Working Paper #003/2019

Does Internal Capital Market Membership Matter for Capital Allocation? Theory and Evidence from the Euro Area [*]

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12 February 2019

Abstract
This paper investigates the capital allocative behavior of firms' integrating active internal capital markets (ICM). Specifically, examines the investment-cash flow sensitivity and its relationship with factors, such as, financial flexibility, suboptimality of investment expenditure, and cross-subsidization, using a matched sample design of two comparable panel data sets of 636 subsidiaries and stand-alone firms of the euro area, over the 2004–2013 sampling period.
Results from panel data regression document that ICM firms exhibit lower sensitivity to the availability of internal funding than pure-play stand-alone firms, and that for stand-alone firms the effect of financial flexibility on investment-cash flow sensitivity is larger than for ICM cohorts. Findings also document that, on average, subsidiaries experience lower levels of investment suboptimality, and that subsidiaries with poor growth opportunities, *ceteris paribus*, invest less than pure-play stand-alone firms, consistent with lower cross-subsidization problems within ICMs.
These findings are consistent with the propositions that centralized capital budgeting systems can potentially mitigate informational and incentive problems associated with investment behavior, and that subsidiary firms may use internal capital markets as a substitute for financial slack.

Keywords: capital allocation; investment-cash flow sensitivity; internal capital markets; financial flexibility; cross-subsidization; bias-corrected estimators
JEL classification: C33; C81; D25; G31; L22

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[*] The authors are grateful to Veljko Fotak, Aníbal Santos and João Pinto, for useful comments and valuable suggestions. The authors are responsible for all remaining errors and omissions. We are especially grateful to João Pinto and BVD for providing access to euro area sovereign treasury bills data, and to the Amadeus database, respectively. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Jorge Mota is the corresponding author and can be reached at: jorgemota@ua.pt.

http://dx.doi.org/10.2139/ssrn.3307123

1. Introduction

Despite the extensive body of theoretical literature on the optimality of firms capital investment (e.g., Arrow 1964; Jorgenson 1963; and Hirshleifer 1958), the archetypal questions — «to what extent does capital get allocated to the right investment projects?» (Stein 2003), «does firm diversity result in an efficient or inefficient allocation of capital?» (Agarwal *et al.* 2011), and «how do firms allocate resources across business units? Do units with better investment opportunities receive larger capital allocations and invest more?» (Glaser *et. al*. (2013), are not yet satisfactorily answered, and are assumed as the generic research questions for this study.

It is widely acknowledged that under conditions of perfect markets, including no borrowing / financing restrictions (at a unique deterministic equilibrium riskless interest rate, for both lenders and borrowers), and contractual completeness, there is no role for capital rationing. Therefore, all investment projects with positive expected net present values can be undertaken, achieving Pareto optimal intertemporal resource allocation (e.g., Brennan 2003).[1]

Under this neo-classical framework, firm's capital allocation process is 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 net present value (hereafter, NPV) of their cash flow streams (e.g., Martin *et al*. 1988; and Litzenberger and Joy 1975). In this framework, whenever capital investment deployment is congruent with the general principle of wealth maximization, capital will be allocated to their most efficient uses, i.e., to those where the economic surplus is greater (e.g., Martin *et al.* 1988).

With equal access to perfect and frictionless capital markets, firms' investment projects are independent from their financing structures (e.g., Brennan 2003), and it does not matter whether such capital allocation decisions are made «[…] in a centralized or decentralized capital budgeting environment» (Thakor 1993).

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, in a setting of incomplete and imperfectly competitive markets, and with conditions of contract

[1] According to Brennan (2003, fn#6), «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».

incompleteness, value maximizing capital allocations may be Pareto suboptimal (Brennan 2003; and Nielsen 1976, fn#1).

It is widely accepted among academics that under imperfect and frictional markets, and contracting incompleteness, managerial decision-making functions are typically separated from residual risk-bearing, and information tend to be unevenly distributed among market participants, preventing the formation of homogeneous expectations, and inducing incentives for potentially inefficient asset allocation. These instances, create incentives for the superiorly informed parties to behave opportunistically, seeking 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 efficiency and firms' claimholders wealth, but also between internal and external capital allocations (Morellec and Schürhoff 2011; Childs *et al.* 2005; Mauer and Triantis 1994; and Jensen and Meckling 1976).

Additionally, corporate institutional environment, namely, the law and legal origin (e.g., La Porta *et. al.* 2008; Demirgüç-Kunt and Levine 2005; Demirgüç-Kunt and Maksimovic 1998; and La Porta *et. al.* 1998); financial system level of development (e.g., Belenzon *et al.* 2013; Love 2003; and Wurgler 2000); firm ownership structure (e.g., Cho 1998; and Shleifer and Vishny 1997); and firms' organizational structure (e.g., Almeida *et al.* 2015; and Buchuk *et al.* 2014), arguably, may also affect firm's investment behavior, namely, capital allocative efficiency.

Whenever a firm has to decide whether to allocate capital to a new project, it must also decide which organizational structure to use on it: either undertaking the project within an existing entity – firm or business group – or, otherwise, organize the project as a distinct and legally independent organization (e.g., Liebeskind 2000; and Holmström and Roberts 1998).

In real-world market economies, business groups are a conspicuous form of economic organization (Belenzon *et al.* 2013; Smangs 2006; and Faccio and Lang 2002), and the study of internal capital markets through which diversified firms allocate investment flows, have been a focus of intense research interest in recent decades (e.g., Almeida *et al.* 2015; Buchuk *et al.* 2014; and Gugler *et al.* 2013).[2]

Scholars have debated whether, and to which extent, internal capital markets, are helpful in mitigating agency and informational costly problems, to which external capital

[2] Henceforth, we use interchangeably, diversified firm, multi-industry group, multi-division firm and business group, as organizational structures operating under internal capital markets. Similarly, we use standalone firm, single-division and single-segment firm.

allocation is particularly prone (Myers and Majluf 1984; and Williamson 1975). However, whether real-world firms operate under investment allocative efficiency, still remains an empirical question (e.g., Maksimovic and Phillips 2002).

Mainstream empirical literature on the efficiency of the within firm's capital allocation can be advantageously systematized across two broad categories: the internal capital markets allocative efficiency (e.g., Khanna and Tice 2001; and Sapienza 2001), and the inefficiency category (e.g., Ozbas and Scharfstein 2010; Scharfstein and Stein 2000; and Rajan *et al.* 2000).

Prior empirical literature investigating investment behavior of European comparable subsidiary and stand-alone firms is remarkably scarce. Additionally, that literature has also noticed the potential endogeneity and model misspecification problems associated with econometric design, specification and implementation of this class of empirical models (e.g., Bazdresch *et al.* 2018; Flannery and Hankins 2013; and Strebulaev and Whited 2012).

The main findings of this investigation document that: (*i*) ICM firms exhibit lower sensitivity to the availability of internal funding than pure-play stand-alone firms, supporting an hypothetical relationship between a centralized capital budgeting process and a potential reduction in informational and incentive problems; (*ii*) for stand-alone firms the effect of financial flexibility on investment-cash flow sensitivity is larger than for ICM cohorts, because the latter may use internal capital market as a substitute for financial slack; (*iii*) subsidiaries may experience a lower degree of suboptimality of investment expenditures, in the form of either under or overinvestment, than comparable stand-alone firms; (*iv*) subsidiaries with poor growth opportunities display lower means for investment expenditures than their comparable stand-alone firms, although the difference is non-statistically significant, which is consistent with the non-existence of cross-subsidization within ICMs.

This essay contributes to the literature on the capital allocative behavior, providing evidence on the differences of ICM members and their comparable cohorts in: (*i*) investment-cash flow sensitivities; (*ii*) the effects of financial flexibility on investment-cash flow sensitivity; (*iii*) the degree of suboptimality of investment expenditures; and (*iv*) investment expenditure for firms with poor and good growth opportunities – the cross-subsidization proposition. Specifically, we provide evidence documenting that centralized capital budgeting may reduce informational and incentive problems increasing the efficiency of the capital allocative behavior.

The remaining of the paper is structured as follows: Section 2 discusses the relevant theoretical and empirical literature and formulates the hypotheses. Section 3 describes the data and the empirical implementation. Section 4 presents and analyzes univariate statistics and the econometric estimation results. Section 5 summarizes and provides concluding remarks.

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 and efficiency, of firms integrated in active ICMs and stand-alone firms.

2.1. Introduction

It is widely acknowledged that under frictional, imperfect and incomplete market conditions, contracting incompleteness, and ownership separation 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 firm's claimholders.

These costly problems may constrain and distort capital allocative behavior, affecting the efficiency of investment behaviors, leading to suboptimal capital allocation in the form of capital rationing, underinvestment, overinvestment or asset substitution (e.g., Stein 2003; Love 2003; Rajan *et al.* 2000; Hubbard 1998; Scharfstein 1998; Harris and Raviv 1996; Bebchuk and Stole 1993; Thakor 1993; and Jensen 1986).

2.2. Agency and Informational Problems and the Capital Allocative Efficiency

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

Extant literature has identified differences in time horizons, in risk preferences between principal and agents, agents' self-interest behavior, and asymmetric distribution of information, as potentially relevant sources of agency and informational costly problems related to capital allocation (e.g., Cadman and Sunder 2014; and Stein 2003).

Typically, firms exhibit longer time horizons than their managers, whose personal tenures are usually shorter. In these instances, managerial insiders may have preference for adopting investment projects with shorter maturities than outsider investors would optimally prefer, affecting investment behavior, particularly because of the potential incentive for managers foregoing expected positive NPV investment opportunities with longer maturities.

Thus, differences in time horizons between principal and agents, may lead managers foregoing expected positive NPV investment opportunities with maturities longer than their temporal preferences, causing suboptimal capital allocation (e.g., Cadman and Sunder 2014; Narayanan 1996; and Dechow and Sloan 1991).

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, consequence of having so much of their wealth tied up to the business organization performance. Contrastingly, well-diversified rational residual claimants, tend to have specific risk neutral preferences (e.g., Amihud and Lev 1981).

Under this framework, differences in specific risk preferences, of both principals and agents, may cause suboptimal distortionary effects preventing the adoption of an optimal investment behavior (e.g., Tanaka and Sawada 2015; and Holmström and Costa 1986). Such as, undertaking 'building empires' projects, instead of returning free cash flow to firm's owners.

Agents' self-interest behavior is also a potential source of inefficiency in 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' (e.g., Stein 2003; and Jensen 1994). Additionally, as argued in Jensen (1986), «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's assets, and from reputational capital gains in the managerial external labor market (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 the firm needs to raise investment project funding externally, 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). 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 net present value (NPV), can be undertaken.

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

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; and Galai and Masulis 1976).

Highly financial constrained firms have an incentive to underinvest, if existing debtholders would be 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 the new projects, will lower the firm's overall financial risk, and consequently benefit existing debtholders at the expense of existing equityholders (Myers 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 accrue to debtholders, while projects' financing is borne by equityholders (e.g., Myers 1984).

According to Berkovitch and Kim (1990, fn#5) 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).

Asset substitution is a ubiquitous form of post contractual opportunistic behavior caused by asymmetric information that can also induce investment policy 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).

In an ICM framework, a subsidiary's investment choices are, typically, made at the headquarters level (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 members (e.g., Charness and Sutter 2012).

2.3. Investment Behavior and Financial Flexibility

Myers and Majluf (1984) show that, because of costly adverse selection problems, external financing, independently of the form and the source from where it is obtained, is costlier than internal funding, and may affect both the availability and the cost of financial capital. In these circumstances, firm's investment and financing decisions become interdependent, and may affect investment behavior (Morellec and Schürhoff 2011; Childs *et al.* 2005; and Mauer and Triantis 1994).

In that framework, financial flexibility becomes of upmost importance for sustain the firm's ability for undertaking profitable investment opportunities (e.g., Sheu and Lee 2012; and Almeida and Campello 2010).[3] According to mainstream literature, financial flexibility is mostly related to the level of excess cash holdings and of debt capacity availability, which can provide an efficient and readily accessible source of corporate financing to avoid underinvestment (e.g., Ferrando *et al*. 2017; Arslan-Ayaydin *et al.* 2014; and Gamba and Triantis 2008).

Capital investment deployment within a diversified firm integrated in an active ICM, can benefit from the centralization of cross-generated cash flow, which is centrally allocated at the headquarters' discretion. As suggested, among others, by Das and Tulin (2017), subsidiaries of business groups may, arguably, be less financially constrained, when compared to their stand-alone peers, because they have access, not only to intra-group resources cross-allocation, but also to loans from the affiliated group firms.

A sizable empirical literature has documented significant effects of financial flexibility on corporate investment (e.g., Ferrando *et al.* 2017; Arslan-Ayaydin *et al.* 2014; Marchica and Mura 2010; and Fazzari *et al.* 1988). However, and despite significant contributions from prior research, the question of, whether or not, financial flexibility is equally relevant in terms of investment behavior for ICMs' participants than for stand-alone firms, still remains an uncompleted answered empirical question (e.g., Arslan-Ayaydin *et al.* 2014).

2.4. Law Origin, Legal System and Investor Protection

Prior mainstream literature has identified country-specific dimensions of the national institutional financial environments, which may affect firms' investment behavior and hinder investment allocative efficiency. Among those features is the legal system and law origins

[3] Henceforth, 'financial flexibility' and 'financial slack' are used interchangeably.

(La Porta *et. al.* 2008; Demirgüç-Kunt and Levine 2005; and Demirgüç-Kunt and Maksimovic 1998), and the legal protection of investor rights (La Porta *et al*. 2008).

La Porta *et al.* (2008), argue that the «legal rules and regulations, many of which are related to legal origins, [may affect] resource allocation». Their argument builds on the structure and effectiveness of both, the legal and the financial system, which may constrain the efficiency of firms' investment behavior (e.g., Love 2003; and Demirgüç-Kunt and Maksimovic 1998).

As argued in La Porta *et al*. (2000), 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».[4] Additionally, La Porta *et al*. (2008) suggest that «[...] the protection of shareholders and creditors by the legal system is central to understanding the patterns of corporate finance in different countries».

In terms of investors legal protection, 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).

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; and La Porta *et al.* 1998).

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.

2.5. Organizational Structure

Under perfectly competitive markets, the return and risk characteristics of an investment project, regardless it is organizationally structured within a firm integrating a business group, or a standalone firm, should be similarly valued, being these two organizational structures identically efficient in terms of their capital allocation processes. Therefore, it is necessary to abandon 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 differently the efficiency of a

[4] Findings by Wurgler (2000), document that «the efficiency of capital allocation is positively correlated with the legal protection of minority investors», namely, curbing overinvestment in declining industries.

corporate capital expenditures, depending on how the projects are incorporated or organized (e.g., Almeida *et al.* 2015; Buchuk *et al.* 2014; and Flannery *et al.* 1993).

Under an imperfect and incomplete market 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 matters, whether an investment project is organized as a stand-alone firm or included as part of a firm's portfolio of assets that can also be organized 'outside' the firm, as a subsidiary with legal independency from other firms in the business group.

Additionally, as suggested in Stein (2003) and Maksimovic and Phillips (2002), the fundamental question in corporate capital allocation, should be divided into two sub-questions: the first, when the capital budgeting process is conducted at the firm level, «does the external capital market channel the right amount of money to each firm?»; and the second, when the investment decision is made within the firm, «do internal capital markets channel the right amount of money to individual projects within firms?» (Stein 2003).

The allocative efficiency of firm's investment policy is a major focus of the internal capital markets' literature, which can, advantageously, be systematized across two broad categories: the allocative efficiency and inefficiency of internal capital markets.[5]

The 'efficient view', argues that the control rights hold at the headquarters level, rise its monitoring incentives, and improve the information quality (Gertner *et al.* 1994; Hart and Moore 1990; and Williamson 1975).

The branch of the literature that espouses the inefficient perspective of ICMs, shows how conflicts of interests between divisions' 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; Scharfstein and Stein 2000; Rajan *et al.* 2000; Shin and Stulz 1998; Lamont 1997; and Berger and Ofek 1995).

Summarizing, prior research does not provide an undisputable base for asserting that internal capital markets are either homogenously beneficial or detrimental for investment allocative efficiency.

2.6. Hypothesis Development

Under the neo-classical framework, firm's investment efficiency is achieved when resources are allocated to those uses where their value is greatest, ensuring congruency with

[5] Often referred to as, respectively, the *bright* and *dark* sides of ICMs. See Maksimovic and Phillips (2013) and Stein (2003), for comprehensive surveys of this literature.

the wealth maximization principle. These environmental conditions also ensure independency between firm investment and financing decisions, implying that the level of capital expenditure is not affected by cash flow generation, but determined by the investment opportunity set.

Real-world conditions of imperfect and incomplete markets, ownership separation from control, and incomplete contracting, may affect firm's investment behavior, eventually leading to suboptimal capital allocation, for example, in the form of under or overinvestment.

Under these instances, investment and financing become interdependent, internal and external financing do matter, a positive investment-cash flow sensitivity may exists, and capital allocation «[…] in a centralized or decentralized capital budgeting environment» (Thakor 1993) is relevant for the efficiency of corporate investment.

The literature provides two well-known explanations for the positive investment-cash flow relationship. The first, when, in the presence of free cash flow, managers choose to overinvest instead of returning it to residual claimants. The second, when the degree of informational asymmetries makes external financing costlier than internal funding, constraining firms to limit investment to available internal cash flow (e.g., Hubbard 1998; Hoshi *et al*. 1991; Fazzari *et al*. 1988; and Jensen 1986).

Findings from prior research document that firms exhibiting higher and positive investment-cash flow sensitivity, may be constrained in raising funding externally (e.g., Ferrando *et al.* 2017; Almeida and Campello 2010; and Hoshi *et al*. 1991).

We hypothesize that investment expenditure behavior of firms integrating an ICM, due lower informational and incentive problems, exhibit lower sensitivity to the availability of internal funds than comparable standalone firms (**H1: Hypothesis 1**).

Financial flexibility may be helpful in mitigating investment allocative inefficiencies, for example, limiting suboptimal investment behavior (e.g., Sheu and Lee 2012; and Almeida and Campello 2010).

Subsidiaries of diversified groups, besides enjoying their own level of financial flexibility, in the form of excess cash holdings and unused debt capacity, may also benefit from internal financing 'socialistic behavior' of their headquarters, which makes capital moved across ICM members (Wulf 2009; Bernardo *et al*. 2006; and Scharfstein and Stein 2000). Typically, their stand-alone comparable peers are not likely to exhibit similar levels of financial flexibility.

Prior empirical evidence suggests an inverse relationship between financial flexibility and investment-cash flow sensitivity. To test this proposition, we hypothesize that the effect of financial flexibility on investment-cash flow sensitivity of stand-alone firms to be larger than for subsidiaries, because the latter may use internal capital market as a substitute for financial slack (**H2: Hypothesis 2**).

Under any organizational form, firm's allocative optimality obtains when all the positive NPV projects in its investment opportunities portfolio are undertaken.

Whenever capital market participants are incompletely and imperfectly informed, they tend to formulate heterogeneous expectations, making internal and external capital imperfect substitutes and affecting differently their individual costs. In these instances, the undertaking of new investment projects will be contingent, *ceteris paribus*, on the availability and the cost of funding.

The dynamics of this dual interdependency is the kernel of the empirically motivated pecking order hypothesis of financing, which predicts that internally generated cash flow, net of dividend payouts, is primarily reinvested (e.g., Myers 1984). Under a set of assumptions including, adverse selection, semi-strong efficient capital markets and residual dividend policy, capital allocation of informationally opaque business organizations are potentially prone to suboptimality, either in the form of under or overinvestment. The former, materializing when the growth opportunity set underruns the aggregated value of internally retained cash flow and financial slack; and the latter whenever, there is free cash flow and cumulative capital expenditure outrun the growth opportunity set (Brealey *et al*. 2011).

However, in an ICM setting, headquarters managerial discretion and informational advantage, may cross-allocate financial capital within a business conglomerate, aiming at lowering the level of suboptimality of corporate investment expenditure (e.g., Bolton and Scharfstein 1998). Therefore, we hypothesize that under an ICM framework, ICM members should experience lower degrees of investment expenditures suboptimality, in the form of under and over-investment, than their comparable cohorts (**H3: Hypothesis 3**).

Based on monitoring and financial flexibility arguments, the dark side perspective of ICMs argues that ICMs may cross-subsidize value-destroying projects, therefore allocating capital inefficiently.

Consistent with the free-cash flow hypothesis, prior research documents that subsidiaries with poor growth opportunities invest more than compared stand-alone firms, what can be interpreted as allocative inefficiency of ICMs (e.g., Scharfstein 1998).

To examine the proposition of cross-subsidization within ICMs, we hypothesize, following Shin and Park (1999), that those ICM members endowed with poor growth opportunities investment more than comparable stand-alone firms (**H4: Hypothesis 4**).

3. Data Description and Empirical Specification

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

3.1. 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 was drawn from Amadeus database of the Bureau van Dijk, which provides financial firm-level data for unlisted firms from 27 European countries. The sampling period spans over 2004-2013.

There is not a unique definition of group 'affiliation'. In this paper, we espouse Khanna and Rivkin's (2001) business group concept, as a network of business and financial relationships of varying degrees and kinds, taking expression through a set of diversified and legally independent firms bounded together by a set of formal and informal ties, and that are used to take coordinated action. This approach is consistent with much academic work related to the European context (e.g. Belenzon *et al.* 2013; Smangs 2006; and Faccio and Lang 2002).[6]

To be included in our subsidiaries subsample, a firm as to satisfy the following criteria: (*i*) to be ultimately owned (co-owned) by a Global Ultimate Owner (GUO), a known equityholder of a firm that holds a path of minimum 50.01 percent (directly or indirectly) of its financial capital titles and is independent, i.e., do not have any other GUO[7], or are co-owned by another firm (business group), although not being a GUO or an individual investor GUO, holds, directly and / or indirectly, a minimum ownership of 50.01 percent of the subsidiary, and owns two or more subsidiaries; (*ii*) similarly to extant empirical literature in the area, we excluded financial services firms, education and regulated utilities; (*iii*) to be established in euro area, for ensuring harmonized financial and fiscal conditions, besides a single unit of account; (*iv*) firms for which their status is active for the entire sampling period,

[6] Like other papers with a similar focus that used Amadeus database, subsidiaries data does not include segment data reported on 'behalf' of the 'parent' firm. Most papers 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.

[7] 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 investment choices of its subsidiaries.

with at least 8 to 10 years of data for all the used variables, to avoid survivorship bias problems and ensure a balanced panel; (v) annual sales revenue higher than 5 million Euros for at least one of the following sampling years: 2013, 2012, 2011, 2010.[8]

Aiming at mitigating the endogeneity of group membership, and ensuring comparability in terms of industry and size, we developed and implemented a tailor-made matching procedure.[9]

Using the above described criteria, we build: (*i*) subsample 1 – subsidiaries belonging to a business group – including 900 subsidiary firms with 9,000 firm-year observations; and (*ii*) subsample 2 – comparable stand-alone firms – including 3,764 stand-alone firms with 37,640 firm-year observations.[10]

After applying the matching procedurewe end up with two subsamples of 636 firms each, and a total of 12,720 testable firm years.

We collect data on a wide variety of firm-specific variables. The specification of the firm-specific variables is presented in subsection 3.2.3. In order to mitigate the potential influence of extreme observations, data was winsorized following the procedures adopted by George *et al.* (2011), La Porta *et al.* (2000) and Cleary (1999). With that objective, 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 excluded firms with negative earnings before interest and taxes (EBIT).

3.2. Empirical Specification

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; and Fazzari *et al.* 1988).

The Euler-equation model aims at mitigating the shortcomings of both the neoclassical and Tobin's *q* models (Bond and Meghir 1994a, b). The model controls for the influence of expected future profitability on investment spending, whilst no explicit measure of

[8] We excluded very small firms from our subsamples, because of missing data problems.
[9] The methodological description of the matching procedure is available from the authors upon request.
[10] For subsample 2, we introduced the following adjustments to the subsample 1 sampling criteria: (i) including firms that were not owned (co-owned) by a GUO, or by another firm (business group), even not being a GUO; (ii) that own (co-own) no subsidiaries; and (iii) that were not an ultimate owner. These changes ensure that the firms are stand-alone in the market, i.e., don't belong to a business group and themselves are not a business group owning subsidiaries.

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), because it is typically associated in the literature with good empirical performance.

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

3.2.1. Endogeneity Problems

Empirical investment models assume implicitly a positive relationship between investment and cash flow, to reflect the importance of internally generated funds for investment purposes due to liquidity constraints (e.g., Ferrando *et al.* 2017; and Shin and Park 1999).

Prior research documents an investment-cash flow positive relationship which is consistent with the pecking order model. However, the cash flow variable may proxy omitted variables, namely, financial flexibility, in the form of excess cash holdings, debt capacity, or both (e.g., Marchica and Mura 2010; Goergen and Renneboog 2001; and Hoshi *et al.* 1991). To control for this potentiality, Roberts and Whited (2013), among others, suggest that when performing a regression analysis, the generalized method of moments (GMM) estimators should be applied instead of, the ordinary least squares (OLS).

The endogeneity of explanatory variables is the result of the equation's disturbance term being correlated with the lagged dependent variable in dynamic panel data models.

According to a non-negligible stream of the empirical literature, instrumental variables (IV) applied in GMM estimators may help to overcome this type of endogeneity (e.g., Roberts and Whited 2013). However, simulation results by Dang *et al.* (2015), Zhou *et al.* (2014) and Shin and Kim (2011), indicate that second generation of dynamic panel data estimators, such as, the least squares dummy variable correction and the bootstrap-based correction procedure, are the 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 – is an endogenous decision –, the simple average difference in firms’ characteristics between treatment (being a subsidiary of a business group), 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; and Whited 2001).

Because the endogeneity problem may bias the estimation results, therefore the estimation procedure must take into account the endogeneity of the decision to become affiliated to a business group (e.g., Campa and Kedia 2002; and Matsusaka 2001).

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

In this investigation, we developed and applied a tailor-made matching procedure aiming at mitigating the endogeneity of group membership problem. The matching procedure consists in building a control group as an 'image' of the treatment group, that reports similar characteristics (variables), given the idea that the treatment does not justifies significant differences between the two subsamples.

3.2.2. Investment in Lumpy Assets

Mostly because of technological indivisibilities, the capital expenditure of specific industries cannot be modeled as a continuous function, as is the case of the cement and the steel industries. It's widely accepted, that either new growth opportunity projects or investments on organic incremental capacity expansions, may occur in discrete units, because of technological, cost, or efficiency considerations (e.g., Gomes 2001; and Dixit and Pindyck 1994).

Despite the relative success of standard investment models in reproducing 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 by individual firms.

Prior research provides empirical evidence documenting that capital adjustment at the firm level may be episodic and lumpy rather than smooth and continuous, presenting periods of inactivity (zero or near zero investment), followed by periods of non-negligible spikes of capital expenditures (e.g., Verona 2014; Del Boca *et al.* 2008; Cooper and Haltiwanger 2006; and Abel and Eberly 1996).

Therefore, the linear adjustment pattern implied by the standard investment models cannot reproduce the spikes of investment observed in the data (e.g., Del Boca *et al.* 2008).[11]

3.2.3. Empirical Testing

[11] There is a potential bias in investment empirical research of operating leases. Under most current lease accounting frameworks, lease payments are not recognized in income statements, not capitalized in balance sheets. Given the unavailability of data on operating leases at the firm level that would allow the applicability of an alternative capital lease accounting method, we do not address the problem in our empirical design.

As hypothesized, we expect the investment expenditure of subsidiary firms integrating active ICMs exhibit lower sensitivity to internally generated funds (β_3) than single segment firms (**H1**). To test this hypothesis, we estimated an adapted dynamic version of the empirical investment models of Sheu and Lee (2012), George *et al.* (2011), Wei and Zhang (2008), Goergen and Renneboog (2001), Cleary (1999), Shin and Park (1999), Hoshi *et al.* (1991) and Fazzari *et al.* (1988):

$$\begin{aligned}\left(\frac{I}{FA}\right)_{it} &= \beta_1\left(\frac{I}{FA}\right)_{it-1} + \beta_2\left(\frac{I}{FA}\right)^2_{it-1} + \beta_3\left(\frac{CF}{FA}\right)_{it} + \beta_4 MtoB_{it} + \beta_5\left(\frac{D}{FA}\right)_{it} + \beta_6 CK_{it} + \\ &+\beta_7\left(\frac{FA}{TA}\right)_{it} + \beta_8\left(\frac{CF}{FA}\right)_{it}\times FF_i + \beta_9\left(\frac{CF}{FA}\right)_{it}\times Lumpy_i + \beta_{10}\left(\frac{CF}{FA}\right)_{it}\times Rights_i + d_t + v_i + \varepsilon_{it}\end{aligned} \quad (1)$$

where I_{it} denotes capital expenditures; FA_{it}, fixed assets; CF_{it}, operating cash flow; $MtoB_{it}$, market-to-book, as a proxy for growth opportunities; D_{it}, total outstanding debt net of excess cash holdings; CK_{it}, forward-looking cost of capital; $\left(\frac{FA}{TA}\right)_{it}$, capital intensity; FF_i, a proxy for financial flexibility; $Lumpy_i$, a proxy for the degree of assets lumpiness; $Rights_i$, a proxy for the level of investors protection; subscripts refer to firm i at time t; d_t and v_i stand for time specific effects and fixed effects, respectively; and, ε_{it} is a disturbance term. See table 1 for variable specification.

[Insert Table 1 here]

Prior research by, e.g., Ferrando *et al.* (2017) and Marchica and Mura (2010), suggest an inverse relationship between financial flexibility and investment-cash flow sensitivity. Therefore, we tested whether the effect of financial flexibility on investment-cash flow sensitivity is larger for the stand-alone firms than for the subsidiaries integrating diversified business firms.

To be consistent with hypothesis **[2]**, the estimated coefficient of the interaction between cash flow-to-fixed assets and financial flexibility, β_8, should exhibit a negative sign for the two subsamples, and β_8 for subsidiary firms should be less negative than β_8 for stand-alone firms.

Prior empirical literature document that firms may incur in suboptimal investment expenditures, either in the form of under or overinvestment. Whenever capital market participants are incompletely and imperfectly informed, firms may potentially underinvest when the aggregated value of internally retained cash flow and financial slack is exceeded by its growth opportunity set. Otherwise, it overinvests when there is free cash flow and cumulative capital expenditure overruns the growth opportunity set.

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

To test if subsidiary firms integrating active ICMs experience a lower suboptimality of corporate investment expenditures, in the form of either under or over-investment, than single segment firms (**H3**) we examined whether the difference between the level of growth opportunities – the difference between equity market and book values – and the amount of funding sources – retained cash flow and financial slack – is closer to zero for subsidiaries when compared with stand-alone firms, conducting both parametric – one and two sided t-test for mean comparison, of two independent subsamples, and assuming unequal variances –, and non-parametric tests, Wilcoxon signed-rank (Mann-Whitney) test for equality of means.

To examine the proposition of cross-subsidization within ICMs (**H4**), we tested whether subsidiaries with poor growth opportunities invest more than pure-play stand-alone firms.

For this purpose, we tested for differences in medians in the investment expenditure of both subsidiaries and comparable stand-alone firms with poor and good growth opportunities, conducting non-parametric tests, Wilcoxon signed-rank (Mann-Whitney) test for equality of means and medians.

Following Hoshi *et al.* (1991), as a proxy for a firm's investment prospects, we used median market-to-book during the sample period 2004-2013. Firms with a value of median market-to-book above (below) the sample median were considered those exhibiting good (poor) investment prospects.

4. Empirical Results

4.1. Univariate Statistics Analysis

Table 2 present subsamples characteristics in terms of industry and country.

[Insert Table 2 here]

Panel A of table 2 shows that all major non-financial industries are represented in the subsamples, with an emphasis on manufacturing and distribution.

Panel B presents the details on the composition of the 636 firms (on each of the two subsamples) by country, for the sampling period. The composition, by country, of the two subsamples is very similar, with Spain, France and Italy having the highest representations (representing 80.7 percent of the all firms in subsample 1 and 78.5 percent of the all firms in subsample 2) while Austria, Finland, Greece, Luxemburg and Portugal present the lowest representations in the two subsamples.

Table 3 reports the summary statistics of the variables used to test **H1** and **H2** for the 2004-2013 sampling period, for the subsidiaries of business groups subsample (Panel A) and pure-play stand-alone firms subsample (Panel B).

[Insert Table 3 here]

To test for differences in means and medians, we conducted both parametric and non-parametric tests (Wilcoxon signed-rank (Mann-Whitney) test for equality of means and medians).

Table 4 reports the means (on the top) and medians (on the bottom) of those variables in the subsamples 1 and 2, and statistics for equality tests across samples.

[Insert Table 4 here]

Section 1 of table 3 presents descriptive statistics for the key variables used to estimate our baseline model to test **H1** and **H2**. As reported, the two subsets of firms are similar in several dimensions, both in terms of means and medians (section 1 of table 4). Our results indicate that the means and medians of investment expenditures $\left(I/FA \right)$ and debt-to-fixed assets ratio $\left(D/FA \right)$ variables, for both subsamples, are not statistically different. Subsidiary firms are larger than comparable stand-alone firms in terms of market-to-book ratio ($MtoB$), a difference statistically significant at the 1 percent level. Pure-play stand-alone firms hold a larger cost of capital (CK), fixed assets-to-total assets ratio $\left(FA/TA \right)$ and cash flow $\left(CF/FA \right)$ than subsidiary firms, differences statistically significant at the 1 to 10 percent levels. 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).

Summary statistics of the variables used to estimate the cross-sectional regression on the determinants of cash holdings are exhibited in section 2 of table 3. As indicated in section 2 of table 4, subsidiary firms are larger in terms of means and medians of total assets $\left(LnTA \right)$, cash flow-to-total assets ratio $\left(CF/TA \right)$ and total debt-to-total assets ratio $\left(TD/TA \right)$ than pure-play firms, differences statistically significant at the 1 and 5 percent levels. Comparable stand-alone firms exhibit higher, and statistically significant at the 1 percent level, cash-to-total assets ratio $\left(CH/TA \right)$, predicted cash-to-total assets ratio $\left(Predicted\_CH/TA \right)$, sales growth, and capital expenditure-to-total assets ratio $\left(I/_{TA} \right)$ than subsidiary firms. These results are consistent with the findings of prior empirical research (e.g. Sheu and Lee 2012; and George *et al.* 2011).

Summary statistics in section 3 of table 3 includes the variables used to estimate the cross-sectional regression on the determinants of target leverage ratio. As reported, subsidiaries are larger in terms means and medians of total assets, and evidence higher profitability, growth opportunities and effective tax rate than pure-play firms. Additionally, another important difference between the two subsets of firms is that subsidiaries exhibit a higher ratio of debt-to-total assets than comparable stand-alone firms. These differences are statistically significant at the 1 percent level. Stand-alone firms exhibit higher, and statistically significant at the 1 percent level, asset tangibility than subsidiaries. These reported results are consistent with extant empirical literature (e.g. Fier *et al.* 2013; Flannery and Rangan 2006; and also Mota and Santos 2018).

Section 4 of table 3 reports descriptive statistics for the variables used to test **H1** and **H2**, conducting robustness checks. Using alternative specifications for the variables involved in the estimation of growth opportunities and expected growth rate of equity cash flows, with impacts on the cost of capital and market-to-book estimations, subsidiary firms remain larger than comparable stand-alone firms in terms of means and medians of market-to-book ratio $(MtoB\_meta)$ and sustainable growth rate (SGR) as surrogates for growth opportunities, a difference statistically significant at the 1 percent level. Pure-play stand-alone firms maintain a higher, and statistically significant at the 1 percent level, cost of capital (CK_meta) than subsidiary firms.

Table 5 reports the Pearson correlation coefficients between the variables used to estimate our baseline model to test **H1** and **H2**, showing that the correlation coefficients on the determinants of corporate investment range from -0.7543 to 0.8328 in subsidiaries subsample, and from -0.7511 to 0.8614 in comparable stand-alone subsample, all at the 1 percent level 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).

[Insert Table 5 here]

4.2. Regression Analysis

To estimate a proxy for the variable firm's financial flexibility, based simultaneously on its excess cash holdings and on its debt capacity, we firstly performed an OLS cross-sectional regression on the determinants of cash holdings to predict the defensive level of cash holdings and through its difference to the actual level of cash holdings, estimating the excess cash holdings (e.g. Foster 1978, 29; and Beaver 1966). Results are reported in table 6.

Estimation results document that the natural log of total assets and the capital expenditure-to-total assets ratio, are negatively related with cash-to-total assets at the 1 percent level of statistical significance in the two subsamples. Additionally, operating cash flow-to-total assets, sales growth, and total debt-to-total assets variables, are positively related to cash-to-total assets ratio at the 1 and 5 percent levels of statistical significance for the two subsets, which is consistent with extant empirical literature, e.g., Sheu and Lee (2012) and Opler *et al.* (1999).[12]

[Insert Table 6 here]

Secondly, an OLS cross-sectional regression on the determinants of the target leverage ratio was estimated for comparing the regressional fitted values with the actual values of net debt, to estimate firm's debt capacity. The results are reported in table 7.

Regression findings show that the industry median debt ratio, size, tangibility, profitability, growth opportunities and effective tax rate are positively related with firms' leverage ratios at the 1, 5 and 10 percent levels of statistical significance for both groups of firms, which is consistent with the findings of prior empirical research, e.g., Fier *et al.* (2013) and Flannery and Rangan (2006).

[Insert Table 7 here]

Equation (1) tests if the investment expenditure of ICM firms exhibit lower sensitivity to internally generated funds than pure-play single segment firms (**H1**).

Table 8 reports the regression results on equation (1), for the subsidiaries of business groups subsample (Panel A) and pure-play stand-alone firms subsample (Panel B). We estimated two alternative empirical model specifications: (*i*) including a proxy for the degree of assets lumpiness and its relationship with the cash flow-to-fixed assets $\left[\left(CF/FA\right)_{it} \times Lumpy_i\right]$ reported in columns 2 to 5; and (*ii*) including a proxy for the level of investors protection and its relationship with the cash flow-to-fixed assets $\left[\left(CF/FA\right)_{it} \times Rights_i\right]$, reported in columns 6 to 9.

[12] The debt-to-total assets ratio in the stand-alone firms subsample is not statistically significant.

Columns 2 and 6 of table 8, displays the regression results estimated using 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 (1) applying the Blundell and Bond (1998) estimators (SYS-GMM), reported in table 8, columns 3 and 7.

[Insert Table 8 here]

Regression results document a statistically significant, at the 1 and 5 percent levels, positive relationship between investment and cash flow, for both subsamples. The FE and SYS-GMM estimates are 15.7 and 13.6 percent (and 15.5 and 11.5 percent, using the empirical model specifications including a proxy for the level of investors protection), respectively, in the ICM firms' subsample, and 44.9 and 40.4 percent (and 45.0 and 33.8 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 no AR(2) in the two subsamples, results for the Sargan and the Hansen tests for 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 three pairs of rows in table 8.[13]

The regression results for the performed bias-corrected estimators, least squares dummy variable correction (LSDVC) and bootstrap-based bias-corrected FE (BCFE), are reported in columns 4 and 5 (and columns 8 and 9) of table 8, respectively. The results on these complementary estimation methods reinforce the reported positive and statistically significant investment-cash flow sensitivity, with LSDVC and BCFE estimates of 16.9 percent for the ICM firms' subsample, and 47.4 and 40.1 percent (and 47.9 and 41.3 percent) for the pure-play stand-alone firms subsample.

Overall, the empirical results, regardless of the estimation methods and empirical specifications performed, indicate that subsidiary firms integrating active ICMs, arguably due, among other factors, to the lower informational and incentive problems presumption, exhibit a lower investment-cash flow sensitivity (β_3) than pure-play stand-alone firms, which is consistent with our **H1**.

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

Findings from our regression analysis also show a dynamic pattern of corporate investment expenditure which is expressed through the positive coefficient of the lagged dependent variable, at the 1, 5 and 10 percent levels of statistical significance for both groups of firms. Additionally, the negative and statistically significant, at 1 and 5 percent levels for both subsets of firms, coefficient of the squared lagged dependent variable also documents a quadratic behavior of the investment function, irrespective of the estimation methods and empirical specifications applied.

Additionally, the capital intensity and the proxy for the degree of assets lumpiness variables, surrogates for the impact of lumpy assets in corporate investment expenditures, exhibit a negative coefficient and statistically significant at the 1 percent level for both groups of firms, depending on the estimation method used. These findings suggest that the lumpy pattern of capital expenditure at firm level, is characterized by periods of investment inactivity and spikes, which have a negative impact on the linear pattern implied by the standard investment models, which is consistent with the findings of prior empirical research, e.g., Verona (2014), Del Boca *et al.* (2008) and Abel and Eberly (1996). These findings suggest the importance of including a proxy for the degree of assets lumpiness in the specification of an investment function.

Finally, the relationship between corporate investment expenditures and a proxy for the level of investors protection does not exhibit a consistent pattern in terms of both coefficient signs and statistical significance.

Equation (1) also tests the effect of financial flexibility on investment-cash flow sensitivity through the estimated coefficient on the interaction between cash flow-to-fixed assets and financial flexibility (β_8).

Prior empirical evidence suggests an inverse relationship between financial flexibility and investment-cash flow sensitivity (e.g., Ferrando *et al*. 2017).

Since subsidiary firms may use internal capital market as a substitute for financial slack, the financial flexibility impact on the investment-cash flow sensitivity should exhibit a negative sign for the two subsamples (β_8). This impact is expected to be larger for pure-play stand-alone firms, exhibiting subsidiaries a less negative β_8 than stand-alone firms (**H2**).

Line 10 of table 8 reports the estimated coefficients (β_8) on the interaction between investment-cash flow sensitivity and financial flexibility $\left[\left(CF/FA\right)_{it} \times FF_i\right]$ for the subsidiaries of business groups subsample (Panel A) and comparable stand-alone firms subsample (Panel B). Regardless of the estimation methods and the empirical specifications used, regression results indicate a negative relationship between financial flexibility and investment-cash flow sensitivity, statistically significant at the 1 and 5 percent levels for both groups of firms. The interaction between cash flow-to-fixed assets and financial flexibility (β_8) varies in a tight range, depending on the estimation method performed, between -8.85 and -12.4 percent in the ICM firms' subsample and -16.9 and -18.8 percent in the pure-play stand-alone subsample. Our results are consistent with prior research, e.g., Arslan-Ayaydin *et al.* (2014), Almeida and Campello (2010) and Scharfstein and Stein (2000).

The empirical results indicate that: (*i*) both subsidiaries and comparable stand-alone firms experience an inverse relationship between cash flow-to-fixed assets and financial flexibility; and (*ii*) subsidiaries exhibit a lower impact of financial flexibility on investment-cash flow sensitivity – reporting a less negative β_8 coefficient – because subsidiaries, besides enjoying their own level of financial flexibility, may also benefit from internal financing through the ICM. Overall, findings are consistent with **H2**.

To test **H3**, we conducted, both parametric and non-parametric, tests for the equality of means to examine whether the difference between the level of growth opportunities and the amount of funding (both in natural logs) is closer to zero for subsidiaries when compared with stand-alone firms. The reported empirical findings suggest that subsidiary firms may experience a lower degree of suboptimality of investment expenditures, than comparable stand-alone firms. Table 9 reports the means for those variables of both subsamples, and statistics for equality tests across samples.

[Insert Table 9 here]

The parametric – one- and two-sided t-test for mean comparison –, and non-parametric tests for equality of means (Wilcoxon signed-rank (Mann-Whitney)), report that the mean of the natural log on the amount of funding for firms integrated in an ICM is significantly higher than for comparable stand-alone firms, at the 1 percent level of significance.

Even though the mean of the natural log of corporate investment expenditures suboptimality is lower and close to zero for subsidiaries when compared with pure-play stand-alone firms, 9.4407 and 9.4791, respectively, which is partially consistent with **H3**, the means for the two subsets of firms are not statistically different from each other and are statistically different from zero (as reported in the last two lines of table 9).

To test the hypothesized cross-subsidization within ICMs (**H4**), we examined whether subsidiaries with lower levels of growth opportunities invest more than comparable stand-alone firms.

Table 10 reports medians for the investment expenditure, as well as the market-to-book cross-section medians for both subsamples, and each firm market-to-book median to estimate a poor and good growth opportunities dummy.

[Insert Table 10 here]

The results of non-parametric tests, document that the firms' median market-to-book is statistically significant higher for subsidiary firm than for pure-play stand-alone firms, at the 1 and 5 percent levels, for both subsets of firms with poor and good growth opportunities.

Additionally, medians for the corporate investment expenditure are higher for subsidiary firm with good and poor growth opportunities when compared with stand-alone firm also with good and poor growth opportunities, respectively. However, these differences are not statistically significant.

Our results display a non-statistically significant difference between medians for the corporate investment expenditure for subsidiary firm and stand-alone firms with poor and good growth opportunities, which is consistent with the non-existence of cross-subsidization within ICMs (**H4**).

5. Robustness Checks

5.1. Robustness checks: alternative specification of variables

To check the robustness of results, for **H1** and **H2**, we used alternative specifications for some of the variables, directly and indirectly, included in the specification of the empirical investment model. Firstly, we used the sustainable growth rate (SGR) as a surrogate for growth opportunities.[14] Secondly, for estimating the equity fair value and the cost of capital, we computed the growth rate of cash flow to equityholders, g_{it}, using the mean of the geometric growth rates of the ratios of total cash flow payout to market value, in Floyd *et al.* (2015), Kalay and Lemmon (2008) and Grullon and Michaely (2002). Thirdly, we classified firms in both subsamples, as 'financially flexible' for at least two consecutive time periods (instead of three), to checking whether or not, results were sensitive to the choice of the number of consecutive periods of leverage conservatism (e.g., Ferrando *et al.*

[14] The SGR was estimated as the product of the return on equity (ROE) by the retention ratio (1 – dividend payout ratio), The mean of the dividend payout ratio was estimated using data on the dividend payout as a percentage of earnings, according to data obtained through a meta-analysis by Floyd *et al*. (2015), Kalay and Lemmon (2008) and Grullon and Michaely (2002).

2017). Fourthly, we classified firms as ‘financially flexible’ based only on the evidence of a low leverage pattern (e.g., Arslan-Ayaydin *et al.* 2014).[15]

The regression results for the performed robustness checks, are reported in tables 11, 12, 13, and 14, respectively. These findings provide support for earlier results in terms of coefficient signs, magnitude, and statistical significance.

[Insert Tables 11 to 14 here]

The finding of a lower investment-cash flow sensitivity (β_3) for subsidiary firms than for pure-play stand-alone firms, holds for all the fifth performed robustness checks and for all the estimation methods and empirical specifications used, reinforcing the baseline model results obtained for **H1**.

The robustness check results document, considering all the alternative specifications of variables and estimation methods we used, that subsidiaries exhibit inverse and lower impact of financial flexibility on investment-cash flow sensitivity than comparable stand-alone firms, consistently with results on **H2** testing. However, it should be noted that in few specifications results were not statistically significant.

The results of the performed robustness checks reinforce the relevance of considering a proxy for the degree of assets lumpiness as a determinant of corporate investment behavior.

To check the robustness of results for **H3**, we also performed non-parametric tests for equality of medians that displayed similar results, reported in table 15, and reinforce the findings previously presented. The median of the amount of funding natural log for subsidiaries is significantly higher than for pure-play stand-alone firms, at the 1 percent level of significance. The median of the natural log on investment expenditures suboptimality is lower and close to zero for firms integrated in an ICM when compared with stand-alone firms. However, the medians for the two subsets of firms are not statistically different from each other.

[Insert Table 15 here]

To check the robustness of results for **H4**, we also performed parametric and non-parametric tests for equality of means with similar results, reported in table 16.

[Insert Table 16 here]

The results display that subsidiaries report higher, and statistically significant at the 1 percent level, market-to-book than pure-play stand-alone firms, for both subsets of firms with

[15] Tables of the panel regressions on the determinants of corporate investment, classifying firms by asset tangibility quartiles, and industry classification, are available from the authors upon request.

poor and good growth opportunities. Additionally, subsidiary firms report higher corporate investment expenditure than comparable stand-alone firms for the subset of firms with good growth opportunities. For the subset of firms with poor growth opportunities the pure-play stand-alone firms hold higher investment expenditures than subsidiary firms. However, these differences are not statistically significant.

The findings of a non-statistically significant difference between investment expenditures for subsidiaries and stand-alone firms with poor and good growth opportunities reinforce our baseline results and the proposition of the non-existence of cross-subsidization within ICMs.

6. Conclusions

This paper investigated empirically the capital allocative behavior of firms' integrating active ICM and their pure-play stand-alone firms. Specifically, we examined, the investment-cash flow sensitivity and its relationship with factors, such as, financial flexibility, the suboptimality of corporate investment expenditures, and the proposition of cross-subsidization.

Regression results provide evidence documenting that the ICM members and pure-play stand-alone firms exhibit a positive and statistically significant investment-cash flow sensitivity. Findings also indicate that, the former exhibit a lower sensitivity, 16.9 percent, than the latter, 47.4 percent (according to the LSDVC), providing support to the hypothesis 1. These empirical findings provide evidence consistent with the prediction that a centralized capital budgeting process may lower informational and incentive problems.

Regression results also provide significant evidence documenting that subsidiary firms exhibit a lower impact of financial flexibility on investment-cash flow sensitivity, that varies in a tight range, between -8.85 and -12.4 percent in the subsidiaries subsample and -16.9 and -18.8 percent in the stand-alone subsample. This evidence is in accordance with the arguing that subsidiaries may use internal capital market as a surrogate for financial flexibility, supporting hypothesis 2.

Results of empirical testing also provide evidence supporting to hypothesis that subsidiary firms report a lower and close to zero natural log of corporate investment expenditures suboptimality when compared with stand-alone peers, 9.4407 and 9.4791, respectively, although not statistically different from each other, which partially supports hypothesis 3. These empirical results are consistent with the prediction that in an ICM framework, the suboptimality of corporate investment expenditures may be lowered through the headquarters informational advantages and managerial discretion.

Empirical findings also provide support to the proposition of non-existence of cross-subsidization within ICMs, consistent with hypothesis 4. The corporate investment expenditure medians for subsidiary firms and stand-alone firms with poor and good growth opportunities exhibit a non-statistically significant difference.

All our results are consistent within all robustness checks performed, and for all the estimation methods and empirical specifications used, reinforcing the baseline results obtained in testing our hypotheses.

Finally, our findings also reinforce the relevance of including a proxy for the degree of assets lumpiness in the specification of a corporate investment function.

Concluding, the paper provides statistically significant findings indicating that: (*i*) subsidiaries exhibit lower investment-cash flow sensitivity than pure-play stand-alone firms, supporting an hypothetical relationship between a centralized capital budgeting setting and a potential mitigation of informational and incentive problems; (*ii*) ICM firms exhibit a lower impact of financial flexibility on investment-cash flow sensitivity, because the former may use ICM as a substitute for financial slack; (*iii*) subsidiary firms may experience lower corporate investment expenditures suboptimality than pure-play stand-alone firms; and (*iv*) medians for the corporate investment expenditure for subsidiary firms and pure-play stand-alone firms with poor and good growth opportunities are non-statistically significantly different, which is consistent with the non-existence of cross-subsidization within ICMs.

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Tables

Table 1. Variables specification

Variables	Specification
Capital Expenditures (I_{it})	Change in fixed assets between time *t* and *t*-1, plus depreciation. Variable specified as in George *et al.* (2011), Wei and Zhang (2008), Goergen and Renneboog (2001) and Fazzari *et al.* (1988).
Fixed Assets (FA_{it})	Beginning-of-period fixed assets.
Operating Cash Flow (CF_{it})	Sum of operating income and depreciation. 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. Therefore, we followed Ferrando *et al.* (2017), Arslan-Ayaydin *et al.* (2014), George *et al.* (2011), and Marchica and Mura (2010), in specifying this variable.
Market-to-book ($MtoB_{it}$)	Following Alam (2010, 20-21), we used market-to-book – the equity market value to its book value – as a proxy for growth opportunities, instead of Tobin's q, because in a rational expectations world, the value growth opportunities are reflected in share price, not in the value of debt, which reflects the time value of money and the premia determined by the debt exposure to risk. We also assumed that the book value of debt is an unbiased proxy of its market value. For further details on market-to-book see, e.g., Lev and Sougiannis (1999).
Total Outstanding Debt (D_{it})	Beginning-of-period total outstanding debt net of excess cash holdings. We estimated excess cash holdings as the difference between actual and predicted normal cash holdings (Sheu and Lee 2012). We estimated the normal level of cash holdings, as Opler *et al.* (1999) and Arslan-Ayaydin *et al.* (2014), using the cash to beginning-of-period total assets as the dependent variable, while the independent variables include natural log of total assets, operating cash flow to beginning-of-period total assets, sales growth, total debt to beginning-of-period total assets, capital expenditure to beginning-of-period total assets

Cost of Capital *(CK_{it})*	The forward-looking cost of capital. for firm *i* at time *t*, was estimated as the standard weighted average cost of capital, where D_{it} denotes the amount of outstanding net debt, E_{it}, the expected equity fair value, k_{Dit}, the expected cost of debt capital, k_{Eit} the expected cost of equity capital, and t_{it}, the expected income tax rate (e.g., Goergen and Renneboog 2001; and Fazzari *et al.* 1988). 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 cash holdings averages of periods *t* and *t*-1. The equity fair value of firm *i* at time *t*, E_{it}, was estimated using the classic steady-state Gordon model (e.g., Titman and Martin 2011, 263/4 and 278; and Benninga 2008, 40-42), where CF_{Eit} denotes the expected cash flow for equityholders, g_{it} the expected growth rate of CF_{Eit}, and k_{Eit} the firm's *i* cost of equity in time *t*. Equity cash flows, CF_{Eit}, were estimated as the algebraic sum of the EBIT of period *t*, 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*. We estimated the expected constant growth rates of cash flow for equityholders, g_{it}, 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, 626). 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_{Dit}, was estimated as the sum of the risk-free rate, r_{Ft} (countries risk-free rates were estimated as the sum of the annual average yield of a portfolio of German and Netherlands' AAA rating 3-month maturity sovereign treasury bills plus a country risk premium estimated as the difference between the average yield on the German and Netherlands' AAA 3-month treasury bill portfolio and average yield on the country's i treasury security benchmark - see Mota and Santos 2018, for further details), with a *spread* proxying the market risk of debt (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). To estimate the debt spreads for the firms included in the two subsamples, we followed the synthetic rating model of Damodaran (2011, 156-8), to estimate firm level rating notations and the spreads associated with them (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, that tracks the performance of non-financial EUR denominated investment grade corporate debt publicly issued in the euro area domestic markets, to collect information on ratings and default spreads). The expected costs of equity capital, k_{Eit}, were estimated as in Mota and Santos (2018, section 3.2.1.1).
Capital Intensity $\left(FA/TA\right)_{it}$	Capital intensity, with TA_{it} as the beginning-of-period total assets.

Table 1. Variables specification (Cont.)

Variables	Specification
Financial Flexibility (FF_i)	The classification of a firm as financial flexible was based on its observed decision to simultaneously hold excess cash and adopt a low leverage pattern. A firm was classified as enjoying financial flexibility based on its debt capacity (e.g., Ferrando *et al.* 2017; Arslan-Ayaydin *et al.* 2014; Marchica and Mura 2010), estimated through the following methodological procedures. Firstly, using OLS we estimated a cross-sectional regression on the determinants of target leverage ratio. In its specification, the leverage ratio (defined as the total debt minus cash to beginning-of-period total assets, according to, e.g., Ferrando *et al.* 2017; Arslan-Ayaydin *et al.* 2014; Bates *et al.* 2009) was the dependent variable, while the independent variables include natural log of total assets (*size*), fixed assets to beginning-of-period total assets (*tangibility*), cash flow to beginning-of-period total assets (*profitability*), market-to-book (*growth opportunities*), total tax to total taxable income (*effective tax rate*), depreciation to beginning-of-period total assets (*non-debt tax shield*) (see also Mota and Santos 2018, subsection 3.2.2). Secondly, we estimated and compared the fitted values from the regression analysis with the actual values of leverage net of cash and categorized the firm as with debt capacity if it exhibits a negative deviation between actual and predicted leverage net of cash (e.g., Faulkender *et al.* 2012; Marchica and Mura 2010). Lastly, to ensure that we observe a consistent pattern, a firm was classified as FF_i (dummy variable taking the value of one) only if: (*i*) the deviation is larger than 5%; and (*ii*) the firm was in a 'financially flexible' *status*, for at least three consecutive time periods. The methodological procedures applied to classify a firm as financial flexible according to its cash holding behavior, were detailed in the Total Outstanding Debt *(D_{it})* variable specification.
Assets Lumpiness ($Lumpy_i$)	The degree of assets lumpiness was estimated as the fraction of inaction periods – the number of near-zero-capital expenditure periods to the total observations available for a firm, with near-zero being defined as a 5 percent ratio of capital expenditures to total assets (specified as in Bazdresch 2013).

Investors Protection ($Rights_i$)	Level of investors' protection as an index of effective investor rights. Wurgler (2000) specified this index as the product of the rule of law, the creditor and shareholders rights indices, being the original variables from La Porta's *et al.* (1998), and Spamann's (2010), respectively.

Table 2. Subsamples characteristics

The industry classification was based on the Nace Rev. 2, main section and is also according to the classifications used by, e.g., Fama and French (1997).

Panel A: Industry composition

Industry	Number of firms in subsample 1 and subsample 2	%
Agriculture, forestry and fishing; Mining and quarrying; Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities (Internal classification - Industry 1)	45	7.1%
Manufacturing (Internal classification - Industry 2)	177	27.8%
Construction (Internal classification - Industry 3)	44	6.9%
Trade (Wholesale and Retail) (Internal classification - Industry 4)	245	38.5%
Transport and Communication's (Internal classification - Industry 5)	59	9.3%
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) (Internal classification - Industry 6)	66	10.4%
	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. Summary statistics of the variables used to test H1 and H2

The subsidiaries of business groups and comparable stand-alone firms subsamples consists of 6,360 firm-year observations from the 2004 to 2013 Amadeus files. This table reports the number of observations (N), mean, median, standard deviation (Std. Dev.), coefficient of variation (cv), minimum (Min), maximum (Max), skewness, and kurtosis of the variables considered in the empirical applications to test H1 and H2. The variables used to test H1 and H2 were described in detail in section 3.2.3.

Section 1: Summary statistics of the variables used to estimate our baseline model to test H1 and H2

Panel A: Summary statistics - subsidiaries of business groups subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
$\left(I/FA\right)_{it}$	5154	0.3547	0.1659	0.4800	1.3534	0.0000	2.0000	2.1834	7.2321
$\left(CF/FA\right)_{it}$	5724	0.5609	0.5109	0.3767	0.6716	-1.0000	1.0000	-0.4044	3.0426
$MtoB_{it}$	2988	5.3462	5.1840	4.0752	0.7623	0.0000	10.0000	-0.0585	1.3432
$\left(D/FA\right)_{it}$	5724	1.5974	2.0000	0.5678	0.3554	0.0000	2.0000	-1.0809	2.7411
CK_{it}	5724	0.0447	0.0344	0.0377	0.8435	0.0000	0.3180	2.3037	10.6469
$\left(FA/TA\right)_{it}$	6360	0.2748	0.2127	0.2381	0.8664	0.0000	0.9813	0.9417	3.0972
$\left(CF/FA\right)_{it} \times FF_i$	5724	0.1023	0.0000	0.2656	2.5971	-1.0000	1.0000	2.5102	8.3431

$\left(\frac{CF}{FA}\right)_{it} \times Lumpy_i$	5724	0.4257	0.3131	0.3634	0.8536	-1.0000	1.0000	0.1080	2.6626
$\left(\frac{CF}{FA}\right)_{it} \times Rights_i$	5724	0.2848	0.2575	0.1967	0.6905	-0.6240	0.6463	-0.2630	3.5495

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
$\left(\frac{I}{FA}\right)_{it}$	5281	0.3520	0.1680	0.4666	1.3254	0.0000	2.0000	2.2087	7.4927
$\left(\frac{CF}{FA}\right)_{it}$	5724	0.5840	0.5493	0.3606	0.6174	-1.0000	1.0000	-0.2542	2.3048
$MtoB_{it}$	2988	4.8865	4.2306	3.9542	0.8092	0.0000	10.0000	0.1376	1.4088
$\left(\frac{D}{FA}\right)_{it}$	5724	1.5879	2.0000	0.5734	0.3611	0.0000	2.0000	-1.0405	2.6311
CK_{it}	3150	0.0465	0.0409	0.0307	0.6591	0.0000	0.2628	2.0570	10.3286
$\left(\frac{FA}{TA}\right)_{it}$	6360	0.2819	0.2216	0.2304	0.8172	0.0000	0.9655	0.8926	2.9456
$\left(\frac{CF}{FA}\right)_{it} \times FF_i$	5724	0.1114	0.0000	0.2803	2.5172	0.0000	1.0000	2.4377	7.4392
$\left(\frac{CF}{FA}\right)_{it} \times Lumpy_i$	5724	0.4275	0.3347	0.3403	0.7960	-1.0000	1.0000	0.2607	2.3108
$\left(\frac{CF}{FA}\right)_{it} \times Rights_i$	5724	0.2927	0.2639	0.1896	0.6478	-0.6463	0.7000	-0.0098	2.8223

Section 2: Summary statistics of the variables used to estimate a cross-sectional regression on the determinants of cash holding, to estimate the predicted normal level of cash holdings, and to estimate the excess cash holdings to be included as a criterion to classify a firm as financial flexible (described in detail in section 3.2.3.)

Panel A: Summary statistics - subsidiaries of business groups subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
CH/TA	5724	0.1130	0.0478	0.1605	1.4199	0.0000	1.0000	2.4005	9.9047
LnTA	6360	9.4387	9.3370	1.1975	0.1269	4.5726	14.6762	0.3532	3.4640
CF/TA	5724	0.1560	0.1269	0.1737	1.1138	-0.2107	8.5502	20.9899	962.2239
Sales Growth	5724	0.0554	0.0352	0.2194	3.9604	-0.9917	1.0000	1.1345	8.5240
TD/TA	5724	0.6781	0.6187	2.2685	3.3452	0.0033	168.4238	70.8794	5227.4340
I/TA	5724	0.0622	0.0221	0.1338	2.1524	0.0000	2.0000	7.4919	87.5234
Predicted CH/TA	5088	0.1086	0.1099	0.0569	0.5236	-0.1380	1.3009	1.7353	41.1080

Table 3. Summary statistics of the variables used to test H1 and H2 (cont.)

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
CH/TA	5724	0.1584	0.0896	0.1917	1.2099	0.0000	1.0000	1.9703	7.1166
LnTA	6360	9.0928	9.0958	1.0527	0.1158	3.1997	12.4623	-0.1677	3.8074
CF/TA	5724	0.1494	0.1173	0.3036	2.0316	-0.1343	21.2461	58.7955	4075.1680
Sales Growth	5724	0.0829	0.0565	0.2317	2.7933	-0.9966	1.0000	1.2715	7.7096
TD/TA	5724	0.6663	0.6338	0.5319	0.7983	0.0117	30.5450	32.1495	1748.5770
I/TA	5724	0.0685	0.0276	0.1317	1.9232	0.0000	2.0000	6.3181	66.5446
Predicted CH/TA	5088	0.1538	0.1516	0.0696	0.4523	-0.0493	1.5745	1.8729	37.4356

Section 3: Summary statistics for the variables used to estimate a cross-sectional regression on the determinants of target leverage ratio, to estimate the fitted values of leverage net of cash, and to categorize a firm as with debt capacity to be included as a criterion to classify a firm as financial flexible (described in detail in section 3.2.3.)

Panel A: Summary statistics - subsidiaries of business groups subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
Leverage ratio	5724	0.5329	0.5346	0.2590	0.4861	0.0003	1.0000	0.0317	2.1628
IndMed	5870	0.5857	0.5849	0.1699	0.2901	0.0000	2.6680	2.1993	26.0738
Size (lnTA)	6360	9.4387	9.3370	1.1975	0.1269	4.5726	14.6762	0.3532	3.4640
Tangibility	5724	0.2889	0.2217	0.2511	0.8691	0.0000	1.0000	0.9512	3.1255

Profitability	5724	0.1560	0.1269	0.1737	1.1138	-0.2107	8.5502	20.9899	962.2239
Growth opportunities	3933	5.4349	5.4729	4.0738	0.7496	0.0000	10.0000	-0.1015	1.3505
Effective tax rate	6360	0.3389	0.3266	0.1459	0.4305	0.0000	1.0000	0.8699	6.5129
Non-debt tax shield	5724	0.0378	0.0260	0.0383	1.0140	0.0000	0.4202	2.2414	10.9530

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
Leverage ratio	5724	0.5205	0.5181	0.2682	0.5154	0.0004	1.0000	0.0792	2.0818
IndMed	5720	0.5231	0.5293	0.1553	0.2968	0.0200	1.0514	-0.0052	3.2058
Size (lnTA)	6360	9.0928	9.0958	1.0527	0.1158	3.1997	12.4623	-0.1677	3.8074
Tangibility	5724	0.3068	0.2427	0.2513	0.8193	0.0000	1.0000	0.9093	3.0252
Profitability	5724	0.1494	0.1173	0.3036	2.0316	-0.1343	21.2461	58.7955	4075.1680
Growth opportunities	4212	4.8827	4.2132	3.9527	0.8095	0.0000	10.0000	0.1406	1.4103
Effective tax rate	6360	0.3320	0.3174	0.1518	0.4573	0.0000	0.9986	1.0519	6.4629
Non-debt tax shield	5724	0.0363	0.0268	0.0362	0.9981	0.0000	1.0000	5.3497	98.9148

Section 4: Summary statistics of the variables used to test H1 and H2, conducting Robustness Checks (described in detail in section 5.)

Panel A: Summary statistics - subsidiaries of business groups subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
SGR_{it}	6360	0.0372	0.0264	0.0713	1.9157	-1.0000	1.0000	6.3258	108.4150
CK_meta_{it}	5724	0.0455	0.0358	0.0367	0.8055	0.0000	0.3180	2.4144	11.3589
$MtoB\_meta_{it}$	5724	4.1481	2.8771	4.1300	0.9957	0.0000	10.0000	0.3730	1.4589

Panel B: Summary statistics - comparable stand-alone subsample

Variables	N	Mean	Median	Std. Dev.	CV	Min	Max	Skewness	Kurtosis
SGR_{it}	6360	0.0323	0.0219	0.0512	1.5833	-0.2741	1.0000	8.3154	132.9834
CK_meta_{it}	3150	0.0461	0.0403	0.0300	0.6516	0.0000	0.2592	2.1832	11.0326
$MtoB\_meta_{it}$	5724	3.6739	2.2159	3.8935	1.0598	0.0000	10.0000	0.5904	1.7564

Table 4. Parametric and non-parametric tests for equality of means and medians between the variables used to test our hypotheses in the subsidiaries of business groups and stand-alone subsamples

The variables used to test our hypotheses were described in detail in section 3.2.3. *, ** 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 statistical significant higher mean for subsidiaries 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 statistical significant higher mean for stand-alone firms when compared with subsidiaries.

	Mean					
	Subsidiaries subsample	Stand-alone subsample	Two-sided t-test (Equality Test)	One sided t-test (statistically significant difference in the means) for:	Wilcoxon-Mann-Whitney test (Stand-alone mean of variable x == Subsidiaries mean 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
Section 1: Parametric and non-parametric tests for equality of means between the variables used to test H1 and H2						

$\left(I/FA\right)_{it}$	0.3547	0.3520	0.2843		1.018	0.506
$\left(CF/FA\right)_{it}$	0.5609	0.5840	-3.3578***	diff < 0***	2.411**	0.513
$MtoB_{it}$	5.3462	4.8865	8.4231	diff > 0***	-11.484***	0.446
$\left(D/FA\right)_{it}$	1.5974	1.5879	0.8937		-0.863	0.496
CK_{it}	0.0447	0.0465	-2.4126**	diff < 0***	8.109***	0.552
$\left(FA/TA\right)_{it}$	0.2748	0.2819	-1.7027*	diff < 0**	3.343***	0.517
$\left(CF/FA\right)_{it} \times FF_i$	0.1023	0.1114	-1.7833*	diff < 0**	0.203	0.501
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.4257	0.4275	-0.2833		0.329	0.502
$\left(CF/FA\right)_{it} \times Rights_i$	0.2848	0.2927	-2.1898**	diff < 0**	1.258	0.507
Section 2: Parametric and non-parametric tests for equality of means between the variables used to estimate a cross-sectional regression on the determinants of cash holding						
CH/TA	0.1130	0.1584	-13.7304***	diff < 0***	17.307***	0.593
LnTA	9.4387	9.0928	17.3025***	diff > 0***	-14.770***	0.424
CF/TA	0.1560	0.1494	1.4098		-3.110***	0.483
Sales Growth	0.0554	0.0829	-6.5309***	diff < 0***	7.494***	0.540
TD/TA	0.6781	0.6663	0.3825		3.244***	0.518
I/TA	0.0622	0.0685	-2.5277**	diff < 0***	6.828***	0.537
Predicted CH/TA	0.1086	0.1538	-35.8913***	diff < 0***	35.214***	0.702
Section 3: Parametric and non-parametric tests for equality of means between the variables used to estimate a cross-sectional regression on the determinants of target leverage ratio						
Leverage ratio	0.5329	0.5205	2.5169**	diff > 0***	-2.594***	0.486
IndMed	0.5857	0.5231	20.7224***	diff > 0***	-21.093***	0.387
Size (lnTA)	9.4387	9.0928	17.3025***	diff > 0***	-14.769***	0.424
Tangibility	0.2889	0.3068	-3.8022***	diff < 0***	4.924***	0.527
Profitability	0.1560	0.1494	1.4098	diff > 0*	-3.110***	0.483
Growth opportunities	5.4349	4.8827	4.4255***	diff > 0***	-4.390***	0.468
Effective tax rate	0.3389	0.3320	2.5960***	diff > 0***	-6.048***	0.469
Non-debt tax shield	0.0378	0.0363	2.1576**	diff > 0**	1.372	0.507

Table 4. Parametric and non-parametric tests for equality of means and medians between the variables used to test our hypotheses in the subsidiaries of business groups and stand-alone subsamples (Cont.)

Section 4: Parametric and non-parametric tests for equality of means between variables used to test H1 and H2, conducting Robustness Checks (described in detail in section 5.)						
SGR_{it}	0.0372	0.0323	4.4298***	diff > 0***	-8.013***	0.459
CK_meta_{it}	0.0455	0.0461	-0.7576		5.733***	0.537
$MtoB\_meta_{it}$	4.1481	3.6739	6.3205***	diff > 0***	-4.739***	0.475

	Median		
	Subsidiaries subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test
Section 1: Non-parametric tests for equality of medians between the variables used to test H1 and H2			
$\left(I/FA\right)_{it}$	0.1659	0.1680	0.1942
$\left(CF/FA\right)_{it}$	0.5109	0.5493	6.9465***

$MtoB_{it}$	5.1840	4.2306	-80.9911***
$\left(D/FA\right)_{it}$	2.0000	2.0000	
CK_{it}	0.0344	0.0409	57.2292***
$\left(FA/TA\right)_{it}$	0.2127	0.2216	2.8381*
$\left(CF/FA\right)_{it} \times FF_i$	0.0000	0.0000	0.2232
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.3131	0.3347	3.2876*
$\left(CF/FA\right)_{it} \times Rights_i$	0.2575	0.2639	0.7075
Section 2: Non-parametric tests for equality of medians between the variables used to estimate a cross-sectional regression on the determinants of cash holding			
CH/TA	0.0478	0.0896	210.9465***
LnTA	9.3370	9.0958	131.6381***
CF/TA	0.1269	0.1173	16.9113***
Sales Growth	0.0352	0.0565	66.7257***
TD/TA	0.6187	0.6338	4.9479**
I/TA	0.0221	0.0276	37.3616***
Predicted CH/TA	0.1099	0.1516	916.5601***
Section 3: Non-parametric tests for equality of medians between the variables used to estimate a cross-sectional regression on the determinants of target leverage ratio			
Leverage ratio	0.5346	0.5181	6.9465***
IndMed	0.5849	0.5293	322.7768***
Size (lnTA)	9.3370	9.0958	131.6381***
Tangibility	0.2217	0.2427	9.7446***
Profitability	0.1269	0.1173	16.7579***
Growth opportunities	5.4729	4.2132	14.0730***
Effective tax rate	0.3266	0.3174	29.6381***
Non-debt tax shield	0.0260	0.0268	1.4762
Section 4: Non-parametric tests for equality of medians between the variables used to test H1 and H2, conducting Robustness Checks (described in detail in section 5.)			
SGR_{it}	0.0264	0.0219	84.0531***
CK_meta_{it}	0.0358	0.0403	26.7191***
$MtoB\_meta_{it}$	2.8771	2.2159	18.3232***

Table 5 - Pearson correlation coefficients between variables used to test H1 and H2

This table reports the Pearson correlation coefficients (and its statistical significance) between the variables used to test our hypotheses H1 and H2. Variables definitions are listed in subsection 3.2.3. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively.

Panel A: Correlations - subsidiaries of business groups subsample							
$\left(I/FA\right)_{it}$	1						
$\left(CF/FA\right)_{it}$	0.3607***	1					
$MtoB_{it}$	0.0486***	0.1402***	1				
$\left(D/FA\right)_{it}$	0.2015***	0.5093***	0.0302	1			
CK_{it}	0.0287	0.0972***	-0.0199	0.1552***	1		
$\left(FA/TA\right)_{it}$	-0.2899***	-0.7276***	0.0259	-0.7543***	-0.0877***	1	
$\left(CF/FA\right)_{it} \times FF_i$	0.0302	0.1995***	0.0313	-0.0520***	-0.0145	-0.1038***	1

$(CF/FA)_{it} \times Lumpy_i$	0.1952***	0.8005***	0.0499***	0.5575***	0.1361***	-0.7340***	0.1189***	1	
$(CF/FA)_{it} \times Rights_i$	0.3186***	0.7994***	0.1341***	0.5200***	0.0877***	-0.6462***	0.1593***	0.8328***	1

Panel B: Correlations - comparable stand-alone subsample

$(I/FA)_{it}$	1								
$(CF/FA)_{it}$	0.3179***	1							
$MtoB_{it}$	0.1014***	0.1546***	1						
$(D/FA)_{it}$	0.1659***	0.4336***	0.0906***	1					
CK_{it}	0.0306	0.1209***	0.0241	0.1866***	1				
$(FA/TA)_{it}$	-0.2682***	-0.7392***	-0.0099	-0.6716***	-0.0890***	1			
$(CF/FA)_{it} \times FF_i$	0.0569	0.2577***	-0.0640***	-0.1687***	-0.0877***	-0.1623***	1		
$(CF/FA)_{it} \times Lumpy_i$	0.1794***	0.8079***	0.0920***	0.5149***	0.1133***	-0.7511***	0.1454***	1	
$(CF/FA)_{it} \times Rights_i$	0.2958***	0.8137***	0.1509***	0.4747***	0.0805***	-0.6955***	0.1852***	0.8614***	1

Table 6. Parameter estimates from cross-sectional regression on the determinants of cash holdings – H1 and H2

This table reports the results obtained from estimating a cross-sectional regression on the determinants of cash holdings. OLS coefficients are presented. The data are draw from the 2004 to 2013 Amadeus files. Values enclosed in parentheses are the *t* statistics for coefficients. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. The variables used to test H1 and H2 were described in detail in section 3.2.3. as follows. The dependent variable, level of cash holdings measured by cash to beginning-of-period total assets (*CH/TA*). The independent variables include natural log of total assets (*LnTA*), operating cash flow to beginning-of-period total assets (*CF/TA*), sales growth, total debt to beginning-of-period total assets (*TD/TA*), capital expenditure to beginning-of-period total assets (*CAPEX/TA*).

Panel A: Parameter estimates from cross-sectional regression on the determinants of cash holdings - subsidiaries of business groups subsample

Independent Variable	
Constant	0.480***
	(4.59)
LnTA	-0.0404***
	(-3.67)

Panel B: Parameter estimates from cross-sectional regression on the determinants of cash holdings - comparable stand-alone subsample

Independent Variable	
Constant	0.683***
	(5.51)
LnTA	-0.0596***
	(-4.25)

CF/TA	0.122***	CF/TA	0.0543***
	(5.11)		(3.76)
Sales growth	0.0279***	Sales growth	0.0558***
	(3.09)		(5.24)
TD/TA	0.000747***	TD/TA	0.00532
	(3.31)		(0.70)
CAPEX/TA	-0.0507***	CAPEX/TA	-0.0389**
	(-3.60)		(-2.42)
Observations	5088	Observations	5088
R^2	0.092	R^2	0.099

Table 7. Parameter estimates from cross-sectional regression on the determinants of target debt ratio – H1 and H2

This table reports the results obtained from estimating equation $\left[D/A\right]^*_{it} = \beta_0 + \sum_{j=1}^{n} \beta_j X_{itj} + \varepsilon_{it}$. OLS coefficients are presented. The data are draw from the 2004 to 2013 Amadeus files. Values enclosed in parentheses are the *t* statistics for coefficients. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. The variables used to test H1 and H2 were described in detail in section 3.2.3. as follows. The dependent variable, leverage ratio measured by the total debt minus cash to beginning-of-period total assets. The independent variables include natural log of total assets (*size*), fixed assets to beginning-of-period total assets (*tangibility*), cash flow to beginning-of-period total assets (*profitability*), market-to-book (*growth opportunities*), total tax to total taxable income (*effective tax rate*), depreciation to beginning-of-period total assets (*non-debt tax shield*).

Panel A: Parameter estimates from cross-sectional regression on the determinants of target debt ratio - subsidiaries of business groups subsample		Panel B: Parameter estimates from cross-sectional regression on the determinants of target debt ratio - comparable stand-alone subsample	
Independent Variable		Independent Variable	
Constant	-0.937***	Constant	-0.801***
	(-6.21)		(-5.83)
IndMed	0.0524*	IndMed	0.345***
	(1.77)		(7.76)
Size (lnTA)	0.129***	Size (lnTA)	0.0962***
	(8.13)		(6.79)
Tangibility	0.354***	Tangibility	0.397***
	(10.08)		(9.92)
Profitability	0.196***	Profitability	0.237***
	(3.82)		(3.90)
Growth opportunities	0.0136***	Growth opportunities	0.0122***
	(15.53)		(13.21)
Effective tax rate	0.0572**	Effective tax rate	0.104***
	(2.42)		(3.51)
Non-debt tax shield	0.323	Non-debt tax shield	-0.0466
	(1.20)		(-0.19)
Observations	5283	Observations	4230
R^2	0.248	R^2	0.296

Table 8. Parameter estimates from panel regressions on the determinants of corporate investment – Eq. (1) – H1 and H2

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 have only a marginal impact on the LSDVC estimates, we used the AH Anderson and Hsiao (1981) initialization); and, (4) Everaert and Pozzi (2007) and De Vos *et al.* (2015) bootstrap-based bias-corrected FE (BCFE) with the 'wboot' resampling scheme that performs a wild bootstrap that allows for general heteroscedasticity. We estimated two alternative empirical model specifications: (*i*) including a proxy for the degree of assets lumpiness and its relationship with the cash flow-to-fixed assets $\left[\left(CF/FA\right)_{it} \times Lumpy_i\right]$ reported in columns 2 to 5; and (ii) including a proxy for the level of investors protection and its relationship with the cash flow-to-fixed assets $\left[\left(CF/FA\right)_{it} \times Rights_i\right]$, reported in columns 6 to 9. The data were draw from the 2004 to 2013 Amadeus files. Variables definitions are listed in subsection 3.2.3. A firm was classified as *FFi* if: (i) the deviation is larger than 5%; and (ii) the firm was in a 'financially flexible' status, for at least three consecutive time periods. The final three pairs of rows report results for the AR(2) test for the null hypothesis of no second-order serial correlation and Sargan and Hansen tests 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 - subsidiaries of business groups subsample

Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	0.138** (2.23)	2.216*** (6.51)	0.0676*** (3.72)	0.158*** (7.38)	0.135** (2.18)	2.174*** (6.26)	0.0663*** (3.58)	0.156*** (6.94)
$\left(I/FA\right)^2_{it-1}$	-0.0846*** (-2.61)	-1.196*** (-6.85)			-0.0843*** (-2.60)	-1.177*** (-6.66)		
$\left(CF/FA\right)_{it}$	0.157*** (3.17)	0.136** (2.40)	0.169*** (4.16)	0.169*** (2.83)	0.155*** (3.11)	0.115** (2.12)	0.169*** (4.13)	0.169*** (2.62)
$MtoB_{it}$	-0.000269 (-0.13)	0.000873 (0.35)	0.000380 (0.16)	-0.00167 (-0.74)	-0.000194 (-0.09)	0.000888 (0.35)	0.000438 (0.19)	-0.00165 (-0.63)
$\left(D/FA\right)_{it}$	0.219*** (6.74)	0.0649** (2.54)	0.212*** (6.92)	0.228*** (5.73)	0.219*** (6.76)	0.0533** (2.33)	0.212*** (6.94)	0.228*** (5.99)
CK_{it}	1.085*** (3.86)	0.420 (1.24)	1.131*** (4.07)	1.098*** (3.45)	1.088*** (3.86)	0.324 (0.97)	1.136*** (4.08)	1.101*** (4.09)
$\left(FA/TA\right)_{it}$	-1.463*** (-12.31)	-0.584*** (-9.08)	-1.371*** (-12.26)	-1.539*** (-9.69)	-1.438*** (-11.79)	-0.525*** (-8.88)	-1.356*** (-11.87)	-1.525*** (-9.85)
$\left(CF/FA\right)_{it} \times FF_i$	-0.0885** (-2.05)	-0.0950** (-2.08)	-0.0891** (-2.21)	-0.123** (-1.98)	-0.0898** (-2.08)	-0.0971** (-2.14)	-0.0888** (-2.20)	-0.124** (-2.17)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.109** (2.10)	-0.198*** (-3.20)	0.0730 (1.53)	0.0303 (0.45)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.173** (2.10)	-0.185 (-1.58)	0.104 (1.30)	0.0520 (0.44)
Constant	0.192** (2.40)				0.181** (2.26)			
Observations	4175	4175	4175	3245	4175	4175	4175	3245
R^2	0.179				0.179			
AR(2) test		-1.009 [0.313]				-0.910 [0.363]		
Sargan		52.456 [0.022]				49.794 [0.039]		
Hansen		28.111 [0.751]				26.849 [0.804]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 8. Parameter estimates from panel regressions on the determinants of corporate investment – Eq. (1) – H1 and H2 (Cont.)

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
$\left(I/FA\right)_{it-1}$	0.138** (2.09)	1.605*** (6.09)	0.0852*** (3.69)	0.0838** (2.13)	0.135* (1.94)	1.659*** (5.89)	0.0849*** (3.71)	0.0906** (2.06)
$\left(I/FA\right)^2_{it-1}$	-0.0754** (-2.14)	-0.911*** (-6.38)			-0.0741** (-2.09)	-0.941*** (-6.37)		
$\left(CF/FA\right)_{it}$	0.449*** (5.57)	0.404*** (4.86)	0.474*** (5.78)	0.401*** (4.36)	0.450*** (5.46)	0.338*** (3.79)	0.479*** (5.78)	0.413*** (4.89)
$MtoB_{it}$	-0.00277 (-1.12)	0.00508* (1.71)	-0.00216 (-0.81)	-0.00385 (-1.45)	-0.00274 (-1.11)	0.00578* (1.89)	-0.00210 (-0.80)	-0.00373* (-1.68)
$\left(D/FA\right)_{it}$	0.235***	0.0939***	0.223***	0.262***	0.230***	0.0790***	0.220***	0.259***

	(5.52)	(3.99)	(5.49)	(7.23)	(5.37)	(3.67)	(5.40)	(5.90)
CK_{it}	-0.359 (-0.82)	-1.383*** (-3.35)	-0.185 (-0.42)	-0.185 (-0.40)	-0.376 (-0.86)	-1.479*** (-3.55)	-0.192 (-0.43)	-0.193 (-0.43)
$\left(FA/TA\right)_{it}$	-1.191*** (-6.89)	-0.335*** (-5.13)	-1.092*** (-6.82)	-0.920*** (-5.66)	-1.180*** (-6.69)	-0.263*** (-4.27)	-1.088*** (-6.75)	-0.920*** (-5.19)
$\left(CF/FA\right)_{it} \times FF_i$	-0.187*** (-2.88)	-0.180*** (-3.39)	-0.188*** (-2.59)	-0.0848 (-1.08)	-0.187*** (-2.86)	-0.169*** (-3.10)	-0.188*** (-2.60)	-0.0840 (-0.88)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.218** (2.43)	-0.360*** (-4.24)	0.132 (1.41)	0.125 (1.16)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.281* (1.94)	-0.414** (-2.28)	0.140 (1.08)	0.0613 (0.38)
Constant	0.0146 (0.13)				0.0271 (0.23)			
Observations	2414	2414	2414	1917	2414	2414	2414	1917
R^2	0.212				0.211			
AR(2) test		0.607 [0.544]				0.688 [0.492]		
Sargan		134.347 [0.000]				132.743 [0.000]		
Hansen		69.589 [0.000]				71.296 [0.000]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 9 - Parametric and non-parametric tests for equality of means between the variables used to test H3 in the subsidiaries of business groups and stand-alone subsamples

The variables used to test H3 were described in detail in section 3.2.3. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively. To test if subsidiary firms integrating active ICMs experience a lower suboptimality of corporate investment expenditures, in the form of either under or over-investment, than single segment 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 financial slack – is closer to zero for subsidiaries when compared with stand-alone firms.

Differences in means of the variables used to test the suboptimality of corporate investment expenditures of both subsidiaries and comparable stand-alone firms						
	Mean					
	Subsidiaries subsample	Stand-alone subsample	Two sided t-test (Equality Test)	One sided t-test (statistically significant difference in the means) for:	Wilcoxon-Mann-Whitney test (Stand-alone mean of variable x ==	Wilcoxon-Mann-Whitney test - probability that a random draw from the first population (stand-alone) is larger than a

					Subsidiaries mean of variable x)	random draw from the second population
$\ln(Level\_Growth\_Opport)_{it}$	9.3945	9.4832	-1.2686		0.990	0.508
$\ln(Amount\_Funding)_{it}$	7.0273	6.7414	7.7708***	diff > 0***	-7.446***	0.448
$\ln(Suboptimality\_InvExp)_{it}$	9.4407	9.4791	-0.5261		-0.616	0.494

Test if means of corporate investment expenditures suboptimality, of both subsidiaries and comparable stand-alone firms, are statistically different from zero		
	Mean	ttest
$Subsidiaries\_\ln(Suboptimality\_InvExp)_{it}$	9.4407	164.7146***
$Stand-alone\_\ln(Suboptimality\_InvExp)_{it}$	9.4791	209.2795***

Table 10 - Non-parametric tests for equality of medians between the variables used to test H4 in the subsidiaries of business groups and stand-alone subsamples

The variables used to test H4 were described in detail in section 3.2.3. *, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively.

	Differences in medians in the investment expenditure of both subsidiaries and comparable stand-alone firms with good growth opportunities			Differences in medians in the investment expenditure of both subsidiaries and comparable stand-alone firms with poor growth opportunities		
	Median			Median		
	Subsidiaries subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test	Subsidiaries subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test
$MtoB\_Sample\_Median$	5.4620	4.2882	336.0068***	5.4620	4.2882	332.0068***
$MtoB_i\_Firm\_Median$	10.0000	8.2927	12.8277***	2.6373	2.2472	3.0380*
$\left(I/FA\right)_i Firm\_Median$	0.1852	0.1563	1.9907	0.1331	0.1295	0.0119

Table 11. Parameter estimates from panel regressions on the determinants of corporate investment – using the *SGR* as a surrogate for growth opportunities in Eq. (1) – Robustness H1 and H2

This table summarizes the estimations on the determinants of corporate investment for both a subsample of subsidiaries of business groups and a subsample of pure-play stand-alone firms conducting a robustness check using the SGR as a surrogate for growth opportunities.

	Panel A: Parameter estimates from panel regressions on the determinants of investment - subsidiaries of business groups 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
$\left(I/FA\right)_{it-1}$	0.133** (2.17)	2.181*** (6.40)	0.0643*** (3.56)	0.150*** (5.79)	0.144** (2.16)	1.612*** (6.09)	0.0860*** (3.76)	0.0848** (1.97)
$\left(I/FA\right)^2_{it-1}$	-0.0830*** (-2.59)	-1.179*** (-6.74)			-0.0768** (-2.17)	-0.912*** (-6.36)		
$\left(CF/\ldots\right)$	0.251***	0.206***	0.264***	0.254***	0.516***	0.477***	0.464***	0.396***

	(4.15)	(3.32)	(6.21)	(2.62)	(5.04)	(5.41)	(5.77)	(3.47)
SGR_{it}	-1.469** (-2.52)	-0.898*** (-2.82)	-1.404*** (-5.87)	-1.328 (-1.39)	-1.264 (-1.27)	-1.248* (-1.78)	0.353 (0.72)	0.142 (0.24)
$\left(D/FA\right)_{it}$	0.221*** (7.02)	0.0571** (2.22)	0.217*** (7.17)	0.229*** (5.83)	0.237*** (5.57)	0.0994*** (4.22)	0.218*** (5.41)	0.259*** (6.68)
CK_{it}	1.197*** (4.18)	0.570* (1.65)	1.264*** (4.54)	1.209*** (4.31)	-0.284 (-0.65)	-1.295*** (-3.17)	-0.220 (-0.50)	-0.175 (-0.44)
$\left(FA/TA\right)_{it}$	-1.392*** (-11.82)	-0.555*** (-8.78)	-1.307*** (-11.60)	-1.485*** (-10.50)	-1.125*** (-6.21)	-0.294*** (-4.59)	-1.097*** (-6.97)	-0.898*** (-4.92)
$\left(CF/FA\right)_{it} \times FF_i$	-0.0891** (-2.10)	-0.0987** (-2.16)	-0.0891** (-2.22)	-0.120** (-2.35)	-0.188*** (-2.89)	-0.197*** (-3.64)	-0.185*** (-2.58)	-0.0831 (-1.12)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.107** (2.10)	-0.194*** (-3.15)	0.0721 (1.51)	0.0310 (0.50)	0.212** (2.39)	-0.368*** (-4.29)	0.106 (1.10)	0.113 (1.15)
Constant	0.163** (2.09)				-0.0285 (-0.24)			
Observations	4175	4175	4175	3245	2414	2414	2414	1917
R^2	0.190				0.214			
AR(2) test		-1.018 [0.309]				0.626 [0.531]		
Sargan		55.695 [0.011]				136.418 [0.000]		
Hansen		29.786 [0.674]				71.275 [0.000]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 12. Parameter estimates from panel regressions on the determinants of corporate investment – using an alternative measure of g_{it} for Eq. (1) – Robustness H1 and H2

This table summarizes the estimations on the determinants of corporate investment for both a subsample of subsidiaries of business groups and a subsample of pure-play stand-alone firms conducting a robustness check estimating g_{it}, using the median of the geometric growth rate of total payout as a percentage of market value, according to the data obtained through a Meta-Analysis.

Panel A: Parameter estimates from panel regressions on the determinants of investment - subsidiaries of business groups 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
$\left(I/FA\right)_{it-1}$	0.139** (2.24)	2.214*** (6.49)	0.0678*** (3.72)	0.158*** (7.42)	0.138** (2.09)	1.604*** (6.09)	0.0856*** (3.70)	0.0841** (2.14)
$\left(I/FA\right)^2_{it-1}$	-0.0851*** (-2.62)	-1.195*** (-6.82)			-0.0749** (-2.13)	-0.911*** (-6.38)		

$\left(CF/FA\right)_{it}$	0.154*** (3.11)	0.132** (2.33)	0.167*** (4.10)	0.168*** (2.78)	0.450*** (5.56)	0.397*** (4.76)	0.475*** (5.79)	0.401*** (4.33)
$MtoB\_Meta_{it}$	-0.00244 (-0.98)	0.00136 (0.49)	-0.00171 (-0.65)	-0.00239 (-0.97)	-0.00325 (-1.23)	0.00673** (2.05)	-0.00275 (-0.97)	-0.00426 (-1.44)
$\left(D/FA\right)_{it}$	0.221*** (6.81)	0.0660*** (2.60)	0.215*** (7.05)	0.231*** (5.70)	0.234*** (5.51)	0.0913*** (3.84)	0.222*** (5.46)	0.261*** (7.13)
CK_Meta_{it}	1.030*** (3.59)	0.402 (1.15)	1.087*** (3.96)	1.102*** (3.27)	-0.339 (-0.77)	-1.406*** (-3.38)	-0.168 (-0.37)	-0.224 (-0.47)
$\left(FA/TA\right)_{it}$	-1.472*** (-12.19)	-0.587*** (-9.17)	-1.376*** (-12.32)	-1.544*** (-9.83)	-1.201*** (-6.94)	-0.340*** (-5.19)	-1.099*** (-6.81)	-0.928*** (-5.69)
$\left(CF/FA\right)_{it} \times FF_i$	-0.0900** (-2.09)	-0.0959** (-2.11)	-0.0901** (-2.22)	-0.125** (-2.01)	-0.188*** (-2.88)	-0.175*** (-3.31)	-0.189*** (-2.60)	-0.0863 (-1.10)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.109** (2.11)	-0.198*** (-3.21)	0.0742 (1.55)	0.0301 (0.46)	0.216** (2.39)	-0.354*** (-4.16)	0.130 (1.39)	0.120 (1.11)
Constant	0.202** (2.48)				0.0204 (0.17)			
Observations	4175	4175	4175	3245	2414	2414	2414	1917
R^2	0.179				0.212			
AR(2) test		-1.024 [0.306]				0.668 [0.504]		
Sargan		52.354 [0.023]				134.334 [0.000]		
Hansen		27.998 [0.756]				69.027 [0.000]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 13. Parameter estimates from panel regressions on the determinants of corporate investment – classifying a firm as FF_i if the firm was in a ‘financially flexible’ status, for at least two (instead of three) consecutive time periods, in Eq. (1) – Robustness H1 and H2

This table summarizes the estimations on the determinants of corporate investment for both a subsample of subsidiaries of business groups and a subsample of pure-play stand-alone firms conducting a robustness check classifying a firm as *FFi* if the firm was in a ‘financially flexible’ status, for at least two (instead of three) consecutive time periods.

Panel A: Parameter estimates from panel regressions on the determinants of investment - subsidiaries of business groups subsample

Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
$\left(I/FA\right)_{it-1}$	0.140** (2.25)	2.219*** (6.49)	0.0677*** (3.73)	0.159*** (7.36)	0.137** (2.21)	2.180*** (6.25)	0.0664*** (3.60)	0.157*** (6.46)
$(\ \ )^2$	-0.0854***	-1.198***			-0.0852***	-1.180***		

	(-2.63)	(-6.83)			(-2.63)	(-6.65)		
$\left(CF/FA\right)_{it}$	0.156*** (3.16)	0.135** (2.41)	0.168*** (4.15)	0.167*** (2.82)	0.154*** (3.10)	0.116** (2.13)	0.168*** (4.11)	0.167*** (2.77)
$MtoB_{it}$	-0.000269 (-0.13)	0.000860 (0.34)	0.000380 (0.16)	-0.00161 (-0.72)	-0.000194 (-0.09)	0.000879 (0.35)	0.000437 (0.19)	-0.00160 (-0.64)
$\left(D/FA\right)_{it}$	0.219*** (6.74)	0.0649** (2.52)	0.212*** (6.93)	0.228*** (5.68)	0.220*** (6.75)	0.0531** (2.31)	0.213*** (6.95)	0.228*** (6.47)
CK_{it}	1.080*** (3.84)	0.415 (1.23)	1.123*** (4.04)	1.081*** (3.39)	1.083*** (3.84)	0.320 (0.95)	1.129*** (4.05)	1.084*** (3.84)
$\left(FA/TA\right)_{it}$	-1.460*** (-12.30)	-0.585*** (-9.11)	-1.368*** (-12.16)	-1.530*** (-9.70)	-1.435*** (-11.78)	-0.527*** (-8.90)	-1.353*** (-11.78)	-1.518*** (-10.47)
$\left(CF/FA\right)_{it} \times FF_i$	-0.0694* (-1.73)	-0.0928** (-2.03)	-0.0697* (-1.84)	-0.0879* (-1.65)	-0.0704* (-1.75)	-0.0970** (-2.15)	-0.0692* (-1.82)	-0.0882* (-1.81)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.108** (2.08)	-0.196*** (-3.18)	0.0719 (1.51)	0.0279 (0.42)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.171** (2.07)	-0.184 (-1.57)	0.101 (1.28)	0.0464 (0.35)
Constant	0.190** (2.38)				0.180** (2.25)			
Observations	4175	4175	4175	3245	4175	4175	4175	3245
R^2	0.179				0.179			
AR(2) test		-1.005 [0.315]				-0.907 [0.365]		
Sargan		52.849 [0.021]				50.120 [0.037]		
Hansen		28.315 [0.742]				27.037 [0.796]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 13. Parameter estimates from panel regressions on the determinants of corporate investment – classifying a firm as FF_i if the firm was in a 'financially flexible' status, for at least two (instead of three) consecutive time periods, in Eq. (1) – Robustness H1 and H2 (Cont.)

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
$\left(I/FA\right)_{it-1}$	0.138** (2.09)	1.606*** (6.13)	0.0853*** (3.71)	0.0822** (1.98)	0.133* (1.93)	1.653*** (5.96)	0.0842*** (3.70)	0.0875* (1.87)
$\left(I/FA\right)^2_{it-1}$	-0.0752** (-2.14)	-0.909*** (-6.43)			-0.0736** (-2.08)	-0.935*** (-6.44)		

$\left(CF/FA\right)_{it}$	0.473*** (5.80)	0.402*** (4.83)	0.499*** (6.25)	0.425*** (3.98)	0.473*** (5.67)	0.341*** (3.75)	0.503*** (6.22)	0.436*** (3.91)
$MtoB_{it}$	-0.00278 (-1.14)	0.00504* (1.70)	-0.00218 (-0.82)	-0.00373* (-1.75)	-0.00275 (-1.13)	0.00575* (1.89)	-0.00213 (-0.81)	-0.00363 (-1.42)
$\left(D/FA\right)_{it}$	0.232*** (5.45)	0.0957*** (4.09)	0.219*** (5.40)	0.259*** (7.13)	0.227*** (5.30)	0.0813*** (3.82)	0.216*** (5.31)	0.256*** (7.44)
CK_{it}	-0.379 (-0.87)	-1.359*** (-3.32)	-0.214 (-0.48)	-0.192 (-0.47)	-0.395 (-0.91)	-1.462*** (-3.54)	-0.221 (-0.50)	-0.200 (-0.40)
$\left(FA/TA\right)_{it}$	-1.202*** (-6.96)	-0.344*** (-5.22)	-1.103*** (-6.89)	-0.935*** (-5.95)	-1.188*** (-6.74)	-0.271*** (-4.41)	-1.097*** (-6.80)	-0.933*** (-5.64)
$\left(CF/FA\right)_{it} \times FF_i$	-0.225*** (-3.71)	-0.154*** (-3.03)	-0.230*** (-3.49)	-0.142** (-2.07)	-0.228*** (-3.73)	-0.145*** (-2.85)	-0.232*** (-3.52)	-0.143** (-2.16)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.216** (2.41)	-0.357*** (-4.19)	0.129 (1.38)	0.125 (1.28)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.289** (2.01)	-0.415** (-2.30)	0.146 (1.13)	0.0746 (0.48)
Constant	0.0225 (0.19)				0.0331 (0.28)			
Observations	2414	2414	2414	1917	2414	2414	2414	1917
R^2	0.215				0.215			
AR(2) test		0.640 [0.522]				0.717 [0.474]		
Sargan		131.530 [0.000]				130.351 [0.000]		
Hansen		69.215 [0.000]				70.599 [0.000]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 14. Parameter estimates from panel regressions on the determinants of corporate investment – classifying a firm as FF_i based only on the decision to adopt a low leverage pattern, in Eq. (1) – Robustness H1 and H2

This table summarizes the estimations on the determinants of corporate investment for both a subsample of subsidiaries of business groups and a subsample of pure-play stand-alone firms conducting a robustness check classifying a firm as *FFi* based only on the decision to adopt a low leverage pattern.

Panel A: Parameter estimates from panel regressions on the determinants of investment - subsidiaries of business groups subsample

Independent Variables	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE	Panel Data Fixed Effects Model	Blundell & Bond	LSDVC	BCFE
[illegible]	0.143**	2.242***	0.0692***	0.166***	0.141**	2.198***	0.0680***	0.164***

	(2.29)	(6.42)	(3.74)	(5.62)	(2.27)	(6.24)	(3.65)	(5.51)
$\left(I/FA\right)^2_{it-1}$	-0.0872*** (-2.68)	-1.209*** (-6.76)			-0.0871*** (-2.68)	-1.189*** (-6.65)		
$\left(CF/FA\right)_{it}$	0.157*** (3.09)	0.137** (2.38)	0.171*** (4.15)	0.171** (2.53)	0.157*** (3.09)	0.116** (2.09)	0.172*** (4.14)	0.171*** (2.58)
$MtoB_{it}$	-0.000287 (-0.14)	0.000777 (0.31)	0.000319 (0.14)	-0.00180 (-0.73)	-0.000237 (-0.11)	0.000764 (0.30)	0.000368 (0.16)	-0.00179 (-0.72)
$\left(D/FA\right)_{it}$	0.224*** (6.99)	0.0655** (2.43)	0.218*** (7.15)	0.234*** (5.73)	0.225*** (7.02)	0.0536** (2.24)	0.219*** (7.16)	0.234*** (5.78)
CK_{it}	1.096*** (3.89)	0.406 (1.19)	1.129*** (4.06)	1.081*** (3.50)	1.102*** (3.90)	0.309 (0.92)	1.135*** (4.08)	1.084*** (3.54)
$\left(FA/TA\right)_{it}$	-1.448*** (-12.20)	-0.575*** (-8.97)	-1.360*** (-12.12)	-1.536*** (-13.22)	-1.426*** (-11.76)	-0.515*** (-8.63)	-1.346*** (-11.78)	-1.516*** (-12.42)
$\left(CF/FA\right)_{it} \times FF_i$	-0.0159 (-0.24)	-0.0589 (-1.39)	-0.0508 (-0.64)	-0.168* (-1.92)	-0.0357 (-0.49)	-0.0622 (-1.51)	-0.0599 (-0.72)	-0.180* (-1.87)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.103* (1.86)	-0.196*** (-3.16)	0.0746 (1.53)	0.0460 (0.76)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.173* (1.81)	-0.175 (-1.47)	0.114 (1.33)	0.0932 (0.82)
Constant	0.178** (2.27)				0.169** (2.14)			
Observations	4175	4175	4175	3245	4175	4175	4175	3245
R^2	0.178				0.178			
AR(2) test		-0.998 [0.318]				-0.901 [0.368]		
Sargan		51.778 [0.026]				49.587 [0.041]		
Hansen		27.686 [0.769]				26.629 [0.812]		
Time and Industry dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 14. Parameter estimates from panel regressions on the determinants of corporate investment – classifying a firm as FF_i based only on the decision to adopt a low leverage pattern, in Eq. (1) – Robustness H1 and H2 (Cont.)

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
$\left(I/FA\right)$	0.143**	1.603***	0.0850***	0.0850	0.139**	1.656***	0.0843***	0.0909*

	(2.16)	(6.02)	(3.70)	(1.64)	(1.99)	(5.80)	(3.71)	(1.84)
$\left(I/FA\right)^2_{it-1}$	-0.0778**	-0.913***			-0.0765**	-0.940***		
	(-2.22)	(-6.29)			(-2.16)	(-6.26)		
$\left(CF/FA\right)_{it}$	0.520***	0.336***	0.537***	0.485***	0.523***	0.260***	0.543***	0.497***
	(5.29)	(3.79)	(6.32)	(3.88)	(5.28)	(2.83)	(6.34)	(4.78)
$MtoB_{it}$	-0.00299	0.00562*	-0.00239	-0.00425*	-0.00296	0.00631**	-0.00235	-0.00414*
	(-1.19)	(1.88)	(-0.90)	(-1.86)	(-1.18)	(2.05)	(-0.88)	(-1.66)
$\left(D/FA\right)_{it}$	0.261***	0.109***	0.248***	0.276***	0.257***	0.0988***	0.245***	0.273***
	(6.17)	(4.40)	(5.98)	(8.00)	(6.05)	(4.21)	(5.89)	(5.67)
CK_{it}	-0.375	-1.350***	-0.184	-0.185	-0.391	-1.417***	-0.190	-0.192
	(-0.86)	(-3.37)	(-0.42)	(-0.50)	(-0.90)	(-3.54)	(-0.43)	(-0.38)
$\left(FA/TA\right)_{it}$	-1.198***	-0.346***	-1.098***	-0.951***	-1.186***	-0.284***	-1.093***	-0.952***
	(-6.77)	(-5.22)	(-6.89)	(-4.89)	(-6.58)	(-4.47)	(-6.80)	(-4.87)
$\left(CF/FA\right)_{it} \times FF_i$	-0.286**	-0.0518	-0.270***	-0.253*	-0.291**	-0.0138	-0.273***	-0.254*
	(-2.25)	(-0.93)	(-2.86)	(-1.92)	(-2.28)	(-0.23)	(-2.91)	(-1.83)
$\left(CF/FA\right)_{it} \times Lumpy_i$	0.209**	-0.357***	0.126	0.114				
	(2.33)	(-4.16)	(1.34)	(1.11)				
$\left(CF/FA\right)_{it} \times Rights_i$					0.274*	-0.429**	0.138	0.0554
					(1.86)	(-2.32)	(1.06)	(0.33)
Constant	-0.0244				-0.0137			
	(-0.21)				(-0.12)			
Observations	2414	2414	2414	1917	2414	2414	2414	1917
R^2	0.211				0.211			
AR(2) test		0.610				0.676		
		[0.542]				[0.499]		
Sargan		134.056				131.862		
		[0.000]				[0.000]		
Hansen		69.490				71.180		
		[0.000]				[0.000]		
Year dummies	Yes	Yes		Yes	Yes	Yes		Yes

Table 15 - Non-parametric tests for equality of medians between the variables used to test H3 in the subsidiaries of business groups and stand-alone subsamples - Robustness H3

*, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively.

Differences in medians of the variables used to test the suboptimality of corporate investment expenditures of both subsidiaries and comparable stand-alone firms

	Median		
	Subsidiaries subsample	Stand-alone subsample	Wilcoxon-Mann-Whitney test
$\ln(Level\_Growth\_Opport)_{it}$	9.6266	9.6479	0.0445
$\ln(Amount\_Funding)_{it}$	7.0678	6.8356	36.7368***
$\ln(Suboptimality\_InvExp)_{it}$	9.6181	9.6906	1.5403

Table 16 – Parametric and non-parametric tests for equality of means between the variables used to test H4 in the subsidiaries of business groups and stand-alone subsamples – Robustness H4

*, ** and *** indicate significance of the coefficients at 10%, 5% and 1% level, respectively.

Differences in means in the investment expenditure of both subsidiaries and comparable stand-alone firms with good growth opportunities

	Mean					
	Subsidiaries subsample	Stand-alone subsample	Two-sided t-test (Equality Test)	One sided t-test (statistically significant difference in the means) for:	Wilcoxon-Mann-Whitney test (Stand-alone mean of variable x == Subsidiaries mean 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
$MtoB\_Sample\_Median$	5.4620	4.2882			-18.412***	0.000
$MtoB_i\_Firm\_Median$	8.8304	5.3141	11.9842***	diff > 0***	-4.914***	0.352
$\left(I/FA\right)_i Firm\_Median$	0.2575	0.2306	0.8320		-1.189	0.463

Differences in medians in the investment expenditure of both subsidiaries and comparable stand-alone firms with poor growth opportunities

	Mean					
	Subsidiaries subsample	Stand-alone subsample	Two-sided t-test (Equality Test)	One sided t-test (statistically significant difference in the means) for:	Wilcoxon-Mann-Whitney test (Stand-alone mean of variable x == Subsidiaries mean 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
$MtoB\_Sample\_Median$	5.4620	4.2882			-18.303***	0.000
$MtoB_i\_Firm\_Median$	2.5580	2.1476	7.7784***	diff > 0***	-2.274**	0.428
$\left(I/FA\right)_i Firm\_Median$	0.1810	0.2027	-1.1576		0.156	0.505