firms, conducting the appropriate parametric and nonparametric hypotheses testing. A close to zero difference between the level of growth opportunities and the amount of funding sources, indicates a low level of underinvestment behavior.

To test whether ICM affiliates become more involved in overinvestment behavior than pure-play single segment firms (H3), we examined whether the ratio between the changes in investment level and the changes in the amount of funding, both scaled by total net assets, is higher than zero and higher for ICM affiliates than for comparable unaffiliated firms, by conducting the appropriate parametric and nonparametric tests for hypotheses testing. A higher than zero ratio between the changes in investment stock and the changes in amount of funding indicates a potential overinvestment problem.

[41] Leary and Roberts (2010, 333) defined debt capacity «in terms of the leverage ratios of investment-grade rated firms in the same industry-year combination [and assuming] that firms can issue debt in a given year up to the point where their leverage ratio is equal to that of an average investment-grade rated firm in the same industry and during the same year».

3.3.2.1. Endogeneity Problems

According to a non-negligible stream of the empirical literature, instrumental variables (IV) applied in the generalized method of moments (GMM) estimators may be helpful in mitigating: (i) the endogeneity associated with the variable internal funding proxying omitted variables, namely, financial flexibility; and (ii) the endogeneity associated with the equation's disturbance term being correlated with the lagged dependent variable in dynamic panel data models (e.g., Roberts and Whited 2013; Marchica and Mura 2010; Goergen and Renneboog 2001; and Hoshi et al. 1991). To control for this potentiality, the GMM estimators should be applied instead of the ordinary least squares (OLS).

However, results in Bazdresch et al. (2018), Dang et al. (2015), Zhou et al. (2014), Flannery and Hankins (2013), Shin and Kim (2011) and references cited therein, indicate that the second generation of dynamic panel data estimators, such as, least squares dummy variable correction (LSDVC) and bootstrap-based bias-corrected FE (BCFE), are less biased estimators.

The estimation of ICM's effect on firms' capital investment behavior is an example of the general problem of estimating treatment effects in observational studies. The problem is that since the affiliation of a firm to a business group is not performed randomly – it is an endogenous decision –, the simple average difference in firms' characteristics between treatment (as it is an ICM member of a diversified firm), and a control group (a non-treated group of firms – stand-alone firms), is a biased estimate of the treatment effect (e.g., Kahn and Whited 2018; Villalonga 2004; Campa and Kedia 2002; Graham et al. 2002; and Matsusaka 2001; Whited 2001).

A branch of empirical literature uses matching procedures that implicitly assume that firms become part of a business group randomly (e.g., Berger and Ofek 1995; Lang and Stulz 1994).

For the purposes of this study, we developed and applied a tailor-made matching procedure aiming at mitigating self-selection of group membership problems. The matching procedure consists of building a control group as an 'image' of the treatment group, which reports similar characteristics (variables), given the idea that the treatment does not justify significant differences between the two subsamples.[42]

[42] Details on the matching procedure are available in subsection Appendix 1 of chapter 2.

3.4. Empirical Results

3.4.1. Univariate Statistics Analysis

Table 3.2 presents the characteristics of the subsamples in terms of data distribution by industry and country.

[Insert Table 3.2 here]

Panel A of table 3.2 shows that all major non-financial industries are represented in the subsamples, with an emphasis on wholesale and retail trade and manufacturing, which represent 66.35 percent of the subsamples.

Panel B presents the details of the distribution of the 636 firms (on each of the two subsamples) by country, for the sampling period. The distribution, by country, of the two subsamples is very similar, with the highest representations in Spain, France and Italy (representing 80.7 percent of all the firms in subsample 1 and 78.46 percent of all the firms in subsample 2) while Austria, Finland, Greece, Luxemburg and Portugal present the lowest representations in the two subsamples, accounting for 3.8 percent of the total of sampled firms in subsample 1 and 8.1 percent of all the firms in subsample 2.

Table 3.3 reports the summary statistics, and parametric tests for equality of means and nonparametric tests for equality of medians (on the right side) between the variables used to test our hypotheses in the ICM affiliates and stand-alone subsamples for the 2004-2017 sampling period.

[Insert Table 3.3 here]

Section 1 of table 3.3 presents descriptive statistics, and parametric tests for equality of means and nonparametric tests for equality of medians, for the key variables used to estimate our baseline model to test H1. As reported, the two subsets of firms are similar in several dimensions, both in terms of means and medians. Our results show that the means (of the two-sided t-test) and medians of investment expenditures $\left({}^{I}\!/\!{}_{FA}\right)$ variable, for both subsamples, are not statistically different. ICM affiliates are larger than comparable unaffiliated firms in terms of cash flow $\left({}^{CF}\!/\!{}_{FA}\right)$, market-to-book ratio ($MtoB$) and financial flexibility (FF), with differences statistically significant at the 1 to 10 percent levels. Pure-play stand-alone firms have a larger cost of capital (CK) than ICM affiliates. These findings are consistent with extant empirical literature (e.g., Hann et al. 2013; George et al. 2011; Shin and Park 1999; and Hoshi et al. 1991).

Section 2 of table 3.3 reports descriptive statistics for the variables used to test H1, by conducting robustness checks. Using alternative specifications for the variables involved in the estimation of: (i) growth opportunities and expected growth rate of equity cash flows, with impacts on the cost of capital and market-to-book estimations; (ii) financial flexibility. ICM affiliates exhibit statistically significant, at the 1 percent level, higher market-to-book ratio $(MtoB\_meta)$ and sustainable growth rate (SGR), as surrogates for growth opportunities, than comparable unaffiliated firms.

[Insert Table 3.4 here]

Table 3.4 reports the Pearson correlation coefficients between the variables used to estimate our baseline model to test H1, showing that the correlation coefficients on the determinants of corporate investment range from -0.4353 to 0.3995 in the ICM affiliates subsample, and from -0.4842 to 0.4136 in comparable unaffiliated subsample, at the 1 to 10 percent levels of statistical significance. Although the high correlations imply that the measures are picking up similar information, it appears that each measure picks up certain unique information (Denis and Sibilkov 2010).

3.4.2. Empirical Analysis

Equation (3.1) tests if the investment expenditure of ICM firms exhibits lower sensitivity to internal funding than pure-play single segment firms (H1).

Table 3.5 reports the regression results on equation (3.1), for the ICM affiliates subsample (Panel A) and pure-play stand-alone firms subsample (Panel B).

Columns 1 and 5 of table 3.5, display the regression results estimated using the panel data fixed effects model (FE) which is likely to suffer from finite-sample (short panel) bias and lead to biased estimates. Given the properties and assumptions of the IV/GMM estimators, we also estimated equation (3.1) applying the Blundell and Bond (1998) estimators (SYS-GMM), reported in table 3.5, columns 2 and 6.

[Insert Table 3.5 here]

Regression results document a statistically significant, at the 1 percent level, positive relationship between investment and the availability of internal funds, for both subsamples. The FE and SYS-GMM estimates are 31.54 and 42.64 percent, respectively, in the ICM firms' subsample, and 38.45 and 45.00 percent, in the pure-play stand-alone subsample, consistent with previous evidence in the literature (e.g., Arslan-Ayaydin et al. 2014; Shin and Park 1999; Hoshi et al. 1991; and Fazzari et al. 1988).

Despite the second-order serial correlation [AR(2)], test results provide evidence in favor of there being no AR(2) in the two subsamples. Results for the Hansen test, with the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid, are against the suitability of instruments for the stand-alone firms subsample, as reported in the final two pairs of rows in table 3.5.[43]

The regression results for the bias-corrected estimators performed are reported in columns 3 and 4 (and columns 7 and 8 for stand-alone subsample) of table 3.5, respectively. The results on these complementary estimation methods reinforce the reported positive and statistically significant relationship between investment and availability of internal funds, with LSDVC and BCFE estimates of 32.22 and 37.84 percent for the ICM firms' subsample, and 38.62 and 39.64 percent for the pure-play stand-alone firms subsample.

In summary, these empirical findings, regardless of the estimation procedures and empirical specifications adopted, document that, consistent with H1**,** ICM affiliates exhibit a lower relationship between investment and the availability of internal funds than their comparable unaffiliated peers. This finding may be related to the estimated lower cost of capital and higher financial flexibility exhibited by the former, which may explain their lower dependence on internal funding for capital allocation. Overall, we interpret these results as evidence in favor of our conjecture that ICM membership may mitigate the deadweight costs associated with informational and incentive frictions.

Findings from regression analysis indicate a significant, at the 1 and 5 percent levels for both groups of firms, positive coefficient of the lagged dependent variable documenting a dynamic pattern of corporate investment expenditure, as suggested, e.g., in Eberly et al. 2012.

Regression results with GMM also document a statistically significant positive coefficient of the financial flexibility variable at the 1 percent level, for both subsamples, consistent with previous evidence in the literature (e.g., Ferrando et al. 2017; Arslan-Ayaydin et al. 2014; Marchica and Mura 2010). Additionally, ICM affiliates exhibit a lower relationship between investment and financial flexibility than their comparable unaffiliated peers, consistent with the prediction that ICM affiliates may have access to

[43] SYS-GMM estimators may produce unreliable estimates whenever their fundamental assumption of valid instruments is violated (e.g., Dang et al. 2015; Zhou et al. 2014; Roberts and Whited 2013; Shin and Kim 2011).

intra-group resource cross-allocation and to headquarters' debt capacity, not exhibiting such a high sensitivity to its own financial flexibility for investment purposes.

Estimated coefficients, with GMM, of the investment spike variable are positive, and significant at the 1 percent level, for both subsamples, consistent with the prediction of lumpy investment behavior. Additionally, regression results with GMM document a statistically significant negative coefficient of the investment inactivity variable at the 1 percent level, for both subsamples.

The industries documenting higher capital intensity levels, estimated as the ratio of total net assets to sales, are also the industries showing higher correlations between corporate investment rate and sales growth, suggesting that the functions of aggregate investment expenditure for specific industries exhibit a discrete dynamic patter (e.g., Gomes 2001; Dixit and Pindyck 1994). These results are reported in columns 3 and 4 (and columns 5 and 6 for stand-alone subsample) of table 3.2, respectively.

Overall, these findings suggest the importance of including a proxy for the degree of asset lumpiness in the specification of corporate investment functions, contributing at mitigating the misspecification problem.

To test investment expenditures' responsiveness to growth opportunities, we correlated the changes in investment expenditure rates and the market-to-book ratio. Results document a 0.0850 positive and statistically significant correlation at the 1 percent level. This finding is consistent with the conjecture that capital allocation behavior is positively related to growth opportunities.[44]

To test H2, we examine whether the difference between the level of growth opportunities and the amount of funding is closer to zero for ICM affiliates compared to stand-alone firms. Our empirical findings (see table 3.6), according to the Wilcoxon-Mann-Whitney nonparametric test for equality of medians, suggest that ICM members may experience a lower degree of underinvestment, than their comparable peers, partially consistent with our earlier hypothesis, as outlined in H2.

[Insert Table 3.6 here]

[44] This finding holds for several robustness checks performed using one- and two-time lag periods on the analyzed variables.

Parametric and nonparametric tests indicate that the mean and median of the level of growth opportunities and the amount of funding for ICM affiliates is significantly higher, at the 1 percent level, than for comparable unaffiliated firms.

Test results for a hypothesized relationship between the level of asset lumpiness, estimated as the fraction of inactivity investment periods (the number of near-zero-capital expenditure periods to the total observations available for a firm), and the degree of underinvestment indicate that the higher the level of asset lumpiness the lower the degree of underinvestment. Results also document that for firms exhibiting higher levels of asset lumpiness, the median of the underinvestment degree for stand-alone firms (2.4284) is higher when compared with the one of ICM affiliates (2.4057).

To test H3, we examine whether the ratio between the changes in the amount of investment and the changes in the amount of funding is higher than zero and higher for ICM members, than for stand-alone firms. Our empirical results, according to the Wilcoxon-Mann-Whitney nonparametric test for equality of medians, suggest that ICM affiliates may overinvest less than their comparable unaffiliated peers, a difference statistically significant at the 5 and 10 percent levels, supporting H3 (see table 3.7).

[Insert Table 3.7 here]

Median tests of the changes in the amount of investment for ICM members is significantly lower, at the 1 percent level, than for comparable stand-alone firms.

Test results on the relationship between the level of asset lumpiness and the degree of overinvestment indicate that the higher the level of asset lumpiness the lower the degree of overinvestment, suggesting that ICM affiliates may time their investment expenditures according to their strategic and operating needs.

Results also show that for firms exhibiting higher levels of asset lumpiness, the mean of the degree of overinvestment for ICM affiliates (2.6141) is lower when compared with the one of stand-alone firms (2.8063).

These findings suggest that ICM members, may be less prone to becoming involved in either under or overinvestment, than their comparable cohorts, potentially benefiting from headquarters' managerial discretion, informational advantage, monitoring efforts, and financial flexibility.

3.5. Robustness Checks

To check the robustness of the test results of our hypothesis H1, we used alternative specifications for some of the explanatory variables of our empirical model. Firstly, we used the sustainable growth rate (SGR), estimated as the product of the return on equity (ROE) by 1- dividend payout ratio (Brealey et al. 2017), as a surrogate for growth opportunities.[45] Secondly, for estimating the equity fair value and the cost of capital, we computed the growth rate of cash flow to equityholders, *g*, using the mean of the geometric growth rates of the ratios of total cash flow payout to market value, following Floyd et al. (2015), Kalay and Lemmon (2008) and Grullon and Michaely (2002). Thirdly, we used an alternative specification for the variable financial flexibility, *FF1*, as the product of the debt-to-equity ratio in time *t* and the change in firm's amount of equity in time *t*, assuming as invariant the firm's financial risk (e.g., Rampini and Viswanathan 2010; Gan 2007; Barclay et al. 2006; Shleifer and Vishny 1992).[46] Lastly, we performed panel data regressions on the determinants of corporate investment (Eq. 3.1), classifying firms based on industry classification.[47]

The regression results for the performed robustness checks, reported in tables 3.8, 3.9, 3.10, and 3.11, respectively, provide support for earlier results in terms of coefficient signs, magnitude, and statistical significance.

[Insert Tables 3.8 to 3.11 here]

The finding of a weaker relationship between investment and the availability of internal funds for ICM affiliates than for single-segment firms holds for all the robustness checks performed and for all the estimation methods and empirical specifications used, reinforcing the baseline model results obtained for H1.

[45] The dividend payout ratio was estimated based on data from Floyd et al. (2015), Kalay and Lemmon (2008) and Grullon and Michaely (2002).
[46] For our subsamples of unlisted firms, share repurchases were not considered.
[47] The industries tested were the most representative ones in the subsamples, industries 2 and 4, according to the classification reported in table 3.1.

3.6. Conclusions

This chapter empirically examines the capital allocative behavior of ICM affiliates and their pure-play stand-alone firms. Specifically, we test the importance of the availability of internal funds for investment purposes, the investment-cash flow sensitivity. Additionally, we also test the suboptimality of corporate investment expenditures, either in the form of underinvestment and overinvestment.

Regression results document that the ICM affiliates and pure-play stand-alone firms exhibit, as expected, a positive and statistically significant relationship between the availability of internal funds and a firm’s investment. Findings also indicate that, the former exhibit a lower sensitivity to internal funds, 32.22 percent, than the latter, 38.62 percent. These findings are consistent with the prediction that centralized capital budgeting may mitigate costly informational and incentive problems.

Empirical testing also provides evidence supporting the hypothesis that ICM affiliates report a lower degree of underinvestment when compared with unaffiliated peers, although not statistically different from each other, which partially supports hypothesis 2. Additionally, results also document that ICM affiliates report a lower and close to zero degree of overinvestment when compared with pure-play stand-alone firms, statistically different from each other at the 5 and 10 percent levels, which supports hypothesis 3. These empirical results are consistent with the prediction that in an ICM framework, the degree of under and overinvestment may be lowered through the headquarters’ informational advantages and managerial discretion.

Finally, our findings suggest the usefulness of including a variable to control for asset lumpiness in the specification of capital allocation empirical models to mitigate potential bias due to model misspecification.

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Tables

Table 3.1. Expected and estimated variable coefficient signs

Variables	Expected Sign	Estimated Sign
Internal Funding – Operating Cash Flow (CF)	+	+
Growth opportunities (MtoB)	+	+
Cost of Capital (CK)	-/+	-/+
Financial Flexibility (FF)	+	+
Spike	+	+
Inact	-	-

Table 3.2. Characteristics of the subsamples

The industry classification was based on the NACE Rev. 2's main section and is according to the aggregation of Fama and French's (1997) industry classification presented in Dewaelheyns and Van Hulle (2012).

Panel A: Industry composition			ICM affiliates		Comparable Stand-alone	
Industry	Number of firms in subsample 1 and subsample 2	%	Capital Intensity (mean)	Correlation between Investment and Sales Growth	Capital Intensity (mean)	Correlation between Investment and Sales Growth
Agriculture, forestry and fishing; Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities (Industry 1)	45	7.1%	1.6318	0.1377***	1.6887	0.1927***
Manufacturing (Industry 2)	177	27.8%	0.8901	0.0731***	0.9957	0.1302***
Construction (Industry 3)	44	6.9%	2.0619	0.1023*	5.8474	0.0269
Trade (Wholesale and Retail) (Industry 4)	245	38.5%	0.6559	0.1429***	0.5746	0.0919***
Transport and Communications (Industry 5)	59	9.3%	1.0014	0.2047***	1.6962	0.1759***
Other (Accommodation and food service activities; Professional, scientific and technical activities; Administrative and support service activities; Human health and social work activities; Arts, entertainment and recreation; Other service activities) (Industry 6)	66	10.4%	1.0986	0.1549***	0.9320	0.2246***
	636					

Panel B: Country composition				
Country	Number of firms in subsample 1	%	Number of firms in subsample 2	%
Austria	2	0.3%	1	0.2%
Belgium	62	9.7%	47	7.4%
Finland	6	0.9%	1	0.2%
France	157	24.7%	151	23.7%
Germany	37	5.8%	39	6.1%
Greece	5	0.8%	34	5.3%
Italy	169	26.6%	137	21.5%
Luxembourg	1	0.2%	3	0.5%
Portugal	10	1.6%	12	1.9%
Spain	187	29.4%	211	33.2%
	636		636	

Table 3.3. Summary statistics, and parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test our hypotheses in the ICM affiliates and stand-alone subsamples

This table reports the mean, median and number of observations (N), respectively in the first, second and third rows, for each variable considered in the empirical models to test our hypotheses. The variables used to test our hypotheses were described in detail in subsection 3.3.2. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively. A statistically significant difference, upward or downward, can be proved through the one-sided t-test for mean comparison of two independent subsamples, and assuming unequal variances: diff > 0*** representing a difference between the mean of the two groups that is statistically significantly greater than zero, i.e., we have a variable that has a statistically significant higher mean for ICM affiliates when compared with stand-alone firms; diff < 0*** representing a difference between the mean of the two groups that is statistically significantly less than zero, i.e., that we have a variable that has a statistically significant higher mean for unaffiliated firms when compared with ICM affiliates.

Variables	ICM affiliates	Comparable Stand-alone	Mean: Two-sided t-test	Mean: One-sided t-test	Median: Wilcoxon-Mann-Whitney test
Section 1: Summary statistics, and parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test H1					
$\left(I/FA\right)_{it}$	0.3457	0.3333	1.5676	diff > 0*	
	0.1651	0.1566			-0.911
	6816	6911			
$\left(CF/FA\right)_{it}$	0.5405	0.5315	1.4761	diff > 0*	
	0.4885	0.4505			-3.383***
	7629	7487			
$MtoB_{it}$	6.7842	6.5809	1.3268	diff > 0*	
	10.000	9.2863			-6.299***
	6159	6335			
CK_{it}	0.07112	0.07383	-1.1235		
	0.0561	0.0568			0.995
	4918	4992			
FF_{it}	0.1863	0.1808	1.8331*	diff > 0**	
	0.1647	0.1552			-2.823***
	8315	8229			
Section 2: Summary statistics, and parametric tests for equality of means and nonparametric tests for equality of medians between variables used to test H1, conducting robustness checks (described in detail in subsection 3.5.)					
SGR_{it}	0.0588	0.0524	4.7187***	diff > 0***	
	0.0443	0.0375			-8.183***
	8263	8206			
CK_meta_{it}	0.0669	0.0684	-0.4019		
	0.0473	0.0486			1.533
	5937	5926			
$MtoB\_meta_{it}$	6.3008	5.8472	6.5973***	diff > 0***	
	7.2303	5.8755			-6.590***
	6079	6224			
$FF1_{it}$	0.6934	0.5996	0.2558		
	0.05852	0.0803			9.819***
	7624	7545			

Table 3.4. Pearson correlation coefficients between variables used to test H1

This table reports the Pearson correlation coefficients between the variables used to test our hypothesis H1. The definitions of the variables are listed in subsection 3.3.2. *, ** and *** indicate significance of the coefficients at the 10%, 5% and 1% level, respectively.

	Panel A: Correlations – ICM members affiliates subsample							
		1	2	3	4	5	6	7
1	$\left(I/FA\right)_{it}$	1						
2	$\left(CF/FA\right)_{it}$	0.2641***	1					
3	$MtoB_{it}$	0.0359**	0.1466***	1				
4	CK_{it}	-0.0032	-0.0493***	-0.0041	1			
5	FF_{it}	0.0129	-0.0233**	-0.0302**	-0.0318**	1		
6	$Spike_{it}$	0.3995***	0.0208*	0.0238*	-0.0006	-0.0114	1	
7	$Inact_{it}$	-0.4353***	0.0232**	-0.0423***	-0.0041	0.0437***	-0.3144***	1

	Panel B: Correlations - comparable stand-alone subsample							
		1	2	3	4	5	6	7
1	$\left(I/FA\right)_{it}$	1						
2	$\left(CF/FA\right)_{it}$	0.3168***	1					
3	$MtoB_{it}$	0.1489***	0.3040***	1				
4	CK_{it}	0.0005	0.0012	-0.0245	1			
5	FF_{it}	-0.0003	-0.0315***	-0.0637***	0.0333**	1		
6	$Spike_{it}$	0.4136***	0.0011	0.0571***	-0.0059	-0.0051	1	
7	$Inact_{it}$	-0.4842***	0.0496***	-0.0980***	0.0086	0.0285**	-0.3163***	1

Table 3.5. Parameter estimates from panel regressions on the determinants of corporate investment – Eq. (3.1) – H1

This table summarizes the estimations on the determinants of corporate investment generated by four estimation methods: (1) panel data fixed effects model; (2) Blundell and Bond (1998) system GMM; (3) Bruno (2005) and Kiviet (1995) least squares dummy variable correction LSDVC (since the differences in the initial estimators only have a marginal impact on the LSDVC estimates, we used the AH Anderson and Hsiao initialization); and, (4) De Vos et al. (2015) and Everaert and Pozzi (2007) bootstrap-based bias-corrected FE (BCFE) with the 'wboot' resampling scheme that performs a wild bootstrap that allows for general heteroscedasticity. The data were drawn from the 2004 to 2017 Amadeus files. Definitions of the variables are listed in subsection 3.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation, and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the *t* or *z* statistics for coefficients, and values in square brackets are the *p*-values for test statistics.

	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0076 (-0.32)	0.0387** (2.05)	0.0455** (2.24)	0.0795*** (2.60)	0.0107 (0.43)	-0.0062 (-0.34)	0.0633*** (3.13)	0.0145 (0.60)
$\left(CF/FA\right)_{it}$	0.3154*** (5.03)	0.4264*** (11.09)	0.3222*** (6.82)	0.3784*** (5.07)	0.3845*** (9.21)	0.4500*** (16.64)	0.3862*** (7.23)	0.3864*** (5.94)
$MtoB_{it}$	0.0021 (0.99)	0.0031* (1.78)	0.0020 (0.67)	0.0002 (0.09)	-0.0017 (-0.64)	0.0071*** (4.03)	-0.0016 (-0.56)	0.0018 (0.58)
CK_{it}	-0.0110** (-2.36)	0.0115 (1.45)	-0.0111 (-0.56)	-0.0179 (-0.53)	-0.0068 (-0.83)	0.0018 (-0.22)	-0.0070 (-0.19)	-0.0007 (-0.03)
FF_{it}	-0.0136 (-0.13)	0.2567*** (3.43)	-0.0039 (-0.03)	0.0933 (0.80)	0.1282 (1.36)	0.2641*** (4.75)	0.1265 (0.94)	-0.0227 (-0.22)
$Spike_{it}$	0.8367*** (11.58)	0.9014*** (11.72)	0.8353*** (13.47)	0.8704*** (11.91)	0.6570*** (10.01)	0.7000*** (7.50)	0.6531*** (12.43)	0.7534*** (10.49)
$Inact_{it}$	-0.4626*** (-15.07)	-0.2667*** (-13.24)	-0.4599*** (-19.10)	-0.4241*** (-12.80)	-0.4658*** (-17.71)	-0.3122*** (-15.02)	-0.4672*** (-22.52)	-0.4018*** (-13.51)
Constant	0.4966*** (9.09)				0.3853*** (8.25)			
Observations	2915	2915	1994	2173	2976	2976	2006	2233
R-squared	0.3283				0.4180			
AR(2) test		0.08 [0.936]				-0.55 [0.583]		
Hansen		101.18 [0.024]				125.20 [0.000]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 3.6. Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test H2 in the ICM affiliates and stand-alone subsamples

The variables used to test H2 were described in detail in subsection 3.3.2. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. To test if ICM affiliates experience lower degree of underinvestment than unaffiliated firms, we examined whether the difference between the level of growth opportunities – the difference between equity market and book values – and the amount of funding – retained cash flow and debt capacity – is closer to zero for ICM affiliates when compared with stand-alone firms.

Differences in means and medians of the variables used to test the degree of underinvestment of both ICM affiliates and comparable stand-alone firms				
		Mean		
	ICM affiliates subsample	Stand-alone subsample	Two-sided *t* test	One-sided *t* test
$ln(Level\_Growth\_Opport)_{it}$	10.3512	9.8046	13.0381***	diff > 0***
$ln(Amount\_Funding)_{it}$	7.8067	7.4623	15.0314***	diff > 0***
$Under\_investment_{it}$	2.5442	2.5254	0.5404	
		Median		
	ICM affiliates subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test	Nonparametric equality-of-medians test
$ln(Level\_Growth\_Opport)_{it}$	10.3462	9.8070	-13.058***	119.2407***
$ln(Amount\_Funding)_{it}$	7.7223	7.4657	-13.423***	90.3242***
$Under\_investment_{it}$	2.4208	2.4539	0.18	0.7557

Test if means of the degree of underinvestment, of both ICM affiliates and comparable stand-alone firms, are statistically different from zero		
	Mean	*t* test
$Subsidiaries\_Under\_investment_{it}$	2.5442	97.9893***
$Stand-alone\_Under\_investment_{it}$	2.5254	109.0455***

Table 3.7. Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test H3 in the ICM affiliates and stand-alone subsamples

The variables used to test H3 were described in detail in subsection 3.3.2. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. To test if ICM affiliates experience higher degree of overinvestment than unaffiliated firms, we examined whether the ratio between the changes in the amount of investment and the changes in amount of funding (both scaled by total net assets) is higher to zero and higher for ICM affiliates when compared with stand-alone firms.

Differences in means and medians of the variables used to test the degree of overinvestment of both ICM affiliates and comparable stand-alone firms

Mean				
	ICM affiliates subsample	Stand-alone subsample	Two-sided *t* test	One-sided *t* test
$\left(\frac{\Delta\ Amount\_Investment}{Total\ Assets}\right)_{it}$	0.0672	0.0698	-1.0213	
$\left(\frac{\Delta\ Amount\_Funding}{Total\ Assets}\right)_{it}$	0.1218	0.1306	-0.9973	
$Over\_investment_{it}$	5.5944	6.0788	-0.3912	

Median				
	ICM affiliates subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test	Nonparametric equality-of-medians test
$\left(\frac{\Delta\ Amount\_Investment}{Total\ Assets}\right)_{it}$	0.0262	0.0293	4.977***	14.0222***
$\left(\frac{\Delta\ Amount\_Funding}{Total\ Assets}\right)_{it}$	0.0504	0.0479	-0.952	1.1286
$Over\_investment_{it}$	0.6200	0.7043	1.929**	3.5205*

Test if means of the degree of overinvestment, of both ICM affiliates and comparable stand-alone firms, are statistically different from zero

	Mean	*t* test
$Subsidiaries\_Over\_investment_{it}$	5.5944	6.7186***
$Stand-alone\_Over\_investment_{it}$	6.0788	6.6323***

Table 3.8. Parameter estimates from panel regressions on the determinants of corporate investment – using the *SGR* as a surrogate for growth opportunities in Eq. (3.1) – Robustness H1

This table summarizes the estimations on the determinants of corporate investment for both subsamples using the *SGR* as a surrogate for growth opportunities.

	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0214 (-1.03)	0.0653*** (2.97)	0.0424*** (2.72)	0.0350 (1.28)	-0.0225 (-1.24)	0.0161 (0.98)	0.0369*** (2.91)	0.0172 (1.05)
$\left(CF/FA\right)_{it}$	0.2037*** (4.64)	0.4410*** (9.59)	0.2077*** (7.40)	0.2365*** (5.20)	0.3068*** (6.40)	0.4571*** (12.08)	0.3145*** (10.25)	0.2973*** (5.69)
SGR_{it}	-0.5283*** (-2.96)	-0.8132*** (-3.84)	-0.5220*** (-3.97)	-0.6596*** (-3.49)	-0.8720*** (-3.18)	-0.5440** (-2.21)	-0.9081*** (-4.69)	-0.6178** (-2.12)
CK_{it}	0.0046 (0.47)	0.0577*** (1.75)	0.0051 (0.23)	0.0077 (0.07)	0.0020 (0.19)	0.0029 (0.29)	0.0013 (0.05)	-0.0094 (-0.38)
FF_{it}	-0.1563* (-1.89)	0.3127*** (4.66)	-0.1510 (-1.65)	-0.0665 (-0.71)	0.1176 (1.37)	0.3284*** (5.59)	0.1175 (1.21)	0.0991 (1.04)
$Spike_{it}$	0.8677*** (16.52)	0.9383*** (13.98)	0.8731*** (21.15)	0.9429*** (19.66)	0.7536*** (16.84)	0.8173*** (15.42)	0.7557*** (21.80)	0.7495*** (14.61)
$Inact_{it}$	-0.5577*** (-20.08)	-0.3442*** (-15.06)	-0.5550*** (-30.08)	-0.5387*** (-16.03)	-0.5304*** (-23.51)	-0.3737*** (-18.39)	-0.5301*** (-31.88)	-0.5244*** (-22.96)
Constant	0.7272*** (16.63)				0.5385*** (13.78)			
Observations	4069	4069	3197	3435	4104	4104	3242	3549
R-squared	0.2936				0.4193			
AR(2) test		0.34 [0.732]				-0.61 [0.544]		
Hansen		107.84 [0.008]				133.35 [0.000]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 3.9. Parameter estimates from panel regressions on the determinants of corporate investment – using an alternative measure of g_{it} for Eq. (3.1) – Robustness H1

This table summarizes the estimations on the determinants of corporate investment for both subsamples estimating g_{it}, using the median of the geometric growth rate of total payout as a percentage of market value.

	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0115 (-0.58)	0.0275* (1.70)	0.0379*** (2.09)	0.0706** (2.48)	0.0320 (1.43)	0.0162 (1.09)	0.0830*** (4.41)	0.0747*** (2.64)
$\left(CF/FA\right)_{it}$	0.3021*** (5.88)	0.4259*** (14.03)	0.3087*** (7.91)	0.3397*** (5.90)	0.3459*** (9.66)	0.4377*** (18.31)	0.3494*** (6.19)	0.3419*** (7.83)
$MtoB\_Meta_{it}$	0.0027 (1.20)	0.0039** (2.40)	0.0026 (0.96)	0.0008 (0.32)	0.0017 (0.66)	0.0087*** (5.31)	0.0018 (0.67)	0.0049* (1.91)
CK_Meta_{it}	0.0022 (0.13)	0.0740 (1.19)	0.0035 (0.08)	-0.0093 (-0.08)	0.0068** (2.20)	-0.0035 (-0.33)	0.0065 (0.34)	0.0052 (0.07)
FF_{it}	-0.0261 (-0.30)	0.2126*** (3.18)	-0.0183 (-0.14)	-0.0007 (-0.01)	0.1033 (1.14)	0.2329*** (4.14)	0.1047 (0.80)	0.0672 (0.59)
$Spike_{it}$	0.8836*** (13.32)	0.9611*** (14.16)	0.8824*** (19.84)	0.9914*** (13.04)	0.7351*** (10.66)	0.8221*** (8.21)	0.7306*** (15.18)	0.8323*** (11.26)
$Inact_{it}$	-0.4518*** (-16.93)	-0.2708*** (-14.90)	-0.4493*** (-20.95)	-0.4073*** (-17.18)	-0.4875*** (-19.08)	-0.3201*** (-15.63)	-0.4883*** (-26.75)	-0.4316*** (-17.76)
Constant	0.4488*** (14.21)				0.3747*** (8.31)			
Observations	3567	3567	2521	2657	3466	3466	2391	2581
R-squared	0.3252				0.3917			
AR(2) test		-0.50 [0.617]				-0.36 [0.715]		
Hansen		8839 [0.138]				121.16 [0.001]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 3.10. Parameter estimates from panel regressions on the determinants of corporate investment – using an alternative measure of FF_{it} for Eq. (3.1) – Robustness H1

This table summarizes the estimations on the determinants of corporate investment for both subsamples estimating $FF1_{it}$, as the product of the debt-to-equity ratio in time t and the change in firm's amount of equity in time t.

	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0031 (-0.13)	0.0392** (2.07)	0.0494** (2.41)	0.0834*** (2.68)	0.0079 (0.32)	-0.0056 (-0.30)	0.0605*** (2.90)	-0.0106 (-0.37)
$\left(CF/FA\right)_{it}$	0.3031*** (4.86)	0.4292*** (10.95)	0.3098*** (5.81)	0.3633*** (5.31)	0.3800*** (9.06)	0.4554*** (16.10)	0.3826*** (7.14)	0.3129*** (6.24)
$MtoB_{it}$	0.0022 (1.03)	0.0036** (1.99)	0.0021 (0.74)	0.0002 (0.07)	-0.0019 (-0.72)	0.0073*** (4.02)	-0.0017 (-0.62)	0.0014 (0.53)
CK_{it}	-0.0109** (-2.40)	0.0062 (0.92)	-0.0112 (-0.57)	-0.0169 (-0.42)	-0.0073 (-0.95)	-0.0006 (-0.07)	-0.0073 (-0.20)	0.0003 (0.03)
$FF1_{it}$	0.0149*** (4.66)	0.0131* (1.76)	0.0152*** (4.02)	0.0163** (2.04)	0.0129 (1.28)	0.0115 (1.57)	0.0110 (1.57)	0.0210* (1.65)
$Spike_{it}$	0.8207*** (11.64)	0.8672*** (11.42)	0.8193*** (13.31)	0.8637*** (9.50)	0.6496*** (9.82)	0.7010*** (7.17)	0.6464*** (12.27)	0.7478*** (10.40)
$Inact_{it}$	-0.4585*** (-15.08)	-0.2532*** (-13.12)	-0.4558*** (-21.22)	-0.4190*** (-13.30)	-0.4647*** (-17.59)	-0.3030*** (-14.32)	-0.4661*** (-22.44)	-0.4009*** (-14.79)
Constant	0.4957*** (9.91)				0.4095*** (9.42)			
Observations	2909	2909	1988	2166	2976	2976	2006	2233
R-squared	0.3328				0.4176			
AR(2) test		-0.05 [0.962]				-0.48 [0.630]		
Hansen		104.10 [0.015]				132.17 [0.000]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 3.11. Parameter estimates from panel regressions on the determinants of corporate investment – classifying firms based on industry classification, in Eq. (3.1) – Robustness H1

This table summarizes the estimations on the determinants of corporate investment for both subsamples classifying firms based on industry classification.

Parameter estimates from panel regressions on the determinants of investment for firms belonging to Industry 2								
	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0047 (-0.19)	0.0751*** (2.79)	0.0401 (1.04)	0.0507 (1.27)	-0.0087 (-0.47)	0.0200 (0.83)	0.0279 (0.79)	0.0199 (0.84)
$\left(CF/FA\right)_{it}$	0.3392*** (4.76)	0.4507*** (10.56)	0.3502*** (4.69)	0.2160** (2.31)	0.3826*** (6.82)	0.4400*** (11.12)	0.3878*** (5.23)	0.3652*** (3.87)
$MtoB_{it}$	-0.0047 (-1.33)	-0.0007 (-0.22)	-0.0046 (-1.11)	-0.0045 (-1.12)	0.0004 (0.12)	0.0060** (2.11)	0.0004 (0.08)	-0.0008 (-0.17)
CK_{it}	-0.0409 (-0.62)	0.0352 (0.35)	-0.0456 (-0.48)	-0.0819 (-0.51)	-0.0198*** (-2.74)	-0.0079 (-0.80)	-0.0205 (-0.66)	-0.0110 (-0.17)
FF_{it}	0.1601 (0.92)	0.3941*** (3.56)	0.1622 (0.85)	0.1792 (0.84)	0.12443 (0.96)	0.2401*** (2.88)	0.1444 (0.67)	0.1518 (1.00)
$Spike_{it}$	0.9844*** (6.29)	1.0985*** (7.46)	0.9965*** (4.98)	1.0971*** (3.36)	0.9913*** (7.43)	0.9241*** (4.59)	0.9981*** (8.29)	0.9644*** (4.28)
$Inact_{it}$	-0.4294*** (-8.60)	-0.3020*** (-8.53)	-0.4262*** (-12.18)	-0.4340*** (-8.58)	-0.3842*** (-10.60)	-0.3065*** (-9.61)	-0.3837*** (-11.21)	-0.3739*** (-10.40)
Constant	0.4265*** (5.82)				0.3193*** (6.25)			
Observations	919	919	666	711	922	922	632	721
R-squared	0.4655				0.4872			
AR(2) test		-1.31 [0.190]				0.50 [0.618]		
Hansen		44.48 [0.108]				94.23 [0.066]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 3.11. Parameter estimates from panel regressions on the determinants of corporate investment – classifying firms based on industry classification, in Eq. (3.1) – Robustness H1 (Cont.)

Parameter estimates from panel regressions on the determinants of investment for firms belonging to Industry 4								
	Panel A: Parameter estimates from panel regressions on the determinants of investment - ICM affiliates subsample				Panel B: Parameter estimates from panel regressions on the determinants of investment – stand-alone subsample			
Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	-0.0295 (-0.91)	0.0376 (1.12)	0.0193 (0.65)	0.0099 (0.29)	0.0204 (0.47)	-0.0106 (-0.46)	0.0789** (2.01)	-0.0102 (-0.15)
$\left(CF/FA\right)_{it}$	0.3107*** (3.48)	0.4354*** (6.90)	0.3218*** (3.89)	0.3647*** (3.39)	0.4024*** (5.18)	0.4488*** (10.62)	0.4043*** (4.19)	0.4045*** (3.93)
$MtoB_{it}$	0.0042 (1.10)	0.0035 (1.13)	0.0041 (0.91)	0.0047 (1.02)	0.0004 (0.09)	0.0077*** (2.92)	0.0006 (0.13)	0.0014 (0.29)
CK_{it}	-0.0135*** (-3.30)	0.0047 (0.57)	-0.0135 (-0.65)	-0.0206 (-0.08)	0.0014 (0.13)	-0.011 (-0.09)	0.0011 (0.03)	-0.2541 (-0.99)
FF_{it}	-0.1266 (-0.82)	0.3059* (1.95)	-0.1203 (-0.57)	-0.0375 (-0.19)	-0.0009 (-0.01)	0.3797*** (4.89)	0.0099 (0.04)	-0.0992 (-0.45)
$Spike_{it}$	0.8839*** (9.72)	1.0387*** (10.74)	0.8749*** (9.50)	0.9943*** (9.87)	0.6535*** (4.66)	0.8135*** (5.63)	0.6411*** (5.80)	0.7410*** (5.23)
$Inact_{it}$	-0.5766*** (-9.48)	-0.3509*** (-7.69)	-0.5727*** (-12.80)	-0.5138*** (-6.17)	-0.5496*** (-11.53)	-0.3661*** (-10.99)	-0.5527*** (-12.96)	-0.4855*** (-7.54)
Constant	0.6114*** (7.25)				0.4869*** (5.37)			
Observations	1060	1060	693	775	1163	1163	758	827
R-squared	0.3097				0.4220			
AR(2) test		0.11 [0.913]				-1.70 [0.088]		
Hansen		82.35 [0.263]				90.07 [0.113]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

4. Firm Diversification and Performance: An Empirical Examination

4.1. Introduction

Pioneering contribution by Ronald Coase (1937), related firm boundaries to resource allocative efficiency, as a result of a dynamic balance between the costs of market and hierarchical coordination.[1] Coase's pathbreaking theoretical argument raises two important questions: «Do firm boundaries affect the allocation of resources? And, what determines where firm boundaries are drawn?» (Mullainathan and Scharfstein 2001, 195).[2]

As argued in transaction cost economics, the organizational forms of economic activity are a continuum of production coordination technologies, spanning between markets and hierarchies (e.g., Gertner and Scharfstein 2013; Milgrom and Roberts 1992). Under this framework, firms emerge as a trade-off between the costs of using the price system and the costs of using a hierarchical management system (e.g., Demsetz 1997).

The examination of diversified firms' behavior, and of the ICMs through which resources are allocated, has received a great deal of attention from economists (e.g., Glaser et al. 2013; Maksimovic and Phillips 2013; Agarwal et al. 2011). However, even today, and despite the theoretical arguments and the empirical findings on the allocative efficiency of diversified versus single-segment firms, the topic still remains a theoretical and empirical challenge for the economic analysis of business organizations.[3]

There is widespread agreement that economic activity carried out within the boundaries of firms is quantitatively more significant, in terms of transactions, value added, and employment, than the ones conducted through markets (Admati 2017; Walker 2017; Otteson

[1] As pointed out by Holmström and Roberts (1998, 73), Coase's «fundamental insight [is] that firm boundaries can be explained by efficiency considerations». Additionally, Maksimovic and Phillips (2007, 425) argue that the problem of setting firm boundaries is embedded in «the relation between diversification and value».

[2] For comprehensive discussions on a firm's boundaries please refer to, e.g., Hart and Holmström (2010), Mullainathan and Scharfstein (2001), Holmström and Roberts (1998), Demsetz (1997), Demsetz (1988), Klein et al. (1978), and Williamson (1975), and references cited therein.

[3] As argued by Admati (2017, 131) «[c]ontracts and markets do not generally create efficient outcomes if markets are not competitive, contracts are incomplete or costly to enforce, or if corporate actions create negative externalities for those with little information or control».

2014; Gertner and Scharfstein 2013; Lafontaine and Slade 2007; and McMillan 2002).[4]

There is also abundant evidence documenting the importance of diversified firms and ICMs, through which they operate as an organizational platform to perform their productive activities. For example: (i) «diversified firms comprise 75% on average of the market value of the S&P 500» (Hund et al. 2012, 1); (ii) «business groups are ubiquitous in many countries» (Carney et al. 2011, 437); (iii) «chaebols are large business conglomerates in South Korea. Since the 1960s, they have played a major role in developing the Korean economy» (Lee et al. 2009, 327); (iv) «conglomerate firm production represents more than 50 percent of production in the United States» (Maksimovic and Philips 2007, 424); (v) «[t]here is ample evidence that large corporations operate an internal capital market» (Inderst and Laux 2005, 215); (vi) «[a] striking feature of most emerging economies is the prominent role played by business groups» (Khanna and Rivkin 2001, 45); (vii) «[d]iversified business groups dominate private sector activity in most emerging markets around the world» (Khanna and Palepu 2000, 867); and (viii) «[i]n Belgium, as in many other European countries, financial and industrial groupings and combines play a crucial role in the accumulation and allocation of capital in the economy» (Deloof 1998, 945).[5]

Despite diversified firms being a ubiquitous form of economic organization in the contemporary corporate world, «there is surprisingly little direct evidence on the efficiency of their capital allocation» (Almeida et al. 2015, 2539). Therefore, additional research may be necessary to enhance the explanatory relevance of extant theoretical predictions, and to improve the generalization power of empirical findings.

Does firm diversification matter? Or, as questioned by Maksimovic and Phillips (2007, 425), «[…] does corporate diversification affect firm value?». The answer to these important questions seems to be intimately linked to where firm boundaries are actually set, and

[4] According to Leland (2007, 765) «[p]ositive or negative operational synergies are often cited as a prime motivation for decisions that change the scope of the firm. A rich literature addresses the roles of economies of scope and scale, market power, incomplete contracting, property rights, and agency costs in determining the optimal boundaries of the firm».

[5] For further recent research on the relevance of diversified firms in the business organization world see, e.g., Buchuk et al. (2014), Belenzon et al. (2013), Gugler et al. (2013), Faccio and Lang (2002).

therefore, to the efficiency of the type and extent of the diversification behavior (e.g., Williamson 1975).[6]

A plethora of theoretical and empirically based arguments indicate that diversification may have ambivalent effects on value (e.g., Campa and Kedia 2002; Berger and Ofek 1995).

The economic performance of diversified firms with active ICMs, is related to the allocative efficiency of their investment and financing behavior (e.g., Gonenc et al. 2007).[7] Furthermore, as suggested by Williamson (1975), «"internal capital markets" in diversified firms can allocate capital more efficiently than external capital markets can, and that they can reduce wasteful investment at lower cost» (Liebeskind 2000, 58).

Therefore, furthering our understanding on the impact of diversification on the economic performance of business organizations has great practical relevance and is assumed as the generic research question for this essay.

This chapter examines the relationship between firms' overall, unrelated and related diversification levels and accounting- and market-based performance measures, using a panel data set of 2,396 euro area firms, over the 2010-2017 sampling period, in a total of 19,168 testable firm-years. We also examine whether the redeployment of 'plastic' assets across unrelated business units may increase their performance levels.

This chapter contributes to the literature and distinguishes from prior research in different ways. Firstly, unlike mainstream literature, predominantly focused on U.S. and Asian firms, findings, investigating the diversification - performance relationship using a sample of euro area diversified firms, therefore enhance the generalization power of the empirical regularities (e.g., Villalonga 2004a; Wernerfelt and Montgomery 1988; Chakrabarti et al. 2007; Ferris et al. 2003).[8] By examining the impact of euro area diversified

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[6] As suggested by Maksimovic and Phillips (2007, 425), «for corporate diversification to be of interest, it must be that the cost of carrying out transactions within the firm are affected if it contains more than one industry within its boundaries».

[7] According to Thakor (1993, 135), in an «idyllic setting», it is irrelevant whether allocative decisions are made: «in a centralized or decentralized capital budgeting environment [regardless of] whether the project is included as part of the firm's portfolio of assets or organized *outside* the firm, i.e., incorporated as a subsidiary with a legal delineation from the firm's existing assets [and] how the project is financed».

[8] For a more in-depth analysis of this topic, see, e.g., Erdorf et al. (2013), Martin and Sayrak (2003), Datta et al. (1991), and references therein.

business organizations on their economic performance, we aim to contribute to mitigating the problems associated with differences in economic, financial, legal and institutional features typically associated with multi-country research, and to enhancing the generalization power of the inferences drawn from empirical findings.

Secondly, by examining a sample composed of 90,1 percent of unlisted and 9,9 percent of listed firms, statistically larger than unlisted ones, we contribute to mitigate the size bias normally associated with this mainstream literature.

Thirdly, by analyzing the somewhat neglected relationship between asset plasticity and the performance level of unrelated diversified firms, aiming at contributing to mitigating the misspecification problem associated with the omission of a potentially relevant independent variable from the empirical model.

The chapter's main findings document: (i) a positive and statistically significant relationship between the levels of overall, unrelated, and related diversification and performance, of 0.34, 0.32 and 0.41, respectively; (ii) significant relationships between performance and size (negative), and growth opportunities (positive); (iii) a positive relation between the levels of overall, unrelated, and related diversification and a market-based performance measure; and (iv) that an unitary increase in the level of asset plasticity has a 2.37 percent effect on the performance level of unrelated diversified firms.

The remainder of the chapter is structured as follows: Section 4.2 discusses the relevant theoretical and empirical literature and formulates the hypotheses. Section 4.3 describes the data and the empirical implementation. Section 4.4 presents and analyzes univariate statistics and the results of econometric estimations. Section 4.5 documents robustness check results. Section 4.6 summarizes and provides concluding remarks.

4.2. Background and Hypotheses

4.2.1. Introduction

Beginning in the early 1920s, the U.S. witnessed the establishment of diversified business organizations – the 'M-Form' – pioneered by the DuPont Company and General Motors (Williamson 1975). Since then, this phenomenon has gained momentum, and diversified firms have gathered a geographically widespread significant economic role (e.g., Montgomery 1994).

A crucial question when studying diversification is naturally, why do firms diversify? According to extant literature, firms diversify in order to improve the economic performance of the resources they have under control (e.g., Giachetti 2012; Chatterjee and Wernerfelt 1991; Ramanujam and Varadarajan 1989; Teece 1984; Penrose 1959). A distinct but related question asks what are the reasons that may lead firms to become involved in diversifying their productive activities? The answer to this question has attracted the interest and has nurtured an ongoing debate among academics and practitioners alike.

Prior research has enlightened various arguments rationalizing firm diversification. A number of them anchored on the seminal contributions of Coase (1937) and Williamson (1985, 1975), on resource allocative efficiency in general, and on the diversified firm (M-form) in particular (see also Liebeskind 2000).[9] On this theoretical perspective, diversification is beneficial whenever the costs of carrying out transactions under an organizational arrangement of a group of coordinated 'hierarchies', is lower than carrying them out in a set of independent 'hierarchies'. Therefore, diversification may be a source of value creation (e.g., Rumelt 1974; Chandler 1962).[10]

However, and despite the accumulated research, still remains an empirical question whether resource usage is more efficient within a diversified organization, or through a set of contracts with independent firms.

Nonetheless, the theoretical and empirically based arguments suggesting that diversification may affect value ambivalently (e.g., Campa and Kedia 2002), findings from prior research document that firms involved in either diversification or refocusing strategies exhibit improvements in economic performance (e.g., Steiner 1997; Hansen and Wernerfelt 1989; Lecraw 1984; Rumelt 1982).[11]

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[9] According to Coase (1937) and Williamson (1975), economies of scope in resources and capabilities can be reached by: (i) selling or licensing them to another firm; (ii) reallocating those resources, depending on their 'plasticity', to another activity (see also, Wade and Gravill 2003).

[10] According to Maksimovic and Phillips (2007, 425) «the relation between diversification and value arise naturally from the larger problem of determining how the boundaries of firms should be set».

[11] We use, interchangeably, refocusing, reverse diversification or downscoping.

The most ubiquitous diversification strategies observed in the real corporate world include: (i) related versus unrelated diversification (e.g., La Rocca et al. 2018; Markides and Williamson 1996, 1994; Chatterjee and Wernerfelt 1991; Palepu 1985; Bettis 1981; Rumelt 1974); (ii) domestic versus international diversification (e.g., Borda et al. 2017; Gaur and Kumar 2009; Freund et al. 2007; Thomas 2006; Lu and Beamish 2004; Capar and Kotabe 2003; Denis et al. 2002; Hitt et al. 1997; Riahi-Belkaoui 1996; Tallman and Li 1996; Kim et al. 1993); (iii) diversification versus refocusing (e.g., Ferris et al. 2002; Matsusaka and Nanda 2002; Markides 1995; Hoskisson and Hitt 1994); and (iv) organic versus external diversification (e.g., Custódio 2014; Leland 2007; Goudie and Meeks 1982; Amihud and Lev 1981; Mueller 1977).[12, 13]

4.2.2. Firm Diversification and Performance

4.2.2.1. Determinants of Diversification

What are the main determinants of firm diversification behavior? Prior research has identified market structure and firm conduct, as major determinants of firms' diversification behavior, and ultimately of their economic performance implications (e.g., Scherer and Ross 1990; Greening 1980; Porter 1980; Bain 1959).

In this perspective, the competitive positioning of a firm is contingent upon the structure of the industry it integrates and on its own conduct, both yielding a random level of performance. As argued by Schumpeter (1942), a firm's competitors strive to erode its competitive advantage, creating the incentive for the firm to adopt innovative strategic and operating behavior, 'the conduct', aiming at sustaining or enhancing its economic performance, and therefore softening the adverse 'creative destruction' effects of the «Schumpeterian world of innovation-based competition, price/performance rivalry, [and] increasing returns» (Teece et al. 1997, 509).

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[12] In a related diversification strategy, a firm expands its activity to closely related industries, e.g., that share technological or commercial similarities. When a firm expands by adding new products or services, technologically or commercially unrelated to its current portfolio of business activities, it is adopting an unrelated diversification strategy. Firm's activities may be spread out across international borders when adopting an international diversification strategy. Related and unrelated diversification strategies may be implemented through internal / organic growth within the organization, using internal resources to develop new business areas, or acquiring growth externally, for example, through merger and acquisitions.

[13] For a more in-depth analysis of this topic, please refer to, among others, Erdorf et al. (2013), Martin and Sayrak (2003), Datta et al. (1991), and references cited therein.

The performance outcome of a firm's conduct in creative destruction competition world, may either have a 'bright side' or a 'dark side'. The former, resulting in sustaining or enhancing its competitive positioning, and therefore economic performance. The latter, unable to sustain its competitiveness, will underperform in terms of shareholder value creation. Therefore, and under the assumption that economic performance and share price are strongly and positively correlated, a firm could become an attractive proposition for 'firm value arbitrageurs', present in the market for corporate control (e.g., Manne 1965).[14]

The degree of competition in an industry depends on its underlying structure, represented by what Porter (1989, 1979) specified as the 'competitive forces', the collective interaction of which determines the potential economic performance of the industry.[15] A firm's exposure to those forces, influences its conduct in response to the industry structure (e.g., Porter 1981; Berry 1974).[16]

A firm's conduct is simultaneously impacted by exogeneous factors, the industry structure, and endogenous factors, the base of available organizational resources and capabilities. In this framework, the firm's performance depends on specific characteristics, namely, scarcity and imperfect mobility, of its resources and distinctive capabilities (e.g., Teece 1984; Wernerfelt 1984; Penrose 1959). Firms use those capabilities, competencies and other assets to accommodate the dynamics of rapidly changing environments (Teece *at al.* 1997), and by developing innovative and difficult-to-replicate combinations of organizational, functional and technological skills as sources of competitive advantage.[17, 18]

Diversification is a commonly used strategy for firms redeploying their assets in place or their growth assets (assets that the firm is expected to invest in the future), to their best

[14] We are assuming the presence of semi-strong informationally efficient markets (Fama 1970).

[15] Threat of new entrants in the industry; Bargaining power of buyers; Bargaining power of suppliers; Threat of substitute products and services; and rivalry among market participants.

[16] Without loss of generality, henceforth, we will use 'market structure' and 'industry structure' interchangeably.

[17] According to Wang and Ahmed (2007), a firm's dynamic capabilities include factors such as adaptive capability, absorptive capability and innovative capability as well as firm-specific processes such as integration, reconfiguration, renewal, and recreation.

[18] Even though a firm does not possess a competitive advantage based on scarcity and imperfect mobility of its resources, it may still create value through 'sharing' resources and capabilities across different businesses. Sharing a common tangible or intangible resource, e.g., a single facility or brand, among several businesses, using a hierarchical governance, may confer economies of scope through the elimination of duplications and lowering marginal costs. For more details on dynamic capabilities, see also, Teece et al. (1997).

usages. This asset reallocation, however, is contingent, among other factors, on the assets' level of 'plasticity'.[19] Alchian and Woodward (1988, 69) «call resources or investment "plastic" to indicate that there is a wide range of discretionary, legitimate decisions within which the user may choose». Therefore, the higher the degree of asset plasticity or redeployability, the larger the opportunity set for reallocating those resources to other business opportunities with higher growth prospects and / or lower expected business risk (e.g., Kim and Kung 2017; Gertner et al. 1994).

4.2.2.2. Determinants of Economic Performance

Value creation is a widely accepted metric for a firm's economic performance, the main determinants of which are market structure characteristics, industry affiliation, and organizational factors (e.g., Otley 1999; Stimpert and Duhaime 1997; Hansen and Wernerfelt 1989; Schmalensee 1985; Scherer 1980; Bain 1956).

Under this framework, the operating cash flow streams and the cost of capital are the key drivers of value creation associated with diversification strategies (e.g., Grant 2016; Morin and Jarrell 2000).

4.2.2.3. Diversification and Performance

Although it is an extensively researched topic, the literature still does not provide unambiguous, convincing and widely accepted evidence about the nature, the signal and the magnitude of the relationship between diversification and performance (e.g., La Rocca et al. 2018; Singh et al. 2007; Villalonga 2004a, 2004b; Campa and Kedia 2002; Palich et al. 2000; Berger and Ofek 1995; Lang and Stulz 1994).[20]

A stream of the literature, popularized as the 'bright side' of diversification, argues that diversification is positively related to performance, therefore promoting diversification allocative efficiency (e.g., Almeida and Wolfenzon 2006; Khanna and Tice 2001; Sapienza 2001). This proposition is anchored in the following arguments: (i) a portfolio of business units, a conglomerate, that generates imperfectly correlated operating cash flows across its members, will exhibit a lower overall business risk, than a single firm operating a comparable set of productive activities, the so-called coinsurance effect (e.g., Jia et al. 2013; Maksimovic

[19] See also Gossy (2008), Alchian and Woodward (1987), Franke (1987), Scott (1987), and Marschak (1938).
[20] For further findings see Villalonga (2003) and Graham et al. (2002) and references therein.

and Phillips 2013; Tong 2012; Kim and McConnell 1977; Lewellen 1971); (ii) sharing resources and capabilities across business units, and benefiting from expanded business portfolio diversification gains, market power gains and bankruptcy risk reduction, may generate operating and financial synergies (e.g., Gatzer et al. 2014; Hann et al. 2013; Fang et al. 2007; Leland 2007; Gomes and Livdan 2004; Liebeskind 2000; Montgomery 1985; Teece 1980; Kim and McConnell 1977; Williamson 1975; Lewellen 1971); (iii) increased monitoring incentives, greater availability and better information quality associated to headquarters exercising control rights (Khanna and Tice 2001; Scharfstein and Stein 2000; Lamont 1997; Stein 1997; Berger and Ofek 1995; Gertner et al. 1994; Hart and Moore 1990; Williamson 1985; Alchian 1969); (iv) the managerial headquarters' active winner-picking behavior (Stein 1997; Gertner et al. 1994; Williamson 1975); (v) effectiveness and efficiency in reallocating capital (e.g., Cline et al. 2014; Maksimovic and Phillips 2002; Matsusaka and Nanda 2002; Khanna and Tice 2001); (vi) the positive value-enhancing role that internal funding plays in adverse states of external capital markets (Santioni et al. 2017; Stein 1997; Williamson 1975); and (vii) 'softeners' of the financial constraints inherent to external capital markets (Maksimovic and Phillips 2007; Graham et al. 2002; Lee and Lee 2002; Erickson and Whited 2000; Lewellen 1971).

Empirical findings of another stream of research are consistent with the argument that the value of diversified firms may be discounted by the market, in relation to their fair value as a portfolio of comparable specialized firms (e.g., Anjos 2010; Servaes 1996; Berger and Ofek 1995; Lang and Stulz 1994). Potential failures of ICMs' financing and investment policies are often interpreted as the source of a 'conglomerate discount'.[21]

This stream of research espouses the diversification inefficient viewpoint, popularized as the 'dark side' of diversification, (e.g., Ozbas and Scharfstein 2010; Scharfstein and Stein 2000; Rajan et al. 2000).[22] This branch of literature suggests: (i) conflicts of interest, informational and incentive problems in the subsidiary's and headquarters' managerial

[21] The literature documents a significant diversification discount of 10 percent in Japan, 15 percent in the UK, and no significant diversification discount in Germany. According to Lins and Servaes (1999), the diversification discount seems robust to different sampling periods and firms' geographical origin.

[22] For a more in-depth analysis of this topic, see, e.g., Maksimovic and Phillips (2013), Martin and Sayrak (2003), Stein (2003), and Gertner et al. (1994).

agency relationships, that may lead to allocative inefficiency, for example, cross-subsidizing unprofitable projects (Cline et al. 2014; Ozbas and Scharfstein 2010; Wulf 2009; Yan 2006; Scharfstein and Stein 2000; Rajan et al. 2000; Lins and Servaes 1999; Rajan and Zingales 1998; Shin and Stulz 1998; Bodnar et al. 1997; Lamont 1997; Berger and Ofek 1995; Meyer et al. 1992; Jensen 1986); (ii) suboptimal capital allocation of diversified versus comparable single-industry firms (e.g., Billett and Mauer 2003, 2000; Shin and Stulz 1998; Berger and Ofek 1995); (iii) corporate governance problems associated to centralized capital budgeting systems (e.g., Sautner and Villalonga 2010); and (iv) subsidiary managers may become involved in rent-seeking behavior, bargaining for larger suboptimal capital allocations for their units (Seru 2014; Glaser et al. 2013; Wulf 2009; Rajan et al. 2000; Scharfstein and Stein 2000; Meyer et al. 1992).

More recent research casts doubt on the diversification discount, based on evidence suggesting the presence of a 'diversification premium'. Furthermore, this stream of the literature suggests that previous findings may suffer from sample-selection bias (e.g., Hund et al. 2019; Villalonga 2004a, 2004b; Campa and Kedia 2002; and Graham et al. 2002), and measurement errors (e.g., Whited 2001). Moreover, as argued in Campa and Kedia (2002, 1731), the «documented discount on diversified firms is not per se evidence that diversification destroys value».[23]

Another line of research, documents that reverse diversification may be value-enhancing (e.g., Dittmar and Shivdasani 2003; Gertner et al. 2002; Berger and Ofek 1999; Markides 1995, 1992; and Hoskisson and Johnson 1992).

Firm diversification, and its implications in terms of value creation, may be 'reflected' in profitability (e.g., Palich et al. 2000; Rumelt 1974). Prior research documents that the levels of related and unrelated diversification are associated with different levels of firm profitability. According to, e.g., Wernerfelt and Montgomery (1988), Varadarajan and Ramanujam (1987), Palepu (1985), Rumelt (1974), related diversification should be more profitable than unrelated diversification. Bettis and Hall (1982) and Christensen and Montgomery (1981) argue that the differences in profitability between Rumelt's

[23] Çolak (2010, 423) finds «no evidence of 'diversification discount' or 'refocusing premium'».

diversification categories could be mainly attributed to industry effects. The geographical scope of diversification may also have an impact on the relationship between diversification and performance (e.g., Denis et al. 2002; Hitt et al. 1997; Tallman and Li 1996; Kim et al. 1993).

However, empirical findings on the relationship between the level of diversification and performance seems to be sensitive to choices concerning performance measures, sample choice, sampling period, variable specification, method of analysis, firms' characteristics, industry affiliation, and the effectiveness and efficiency of allocative features of, e.g., the financial and legal systems (e.g., Ahn 2011; Çolak 2010; Fauver et al. 2003).

Findings of non-U.S. firm samples, mostly Asian (e.g., Bae et al. 2011; Wade and Gravill 2003), and European (e.g., La Rocca et al. 2018; Luffman and Reed 1984), also suggest the presence of some kind of ambivalence.

4.2.2.4. Diversification and Performance Measures

In this study, we only focus on quantitative measures of diversification. The number of business activities in which a firm operates, is one of the most used quantitative diversification measures (e.g., Farjoun 1998; Montgomery 1982). However, due to the lack of information provided by this measure, other metrics are suggested in the literature, among them: (i) the product specialization ration (e.g., Rumelt 1974); (ii) the Herfindahl index (e.g., Hitt et al. 2006; Kor and Leblebici 2005; Denis et al. 2002; Lang and Stulz 1994; Grant et al. 1988; Utton 1977; Berry 1971); (iii) the concentric index (e.g., Wernerfelt and Montgomery 1988; Caves et al. 1980; Pomfret and Shapiro 1980); and (iv) the entropy index (e.g., La Rocca et al. 2018; Chakrabarti et al. 2007; Singh et al. 2007; Hitt et al. 1997; Markides 1995; Chatterjee and Wernerfelt 1991; Varadarajan and Ramanujam 1987; Palepu 1985; Jacquemin and Berry 1979).

Extant literature that focuses on an empirical examination of a firm's performance documents that the metrics of performance mostly used in prior research are, either market-based, or accounting-based. The former category encompasses the stock market reaction to the announcement of diversifying events; and the latter, includes profitability and associated risk measures, such as, the return on assets (ROA), the return on equity (ROE), and the return on sales (ROS).

4.2.3. Hypothesis Development

As argued by Williamson (1975), diversified firms may exhibit a better performance than undiversified firms, due to potential operating and financial synergies (e.g., Gatzer et al. 2014; Hann et al. 2013; Leland 2007; Gomes and Livdan 2004; Teece 1980; Kim and McConnell 1977; Lewellen 1971).

Findings using accounting-based performance measures, spanning a wide range of sampling periods, suggest the presence of a positive relationship between diversification and performance (e.g., George and Kabir 2012; Khanna and Rivkin 2001; Pandya and Rao 1998; Grant and Jammine 1988; Grant et al. 1988; Carter 1977). This pattern of findings seems more ubiquitous in tests of non-U.S. firm-level samples.

However, as argued in, e.g., Scharfstein and Stein (2000), Denis et al. (1997), and Jensen (1986), the presence of free cash-flow in diversified firms, may yield negative impacts on the level of their economic performance because of agency problems associated with managerial discretion. Empirical evidence, gathered through market-based performance metrics, spanning a wide range of sampling periods, documents a negative relationship between diversification levels and performance (e.g., Singh et al. 2007; Ferris et al. 2003; Lang and Stulz 1994; Montgomery and Wernerfelt 1988). This pattern of findings seems more ubiquitous in tests of U.S. firm-level samples.

Under the standard assumption that firms diversify with the aim of improving their overall economic performance (e.g., Giachetti 2012; Chatterjee and Wernerfelt 1991; Ramanujam and Varadarajan 1989; Teece 1984; Penrose 1959), and following the branch of literature that documents that the benefits of diversification outweigh the costs, (e.g., George and Kabir 2012; Khanna and Rivkin 2001; Grant et al. 1988), we hypothesize a positive relationship between diversification and performance levels − Hypothesis 1 (H1).

Conventional wisdom suggests that firms may undertake diversification strategies aiming at improving their performance in terms of value creation, by exercising diversification options, e.g., on assets-in-place or growth-opportunities. For example, by enlarging their boundaries into other related or unrelated products and/or markets, capturing operating and financial synergies, benefiting from market power, and / or reaping economies of scale (e.g., Hann et al. 2013; Devos et al. 2008; Leland 2007; Gomes and Livdan 2004;

Sapienza 2002; Liebeskind 2000; Kim and Singal 1993; Teece 1980; Kim and McConnell 1977; Williamson 1975; Lewellen 1971).

More recent research suggests that growth-opportunity diversification options may be helpful in explaining the diversification-performance relationship (e.g., de Andrés et al. 2017, 2016, 2014; Borghesi et al. 2007).

La Rocca et al. (2009), Menéndez-Alonso (2003), and Bergh (1997), among others, argue that the coinsurance effect is expected to be more intense in unrelated diversified firms (see also Chatterjee and Wernerfelt 1991).

Prior research, based on accounting-based performance measures, reports that related diversified firms exhibit higher levels of performance than unrelated diversified firms (e.g., Wade and Gravill 2003; Palich et al. 2000; Wernerfelt and Montgomery 1988; Varadarajan and Ramanujam 1987; Palepu 1985; Lecraw 1984; Bettis 1981). Another stream of this literature documents that unrelated diversified firms perform better compared to related diversified firms (e.g., La Rocca et al. 2018; Bae et al. 2011; Hoskisson 1987; Luffman and Reed 1984; Michel and Shaked 1984).

Since related diversification appears to be more associated with positive operating synergies, and unrelated diversification more associated with positive financial synergies, we hypothesize a positive relationship between diversification, both unrelated and related, and firm performance (e.g., Leland 2007; Gomes and Livdan 2004; Teece 1980; Lewellen 1971) − Hypothesis 2 (H2).

Diversification strategies may, arguably, improve the performance of portfolios of firm-specific organizational, functional, and technological resources and capabilities. Redeploying assets, though, may also be helpful in promoting their most efficient usage (e.g., Teece *at al.* 1997).

Asset redeployment, however, is contingent on assets degree of ‘plasticity’, that is, their capability to perform efficiently other productive tasks than the ones they were firstly assigned to (e.g., Kim and Kung 2017; Gertner et al. 1994; Alchian and Woodward 1988). We expect that, the higher the degree of asset plasticity, the larger the set of opportunities for reallocating those resources to other unrelated business opportunities with positive value creation prospects. Therefore, we hypothesize a positive relationship between the degree of asset plasticity and the performance level of unrelated diversified firms − Hypothesis 3 (H3).

4.3. Data Description and Empirical Specification

4.3.1. Sample Selection and Data Description

For this empirical investigation, we developed a sample of diversified firms from euro area countries drawn from Bureau van Dijk's Amadeus database, for the 2010-2017 sampling period.

In this essay, we espouse the concept of a business group, as an entity coordinating a set of diversified and legally independent firms with a network of business and financial relationships of varying degrees and kinds (e.g., Khanna and Rivkin 2001).[24]

Amadeus database contains financial data of European diversified firms and their European subsidiaries. It also includes ownership data on subsidiaries outside European countries, but not their financial statement data. Therefore, our sample consists of data of euro area diversified firms and their euro area subsidiaries only.

To be included in the sample, firms had to satisfy the following criteria: (i) to be a non-financial Global Ultimate Owner (GUO), and other diversified firms that although they were not a GUO, hold, directly and / or indirectly, a minimum 50.01 percent ownership in any subsidiary, and own two or more subsidiaries;[25] (ii) to be established in the euro area; (iii) to be active for the entire sampling period, with at least 6 to 8 years of data for all the variables, to ensure a balanced panel;[26] and (iv) to have annual sales revenue higher than 20 million Euros.[27] All financial service firms, education and regulated utilities were excluded from the sample.

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[24] Like other papers with a similar focus and that used the Amadeus database, subsidiaries' data do not include segment data reported on 'behalf' of the 'parent' firm. Most papers on diversified firms use firm segment data (U.S. conglomerate information) that may introduce measurement errors in variables. See, e.g., Whited (2001) for more details.

[25] This classification criterion is based on a strong concept of ownership, which enables us to observe situations in which the parent firm has enough authority to control the investment and financing choices of its subsidiaries.

[26] Similar studies included in their samples only firms that had data available for the whole period or for at least six consecutive years (e.g., Dewaelheyns and Van Hulle 2012; La Rocca et al. 2009).

[27] We exclude very small firms from our estimation sample, whose ownership and financial data may miss and may cause bias.

Using the abovementioned selection criteria, we build our sample of diversified firms including 2,396 parent firms with 19,168 firm-year observations. In our sample, the average number of subsidiaries per diversified firm is 5, and the max is 139.[28]

The specification of the firm-specific variables is presented in subsection 4.3.2. In order to mitigate the potential influence of extreme observations, data were censored according to the following criterion: whenever both market-to-book ratio and Tobin's *q* were greater than 15 the firm was dropped from the sample (e.g., George et al. 2011; Cleary 1999).

4.3.2. Implementation Design and Testing

This subsection describes the specification of the empirical model, the variables and the methodology applied in hypotheses testing.

To test the effect of the firm diversification level on firm performance (H1), we estimated the following regression model:

$$Performance_{it} = \beta_1 Performance_{it-1} + \beta_2 LD_{it} + \beta_3 Size_{it} + \beta_4 MtoB_{it} + \varepsilon_{it} \qquad (4.1)$$

where $Performance_{it}$ denotes firm performance; LD_{it}, firm diversification level; $Size_{it}$, firm size; $MtoB_{it}$, growth opportunities; subscripts refer to firm *i* at time *t*; and, ε_{it} is the error term with zero mean and constant variance (e.g., George and Kabir 2012; Khanna and Palepu 2000). See table 4.1 for expected and estimated variable coefficient signs.

[Insert Table 4.1 here]

We specified the performance variable, *Performance*, as the return on assets (*ROA*) ratio, earnings before interest, tax, depreciation, and amortization (EBITDA) to total net assets (e.g., La Rocca et al. 2018; George and Kabir 2012; Chakrabarti et al. 2007; Singh et al. 2007; Kim et al. 2004; Khanna and Palepu 2000).

We specified the total diversification level variable, *LD*, as the total entropy diversification index (as in Palepu 1985; Jacquemin and Berry 1979).

We also control for size, *Size*, estimated as the natural logarithm of total net assets.

[28] Compared with previous studies, our sample, in general, focuses on an increased number of business groups, and is also based on a longer period (e.g., La Rocca et al. 2018; George and Kabir 2012; Kim et al. 2004; Khanna and Palepu 2000; Chatterjee and Wernerfelt 1991; Grant et al. 1988; Varadarajan and Ramanujam 1987; Montgomery 1985; Palepu 1985; Lecraw 1984).

To control for growth opportunities, we used the market-to-book ratio, *MtoB* (e.g., George et al. 2011; Wei and Zhang 2008; Hoshi et al. 1991). We estimated the market-to-book ratio as the equity market value to its book value both in time *t* (e.g., Adam and Goyal 2008; Lev and Sougiannis 1999). For further details on the use of market-to-book as a proxy for growth opportunities, instead of Tobin's *q*, see subsection 3.3.2.

Despite the context and the methodological implementation, a firm performance variable proxied through an accounting-based measure should be anchored in a risk-return framework. Therefore, for this study we adopted adjusted asset betas, for a firm's specific financial leverage, as the accounting-based risk measure, scaling all regressed variables by this risk measure:[29] we estimated the systematic risk of a firm's assets, the asset beta (β_A), as a measure of the operating cash-flow relative volatility generated in a business activity and represented by the coefficient of variation of operating cash flow (e.g., Kale et al. 1991; Gabriel and Baker 1980; and Beaver and Manegold 1975).[30, 31, 32]

Underlying this procedure is the assumption that firms in the same industry tend to exhibit similar business risk levels (e.g., He and Kryzanowski 2007; Kaplan and Peterson 1998; Alexander et al. 1996). Accordingly, firms in our sample were grouped into industry categories according to their NACE code, and for each industry an asset beta was estimated as the weighted (by total net assets) average of the individual firm's business risk.

Asset betas were then adjusted for a firm's specific financial leverage, using Hamada's (1972) procedure:

$$\beta_E = \beta_A \left(1 + (1 - t)\left(\frac{D}{E}\right)\right) \tag{4.2}$$

where β_A denotes the asset beta, the β_E the equity beta, D the market value of debt, E the market value of equity and t the marginal corporate tax rate on the firm's income, specified as the income tax expenses divided by income before tax. Hamada's approach simply adjusts

[29] This transformation also allows the cross-section heterogeneity to be mitigated, like the transformation commonly applied in the literature of dividing all the measures included in a regression by the same firm measure, e.g., its total net assets.
[30] According to Kale et al. (1991, 1702) «business risk is represented by the coefficient of variation (CV), u / μ, where u is the standard deviation of the firm's cash flows [(and μ the average)]».
[31] For further details on empirical proxies for business risk see, e.g., Titman and Wessels (1988).
[32] Because of the 8-year data availability on Amadeus, statistics were estimated for that sampling period.

the asset beta (business risk) for the firm's after tax financial risk measured by its debt-equity ratio.

The explanatory variable total diversification level for firm *i*, *LD*, measures a firm's diversification levels using the 'entropy diversification index', firstly proposed by Jacquemin and Berry (1979), to analyze the relationship between corporate diversification and growth, (see also, e.g., Palepu 1985).[33]

The entropy index as a measure of a firm's diversification level, simultaneously considers the number of subsidiaries in which a diversified firm operates, the distribution of a firm's total sales across industry subsidiaries, and the identification of the degree of relatedness among the various subsidiaries. According to, e.g., La Rocca et al. (2018, 65), the entropy index allows «the objectivity of the product-count measures to be combined with the ability to apply the relatedness concept categorically, weighting the businesses by the relative size of their sales» (see also Palepu 1985). This measure provides three diversification indices for each firm: (i) the total diversification index; (ii) the related diversification index; and (iii) the unrelated diversification index.

Following Palepu (1985), we estimated the total entropy diversification index (*LD*), as:

$$LD = \sum_{i=1}^{N} P_i \times \ln\left(1/P_i \right) \tag{4.3}$$

where *P* refers to the share of the i^{th} subsidiary in the total sales of the diversified firm.[34]

As hypothesized, we expect a positive relationship between, both unrelated and related diversification levels, and firm performance (H2). To test this hypothesis, we estimated the following version of model 1:

$$Performance_{it} = \beta_1 Performance_{it-1} + \beta_2 RD_{it} + \beta_3 UD_{it} + \beta_4 Size_{it} + \beta_5 MtoB_{it} + \varepsilon_{it} \tag{4.4}$$

where RD_{it} denotes the related diversification index, estimated from subsidiaries in different 3- or 4-digit businesses within a 2-digit industry group; and UD_{it} the unrelated diversification index estimated from subsidiaries in different 2-digit industry groups (e.g., Palepu 1985; and Jacquemin and Berry 1979).

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[33] As argued by Pomfret and Shapiro (1980, 145), «[o]ther measures of diversification could be calculated, but the reward is small because the measures tend to be correlated».

[34] For more details on the entropy measure see Palepu (1985) and Jacquemin and Berry (1979).

To test the argument that a higher degree of asset plasticity may increase the set of opportunities for reallocating those resources to other business opportunities with positive value creation prospects, increasing the performance level of unrelated diversified firms (H3), we estimated the following regression model (e.g., Shyu and Chen 2009):

$$Performance\_UD_{it} = \beta_1 Performance\_UD_{it-1} + \beta_2 AssetPlasticity_{it} + \beta_3 Size_{it} + \varepsilon_{it} \quad (4.5)$$

where $Performance\_UD_{it}$ denotes unrelated diversified firms performance; and $AssetPlasticity_{it}$ denotes the firm's degree of asset plasticity, proxied by Tobin's *q* ratio (as specified in Lang and Stulz 1994; Wernerfelt and Montgomery 1988; Lindenberg and Ross 1981). A higher Tobin's *q* ratio implies that the market value of a firm's assets is higher than its replacement cost, i.e., the market perceives that a firm's assets are worth more than what it costs to replace them (Lindenberg and Ross 1981). Since an asset with a higher degree of plasticity may present a wide range of options in its reallocation to business opportunities with higher growth prospects, the market may value a 'plastic' asset more when compared to the cost of its replacement. Thus, a firm with higher asset plasticity may also have a higher Tobin's *q* ratio. This reallocation of more 'plastic' assets may potentially help to increase sales in the subsidiaries to which they are relocated or 'shared', which also may increase the performance level of a conglomerate.

4.3.2.1. Endogeneity Problems

Since diversification has an impact on performance, but performance also influences diversification decisions, as examined in several prior studies (e.g., Graham et al. 2002; Hyland and Diltz 2002; and Lang and Stulz 1994), we expect an endogenous relationship between the level of diversification and firm performance. Thus, an estimation method has to be selected in order to mitigate endogeneity (e.g., Kahn and Whited 2018).

Panel data estimation using the Generalized Method of Moments (GMM) procedure, allows the dynamic nature of performance at firm level to be analyzed and controlled for endogeneity problems.

According to a non-negligible stream of the empirical literature, instrumental variables (IV) applied in GMM estimators may help to lessen endogeneity problems (e.g., Roberts and Whited 2013).

4.4. Empirical Results

4.4.1. Univariate Statistics Analysis

Table 4.2 presents sample characteristics in terms of data distribution by industry and country.

[Insert Table 4.2 here]

Panel A of table 4.2 shows that all major non-financial industries are represented in the sample, with an emphasis on manufacturing and trade.

Panel B presents the details of the distribution of the 2,396 diversified firms by country, for the sampling period. The distribution, by country, documented Italy, Spain and France as having the highest representations (73.87 percent of all the diversified firms in the sample), while Finland, Austria and Portugal exhibit the lowest representations (accounting for 8.51 percent of the total of sampled firms).

Table 4.3 reports the summary statistics for the variables used to test our hypotheses for the 2010-2017 sampling period.

[Insert Table 4.3 here]

To test for differences in means and medians of the variables included in the empirical model, we conducted parametric tests for the equality of means, and Wilcoxon-Mann-Whitney tests for the equality of medians. Table 4.4 reports the means (on the left side) and medians (on the right side) of those variables, and statistics for equality tests across the sample. Section 1 and 2 compare the descriptive statistics, sorting the sample by unrelated diversified *vs* related diversified firms and unlisted *vs* listed diversified firms, respectively.

[Insert Table 4.4 here]

Testing for differences between the variables used to test our hypotheses in the unrelated diversified and related diversified firm subsamples for the 2010-2017 sampling period (section 1 of table 4.4), our results document that: (i) The means and medians of return on assets ($Performance$), and return on equity (ROE), are not statistically different; (ii) Unrelated diversified firms exhibit statistically significant, at the 1 and 10 percent levels, higher market-to-book (*MtoB*), plasticity of assets (*AssetPlasticity*) than related diversified firms; (iii) Related diversified firms exhibit larger level of diversification (LD) and size (*Size*) than unrelated diversified firms, with differences statistically significant at the 1 and 10 percent levels.

Listed diversified firms exhibit a higher, and statistically significant at the 1 percent level, return on assets ($Performance$), level of diversification (LD), level of unrelated diversification (UD), level of related diversification (RD), size ($Size$), market-to-book (*MtoB*) and plasticity of assets ($AssetPlasticity$) than unlisted diversified firms (refer to section 2 table 4.4). Unlisted diversified firms exhibit statistically significant, at the 1 percent level, *EquityBeta* than listed firms. Overall, all these findings are consistent with extant empirical literature (e.g. La Rocca et al. 2018; Wade and Gravill 2003; Chatterjee and Wernerfelt 1991; Bettis 1981).

Table 4.5 reports the Pearson correlation coefficients between the variables (scaled by the adjusted asset betas, for firms' specific financial leverage, as the accounting-based risk measure) used to estimate our hypotheses, showing that the correlation coefficients range from 0.1175 to 0.8263, at the 1 percent level of statistical significance.

Scaling all the regressed variables by a risk index and using several explanatory variables simultaneously may raise multicollinearity problems among them, potentially yielding, e.g., less accurate estimators. To test for the existence of multicollinearity, we performed the variance inflation factor (VIF) test. The larger individual VIF is 5.79, and the mean VIF for our empirical models - Eq(4.1), Eq(4.4), Eq(4.6.1) and Eq(4.6.2) – are respectively, 4.10, 3.30, 3.47 and 2.62, which are below the critical value of 10, potentially revealing the non-existence of collinearity (Table 4.5).

[Insert Table 4.5 here]

4.4.2. Regression Results

Equation (4.1) tests the effect of the firm's overall diversification level on the firm's performance (H1). Equation (4.4) tests whether diversified firms exhibit a positive relationship between, both unrelated and related diversification levels, and their performance (H2).

Table 4.6 reports the regression results on equation (4.1) and equation (4.4), for a sample of diversified firms, estimated using OLS and GMM estimators (Blundell and Bond

1998). We used the lag of all the right-hand-side variables and their first differences as instruments in our SYS-GMM estimations.

[Insert Table 4.6 here]

The assumption of no serial correlation in the error terms was verified testing for the absence of a second-order serial correlation in residuals. In our models, this hypothesis of second-order serial correlation was always rejected.

Regression results document a statistically significant, at the 1 percent level, positive relationship between the firm's overall diversification level and the firm's performance. The SYS-GMM estimate is 0.34 percent, consistent with previous evidence in the literature (e.g., Giachetti 2012; Wan and Hoskisson 2003; Palich et al. 2000; Palepu 1985; Bettis 1981).

Findings from our regression analysis also show a dynamic pattern of performance, which is expressed through the positive coefficient of the lagged dependent variable, at the 1 percent level of statistical significance. Additionally, the positive and statistically significant, at the 1 percent level, coefficient of growth opportunities is consistent with the findings of prior empirical research, e.g., La Rocca et al. (2018), Giachetti (2012), Chakrabarti et al. (2007), Wan and Hoskisson (2003).

As expected, we found a significant inverse relationship between size and performance, of -0.14 percent (see section 3 of table 4.4).

Results also indicate a 0.94 percent significant relationship between performance and the growth opportunities proxied by the market to book ratio.

In summary, these empirical results, document that diversified firms, arguably due to, among other factors, the potential operating and financial synergies, exhibit a positive relationship between overall diversification and their performance levels ($ß_2$), which is consistent with H1.

Since related diversification appears to be more related to positive operating synergies, and unrelated diversification more associated with positive financial synergies, the effect of both related and unrelated diversification levels should exhibit a positive sign (β_2 and β_3) – H2. Equation (4.4) tests the effect of both unrelated and related diversification levels on diversified firms' levels of performance.

Column (3 and 4) of table 4.6 reports the estimated coefficients (β_2 and β_3) of the effects of unrelated and related diversification on diversified firms' performance (UD_{it} and RD_{it}). Regression results document positive relationships between unrelated (0.32 percent) and related (0.41 percent) diversification levels and diversified firms' performance, as they are both statistically significant at the 1 percent level. Our results are consistent with H2 and with prior research, e.g., La Rocca et al. (2018), Bettis (1981).

Overall, these findings suggest that both operating and financial synergies, associated with related and unrelated diversification, respectively, may have an important and positive effect on a firm's performance level.

To test the hypothesis that a higher degree of asset plasticity may increase the performance level of unrelated diversified firms, we estimated equation (4.5). To be consistent with H3, the estimated coefficient of the firms' levels of their asset plasticity, β_3, should exhibit a positive sign for our sample of diversified firms.

Findings from our regression analysis show a positive and statistically significant coefficient (2.37 percent), at the 1 percent level, for the effect of degrees of asset plasticity on the performance level of unrelated diversified firms. Table 4.7 reports the regression results on equation (4.5).

[Insert Table 4.7 here]

Our results indicate that asset plasticity level exhibits a positive effect on the performance level of unrelated diversified firms ($ß_3$), which is consistent with H3. These findings suggest that the higher the degree of asset 'plasticity', the larger the opportunity set for reallocating those assets to unrelated business opportunities with positive value creation prospects and the greater the potential for increasing firm performance.

4.5. Robustness Checks

To test for robustness, we firstly adjusted asset betas for firms' financial leverage, using the book value of equity in Hamada's (1972) procedure. Secondly, we scaled all the variables by a 'risk index' adapted from Hannan and Hanweck (1988): $\left[ROA + \left(E/A\right)\right] / \sigma ROA$, where *ROA* denotes the return on assets, *E/A* the equity-total net assets ratio, and σ_{ROA} the standard deviation of *ROA*.[35] Thirdly, we scaled all the variables by the coefficient of variation of the return on assets. Fourthly, we used the return on equity (*ROE*), specified as the ratio of earnings before interest, tax, depreciation, and amortization (EBITDA) to equity, as a proxy for firm performance, following, e.g., Singh et al. (2007), Grant et al. (1988), Christensen and Montgomery (1981). Fifthly, we used the Tobin's *q* ratio as a surrogate for growth opportunities, according to, e.g., Freund et al. (2007). Sixthly, to mitigate potential errors in our regression results, we included a variable to control for the non-included data concerning both foreign subsidiaries and subsidiaries without reported data on the database, such as, the number of foreign subsidiaries and subsidiaries without reported data per each diversified firm in our sample. Lastly, we used the number of subsidiaries per each diversified firm as a proxy for a firm total diversification level, following, e.g., George and Kabir (2012), Giachetti (2012), Wade and Gravill (2003), Denis et al. (2002).

As an additional check of robustness for H1 and H2, we tested the relationship between total, unrelated and related diversification levels and performance using a market-based performance measure, estimating the following regression models:

$$MtoB_{it} = \beta_1 LD_{it} + \beta_2 Size_{it} + \varepsilon_{it} \qquad (4.6.1)$$

and

$$MtoB_{it} = \beta_1 UD_{it} + \beta_2 RD_{it} + \beta_3 Size_{it} + \varepsilon_{it} \qquad (4.6.2)$$

The regression results for the performed robustness checks, are reported in tables 4.8, 4.9, 4.10, 4.11 and 4.12. Column (1) of tables 4.8, 4.9, 4.10 and 4.12, and also column (3) of table 4.12, report, for the purpose of comparison, the estimated coefficients of the baseline models used to test our hypotheses H1, H2 and H3. Column (2) of tables 4.8 and 4.9 reports the estimated coefficients of testing our hypotheses H1 and H2, respectively, adjusting the risk index, asset betas, for firms' specific financial leverage, using E as the book value of equity in Hamada's (1972) procedure. Column (3) of tables 4.8 and 4.9, and Column (2) of table 4.10 reports the estimated coefficients of testing our hypotheses H1, H2 and H3, respectively, scaling all the variables by a RI adapted from Hannan and Hanweck (1988).

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[35] The risk index expresses, in units of the ROA standard deviation, how much the accounting earnings can fall before becoming negative, i.e., before a situation of accounting insolvency.

Additionally, column (4) of tables 4.8 and 4.9, and columns (2 and 4) of table 4.12, report the estimated coefficients of testing our hypotheses H1 and H2, respectively, scaling all variables by the coefficient of variation of the return on assets. The regression results on H1 and H2 hypotheses testing using the *ROE* ratio as a proxy for firm performance are reported in column (5) of tables 4.8 and 4.9, respectively. The regression results on H1 and H2 hypotheses testing using a variable to control for the non-included data on both foreign subsidiaries and subsidiaries without reported data on the database are reported in column (6) of tables 4.8 and 4.9, respectively. Column (7) of table 4.8 reports the estimated coefficients of testing our hypotheses H1 using the number of subsidiaries per each diversified firm as a proxy for a firm total diversification level. These findings provide support for earlier results in terms of coefficient signs, magnitude, and statistical significance.

[Insert Tables 4.8 to 4.12 here]

The finding of a positive relationship between a firm's total diversification level and a firm's performance ($ß_2$), holds for almost all the robustness checks performed and the estimation methods and empirical specifications used, reinforcing the baseline model results obtained for H1. When using the number of subsidiaries per each diversified firm as a proxy for a firm's total diversification level, our results also report a positive and statistically significant coefficient of the relationship between diversification level and performance.

The robustness check results document, considering all the alternative specifications of variables and estimation methods we used, a positive relationship between both unrelated and related diversification levels and diversified firms' performance, which are consistent with the results from H2 testing. However, it should be noted that in a few specifications, results were not statistically significant.

The results, on the robustness checks for H3**,** show a positive effect of the firms' asset plasticity level on the performance level of unrelated diversified firms, which are consistent with the baseline model results obtained for H3.

Regression results on equations 4.6.1 and 4.6.2, to check the robustness of results for H1 and H2 using a market-based performance measure, are reported in tables 4.11 and 4.12. The reported empirical findings suggest that firms' total diversification level exhibit a positive effect (0.3056 percent) on the market-based performance, statistically significate at the 5 percent level. Additionally, regression results also indicate that the unrelated and related diversification levels exhibit a positive effect on market-based performance, 0.4810 and 0.1788 percent. These results strengthen the results obtained in the empirical testing of H1 and H2.

4.6. Conclusions

This essay carries out an empirical examination of the relationship between firms' total diversification levels, and also of both unrelated and related diversification levels, and the performance levels of diversified firms, using both accounting- and market-based performance measures. Additionally, we also test the argument that reallocating 'plastic' assets across different business units increases the performance level of unrelated diversified firms.

Regression results document that euro area diversified firms exhibit a positive and statistically significant relationship between their diversification level and performance, providing support to hypothesis 1. Under the standard assumption that firms diversify with the aim of improving their overall economic performance and that the benefits of diversification outweigh the costs, our findings are consistent with that of a positive relationship between diversification and performance levels.

Regression results also show that sampled euro area diversified firms exhibit positive and statistically significant relationships, between unrelated and related diversification levels and diversified firms' performance. This evidence is consistent with the argument that horizontally diversified firms may have a positive relationship between financial synergies and performance, and vertically integrated diversified firms may exhibit a positive relationship between operating synergies and performance, both providing support for hypothesis 2.

Empirical testing also provides evidence supporting the hypothesis that firms' overall, unrelated and related diversification levels exhibit a positive and statistically significant effect on the market-based performance. These empirical results are consistent with the prediction that the market-based performance measure (as well as the accounting-based performance measure) may be determined by firms' diversification behavior.

Empirical findings also support the argument that a higher degree of asset plasticity may increase the performance level of unrelated diversified firms, to potentially take advantage of an increase in the set of opportunities for reallocating those resources to other business opportunities with positive value creation prospects, consistent with hypothesis 3.

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Tables

Table 4.1. Expected and estimated variable coefficient signs

Variables	Expected Sign	Estimated Sign
Firm diversification level (LD)	+	+
Related diversification level (RD)	+	+
Unrelated diversification level (UD)	+	+
Size (Size)	-	-
Growth opportunities (MtoB)	+	+
Asset Plasticity (AssetPlasticity)	+	+

Table 4.2. Characteristics of the sample

The industry classification was based on the NACE Rev. 2's main section and is according to the aggregation of Fama and French's (1997) industry classification presented by Dewaelheyns and Van Hulle (2012).

Panel A: Industry composition

Industry	Number of firms in sample	%
Agriculture, forestry and fishing; Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities (Industry 1)	111	4.63%
Manufacturing (Industry 2)	953	39.77%
Construction (Industry 3)	126	5.26%
Trade (Wholesale and Retail) (Industry 4)	518	21.62%
Transport and Communications (Industry 5)	200	8.35%
Other (Accommodation and food service activities; Professional, scientific and technical activities; Administrative and support service activities; Human health and social work activities; Arts, entertainment and recreation; Other service activities) (Industry 6)	488	20.37%
	2396	

Panel B: Country composition

Country	Number of firms in sample	%
Austria	39	1.63%
Belgium	176	7.35%
Finland	130	5.43%
France	432	18.03%
Germany	246	10.27%
Italy	836	34.89%
Portugal	35	1.45%
Spain	502	20.95%
	2396	

Table 4.3. Summary statistics of the variables used to test our hypotheses

The diversified firms' sample consists of 19,168 firm-year observations from the 2010 to 2017 Amadeus files. This table reports the number of observations (N), mean, median, standard deviation (Std. Dev.), coefficient of variation (cv), minimum (Min), maximum (Max) of the variables considered in the empirical applications to test hypotheses. The variables used to test hypotheses were described in detail in section 4.3.2.

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max
$Performance_{it}$	18769	0.10505	0.09466	0.06458	0.61479	-0.18144	0.77319
LD_{it}	19164	0.80529	0.69100	0.57028	0.70817	0.00000	3.68681
UD_{it}	19164	0.42782	0.37786	0.39290	0.91838	0.00000	2.17244
RD_{it}	19164	0.37747	0.22826	0.44785	1.18645	0.00000	2.99603
$Size_{it}$	18878	11.71462	11.47015	1.60741	0.13721	2.70805	19.86097
$MtoB_{it}$	15541	5.39179	4.43398	3.80308	0.70535	0.00251	15.00000
$AssetPlasticity_{it}$	15825	2.23398	1.90082	1.54909	0.69342	0.00131	15.00000
$EquityBeta_{it}$	15768	0.48650	0.46594	0.69429	1.42711	0.22158	67.07367
ROE_{it}	18663	0.33265	0.25795	0.87870	2.64155	0.00008	106.9022
$N\_euro\_area\_subsidiaries_{i}$	19168	5.24708	3.00000	7.27691	1.38685	2	139
$N\_foreign\_subsidiaries_{i}$	19168	8.94616	3.00000	26.94797	3.01224	0	383

Table 4.4. Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test our hypotheses

The variables used to test our hypotheses were described in detail in section 4.3.2. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. A statistically significant difference, upward or downward, can be proved through the one-sided t-test for mean comparison of two independent subsamples, and assuming unequal variances: diff > 0*** representing a difference between the mean of the two groups that is statistically significantly greater than zero; diff < 0*** representing a difference between the mean of the two groups that is statistically significantly less than zero.

Section 1: Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test our hypotheses – 10,915 unrelated diversified firm-year observations *vs* 8,253 related diversified firm-year observations

	Mean				Median			
	Unrelated diversified	Related diversified	Two-sided t-test	One-sided t-test	Unrelated diversified	Related diversified	Wilcoxon-Mann-Whitney test	Nonparametric equality-of-medians test
$Performance_{it}$	0.1048	0.1054	-0.6967		0.0951	0.0940	-0.375	0.99
LD_{it}	0.7649	0.8587	-11.0103***	diff < 0***	0.6793	0.7436	8.315***	96.69***
$Size_{it}$	11.6980	11.7366	-1.6252	diff < 0*	11.4728	11.4651	0.985	0.06
$MtoB_{it}$	5.5731	5.3138	4.0894***	diff > 0***	4.5608	4.3556	-2.452**	6.63***
$AssetPlasticity_{it}$	2.3180	2.2778	1.2655	diff > 0*	1.9365	1.9120	-1.600*	1.90
ROE_{it}	0.3390	0.3242	1.2659		0.2605	0.2546	-1.290	2.03

Section 2: Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test our hypotheses – 2,160 unlisted *vs* 236 listed firms

	Mean				Median			
	Unlisted	Listed	Two-sided t-test	One-sided t-test	Unlisted	Listed	Wilcoxon-Mann-Whitney test	Nonparametric equality-of-medians test
$Performance_{it}$	0.1033	0.1208	-11.1335***	diff < 0***	0.0925	0.1128	-13.76***	168.95***
LD_{it}	0.7606	1.2144	-27.5283***	diff < 0***	0.6806	1.1545	-28.19***	509.26***
UD_{it}	0.4046	0.6405	-22.2318***	diff < 0***	0.3455	0.6465	-22.93***	298.69***
RD_{it}	0.3560	0.5738	-17.6230***	diff < 0***	0.1860	0.5254	-19.93***	222.22***
$Size_{it}$	11.4822	13.8171	-50.3929***	diff < 0***	11.3369	13.6062	-47.91***	1200.00***
$MtoB_{it}$	5.4450	5.7362	-3.0097***	diff < 0***	4.4337	4.8833	-5.603***	26.55***
$AssetPlasticity_{it}$	2.2671	2.5969	-7.1989***	diff < 0***	1.6852	2.1974	-9.857***	74.52***
ROE_{it}	0.3339	0.3212	1.4352	diff > 0*	0.2532	0.2839	-7.148***	75.44***
$EquityBeta_{it}$	0.5133	0.4558	2.1678**	diff > 0**	0.4658	0.4640	6.619***	

Section 3: Parametric tests for equality of means and nonparametric tests for equality of medians between the variables used to test our hypotheses – size first quantile *vs* size fourth quantile

	Mean				Median		
	Size first quantile	Size fourth quantile	Two-sided t-test	One-sided t-test	Size first quantile	Size fourth quantile	Wilcoxon-Mann-Whitney test
$EquityBeta_{it}$	0.8301	0.9080	-1.026		0.5809	0.5788	-3.741***
$Performance_{it}$	0.2616	0.2489	2.902***	diff > 0***	0.2099	0.2176	-0.101

Table 4.5. Pearson correlation coefficients between variables used to test our hypotheses and variance inflation factor (VIF)

This table reports the Pearson correlation coefficients between the variables (scaled by the systematic risk of a firm's assets as the risk measure) used to test our hypotheses, and the variance inflation factor (VIF) to test for possible multicollinearity problems. Definitions of the variables are listed in subsection 4.3.2. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively.

	1		2	3	4		5	6	7
	$Performance_{it}$		LD_{it}	UD_{it}	RD_{it}		$Size_{it}$	$MtoB_{it}$	$AssetPlasticity_{it}$
1	1.0000								
2	0.2091***		1.0000						
3	0.1709***		0.6555***	1.0000					
4	0.1281***		0.7537***	-0.0023	1.0000				
5	0.4625***		0.5159***	0.3800***	0.3524***		1.0000		
6	0.6603***		0.2143***	0.1904***	0.1175***		0.5066***	1.0000	
7	0.8263***		0.2291***	0.1950***	0.1336***		0.5280***	0.7937***	1.0000
Equation 4.1									
VIF	-	3.47			5.72	3.11			
1/VIF	-	0.2878			0.1747	0.3219			
Mean VIF	4.10								
Equation 4.4									
VIF	-		2.43	1.87	5.79	3.11			
1/VIF	-		0.4110	0.5354	0.1727	0.3214			
Mean VIF	3.30								
Equation 4.6.1									
VIF		3.47			3.47	-			
1/VIF		0.2881			0.2881	-			
Mean VIF						3.47			
Equation 4.6.2									
VIF			2.43	1.86	3.57	-			
1/VIF			0.4110	0.5367	0.2800	-			
Mean VIF						2.62			

Table 4.6. Parameter estimates from panel regressions on the effect of the firm's overall, unrelated and related diversification levels and performance – Eq. (4.1) and Eq. (4.4) – H1 and H2

This table summarizes the estimations on the effect of the firm's overall diversification level on the firm's performance (H1) – column (1 and 2) – and the effect of both unrelated and related diversification levels on diversified firms' performance (H2) – columns (3 and 4) – generated by: (1) OLS; (2) Blundell and Bond (1998) system GMM. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the *t* or *z* statistics for coefficients, and values in square brackets are the *p*-values for test statistics.

Independent Variables	Pooled OLS (1) $Performance_{it}$ **H1**	Blundell & Bond (2) $Performance_{it}$ **H1**	Pooled OLS (1) $Performance_{it}$ **H2**	Blundell & Bond (2) $Performance_{it}$ **H2**
$Performance_{it-1}$		0.3364*** (9.29)		0.3248*** (9.28)
LD_{it}	0.0074*** (10.63)	0.0034*** (3.16)		
UD_{it}			0.0071*** (6.74)	0.0032** (2.45)
RD_{it}			0.0077*** (8.44)	0.0041*** (2.93)
$Size_{it}$	-0.0024*** (-26.39)	-0.0014*** (-7.77)	-0.0024*** (-26.39)	-0.0015*** (-7.01)
$MtoB_{it}$	0.0100*** (104.37)	0.0094*** (23.17)	0.0101*** (104.15)	0.0094*** (23.49)
Constant	0.1552*** (49.03)		0.1553*** (48.95)	
Observations	15482	10795	15.482	10795
F-Statistic	1560.78 [0.000]	3882.06 [0.000]	1404.64 [0.000]	3253.16 [0.000]
AR(2) test		0.92 [0.360]		0.88 [0.377]
Hansen test		61.41 [0.000]		59.20 [0.000]
Year dummies	Yes	Yes	Yes	Yes

Table 4.7. Parameter estimates from panel regressions on the relationship between the degree of asset plasticity and the performance level of unrelated diversified firms – Eq. (4.5) – H3

This table summarizes the estimations on the effect of the levels of asset plasticity on the performance level of unrelated diversified firms (H3), generated by Blundell and Bond's (1998) system. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	Pooled OLS	Blundell & Bond
	$Performance_{it}$ **H3**	$Performance_{it}$ **H3**
$Performance_{it-1}$		0.3691*** (6.73)
$AssetPlasticity_{it}$	0.0362*** (133.93)	0.0237*** (11.69)
$Size_{it}$	-0.0002*** (-3.76)	-0.0006*** (-3.12)
Constant	0.1084*** (26.22)	
Observations	5391	4239
F-Statistic	2314.87 [0.000]	3044.58 [0.000]
AR(2) test		1.40 [0.161]
Hansen test		6.76 [0.239]
Year dummies	Yes	Yes

Table 4.8. Parameter estimates from panel regressions on the effect of the firm's diversification level on firm's performance – Robustness H1

This table summarizes the estimations on the effect of the firm diversification level on firm performance (H1), generated by Blundell and Bond's (1998) system, the GMM estimation method, conducting the following robustness checks: (1) adjusting asset betas for firms' specific financial leverage, using *E* as the book value of equity in Hamada's (1972) procedure – column (2); (2) scaling all the variables by a risk index adapted from Hannan and Hanweck's (1988) – column (3); (3) scaling all the variables by the coefficient of variation of the return on assets – column (4); (4) using the return on equity (*ROE*) ratio as a proxy for firm performance – column (5); (5) using a variable to control for the non-included information on both foreign subsidiaries and subsidiaries without reported information on the database – column (6); (6) using the number of subsidiaries per each diversified firm as a proxy for a firm's total diversification level – column (7). Column (1) is reported for the purpose of comparison with the estimated coefficients on the baseline model. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	(Baseline Model) $Performance_{it}$ **H1**	(1) $Performance_{it}$ **[EMarket→EBook]**	(2) $Performance_{it}$ **[$\beta_A \rightarrow RI$]**	(3) $Performance_{it}$ **[$\beta_A \rightarrow CV$]**	(4) $Performance_{it}$ **[$ROA \rightarrow ROE$]**	(5) *Control Variable* **[*N_foreign_subsidiaries*]**	(6) LD_{it} **[*N_euro_area_subsidiaries*]**
$Performance_{it-1}$	0.3364***	0.5119***	0.4174***	0.3983**	0.6804***	1.1294***	0.9555***
	(9.29)	(8.69)	(5.22)	(2.45)	(3.74)	(16.81)	(13.44)
LD_{it}	0.0034***	0.0039***	0.0090***	0.0037*	0.0192**	0.0007	
	(3.16)	(3.11)	(2.58)	(1.92)	(2.53)	(0.89)	
$N\_euro\_area\_subsidia$							0.0009***
							(6.66)
$Size_{it}$	-0.0014***	-0.0007	0.0024***	0.0032***	-0.0042*	-0.0034***	-0.0052***
	(-7.77)	(-1.16)	(4.28)	(2.67)	(-1.89)	(-7.98)	(-8.08)
$MtoB_{it}$	0.0094***	0.0075***	0.0030***	0.0051***	0.0222***	0.0035***	0.0052***
	(23.17)	(23.72)	(4.77)	(5.58)	(22.16)	(9.31)	(14.94)
$N\_foreign\_subsidiari$						0.0003***	
						(6.89)	
Observations	10795	12507	13068	13102	10821	10823	10823
AR(2) test	0.92	0.36	1.58	-0.19	0.65	0.95	1.00
	[0.360]	[0.722]	[0.114]	[0.848]	[0.513]	[0.341]	[0.316]
Hansen test	61.41	18.60	34.33	18.54	23.53	77.87	86.12
	[0.000]	[0.181]	[0.127]	[0.018]	[0.133]	[0.000]	[0.000]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.9. Parameter estimates from panel regressions on the effect of both unrelated and related diversification levels on firm's performance – Robustness H2

This table summarizes the estimations on the effect of both unrelated and related diversification levels on diversified firms performance (H2), generated by Blundell and Bond's (1998) system, the GMM estimation method, conducting the following robustness checks: (1) adjusting asset betas for firms' specific financial leverage, using *E* as the book value of equity in Hamada's (1972) procedure – column (2); (2) scaling all the variables by a risk index adapted from Hannan and Hanweck's (1988) – column (3); (3) scaling all the variables by the coefficient of variation of the return on assets – column (4); (4) using the return on equity (*ROE*) ratio as a proxy for a firm's performance – column (5); (5) using a variable to control for the non-included information on both foreign subsidiaries and subsidiaries without reported information on the database – column (6). Column (1) is reported for the purpose of comparison with the estimated coefficients on the baseline model. The data were drawn from the 2010 to 2017 Amadeus files. Variable's definitions are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	(Baseline Model) $Performance_{it}$ **H2**	(1) $Performance_{it}$ **[*E*Market→*E*Book]**	(2) $Performance_{it}$ **[β_A → *RI*]**	(3) $Performance_{it}$ **[β_A → CV]**	(4) $Performance_{it}$ **[*ROA* → *ROE*]**	(5) *Control Variable* **[*N_foreign_subsidiaries*]**
$Performance_{it-1}$	0.3248***	0.5136***	0.4184***	0.2562***	0.8368***	1.105***
	(9.28)	(8.57)	(5.16)	(6.11)	(16.03)	(14.91)
UD_{it}	0.0032**	0.0080***	0.0122***	-0.0054	0.0290***	0.0096***
	(2.45)	(4.09)	(2.66)	(-1.33)	(6.30)	(5.53)
RD_{it}	0.0041***	0.0098***	0.0066	0.0091**	0.0320***	0.0096***
	(2.93)	(5.90)	(1.58)	(2.53)	(7.97)	(6.16)
$Size_{it}$	-0.0015***	-0.0012*	0.0024***	0.0040***	-0.0160***	-0.0071***
	(-7.01)	(-1.67)	(4.22)	(10.47)	(-11.90)	(-9.27)
$MtoB_{it}$	0.0094***	0.0075***	0.0030***	0.0062***	0.0143***	0.0044***
	(23.49)	(23.75)	(4.75)	(10.63)	(12.65)	(12.42)
$N\_foreign\_subsidiaries_i$						0.0004***
						(5.78)
Observations	10795	12509	13034	13104	10823	10823
AR(2) test	0.88	0.37	1.61	0.58	1.25	0.97
	[0.377]	[0.709]	[0.108]	[0.564]	[0.210]	[0.330]
Hansen test	59.20	18.67	33.96	29.79	11.39	65.11
	[0.000]	[0.178]	[0.136]	[0.073]	[0.328]	[0.000]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.10. Parameter estimates from panel regressions on the relationship between the degree of asset plasticity and the performance level of unrelated diversified firms – Robustness H3

This table summarizes the estimations on the effect of the levels of asset plasticity on the performance level of unrelated diversified firms (H3) generated by Blundell and Bond's (1998) system, conducting the following robustness check: (1) scaling all the variables by a risk index adapted from Hannan and Hanweck's (1988) – column (2). Column (1) is reported for the purpose of comparison with the estimated coefficients on the baseline model. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	(Baseline Model) $Performance_{it}$ **H3**	(1) $Performance_{it}$ **[$\beta_A \rightarrow RI$]**
$Performance_{it-1}$	0.3691***	0.5836***
	(6.73)	(8.14)
$AssetPlasticity_{it}$	0.0237***	0.0138***
	(11.69)	(7.76)
$Size_{it}$	-0.0006***	0.0007**
	(-3.12)	(-2.46)
Observations	5391	5074
AR(2) test	1.40	0.60
	[0.161]	[0.548]
Hansen test	6.76	36.49
	[0.239]	[0.083]
Year dummies	Yes	Yes

Table 4.11. Parameter estimates from panel regressions on the relationship between firms' total, unrelated and related diversification levels and a market-based performance measure – Eq. (4.6.1) and Eq. (4.6.2) – Robustness H1 and H2

This table summarizes the estimations on the relationship between: (1) firms' total diversification level and market-based performance – column (1); (2) unrelated and related diversification levels and market-based performance measure – column (2); generated by Blundell and Bond's (1998) system, the GMM estimation method. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	(1) $MtoB_{it}$ **H1**	(2) $MtoB_{it}$ **H2**
$MtoB_{it-1}$	0.6095*** (5.41)	0.6053*** (5.39)
LD_{it}	0.3056** (2.17)	
UD_{it}		0.4810*** (3.19)
RD_{it}		0.1788 (1.15)
$Size_{it}$	0.1935* (1.70)	0.1942* (1.72)
Observations	10383	10383
AR(2) test	1.17 [0.241]	1.17 [0.243]
Hansen test	12.16 [0.144]	12.04 [0.149]
Year dummies	Yes	Yes

Table 4.12. Parameter estimates from panel regressions on the relationship between firms' total, unrelated and related diversification levels and a market-based performance measure – Robustness H1 and H2

This table summarizes the estimations on the relationship between: (1) firms' total diversification level and a market-based performance, scaling all the variables by the coefficient of variation of the return on assets – column (2); (2) unrelated and related diversification levels and a market-based performance measure, scaling all the variables by the coefficient of variation of the return on assets – column (4); generated by Blundell and Bond's (1998) system, the GMM estimation method, conducting robustness checks on H3. Column (1) and Column (3) are reported for the purpose of comparison with the estimated coefficients on the baseline models. The data were drawn from the 2010 to 2017 Amadeus files. Definitions of the variables are listed in subsection 4.3.2. The final two pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Hansen test for the null hypothesis of instruments that are uncorrelated with the disturbances and instruments that are valid (over-identifying restrictions). *, ** and *** indicate significance at 10%, 5% and 1%, respectively. Values enclosed in parentheses are the t or z statistics for coefficients, and values in square brackets are the p-values for test statistics.

Independent Variables	(Baseline Model Eq. 4.6.1) $MtoB_{it}$ **H1**	(1) $MtoB_{it}$ **[$\beta_A \rightarrow$ CV, Eq. 4.6.1]**	(Baseline Model Eq. 4.6.2) $MtoB_{it}$ **H2**	(2) $MtoB_{it}$ **[$\beta_A \rightarrow$ CV, Eq. 4.6.2]**
$MtoB_{it-1}$	0.6095***	0.7147***	0.6053***	0.7153***
	(5.41)	(4.30)	(5.39)	(4.31)
LD_{it}	0.3056**	0.2295***		
	(2.17)	(3.17)		
UD_{it}			0.4810***	0.2095*
			(3.19)	(1.79)
RD_{it}			0.1788	0.2242***
			(1.15)	(2.74)
$Size_{it}$	0.1935*	0.1282	0.1942*	0.1283
	(1.70)	(1.49)	(1.72)	(1.49)
Observations	10383	10383	10383	10383
AR(2) test	1.17	1.55	1.17	1.55
	[0.241]	[0.121]	[0.243]	[0.121]
Hansen test	12.16	13.18	12.04	13.19
	[0.144]	[0.106]	[0.149]	[0.106]
Year dummies	Yes	Yes	Yes	Yes

5. Conclusions

When we designed and structured our research proposal, we articulated the following research questions we aimed at answering: (i) Does the financing behavior of firms operating within diversified firms with active ICMs is more efficient than that of single-segment comparable firms? (ii) Does the investment behavior of within M-form firms endowed with active ICMs is more efficient than that of peer stand-alone firms? and (iii) Is the relationship between M-form firm diversification and its economic performance contingent on the efficiency of their investment and financing behavior?

In this conclusions' chapter, we summarize the main findings of the thesis' essays, and offer concluding remarks on the contributions of each one of them, and their interrelations, in answering the generic research of the thesis.

Anchored on the pioneer theoretical arguments by Ronald Coase and Oliver Williamson, positing that firm boundaries can be rationalized in terms of economic efficiency, we asked the generic research question, whether a M-form firm exhibits higher allocative efficiency, than a portfolio of comparable single-industry firms. In this framework, investment and financing behavior are key drivers of firms' economic performance.

With this purpose, we examined financing, investment and diversification behavior of affiliates of diversified firms, controlling with a comparable stand-alone sample.

Empirical testing was specified and conducted under econometric methods that mitigate the self-selection and endogeneity problems to which corporate finance research is prone. Additionally, for the sake of mitigation potential errors-in-variables, we also performed robustness checks on explanatory variables specification.

Findings of Essay I, are consistent with the proposition that the financing behavior of members of diversified firms operating within active internal capital markets, is more efficient, than a portfolio of comparable stand-alone firms raising their funding needs on external capital markets. In addition, show that the former are significantly more leveraged and exhibit lower cost of capital, than their comparable cohorts. Further, the latter, under costly leverage adjustments, tend to revert to their preferred leverage ratios at higher speeds than M-Form affiliates, aiming at, at least partially, mitigating the economic disadvantages of being away from its preferred capital structure.

Centralized capital budgeting systems of M-Form firms are, arguably, advantageous in terms of mitigating the deadweight agency and informational costs associated with investment behavior at the firm level. In Essay II, we tested the relationships between investing behavior, with investment-internal funding sensitivity, growth opportunities, asset lumpiness, financial flexibility, and suboptimal investment.

Empirical results of Essay II document a positive significant relationship between investment behavior and investment-cash flow sensitivity, for both samples. Because the difference between estimated coefficients was not statistically significant, we cannot reject the null hypothesis that M-form firms have higher capital allocative efficiency, than their comparable stand-alone peers. However, the ICM members exhibit lower suboptimal investment behavior, than comparable stand-alone cohorts. Results also document a positive significant relationship between financial flexibility and investment behavior for both samples, with ICM affiliates exhibiting higher financial flexibility. The investment expenditures' responsiveness to growth opportunities is positive and statistically significant for both samples which is consistent with the conjecture that investment behavior is positively related to growth opportunities. Results on the relationship between both investment spikes and inactivity, and investment expenditures, are significantly positive and negative, respectively, for both samples, which is consistent with the prediction of lumpy investment behavior. We interpret those empirical results, as consistent with the proposition that the investment behavior of M-form members is more efficient than that of comparable stand-alone. Potential benefits of headquarters' managerial discretion on resource allocation, and monitoring efforts and informational advantages, may explain such efficiency primacy.

Investment and financing allocative efficiency are, arguably, the key drivers of diversified firms' economic performance. In Essay III, we probe the relationship between the M-form firm and its overall economic performance, and with the related and unrelated models of diversification, to test the proposition that diversification is value-enhancing. Further, we also examined, the performance effects of redeploying 'plastic assets' under unrelated diversification strategies. Overall, findings document that both related and unrelated forms of diversification matter, significantly and positively, for performance. However, the effect for the latter, may be explained by the influence of plastic assets' redeployment to other business opportunities with positive value creation prospects.

The evidence gathered in empirical testing conducted in the three Essays contribute, each on its own way, to answering the generic research question of the thesis, that firms affiliated with M-form business organizations, are more efficient than comparable portfolios of single-industry firms, in terms of both investment and financing behavior, with its diversification having positive impact on their economic performance.

Accumulated research on the *bright* and *dark* sides of diversification seems relatively inconclusive. This investigation contributes to the *bright* side of diversification literature, by documenting that diversification at the firm level, have positive effects on financing and investment behavior, and on economic performance.

The overall empirical findings of our research may be interpreted in favor of the economic benefits that ICM affiliates may experience associated with its organizational form, namely, on its economic performance, lowering asymmetric information with impact on the cost of capital, 'softening' financial constraints due to the role played by internal funding. Our results are robust to different empirical specifications.

We argue that the empirical findings of this research, are consistent with the prediction that the affiliation with a diversified firm, does matter for its economic performance, and appeared to be driven by the efficiency of its financing and investment behavior.

Overall, we interpret the economic benefits in terms of efficiency improvements, of the M-organizational form, found in our research, as the effects, among others, of lower cost of capital, reduced underinvestment associated with the 'softening' of financial constraints due to internally generated funding, and asset redeployability.

Concluding, in our view, the pillars of the M-form firm economic performance gains found in this research, seem to be well grounded in terms of lower deadweight agency, informational and governance costs, and in providing adequate incentives for control rights alignment of managerial decision-making at the headquarters and business unit level. We believe that we have, at least partially, enlightened some of the aforementioned research questions we formulated in our research project.