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Essays on internal capital markets

by

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To the memory of my father and to my mother

Biographical note

Tiago de Pinho Pereira was born on May 31st, 1988, in Porto, Portugal.

In 2006, he started his undergraduate studies in Economics at FEP – School of Economics and Management, University of Porto and he graduated in 2009. In the same year, he started his master’s degree in Finance also at FEP. He finished his Master in Finance in 2011, with a dissertation entitled “Is There a Berlin Wall in Post-Issue Operating Performance of European IPOs”, where he studied the post-IPO operating performance of a sample of European companies and found that there were differences in operating performance between firms headquartered in western and eastern European countries.

A paper based on his dissertation was presented, in 2012, at three conferences: the 19th Annual Conference of the Multinational Finance Society, held in Kraków, Poland, the 7th Finance Conference of the Multinational Finance Network, held in Aveiro, and the 2012 Financial Management Association Annual Meeting, held in Atlanta, USA. In 2017, a final version of the paper was published in the *International Journal of Finance and Economics*.

In 2011, he started working at Banco de Portugal. At first, in Lisbon, at the Sectoral Analysis Unit of the Central Balance Sheet Database and, afterwards, in Porto, at the Balance Sheet Analysis Unit of the Central Balance Sheet Database, where he still develops his professional activity. Throughout his time at Banco de Portugal, he helped co-writing several publications, namely some Central Balance Sheet Studies and some papers presented in national and international conferences. He also performed quality control of data reported by firms to the central bank, developed tools for the improvement of internal processes and provided mentoring.

Somewhere in between of his intense professional and caregiving activities, he never let the passion for academic research die. He entered the Doctoral Programme in Economics at FEP in 2013 and always struggled to finish this PhD thesis.

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Abstract

This Doctoral Thesis is composed by three essays and uses data from Portuguese non-financial corporations available at Banco de Portugal.

The first essay, in Chapter 2, assesses the impact of the 2008 global financial crisis and the following sovereign debt crisis on firms' operating performance, measured by EBITDA/Total Assets, through an event study. Business group firms didn't decline their operating performance so much as stand-alone firms after the crises. To reach this conclusion, business group firms are compared with matched stand-alone firms in terms of industry classification and level of operating performance. Then, using Ordinary Least Squares (OLS) with industry fixed effects, some hypotheses to explain this higher operating performance of business group firms are tested, namely the amount of business group cash holdings, total and related diversification. and the existence of intra-group loans, with business group cash holdings being the one with most explanatory power.

The second essay, in Chapter 3, relates business group firms and a sample of comparable stand-alone counterparts and focus on the likelihood of being financially constrained, capital expenditures, investment-cash flow sensitivity and cash-cash flow sensitivity. The sample of stand-alone firms is generated using propensity score matching methods. Using logit regressions, we find that stand-alone firms are more financially constrained than business group firms. Moreover, results for panel data regressions demonstrate that business group membership positively impacts investment and that stand-alone firms rely more on their own cash flows to invest as they present higher investment-cash flow sensitivities than business group firms. Finally, we also investigate the role of business group affiliation on the change of cash holdings and demonstrate that being a group member decreases the level of cash holdings.

The third essay, in Chapter 4, analyses the impact of business group affiliation on market concentration, entry and exit of recent entrants, but now using industries rather than firms as observations in the panel data regressions. It is observed that the market share of business group firms decreases market concentration, measured by the four-firm concentration ratio (CR4). Then, we find a U-shaped relationship between the market share of business group firms and entry. In addition, we show that the cash held by the business groups of entrant firms also encourages entry. Concerning the exit of recent entrants, data show that it is not

impacted by the presence of business groups, but by other industry-level factors such as profitability and capital intensity.

JEL Classification: G01; G32; G38; L11; L25; L41

Keywords: Business groups, cash-cash flow sensitivity, cash holdings, diversification, entry, exit, financial constraints, financial crisis, internal capital markets, intra-group loans, investment-cash flow sensitivity, market concentration, operating performance, product market competition

Resumo

Esta Tese de Doutoramento é composta por três ensaios e utiliza dados do Banco de Portugal sobre sociedades não financeiras portuguesas.

O primeiro ensaio, no Capítulo 2, avalia o impacto da crise financeira global de 2008 e da crise da dívida soberana que lhe sucedeu na performance operacional das empresas através de um estudo de eventos, com a performance operacional a ser medida pelo rácio EBITDA/Total do Ativo. As empresas integradas em grupos económicos apresentam um declínio menos acentuado da sua performance operacional do que as empresas não integradas em grupos económicos. Para a obtenção desta conclusão, as empresas integradas em grupos económicos são comparadas com empresas não integradas em grupos económicos que partilhem o mesmo setor de atividade e o mesmo nível de performance operacional. Depois, usando o método dos mínimos quadrados com efeitos fixos por setor, algumas hipóteses são testadas para explicar esta performance operacional superior, designadamente o montante de caixa do grupo económico, a diversificação total e relacionada, e a existência de empréstimos de grupo, com o montante de caixa do grupo económico a constituir a hipótese com maior poder explicativo.

O segundo ensaio, no Capítulo 3, relaciona as empresas integradas em grupos económicos com uma amostra de empresas não integradas em grupos comparáveis e concentra-se na probabilidade das empresas apresentarem restrições ao financiamento, nas despesas de capital, na sensibilidade do investimento ao fluxo de caixa e na sensibilidade da caixa ao fluxo de caixa. A amostra de empresas não integradas em grupos é gerada usando métodos de *propensity score matching*. Usando regressões logísticas, verificamos que as empresas não integradas em grupos apresentam maiores restrições ao financiamento do que as empresas integradas em grupos. Para além disso, os resultados das regressões com dados em painel demonstram que a pertença a um grupo económico impacta positivamente o investimento e que as empresas não integradas em grupos dependem mais dos seus próprios fluxos de caixa para investirem uma vez que apresentam uma sensibilidade do investimento ao fluxo de caixa superior à das empresas integradas em grupos. Finalmente, também investigamos o papel da pertença a um grupo económico na variação da caixa e demonstramos que a pertença a um grupo económico diminui o nível de caixa.

O terceiro ensaio, no Capítulo 4, analisa o impacto da pertença a um grupo económico na

concentração de mercado, entrada e saída de empresas que entraram recentemente, mas agora usando setores de atividade em vez de empresas como observações nas regressões com dados em painel. É observado que a quota de mercado das empresas integradas em grupos económicos diminui a concentração de mercado medida através do rácio de concentração das quatro empresas com maior quota de mercado. Depois, verificamos que existe uma relação em U entre a quota de mercado das empresas integradas em grupos e a entrada. Adicionalmente, mostramos que o montante de caixa do grupo económico também encoraja a entrada. Relativamente à saída de empresas que entraram recentemente, os dados mostram que ela não é impactada pela presença de grupos económicos, mas por outros fatores setoriais como a rentabilidade e a intensidade do capital.

Classificação JEL: G01; G32; G38; L11; L25; L41

Palavras-chave: Grupos económicos, sensibilidade da caixa ao fluxo de caixa, caixa, diversificação, entrada, saída, restrições ao financiamento, crise financeira, mercados de capital internos, empréstimos intra-grupo, sensibilidade do investimento ao fluxo de caixa, concentração de mercado, performance operacional, concorrência no mercado do produto

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1 Introduction

The global financial crisis of 2008 and the following sovereign debt crisis constitute the most important trigger for this thesis. At the time, the emergence of financial constraints or, at least, the emergence of news announcing some sort of credit market tightening induced the need for understanding how firms can escape these restrictions and pursue their operating activity without disruptions. This need combined with some evidence acquired in professional context that firms were borrowing more from intra-group counterparts led to the study of business groups and their internal capital markets.

Gertner e Scharfstein (2013) divide the literature on internal capital markets in three main research directions: one focusing on capital allocation, other concentrating on the consequences of incentives and rent-seeking behaviour, and the remaining on the workings of internal capital markets in business groups. The present investigation clearly approaches this last research stream and it is deeply influenced by Boutin et al. (2013) and Almeida et al. (2015), who also study the functioning of internal capital markets inside business groups.

The thesis comprises five chapters. Data are from Portuguese non-financial corporations and their source is Informação Empresarial Simplificada (IES), which is an annual mandatory survey conducted by Banco de Portugal, Portuguese Ministries of Finance and Justice, and Instituto Nacional de Estatística - INE (Statistics Portugal) and comprises the yearly financial statements from all the firms in Portugal and the annex to them. In the annex, information on the business group structure of each firm is available. The time span covers the years from 2008 to 2014.

Chapter 1 presents the motivations for the work and introduces the three essays that are developed in the next three chapters.

Chapter 2 compares the post-crisis operating performance of business groups and matched stand-alone firms and analyses the influence of business group membership on the performance of member firms. According to the literature review, four research hypotheses were posed. Hypothesis 1 (H1): Cash holdings of the entire business group positively impact the post-crisis operating performance of business group affiliates and Hypothesis 3 (H3): Intra-group loans positively impact the post-crisis operating performance of business group

affiliates are heavily inspired on the general assumption that internal capital markets are centrally managed and that the head of the business group or its managers have the ability of channelling funds from the least to the most profitable business group firms (winner-picking) or to the most troubled business group firms (cross-subsidisation) in order to guarantee the financial health of the whole business group and prevent some sort of contagion effects. On the other hand, Hypothesis 2 (H2): Diversification impacts the post-crisis operating performance of business group affiliates and Hypothesis 2a (H2a): Related diversification in more “performance-friendly” than unrelated diversification have the aim of providing an additional contribution to the rich, but controversial debate on the value of diversification. Older studies often refer the so-called “diversification discount” or “conglomerate discount”, meaning that more diversified firms are less profitable than less diversified firms (e.g., Campa and Kedia, 2002; Villalonga, 2004a; Villalonga, 2004b). However, more recent research suggests that diversification created value in the aftermath of the global financial crisis of 2008 (e.g., Maksimovic and Phillips, 2013; Rudolph and Schwetzler, 2013; Kuppuswamy and Villalonga, 2016). Furthermore, there are also studies that distinguish between related and unrelated diversification and find that related diversification is more profitable than unrelated diversification (Bettis, 1981; Rumelt, 1982; Palepu, 1985). Our results show that internal capital markets of business groups work given that the cash held by business groups positively impacts post-crisis operating performance. Moreover, intra-group loans also benefit post-crisis operating performance, but their effect is short-lived. Concerning diversification, we find that total diversification negatively impacts operating performance, while the contribution of related diversification is not so clear.

Chapter 3 shows the evolution of some categories of corporate spending, namely investment, proxied by capital expenditures, cash holdings and dividends after the beginning of the global financial crisis of 2008, assesses if stand-alone firms are more financially constrained than business group firms, and addresses the topics of the investment-cash flow sensitivity and the cash-cash flow sensitivity. Data exhibit that mean and median levels of investment deflated by net fixed assets decrease after the beginning of the global financial crisis of 2008, with the reduction being steeper in stand-alone firms. On the other hand, mean and median cash holdings deflated by net fixed assets increase, in particular in stand-alone firms, possibly due to precautionary motives. This empirical evidence, alongside with the extant literature on the matter (e.g., Almeida et al., 2015; Kuppuswamy and Villalonga, 2016), led to the formulation of Hypothesis 1 (H1): Business group firms are less financially constrained than

stand-alone firms and Hypothesis 2 (H2): Business group membership positively impacts investment in periods of crises. As a corollary for these two first hypotheses, two more are posed: Hypothesis 3 (H3): Stand-alone firms exhibit higher investment-cash flow sensitivities, because investment cash-flow sensitivity is often correlated with financial constraints and is typically larger for stand-alone firms (Hoshi et al., 1991; Shin and Park, 1999) and Hypothesis 4 (H4): Business group affiliation decreases cash savings, given that, due to the workings of internal capital markets, the funds of the entire business group can flow across member firms whenever needed. Our results demonstrate that being a business group firm decreases the likelihood of being financially constrained, using the Whited and Wu (2006) Index as the measure of financial constraints. Moreover, it is observed that business group affiliation has a positive impact on investment and that the investment-cash flow sensitivity is larger for stand-alone firms. Regarding the relationship between being a business group firm and the change in cash holdings, we find that business group membership negatively accounts for that change.

Chapter 4 examines the link between business groups and product market competition. In particular, their impact on market concentration, entry and exit of recent entrants. As referred by Khanna and Yafeh (2007), empirical evidence on this theme is “surprisingly scarce” and so we find it would be interesting to add some more conclusions. Conventional wisdom in the literature points out that business groups exert power and influence and so they are bad for competition. However, some studies provide evidence that they can decrease industry concentration (e.g., Cestone and Fumagalli, 2005). Given these mixed predictions, Hypothesis 1 (H1): Business groups impact market concentration is presented. Then, about entry and the exit of recent entrants, because there are works which conclude that business group affiliation simultaneously encourages and deters entry (e.g., Pattnaik et al, 2018) we define Hypothesis 2 (H2): Business groups influence market entry, while Hypothesis 3 (H3): Business groups increase the exit of recent entrants is defined according to the findings of Boutin et al. (2013), who show that stand-alone firms are more likely to exit the market due to the business group internal capital markets. Our evidence suggests that the presence of business groups, proxied by their market share, reduces market concentration and has a quadratic relationship with entry. We also observe that the cash held by business groups positively impacts entry indeed. Regarding the exit of recent entrants, the findings do not display any influence attributable to business groups, but to industry-specific factors.

Finally, Chapter 5 concludes by presenting the main findings and some avenues for future research.

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2 Are internal capital markets an insurance against bad states of nature? A study on post-crisis operating performance

Abstract

This paper provides new evidence on the impact of internal capital markets on the operating performance of firms in a small economy. Using a unique Portuguese sample of business groups, we study the post-crisis operating performance of business group firms using a 7-year window (2008-2014) and find that business group firms didn't decline their operating performance so much as their stand-alone counterparts. We also show that firms belonging to business groups are, in general, larger, older, and benefitted from the access to internal capital markets to mitigate the negative effects of the financial crisis of 2008-2009 as the cash holdings of the entire business group positively impact changes in post-crisis operating performance. Moreover, we contribute to the extant literature on the value of diversification by demonstrating that total diversification decreases performance while results for the impact of related diversification are mixed.

JEL Classification: G32; L25

Keywords: Business groups, financial crisis, internal capital markets, cash holdings, diversification, intra-group loans, operating performance

2.1 Introduction

The aim of this paper is to assess if firms benefit from their affiliation to business groups in a context of a financial crisis. To address this question, we use a sample of Portuguese business group firms and compare their performance to that of their stand-alone counterparts after the global financial crisis of 2008-2009.

The existing literature on business groups mostly concentrates on U.S. conglomerates (Almeida et al., 2015), on emerging economies, especially from Asia (Almeida et al., 2015) and Latin America (Buchuk et al., 2014) but, maybe due to a growing availability of data, there are several studies appearing on Europe, such as Boutin et al. (2013), which use data from French companies, and Santioni et al. (2017) that use data from Italy. Research on the topic seems to have been fostered by the financial crisis of 2008-2009 as the credit crunch left many firms without external financing, so they were compelled to look for internal funds. The present study aims to improve the literature of internal capital markets, contributing to a better worldwide understanding of the impact of business group affiliation on performance. In addition, as it mainly focuses in unlisted and smaller firms, it also allows to reduce size bias associated to the existing research on the topic and to the fact that many studies about internal capital markets focus on large U.S. conglomerates. Furthermore, as Portugal was one of the countries that received financial assistance in the aftermath of the sovereign crisis of 2011, this article also sheds some light on how can internal capital markets function when countries are subject to external financial support. Finally, it also aims to add to the debate regarding the relationship between diversification and performance.

We study the post-crisis performance using an event study framework, where the event is the global financial crisis of 2008-2009. We compare the performance of business group firms with the performance of non-business group (stand-alone) firms immediately before and after the peak of the crisis. Then, we observe firm performance during a 7-year window from 2008 to 2014 to capture not only the response of firms to the global financial crisis of 2008-2009, but also to the following sovereign crisis of 2011.

We find that firms belonging to business groups are, in general, older and larger than their stand-alone counterparts. Also, univariate results show that, after crisis, business group firms exhibit a higher performance, measured by operating returns (EBITDA) on assets, relatively to their stand-alone counterparts. We observe a decline in performance after crisis for all firms, but the decline is higher for stand-alone firms, consistent with Matvos and Seru (2014),

Almeida et al. (2015) and Kuppuswamy and Villalonga (2016). In general, being included in a business group allows the access to internal capital markets and provides insurance against financial constraints. As this work also concentrates on the response of firms to crises, its aim is extending the above presented contributions.

Multivariate results suggest that this better operating performance is explained by intrinsic characteristics of the business groups, namely the total business group cash holdings (in line with Boutin et al., 2013). The results also show that total diversification has a negative impact on post-crisis performance, suggesting that, as referred by Maksimovic and Phillips (2007), agency conflicts and disputes among divisions can lead to inefficiencies in resources' allocation that will negatively impact performance. However, related diversification turns out to be positive to operating performance at the end of the period of analysis, which is consistent with previous findings by Bettis (1981) and Bae et al. (2011). Finally, benefitting from the availability of a large amount of intra-group loans induce short-lived but timely statistically significant impacts on performance, as firms with high intra-group loans enjoyed operating performance gains in 2011, the year of the beginning of the financial assistance programme.

The remainder of this paper is as follows. Section 2.2 presents a literature review and poses the hypotheses to be tested, while Section 2.3 provides a description of the data source and some summary statistics. Section 2.4 explains the empirical methodology. Univariate results are displayed in Section 2.5 and multivariate results in Section 2.6. Finally, Section 2.7 concludes the paper.

2.2 Literature review and hypotheses development

As stressed by Almeida et al. (2015), the literature on internal capital markets concentrates on multisegment firms, such as conglomerates. On the contrary, a business group is a set of legally independent firms which are controlled by a single firm. However, many of the features of a conglomerate are shared by a business group and one can look to a business group as a multisegment firm, where each firm is a segment of a single firm which exerts the control. Bearing this assumption in mind, the theories on internal capital markets apply to business group firms. Hence, while studying the issue of internal capital markets in a context of business groups, we assume that analysing the different segments of a diversified firm is the same as analysing different firms with a common control, the business group head. In

fact, Cestone and Fumagalli (2005) point out that there are differences between multidivisional firms and business groups, but there is enough evidence that business groups can create internal capital markets like multidivisional organisations and that studies on internal capital markets in business groups are more reliable given that data on assets and investments are better defined when firms rather than divisions are used.

Research on the topic of internal capital markets started to spread in the 1990s and usually highlights their benefits and costs. Khanna and Palepu (2000) point out that the main benefits of group affiliation include the access to foreign capital and technology, direct monitoring by headquarters and access to internal capital markets. One of the major advantages of internal capital markets is promoting winner-picking practices, i.e., redirecting funds from poor-performing to rich performing projects, while their main drawback lies on the inefficient cross-subsidisation of weaker firms. In fact, as concluded by Gertner and Scharfstein (2013), the central question when it comes to internal capital markets is how firms allocate resources. If they allocate funds to their best use and thus promote winner-picking practices, they are efficient (Sapienza, 2001).

Gertner et al. (1994) present a theoretical cost-benefit analysis of internal capital markets versus external capital markets. According to them, internal capital markets allow more monitoring than external capital markets, given that financing is owner-provided. Also, they decrease managers' entrepreneurial incentives and enable an efficient reallocation of the assets from poor-performing to rich-performing projects (the so-called winner-picking effect). On the other hand, Lamont (1997) empirically studies the behaviour of investment and cash flow of firms operating on both oil and non-oil industries after the 1986 oil price decrease. Data show that oil firms reduced their investment on non-oil subsidiaries in response to a cash flow reduction, suggesting that funds are targeted to the core business, which is, perhaps, the best performing one. Stein (1997) refers that, despite corporate headquarters can generate financial constraints by overinvesting, they can also create value by promoting winner-picking practices and directing funds from low-profit to high-profit projects, which is a "bright side" of internal capital markets as restated by Khanna and Tice (2001). However, as shown by Shin and Stulz (1998) and Shin and Park (1999), although the segments with the best investment opportunities have higher levels of investment, sometimes internal capital markets do not protect them, channelling funds to poor-performing segments. In fact, bargaining and rent-seeking from better connected and

powerful managers harm the efficiency of internal capital markets and drive resources to weaker divisions (Scharfstein and Stein, 2000; Glaser et al., 2013).

One crucial aspect highlighted by these papers is that the investment of a segment or firm, in a context of high diversification, relies not only on its own cash flow, but also on the cash flows of other segments or firms within a business group. More recently, Boutin et al. (2013) emphasize the “deep-pocket effect” of internal capital markets, showing that entry rates in the manufacturing sector are positively influenced by the entrant groups’ cash holdings. They find that the group cash holdings positively impact the survival rate of entrant firms by alleviating financial constraints. This evidence led us to formulate the following hypothesis:

Hypothesis 1 (H1): Cash holdings of the entire business group positively impact the post-crisis operating performance of business group affiliates.

Another hypothesis we pose regards the impact of diversification on the performance of business group firms. As we’ve seen above, one of the core aspects underlying internal capital markets is the flow of funds between segments. Hence, across a multisegment firm or a business group, it is almost mandatory to address this question. The discussion on the pros and cons of diversification and its impact on performance is wide.

Montgomery (1994) underlines that most of the empirical work on the matter tries to find, indeed, a relationship between diversification and performance, although it was a difficult task. She also concludes that, on average, firms which diversify more are less profitable than firms which diversify less.

Academic research in the 90s regularly argues that diversification erodes value (Graham et al., 2002), but Datta et al. (1991) underlines that different conclusion can arise due to theoretical and methodological issues, such as the conceptualisation and the measurement of diversification and economic performance, and that authors should pay attention to specific industry and organizational factors. Thus, later literature tries to go further to address these limitations.

Many studies address the so-called “diversification discount” or “conglomerate discount” (e.g., Campa and Kedia, 2002; Villalonga, 2004a; Villalonga, 2004b), which means that diversified firms are less valuable in the stock markets than non-diversified firms, suggesting

that diversification harms value and performance. Moreover, diversification discount can also be a by-product of the global picture of the firm next to their stakeholders as managers may be tempted to free ride if that perception is good (De Motta, 2003).

Liebeskind (2000) mentions that internal capital markets can increase the value of some units of business especially when external capital markets face instability, which happened during the global financial crisis. Also, Graham et al. (2002) point out that the loss of value from diversification does not come from diversification itself, but from the acquisition of already discounted business divisions. Maksimovic and Phillips (2002) find that conglomerates are in general value-maximisers and thus efficient and do not subsidise less productive units. What happens is that conglomerates comprise several segments with some of them naturally being less productive than the industry average and so the discount is endogenous. Campa and Kedia (2002), who control for endogeneity, and Villalonga (2004b) demonstrate that the discount exists, but is not attributable to diversification *per se* and Villalonga (2004a) shows that there could be a premium instead and justifies it with differences between databases.

However, other authors found that diversification is “value destroying” and decreases performance (e.g., Agarwal et al., 2011; Singh et al., 2007), although it is interesting to notice that when decisions on resource allocation have long-lasting effects, headquarters act efficiently (Agarwal et al., 2011).

More recently, Maksimovic and Phillips (2013), Rudolph and Schwetzler (2013) and Kuppuswamy and Villalonga (2016) present evidence that diversified firms actually trade at premium regarding stand-alone firms. Maksimovic and Phillips (2013) emphasise that conglomerates and their inherent internal capital markets are helpful in times of crises; Rudolph and Schwetzler (2013) find that the financial crisis caused a decrease of the diversification discount in almost all the world, with the exception of continental Europe; and Kuppuswamy and Villalonga (2016) stress that conglomerates used internal capital markets more efficiently in response to the global financial crisis and their members benefitted from debt coinsurance provided by them. Finally, Borda et al. (2017) show that there is an inverted U-shaped relationship between business group diversification and firm performance and George and Kabir (2012) observe that larger business groups and augmented foreign ownership benefit performance.

In addition to the above mentioned literature, some research disentangle diversification between related and unrelated, showing that related diversified¹ firms are, on average, more profitable than non-diversified or unrelated diversified firms (Bettis, 1981; Rumelt, 1982; Palepu, 1985). Berger and Ofek (1995) conclude that there is a value loss due to diversification, but that this value loss is softer when diversified firms are in the same two-digit Standard Industrial Classification (SIC) code, confirming the potential benefits of related diversification. To conclude, Bae et al. (2011) also demonstrate that unrelated diversification contributes to the destruction of value, but related diversification does not, with these effects being amplified by the size of the business group.

Considering these arguments, we pose the following hypotheses regarding diversification:

Hypothesis 2 (H2): Diversification impacts the post-crisis operating performance of business group affiliates.

Hypothesis 2a (H2a): Related diversification in more “performance-friendly” than unrelated diversification.

Finally, it is also important to find if the amount of financing from group enterprises plays a role in the performance of business group affiliates. Gopalan et al. (2007) show that intra-group loans are a way to transfer funds between companies within a business group and they are used to help weaker firms to prevent an eventual bankruptcy, and, consequently, avoid negative spillovers to the rest of the group. Although it could be inefficient to cross-subsidise weaker firms in a context of internal capital markets as discussed above, the authors point out three explanations for that. First, to help firms where the ownership stake is high and, thus, losses will be high if they go bankrupt, second, to extract private benefits and, third, to prevent negative signs concerning future prospects that could be sent to external capital providers and, thus, alleviate potential reputational risks. They find that the first bankruptcy in the business group leads to a significant decrease of the levels of investment and

¹ According to Markides and Williamson (1994), firms are related when they have similar industrial classifications or share the same resources, input needs, goals and production or technology functions.

performance of the healthy firms in the group, so it is the interest of the group trying to avoid insolvency and, hence, keep or even boost the levels of investment and performance. Consistent with this view, Buchuk et al. (2014) show that there is, in fact, a financial advantage of belonging to a business group and refer that net receivers of intra-group loans have higher levels of investment and return on equity (ROE). They stress that intra-group loans have two motives behind: tunnelling and financing advantage. Tunnelling refers to the transfer of funds between intra-group firms with the aim of benefitting the controlling shareholders at the expenses of the minority shareholders. Hence, it is expected that, according to the tunnelling hypothesis, funds will flow from firms where the controlling shareholders have less cash flow rights to firms where they have higher cash flow rights. On the other hand, the financing advantage consists of helping financial constrained firms within the group without hurting minority shareholders. This implies that financial constrained firms are able to keep their investment and performance levels, while increase their debt. The results show that, for their sample, the financing advantage dominates over tunnelling.

Lastly, Beaver et al. (2015) study intra-group loans for a set of U.K. business groups and find that there are incentives to aid troubled subsidiaries in order to prevent bankruptcies and, thus, keep the financial stability of the group as a whole. They show that large and diversified groups are better succeeded in this task and that internal capital markets are also useful to manage credit risk within the business group, whether or not they are overall efficient. Given the previous results, we expect that:

Hypothesis 3 (H3): Intra-group loans positively impact the post-crisis operating performance of business group affiliates.

2.3 Data sources and sample description

As in Boutin et al. (2013), a business group is defined as a set of companies controlled, directly or indirectly, by the same company, which is the head of the group. Formal definitions of control require that the head of the group holds, directly or indirectly, at least 50% of the voting rights in another company.

We use individual data from the Central Balance Sheet Database (CBSD) of Banco de Portugal. Annual data from this database relies on Informação Empresarial Simplificada

(IES²), which is a mandatory survey conducted by Banco de Portugal, Portuguese Ministries of Finance and Justice, and Instituto Nacional de Estatística - INE (Statistics Portugal).

For this work, and in order to delimit business group firms, we focus on the information available regarding the group structure of each company. The first fiscal year for which IES is available is 2006. Also, although it is possible to identify non-resident business group affiliates through IES, just resident affiliates were considered because complete economic and financial data is only available for them.

Acting this way, and excluding financial firms and utilities, it was possible to identify 8,112 firms belonging to business groups before the crisis (2008). These firms represented 2% of the total number of non-financial corporations in 2008 and were responsible for 29% of the total turnover and 18% of the total number of employees.

Table 2.1 presents summary statistics regarding age, total assets, total sales, and total employees for the total number of firms and the sample of business group firms used in this study for the year 2008. The measures of central tendency and variability show that both total firms and business group firms differ in terms of all variables.

Business group firms are, in general, older, having a mean (median) age of 17 (12) years. They also have a higher size (proxied by total assets), sell more (mean and median sales of € 12.8 and € 0.5 million, respectively) and have more employees. It should be stressed that, at the time, almost 90% of the companies in Portugal were microenterprises³ according to Banco de Portugal (2011), what explains the low mean and median values. Also, because means are higher than medians, distributions are positively skewed, revealing heterogeneity not only among all firms, but also within the business group sample, which is highlighted by the values of the standard deviation.

Santioni et al. (2017), for Italy, split the total number of firms before the crisis between small

² Through IES, Portuguese companies report their annual financial statements (balance sheet, income statement, statement of changes in equity and statement of cash flows), as well as extra detailed information regarding the financial statements (e.g., for companies reporting investments in affiliated companies in the balance sheet, the identification of affiliated companies is required). This information is available in IES Annex A. In addition to the Annex A, IES also comprises plant- or establishment-level information on each non-financial company inquired (Annex R). Besides information on non-financial corporations, IES also provides information about banks and insurance companies, which, respectively, fill Annex B and Annex C, as well as Annex S and Annex T for establishment-level information. Data provided by companies is subject to quality control at Banco de Portugal.

³ Still today, this percentage is up to date. This is a structural characteristic of the Portuguese economy. Microenterprises are companies with less than 10 employees and total turnover or total assets less than € 2 million.

domestic groups, large domestic groups and unaffiliated firms and report mean (median) total assets of € 37.6 (€ 5.9) million for large domestic groups and € 2.2 (€ 0.9) million for small domestic groups, with standard deviations being large, as well.

Regarding industry classification, 47% of the business group affiliates operate in the sectors of wholesale and retail trade, real estate and manufacturing. The complete distribution of business group firms by industry classification according to the statistical classification of economic activities in the European Community (NACE Rev.2) is available in the Appendix.

Table 2.1: Summary statistics

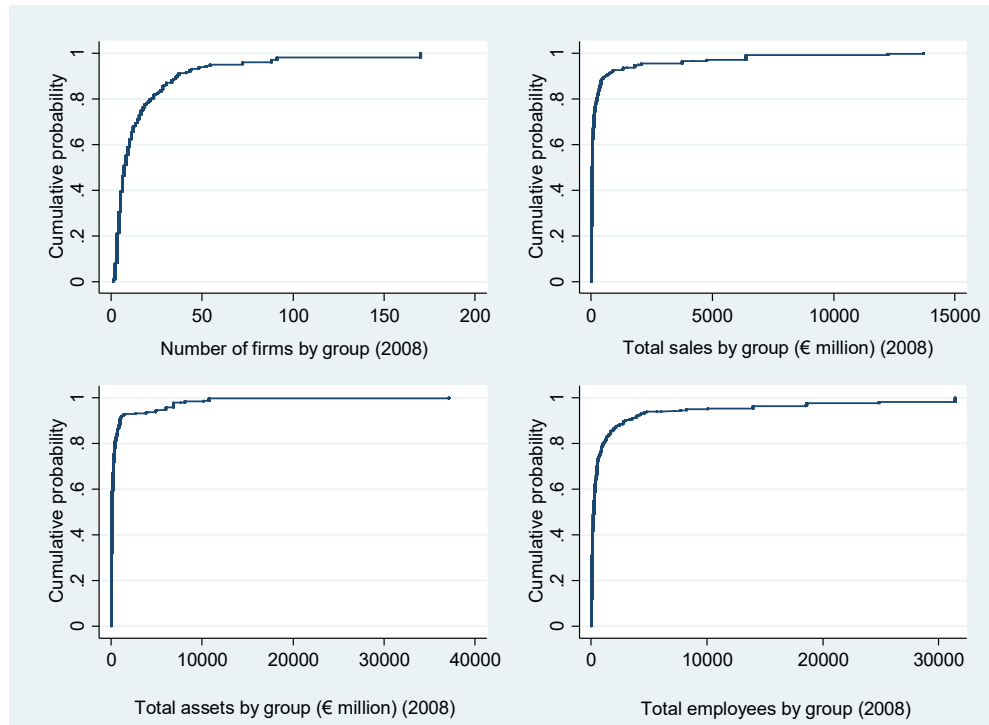
Panel A shows the age, size, total sales and total employees for the non-financial corporations in Portugal in 2008, while Panel B shows the same information for the sample of business group firms considered in this study. Age is the age of the firms in 2008 and is calculated as 2008 minus the year of incorporation. Size is proxied by total assets.

PANEL A: SUMMARY STATISTICS FOR NON-FINANCIAL CORPORATIONS (2008)				
Variable	Number of observations (units)	Mean	Median	Std. Dev.
Age	373,431	11.5	7.0	12.4
Size (Total Assets, € million)	373,518	1.6	0.1	55.3
Total Sales (€ million)	373,518	1.0	0.1	22.7
Total Employees	373,518	7.8	2.0	81.5

PANEL B: SUMMARY STATISTICS FOR THE SAMPLE OF BUSINESS GROUP FIRMS (2008)				
Variable	Number of observations (units)	Mean	Median	Std. Dev.
Age	8,111	16.6	12.0	16.8
Size (Total Assets, € million)	8,112	21.4	2.1	157.7
Total Sales (€ million)	8,112	12.8	0.5	114.0
Total Employees	8,112	65.3	5.0	392.5

To corroborate the heterogeneity among business group firms, Figure 2.1 shows cumulative probabilities for some variables by business group before the peak of the crisis (2008), namely the number of firms within the group and the total sales of the group.

Figure 2.1: Cumulative probabilities of some variables by business group



2.4 Empirical methodology

In this section it is presented the empirical methodology followed in the article. To measure operating performance, three measures were used: (1) EBITDA⁴, (2) CAPEX⁵ and (3) Operating Cash Flows, calculated as EBITDA minus CAPEX. To control for investments and disinvestments, these variables are deflated by end of year total assets and revenues. Furthermore, the asset turnover ratio, defined as total revenues over total assets, is also presented and used as a measure of efficiency. As in Kaplan (1989) and Jain and Kini (1994), medians are used instead of means to control for eventual outliers that dominate the means. Also, utilities and financial firms were excluded from the analysis.

⁴ EBITDA – Earnings Before Interest, Taxes, Depreciation, and Amortisation.

⁵ CAPEX – Capital Expenditures.

To figure out the impact of the crisis in the operating performance of business group firms we performed an event study and compared the median levels of the operating performance measures presented above before and after the crisis. We set the year of 2009 as the “peak of the crisis” given that it was the year when the sharpest GDP falls occurred in the world’s most developed economies⁶.

Then, operating performance changes between 2010 (Year +1 after the peak of the crisis) and 2008 (Year –1 relatively to the peak of the crisis), between 2011 (Year +2) and 2008, between 2012 (Year +3) and 2008, between 2013 (Year +4) and 2008, and between 2014 (Year +5) and 2008 were measured in order to assess the consequences of the crisis in the operating performance of business group companies.

To evaluate if business group firms performed better or worse than their stand-alone counterparts, we added the median industry-adjusted change and the median industry-performance-adjusted measures. That is, besides the calculation of the median level of each measure of operating performance for the business group companies, we also computed the median level of each operating performance measure for stand-alone firms within the same industry classification, and with similar levels of past performance, measured by operating return on assets (EBITDA/Total Assets), to effectively understand if business group companies performed better or worse than their stand-alone counterparts.

Matching firms according to the industry classification and past performance is common in the detection of abnormal operating performance after corporate events (see, for example, Barber and Lyon, 1996, and Lie, 2001). Following these authors, who also highlight the importance of using the right test statistics, we used the non-parametric Wilcoxon test to evaluate if changes were statistically significant.

At the industrial classification level, matching was done according to the two-digit NACE-Rev.2 code (divisions), i.e., firms with NACE codes 1011 “Processing and preserving of meat” and 1041 “Manufacture of oils and fats” were considered as belonging to the same industry classification 10 “Manufacture of food products”. According to Barber and Lyon (1996), using four-digit SIC codes instead of two-digit SIC codes brings no improvements. Here, instead of using SIC, we use NACE, the European classification.

⁶ The GDP growth for a set of countries and regions of greater interest between 2008 and 2014 is shown in the Appendix.

At the past performance level, we calculated the lagged EBITDA/Total Assets ratio for all the non-financial corporations available from the CBSD, ranked it from the lowest to the highest and created 50 categories of equally performant companies based on the percentiles. That is, companies with EBITDA/Total Assets ratios placed between the minimum and the 2nd percentile were considered equally performant (Category 1) and the same for companies with ratios between the 98th percentile and the maximum (Category 50). Since we didn't only do a performance matching, but also an industry-performance matching, we matched business group firms placed in a certain industry (based on the two-digit NACE Rev.2 code) and in a certain category of past performance with their stand-alone counterparts in the same industry and category of past performance. Then, we calculated the median changes as follows:

1. Median change:

$$\text{Change}_{\text{Year} + t} = \left(\text{Measure of operating performance}_{i, \text{Year} + t} - \text{Measure of operating performance}_{i, \text{Year}-1} \right), t \in \{1,2,3,4,5\}$$

2. Median industry-adjusted change:

$$\text{Industry-adjusted change}_{\text{Year} + t} = \left[\left(\text{Measure of operating performance}_{i, \text{Year} + t} - \text{Industry median}_{\text{Year} + t} \right) - \left(\text{Measure of operating performance}_{i, \text{Year}-1} - \text{Industry median}_{\text{Year}-1} \right) \right], t \in \{1,2,3,4,5\}$$

3. Median industry-performance-adjusted change:

$$\text{Industry-performance-adjusted change}_{\text{Year} + t} = \left[\left(\text{Measure of operating performance}_{i, \text{Year} + t} - \text{Industry-performance median}_{\text{Year} + t} \right) - \left(\text{Measure of operating performance}_{i, \text{Year}-1} - \text{Industry-performance median}_{\text{Year}-1} \right) \right], t \in \{1,2,3,4,5\}$$

After computing the results for the entire sample of business group firms, we split the sample to test the hypotheses developed in Section 2.2. Namely if total cash holdings of the business group (H1), the level of diversification of the business group (H2 and H2a) and the existence of intra-groups loans (H3) impact operating performance after the financial crisis.

To evaluate if total cash holdings of the business group influence operating performance we divided the business group sample between firms belonging to business groups with total cash holdings above the median and firms belonging to business groups with total cash holdings below the median. We summed the individual amounts of cash and cash equivalents for each affiliate to obtain the total cash holdings of the group and then we sorted the groups according to the total amount of cash holdings. Firms belonging to business groups with total cash holdings above the median were labelled as “High BG Cash Holdings” while firms belonging to business groups with total cash holdings below the median were labelled as “Low BG Cash Holdings”. This definition is evaluated for the 7-year window (2008-2014) and we use a strict criterion. That is, we consider that the business group has total cash holdings above the median if it meets this definition for the 7-year window. If it misses one year, it is not considered for the subsample of groups with cash holdings above the median. Then, to assess the effects of diversification on operating performance, we followed the works of Jacquemin and Berry (1979) and Palepu (1985) and calculated the entropy measures of total and related diversification:

Total diversification = $\sum_{i=1}^N P_i \ln\left(\frac{1}{P_i}\right)$, where N are the industry segments (three-digit NACE Rev.2 codes) and P_i is the share of the i th segment in firm’s total sales

Unrelated diversification = $\sum_{j=1}^M P_j \ln\left(\frac{1}{P_j}\right)$, where M are the industry groups (two-digit NACE Rev.2 codes) and P_j is the share of the j th group in firm’s total sales

Related diversification = *Total diversification* – *Unrelated diversification*

Entropy measures calculated this way have the advantage of giving a most complete and accurate assessment of diversification as they consider not only the number of segments in which the firms operate, but also the distribution of sales across the segments and the degree of relatedness between the segments.

Firms belonging to business groups with a related diversification index above the median were labelled as “Highly related diversified” while firms belonging to business groups with a related diversification index below the median were labelled as “Lowly related diversified”. Again, this definition is evaluated for the 7-year window (2008-2014) and we use a strict criterion. That is, we consider that the business group is highly related diversified if it has a related diversification index above the median in all the years of the 7-year window. If it misses one year, it is not considered for the subsample of highly related diversified groups.

Finally, to measure the eventual impact of intra-group lending in the post-crisis operating performance, we ranked business group companies according to the amount of their intra-group loans and calculated the median value. Firms with intra-group loans above the median were classified as “High Intra-Group Loans” while those with intra-group loans below the median were classified as “Low Intra-Group Loans”. As for the previous cases, we apply a strict criterion and firms only belong to the subsample of “High Intra-Group Loans” if they have intra-group loans above the median in all the years between 2008 and 2014, the 7-year window of the event study.

2.5 Univariate results

2.5.1 Entire sample

According to the methodology presented in the previous section, changes in operating performance were measured and results are shown in Table 2.2, 2.3, 2.4 and 2.5. These tables present the results for the entire sample. Results for the impacts of cash holdings, diversification and intra-group loans are presented afterwards.

In 2008, the median levels of the operating return on assets, capital expenditures deflated by total assets and by total revenues and asset turnover were higher in matched industry firms than in business group firms, which may be justified by some aspects related to the life cycle of firms (see, for example, Bodie et al., 2014, Chapter 17). We’ve seen before that business groups firms are, on average, older, suggesting that they reached the consolidation or maturity stages of their life cycle and, thus, have a slower growth and less investment. Also, Buyschaert et al. (2008) stress that the operating profitability of business group affiliates is significantly lower than that of their stand-alone counterparts and Khanna and Rivkin (2001) and Carney et al. (2011) find evidence of lower affiliate performance as well, although they

point out that group affiliation obeys to complex motivations and processes and its effects depend on the contexts. In the case of this work, we want to show that, regardless of their actual level of operating performance, affiliates show a higher resistance than stand-alone companies in periods of crises.

After the financial crisis of 2008, Europe, and Portugal in particular, were hit by a sovereign debt crisis that helps understanding the successive (and more severe) decays in performance illustrated in the tables, especially in Years +2 and +3, which correspond to 2011 (the year when Portugal asked for financial assistance) and 2012. However, data show that business group affiliates were, indeed, more resilient and decreased their performance less than their industry and performance counterparts. Data for Year +4 (2013) and Year +5 (2014) show a recover, especially for the operating return on assets and asset turnover, with some industry- and industry-performance-adjusted changes losing their statistical significance in Year +5. This year corresponds to the end of the financial assistance program and so this suggests that business groups also started to end, in a certain extent, the very important work of providing cushion to their members.

Business groups firms reduced their median operating return on assets by 2.11 p.p. in 2012 in comparison to 2008 (Table 2.2). Nevertheless, subtracting the observed return of their industry counterparts, we find that business group companies actually decreased less their operating return on assets than their industry counterparts by a very slight amount of 0.01 p.p., which is significant at the 1% level. And if we consider industry counterparts with similar levels of past performance, the decrease was lower than the one observed for matched firms by 0.03 p.p., which is significant at the 10% level. This suggests, again, that business groups provide insurance against bad states of nature, but now regarding the sovereign debt crisis. Results for the operating return on sales show the same trend.

Table 2.2: Operating returns of business group companies

Table values show the median absolute change in percentage points for the sample of business group companies. Change is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Operating Return on Assets is calculated as EBITDA over total assets at the end of the year. Operating Return on Revenues is calculated as EBITDA over total revenues at the end of the year. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”.

Measure of Operating Performance	Year Relative to the Peak of the Crisis (Year 2009)				
	From - 1 to + 1	From - 1 to + 2	From - 1 to + 3	From - 1 to + 4	From - 1 to + 5
Operating Return on Assets					
Median level in Year - 1 (%):					
Business Group sample: 3.63					
Matched industry firms: 4.37					
Median change (p.p.)	-0.85 ***	-1.56 ***	-2.11 ***	-1.76 ***	-1.24 ***
Median industry-adjusted change (p.p.)	-0.56 ***	-0.11 ***	0.01 ***	-0.07 ***	0.06
Median industry-performance-adjusted change (p.p.)	0.02 **	0.00	0.03 *	0.01	0.03
Number of observations	6,867	6,171	5,596	5,113	4,943
Operating Return on Revenues					
Median level in Year - 1 (%):					
Business Group sample: 8.60					
Matched industry firms: 6.19					
Median change (p.p.)	-1.30 ***	-2.41 ***	-3.14 ***	-2.27 ***	-1.65 ***
Median industry-adjusted change (p.p.)	-0.36 ***	-0.54 **	-0.26 ***	-0.43 ***	-0.49 ***
Median industry-performance-adjusted change (p.p.)	0.15	-0.02 ***	0.18 **	0.41	0.27
Number of observations	5,050	4,465	4,025	3,671	3,498

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

Regarding operating cash flows (Table 2.3), business group firms exhibit an increase of their median level in Years +1 and +5 relatively to Year -1 but declines in Years +2, +3 and +4 relatively to Year -1, which is explained by the emergence of the sovereign debt crisis.

Considering industry-adjusted median changes, operating cash flows over total assets of business groups firms increased even more in Years +1 and +5 relatively to Year -1 and were positive in Years +2, +3 and +4 (+0.09, +0.41 and +0.25 p.p.) suggesting once again that group affiliation mitigates the negative effects of crisis.

Observing median industry-performance-adjusted changes for operating cash flows over total assets and total revenues, they are both positive and higher than raw median changes in Year +1 (+0.92 and +1.36 p.p., respectively), confirming the relatively better performance of group affiliates. However, they are both negative and lower than raw median changes, in Years +2 and +3 relatively to Year -1, suggesting a relatively worst performance of business group companies when compared with their industry and equal performant counterparts. In fact, after adjusting for same industry and past performance, median changes for operating cash flows scaled by total assets are actually worse than raw median changes (e.g., -0.96 vs. -0.36 in Year +2 and -0.79 vs. -0.36 in Year +3). But these measures, if combined with those for operating return on assets (Table 2.2) and capital expenditures deflated by total assets (Table 2.4) seem to show that this apparent worst performance lies in the fact that stand-alone companies decreased their capital expenditures deflated by total assets more than business group firms did and more than their own operating returns on assets, leading to a superior level of operating cash flows scaled by total assets, which are calculated as operating return on assets minus capital expenditures.

Moreover, as stressed by Jain and Kini (1994), although operating cash flows are a good measure of operating performance given that they are a component of Net Present Value (NPV) calculations used for company valuation, their meaning should be interpreted with caution because positive NPV projects may have negative inflows at first.

Table 2.3: Operating cash flows of business group companies

Table values show the median absolute change in percentage points for the sample of business group companies. Change is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Operating Cash Flows are defined as EBITDA minus capital expenditures. Operating Cash Flows/Total Assets is calculated as Operating Cash Flows over total assets at the end of the year. Operating Cash Flows/Total Revenues is calculated as Operating Cash Flows over total revenues at the end of the year. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”.

Measure of Operating Performance	Year Relative to the Peak of the Crisis (Year 2009)					
	From - 1 to + 1	From - 1 to + 2	From - 1 to + 3	From -1 to +4	From -1 to +5	
Operating Cash Flows/Total Assets						
Median level in Year - 1 (%):						
Business Group sample: 2.31						
Matched industry firms: 1.70						
Median change (p.p.)	0.37 ***	-0.36	-0.36	-0.30 *	0.33 ***	
Median industry-adjusted change (p.p.)	0.57 ***	0.09 ***	0.41 ***	0.25 ***	1.09 ***	
Median industry-performance-adjusted change (p.p.)	0.92 ***	-0.96 ***	-0.79	-0.89 **	-0.88 **	
Number of observations	3,653	3,984	3,705	3,436	3,334	
Operating Cash Flows/Total Revenues						
Median level in Year - 1 (%):						
Business Group sample: 2.88						
Matched industry firms: 1.77						
Median change (p.p.)	0.58 ***	-0.31	-0.07 **	0.34 ***	1.03 ***	
Median industry-adjusted change (p.p.)	0.89 ***	-0.56	0.17 **	-0.02 **	0.14 ***	
Median industry-performance-adjusted change (p.p.)	1.36 ***	-0.47	-0.09 *	0.02 ***	-0.11 ***	
Number of observations	3,455	3,597	3,300	3,023	2,896	

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

The documented decrease in corporate investment is illustrated in Table 2.4. The median levels of capital expenditures deflated by total assets and total revenues decrease in Years +1, +2, +3, +4 and +5 relatively to -1 but, again, when matching group companies with their industry and equal performant stand-alone counterparts, we verify an increase in Years +2, +3, +4 and +5 indicating that business group firms didn't decrease their levels of investment so much as stand-alone firms.

Finally, the analysis of the asset turnover ratio (Table 2.5) corroborates the previous findings, showing that business group companies are, in general, more efficient than their stand-alone counterparts during economic downturns. As a result of the crisis, raw median levels decreased in Years +1, +2, +3, +4 and +5 in comparison to Year -1, but, again, adjusted median levels increased, highlighting that the financial crisis was much more severe for stand-alone firms. The results, however, are not so negative when equally performant companies are included, confirming the conclusions of Barber and Lyon (1996) and Lie (2001) on matching firms. Indeed, matching firms by industry and past performance produces closer results than matching only by industry.

Table 2.4: Capital expenditures of business group companies

Table values show the median absolute change in percentage points for the sample of business group companies. Change is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”.

Measure of Operating Performance	Year Relative to the Peak of the Crisis (Year 2009)				
	From - 1 to + 1	From - 1 to + 2	From - 1 to + 3	From - 1 to + 4	From - 1 to + 5
Capital Expenditures/Total Assets					
Median level in Year - 1 (%):					
Business Group sample: 2.51					
Matched industry firms: 3.90					
Median change (p.p.)	-1.05 ***	-1.27 ***	-1.68 ***	-1.43 ***	-1.51 ***
Median industry-adjusted change (p.p.)	-0.38 ***	2.02 ***	1.78 ***	1.85 ***	1.86 ***
Median industry-performance-adjusted change (p.p.)	-0.79 ***	1.27 ***	1.04 ***	1.15 ***	1.17 ***
Number of observations	3,654	3,984	3,705	3,436	3,334
Capital Expenditures/Total Revenues					
Median level in Year - 1 (%):					
Business Group sample: 3.06					
Matched industry firms: 3.35					
Median change (p.p.)	-1.07 ***	-1.39 ***	-1.81 ***	-1.63 ***	-1.76 ***
Median industry-adjusted change (p.p.)	-0.65 ***	1.56 ***	1.34	1.39	1.34
Median industry-performance-adjusted change (p.p.)	-0.97 ***	1.19 ***	1.02	1.15	1.16
Number of observations	3,455	3,597	3,300	3,023	2,896

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

Table 2.5: Asset turnover of business group companies

Table values show the median absolute change in percentage points for the sample of business group companies. Change is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Asset Turnover equals total revenues over total assets. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”.

Measure of Operating Performance	Year Relative to the Peak of the Crisis (Year 2009)				
	From - 1 to + 1	From - 1 to + 2	From - 1 to + 3	From - 1 to + 4	From - 1 to + 5
Asset Turnover					
Median level in Year - 1:					
Business Group sample: 0.75					
Matched industry firms: 1.02					
Median change (p.p.)	-3.00 ***	-5.36 ***	-7.85 ***	-7.49 ***	-6.67 ***
Median industry-adjusted change (p.p.)	0.82 ***	18.41 ***	19.23 ***	18.63 ***	16.41 ***
Median industry-performance-adjusted change (p.p.)	-0.54 ***	5.55 ***	5.12 ***	4.36 **	3.08
Number of observations	6,910	6,173	5,597	5,113	4,945

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

2.5.2 High vs. Low Business Group Cash Holdings

Table 2.6 decomposes the figures presented in Tables 2.2, 2.3, 2.4 and 2.5 for the total sample of business group firms into two groups: firms belonging to business groups with total cash holdings above and below the median to test if business groups' "deep pockets" impact operating performance.

In Year +1 after the peak of the crisis, firms belonging to business groups with high cash holdings decreased their operating returns on assets (Panel A) relatively to Year -1 (-0.76 p.p.), but to a lower extent than firms belonging to business groups with low cash holdings (-0.95 p.p.), with the difference (+0.19 p.p.) being statistically significant. Industry-adjusted numbers show the same trend, but industry-performance-adjusted figures don't show differences between the two sets of companies. In Years +2, +3 and +4 the trends are similar and, in Year +5, the observation of raw median changes suggests a better performance by firms from low cash holdings business groups, but differences are not statistically significant.

For operating cash flows deflated by total assets (Panel B), results show a better performance of firms belonging to business groups with low cash holdings in Year +1 relatively to Year -1, with differences between the two categories being statistically significant in terms of industry-performance-adjusted changes. However, again, this is explained by a relatively lower level of capital expenditures by these firms (Panel C). In Years +2 and +4 relatively to Year -1, raw, industry-adjusted and industry-performance-adjusted changes are slightly higher for firms from business groups with high cash holdings, but differences are only statistically significant in the case of raw and industry-adjusted figures.

Regarding capital expenditures over total assets (Panel C) and considering raw median changes, there is a decrease in investment in Years +1 to +5 in comparison to Year -1, with this reduction being higher, in general, for companies belonging to business group with low cash holdings.

Finally, Panel D shows that companies belonging to business groups with high cash holdings decreased less their efficiency than their counterparts from business groups with low cash holdings, with all the differences being statistically significant.

Table 2.6: Operating performance of business group companies split by median business group cash holdings

Table values show the median absolute change in percentage points for the sample of business group companies. Change in operating performance is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Operating Return on Assets is calculated as EBITDA over total assets at the end of the year. Operating Cash Flows are defined as EBITDA minus capital expenditures. Asset Turnover equals total revenues over total assets. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, while significance levels of median differences are based on a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test), which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “BG” stands for “Business Group” and “p.p.” stands for “percentage points”. Shaded cells are those for which median differences are statistically significant at the .10 level, at least.

Year Relative to the Peak of the Crisis (Year 2009)	- 1 to + 1		- 1 to + 2		- 1 to + 3		- 1 to + 4		- 1 to + 5	
	High BG Cash Holdings	Low BG Cash Holdings	High BG Cash Holdings	Low BG Cash Holdings	High BG Cash Holdings	Low BG Cash Holdings	High BG Cash Holdings	Low BG Cash Holdings	High BG Cash Holdings	Low BG Cash Holdings
Panel A: Operating Return on Assets										
Median change (p.p.)	-0.76 ***	-0.95 ***	-1.49 ***	-1.67 ***	-2.07 ***	-2.18 ***	-1.68 ***	-1.78 ***	-1.29 ***	-1.10 ***
Median industry-adjusted change (p.p.)	-0.50 ***	-0.64 ***	-0.04 **	-0.17 ***	0.06	-0.12 ***	-0.02	-0.19 ***	0.05	0.10
Median industry-performance-adjusted change (p.p.)	0.01	0.03 **	0.00	0.00	0.02	0.04 *	0.00	0.02	0.02	0.04 *
Number of observations	3,219	3,648	3,224	2,947	3,224	2,372	3,224	1,889	3,222	1,721
Panel B: Operating Cash Flows/Total Assets										
Median change (p.p.)	0.34 ***	0.41 ***	-0.18	-0.74	-0.11 **	-0.77	-0.04 **	-0.82	0.43 ***	0.11 **
Median industry-adjusted change (p.p.)	0.51 ***	0.62 ***	0.42 ***	-0.21	0.69 ***	0.05	0.47 ***	-0.36	1.15 ***	0.94 ***
Median industry-performance-adjusted change (p.p.)	0.75 ***	1.07 ***	-0.10 ***	-0.91 **	-0.87	-0.63	-0.89 **	-0.90	-0.97 ***	-0.74
Number of observations	1,938	1,715	2,291	1,693	2,291	1,414	2,291	1,145	2,290	1,044
Panel C: Capital Expenditures/Total Assets										
Median change (p.p.)	-0.94 ***	-1.22 ***	-1.31 ***	-1.24 ***	-1.63 ***	-1.86 ***	-1.38 ***	-1.48 ***	-1.40 ***	-1.74 ***
Median industry-adjusted change (p.p.)	-0.24 ***	-0.55 ***	2.06 ***	1.95 ***	1.82 ***	1.68 ***	1.85 ***	1.84 ***	1.87 ***	1.84 ***
Median industry-performance-adjusted change (p.p.)	-0.65 ***	-0.97 ***	1.27 ***	1.23 ***	1.13 ***	0.95	1.18 ***	1.11 ***	1.24 ***	1.05 *
Number of observations	1,938	1,716	2,291	1,693	2,291	1,414	2,291	1,145	2,290	1,044
Panel D: Asset Turnover										
Median change (p.p.)	-2.19 ***	-3.89 ***	-3.33 ***	-8.64 ***	-5.73 ***	-11.91 ***	-5.57 ***	-12.09 ***	-5.47 ***	-8.81 ***
Median industry-adjusted change (p.p.)	1.69	-0.16 ***	20.59 ***	14.97 ***	21.03 ***	15.69 ***	20.21 ***	14.75 ***	17.31 ***	13.92 ***
Median industry-performance-adjusted change (p.p.)	0.20	-1.57 ***	6.55 ***	4.62	5.92 ***	3.73	5.18 ***	3.26	2.97	3.31
Number of observations	3,493	3,417	3,364	2,809	3,345	2,252	3,318	1,795	3,345	1,600

To sum up, firms belonging to business groups with high cash holdings seem to have benefitted from the “deep pockets” of the business group as stressed before by Boutin et al. (2013), especially in Year +1. The results confirm our first hypothesis (H1) suggesting that cash holdings of the entire business group positively impact the post-crisis operating performance of business group affiliates.

2.5.3 Highly Related vs. Lowly Related Diversification

Another hypothesis we previously posed was that diversification plays a role in the operating performance of firms. In this section, we try to assess if firms belonging to highly related diversified groups perform better than firms affiliated to lowly related diversified groups. In other words, we tried to evaluate if related diversification helps firms to keep their levels of operating performance after crisis. We adopted the same research design used before and split business group firms between those that belong to highly related diversified groups and those that belong to lowly related diversified groups. Results are shown in Table 2.7.

Concerning operating returns on assets (Panel A) and operating cash flows deflated by total assets (Panel B), firms belonging to highly related diversified groups didn't differ from their counterparts that belong to lowly related diversified groups. The exception is only Year +5, in which firms belonging to highly related diversified groups performed worse than their counterparts from lowly related diversified groups after adjusting median changes by industry and past performance.

Regarding capital expenditures (Panel C), firms from highly related diversified groups didn't decrease their expenditures so much as firms from lowly related diversified groups when compared with matched stand-alone firms in the same industry and with the same performance in Years +3, +4 and +5 relatively to Year -1.

Finally, results for the assets turnover ratio (Panel D) point out that firms belonging to highly related diversified groups managed to keep their previous levels of efficiency given that they didn't decrease their ratio so much after the financial crisis.

In brief, the results suggest that diversification impacts the post-crisis operating performance of business group affiliates (H2) and related diversification is more “performance-friendly” than unrelated diversification (H2a), especially in terms of capital expenditures and efficiency, measured by the asset turnover.

Table 2.7: Operating performance of business group companies split by level of related diversification

Table values show the median absolute change in percentage points for the sample of business group companies. Change in operating performance is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Operating Return on Assets is calculated as EBITDA over total assets at the end of the year. Operating Cash Flows are defined as EBITDA minus capital expenditures. Asset Turnover equals total revenues over total assets. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, while significance levels of median differences are based on a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test), which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”. Shaded cells are those for which median differences are statistically significant at the .10 level, at least.

Year Relative to the Peak of the Crisis (Year 2009)	- 1 to + 1		- 1 to + 2		- 1 to + 3		- 1 to + 4		- 1 to + 5	
	Highly Related Diversified	Lowly Related Diversified	Highly Related Diversified	Lowly Related Diversified	Highly Related Diversified	Lowly Related Diversified	Highly Related Diversified	Lowly Related Diversified	Highly Related Diversified	Lowly Related Diversified
	Measure of Operating Performance									
Panel A: Operating Return on Assets										
Median change (p.p.)	-0.87 ***	-0.84 ***	-1.66 ***	-1.54 ***	-2.25 ***	-2.07 ***	-1.77 ***	-1.72 ***	-1.30 ***	-1.21 ***
Median industry-adjusted change (p.p.)	-0.55 ***	-0.56 ***	-0.10 **	-0.11 ***	0.04	0.00 ***	0.00	-0.11 ***	0.30	-0.01
Median industry-performance-adjusted change (p.p.)	0.01	0.02 **	-0.01	0.01	0.02	0.03 *	-0.01	0.01	0.03	0.03 *
Number of observations	1,407	5,460	1,408	4,763	1,408	4,188	1,408	3,705	1,407	3,536
Panel B: Operating Cash Flows/Total Assets										
Median change (p.p.)	0.61 ***	0.31 ***	-0.25	-0.41	-0.39	-0.34	-0.04 *	-0.47	0.59 ***	0.18 ***
Median industry-adjusted change (p.p.)	0.79 ***	0.45 ***	0.21 *	0.00 **	0.48 ***	0.38 ***	0.44 ***	0.13 ***	1.34 ***	0.86 ***
Median industry-performance-adjusted change (p.p.)	1.13 ***	0.84 ***	-1.00 **	-0.94 ***	-0.90	-0.73	-1.00 *	-0.85	-1.06 **	-0.82
Number of observations	860	2,793	1,031	2,953	1,031	2,674	1,031	2,405	1,031	2,303
Panel C: Capital Expenditures/Total Assets										
Median change (p.p.)	-1.17 ***	-1.01 ***	-1.42 ***	-1.23 ***	-1.83 ***	-1.63 ***	-1.44 ***	-1.41 ***	-1.47 ***	-1.52 ***
Median industry-adjusted change (p.p.)	-0.37 ***	-0.38 ***	2.15 ***	1.97 ***	1.85 ***	1.74 ***	1.96 ***	1.83 ***	2.05 ***	1.83 ***
Median industry-performance-adjusted change (p.p.)	-0.89 ***	-0.75 ***	1.42 ***	1.23 ***	1.19 ***	0.99 **	1.32 ***	1.09 ***	1.42 ***	1.06 ***
Number of observations	860	2,794	1,031	2,953	1,031	2,674	1,031	2,405	1,031	2,303
Panel D: Asset Turnover										
Median change (p.p.)	-1.84 ***	-3.48 ***	-2.74 ***	-6.96 ***	-4.99 ***	-9.34 ***	-4.68 ***	-8.81 ***	-4.18 ***	-7.81 ***
Median industry-adjusted change (p.p.)	2.26 *	0.22 ***	21.64 ***	17.02 ***	22.42 ***	17.91 ***	22.33 ***	16.59 ***	19.72 ***	14.74 ***
Median industry-performance-adjusted change (p.p.)	0.29	-0.96 ***	7.48 ***	5.03 ***	6.89 ***	4.26 ***	7.22 ***	3.33	3.19 *	3.08
Number of observations	1,619	5,291	1,542	4,631	1,532	4,065	1,520	3,593	1,533	3,412

2.5.4 High vs. Low Intra-Group Loans

The last hypothesis we developed was that the amount of intra-group loans positively impacts the post-crisis operating performance of business group affiliates (H3).

To test it, we split our sample of business group firms into those which have an amount of intra-group loans higher than the median and those which have an amount of intra-group loans lower than the median. Indeed, Table 2.8 shows that companies with higher amounts of intra-groups loans performed relatively better after the crisis, confirming H3.

Operating returns on assets (Panel A) didn't decline so much after the crisis in "High Intra-Group Loans" firms (with the difference being statistically significant in Year +2, +3, +4 and +5 regarding raw median changes and in Year +5 for both raw and industry-performance-adjusted median changes), while operating cash flows deflated by total assets (Panel B) increased more in this category in Year +5 when taking into account raw and industry-adjusted median changes.

Capital expenditures over total assets (Panel C) decreased more in "High Intra-Group Loans" companies suggesting that loans are not used to sustain previous levels of investment. However, differences between the two categories are not statistically significant.

Finally, as measured by asset turnover (Panel D), affiliates with high levels of intra-group loans manage to keep their previous levels of efficiency in the sense that their asset turnover diminish less after the crisis, with the results being statistically significant. Overall, results are in line with the idea that internal funds provided by business groups allow affiliates to overcome financial constraints and exhibit better performances (e.g., Buchuk et al., 2014).

Table 2.8: Operating performance of business group companies split by median intra-group loans

Table values show the median absolute change in percentage points for the sample of business group companies. Change in operating performance is relative to Year - 1, which is the fiscal year of 2008, the year before the peak of the crisis, which is defined as 2009. Operating Return on Assets is calculated as EBITDA over total assets at the end of the year. Operating Cash Flows are defined as EBITDA minus capital expenditures. Asset Turnover equals total revenues over total assets. Adjusted changes for a given company are the deviation from the contemporaneous benchmark median. The significance tests are based on the Wilcoxon signed-rank test, while significance levels of median differences are based on a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test), which assumes that the observations are independent. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. “p.p.” stands for “percentage points”. Shaded cells are those for which median differences are statistically significant at the .10 level, at least.

Year Relative to the Peak of the Crisis (Year 2009)	- 1 to + 1		- 1 to + 2		- 1 to + 3		- 1 to + 4		- 1 to + 5	
	High Intra-Group Loans	Low Intra-Group Loans	High Intra-Group Loans	Low Intra-Group Loans	High Intra-Group Loans	Low Intra-Group Loans	High Intra-Group Loans	Low Intra-Group Loans	High Intra-Group Loans	Low Intra-Group Loans
Panel A: Operating Return on Assets										
Median change (p.p.)	-0.75 ***	-1.00 ***	-1.07 ***	-1.98 ***	-1.52 ***	-2.53 ***	-1.17 ***	-2.11 ***	-0.77 ***	-1.64 ***
Median industry-adjusted change (p.p.)	-0.50 ***	-0.62 ***	0.05 *	-0.29 ***	0.11 *	-0.13 ***	0.06	-0.24 ***	0.35	-0.15 *
Median industry-performance-adjusted change (p.p.)	0.01	0.03 ***	0.00	0.01	0.04	0.01	0.01	0.00	0.04 **	0.01
Number of observations	3,237	3,630	2,810	3,361	2,842	3,114	2,246	2,867	2,201	2,742
Panel B: Operating Cash Flows/Total Assets										
Median change (p.p.)	0.48 ***	0.29 ***	-0.11	-0.62	0.01 *	-0.53	-0.20 *	-0.35	0.83 ***	0.03 **
Median industry-adjusted change (p.p.)	0.66 ***	0.43 ***	0.12 **	0.07 **	0.40 ***	0.41 ***	0.12 ***	0.39 ***	1.59 ***	0.74 ***
Median industry-performance-adjusted change (p.p.)	0.96 ***	0.85 ***	-0.83 **	-1.02 ***	-0.86	-0.73	-0.83	-0.96 **	-0.84	-0.90 **
Number of observations	1,524	2,129	1,610	2,374	1,454	2,251	1,348	2,088	1,332	2,002
Panel C: Capital Expenditures/Total Assets										
Median change (p.p.)	-1.13 ***	-1.01 ***	-1.36 ***	-1.21 ***	-1.71 ***	-1.66 ***	-1.56 ***	-1.32 ***	-1.51 ***	-1.51 ***
Median industry-adjusted change (p.p.)	-0.48 ***	-0.34 ***	1.98 ***	2.05 ***	1.83 ***	1.72 ***	1.85 ***	1.85 ***	1.87 ***	1.85 ***
Median industry-performance-adjusted change (p.p.)	-0.94 ***	-0.70 ***	1.22 ***	1.29 ***	1.15 ***	0.99 **	1.20 ***	1.12 ***	1.20 **	1.15 ***
Number of observations	1,524	2,130	1,610	2,374	1,454	2,251	1,348	2,088	1,332	2,002
Panel D: Asset Turnover										
Median change (p.p.)	-2.72 ***	-3.23 ***	-4.13 ***	-6.62 ***	-5.07 ***	-10.58 ***	-4.94 ***	-9.89 ***	-4.37 ***	-8.72 ***
Median industry-adjusted change (p.p.)	1.11 **	0.52 *	19.80 ***	17.39 ***	21.87 ***	17.11 ***	21.12 ***	16.38 ***	18.87 ***	14.14 ***
Median industry-performance-adjusted change (p.p.)	-0.94 **	-0.43	5.96 ***	5.25 ***	5.83 ***	4.73 **	5.53 **	3.70	3.88	2.60
Number of observations	3,074	3,836	2,677	3,496	2,356	3,241	2,139	2,974	2,098	2,847

2.6 Multivariate results

After presenting the univariate results, in this section we present a multivariate analysis with the aim of confirming the previous figures. Hence, we run several regressions for our sample of business group companies in order to explain the changes in operating return on assets (ROA) and in operating cash flows deflated by total assets (OCF/A). As we measure changes yearly (for Years +1, +2, +3, +4 and +5) relatively to Year -1, the dependent variables of each equation were the ROA change and the OCF/A change for each year.

To test the univariate results, we assume that the post-crisis performance of business group companies is influenced by their own characteristics, namely their age and size, their pre-crisis operating performance and by the total amount of cash holdings of the group, the degree of diversification of the business group and the amount of intra-group loans granted to business group affiliates. Equations were estimated according to the OLS method.

The following model was estimated:

$$y_i = \mathbf{x}_i' \beta_1 + \mathbf{z}_i' \beta_2 + \varepsilon_i$$

Where:

- **y** is the firm's operating performance change after the peak of the crisis. It is first measured by the ROA and, then, by the OCF/A.
- **x** is a vector of six variables that control for each firm's characteristics, pre-crisis operating performance and investment opportunities. The variables are the following:
 - i. **Age:** It is the logarithm of the age of the firm. The age of the firm is the age in the year before the peak of the crisis (2008, Year -1) and it is defined as 2008 minus the year of incorporation.
 - ii. **Size:** It is the logarithm of the book value of total assets in the year before the peak of the crisis.
 - iii. **EBITDA/Assets:** It is the operating return on assets in the year before of the peak of the crisis. Controls for pre-crisis operating performance.
 - iv. **Turnover/Assets:** It is the asset turnover ratio in the year before of the peak of the crisis. Controls for pre-crisis operating performance.
 - v. **CAPEX/Assets:** It is the fraction of capital expenditures on total

assets in the year before of the peak of the crisis. Controls for pre-crisis operating performance.

- vi. **Turnover growth:** It is sales growth in the year before of the peak of the crisis. Controls for investment opportunities (Asker et al., 2015).
- **z** is a vector of four variables that reflect the hypotheses previously posed and whose influence on the post-crisis operating performance we want to test. The variables are the following:
 - i. **Business group cash holdings:** It is the logarithm of the sum of the previous year-end cash and cash equivalents of all the companies that belong to a certain business group.
 - ii. **Total diversification:** It is the total entropy index of diversification (see Section 2.4) in the previous year.
 - iii. **Related diversification:** It is the related entropy index of diversification (see Section 2.4) in the previous year.
 - iv. **High intra-group loans:** It is a dummy variable that is equal to 1 for firms with intra-group loans above the median and 0 otherwise.

To conclude, industry fixed effects are also included.

Table 2.9 displays the results of the OLS estimations for the ROA change in Years +1, +2, +3, +4 and +5 relatively to Year -1.

Total business group cash holdings and size have a positive and statistically significant impact in the ROA change in all the regressions. This evidence is consistent with the so-called “deep-pocket effect of internal capital markets” previously highlighted by Boutin et al. (2013) and with our first hypothesis that the cash holdings of the entire business group positively impact the post-crisis operating performance of business group affiliates.

On the other hand, the pre-crisis ROA (EBITDA/Assets) have a negative and statistically significant impact on the post-crisis ROA change.

Regarding total and related diversification, OLS estimates for the ROA changes show that total diversification negatively impacts operating performance, while conclusions for the impact of related diversification are ambiguous. However, as for the majority of the years related diversification is not statistically significant and total diversification is statistically

significant and negative for performance, we can conclude that diversification impacts the post-crisis operating performance of business group affiliates (H2) and that related diversification is more “performance-friendly” than unrelated diversification (H2a), because total diversification is the sum of related and unrelated diversification.

Business group firms with intra-group loans above the median have a relatively higher and statistically significant performance in Year +2 in comparison with Year -1, which is consistent with our third hypothesis that intra-group loans positively impact the post-crisis operating performance of business group affiliates and Buchuk et al. (2014) who stress that intra-group loans positively impact investment and the ROE of net receivers of funds. The univariate results previously shown displayed that intra-group loans didn't seem to be used to make new investments as the CAPEX/Assets ratio decreases.

To conclude, business groups' deep pockets are particularly important in response to the peak of the crisis, but their positive impact seems to vanish over time. On the other hand, results also show that investments made before the crisis, measured by CAPEX/Assets, lead to a superior performance after Year +3 suggesting that firms which were able to invest before gained a competitive advantage relatively to those which didn't invest and were hit by financial constraints during the crisis.

Table 2.9: ROA change (OLS estimation)

This table reports the multivariate regressions for post-crisis ROA (EBITDA/Total Assets) change from Year -1 to Year +1, Year +2, Year +3, Year +4 and Year +5 for our sample of business group companies. Business group cash holdings correspond to the logarithm of the sum of the previous year-end cash and cash equivalents of all the companies that belong to a certain business group. Total diversification is the total entropy index of diversification in the previous year. Related diversification is the related entropy index of diversification in the previous year. High intra-group loans is a dummy variable that is equal to 1 for firms with intra-group loans above the median and 0 otherwise. Age is the logarithm of the age of the company in the year before the peak of the crisis (Year -1=2008) and is defined as 2008 minus the year of incorporation. Size is the logarithm of the book value of total assets in the year before the peak of the crisis (Year -1=2008). A dummy variable that controls for industry fixed effects is included as well. Regressions are estimated using the OLS method. Explained variables are winsorised between 0.01 and 0.99 percentiles as are also the variables signed with +. Robust and clustered (by business group) standard errors are in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Dependent variable: ROA change after the peak of the crisis	From - 1 to + 1		From - 1 to + 2		From - 1 to + 3		From - 1 to + 4		From - 1 to + 5	
Business group cash holdings	0.009	***	0.007	***	0.010	***	0.007	**	0.004	*
	(0.002)		(0.002)		(0.003)		(0.003)		(0.002)	
Total diversification	-0.022	**	-0.025	**	-0.019	*	-0.016		-0.027	**
	(0.009)		(0.011)		(0.011)		(0.011)		(0.014)	
Related diversification	0.016		-0.007		-0.043	*	-0.006		0.053	*
	(0.020)		(0.021)		(0.023)		(0.030)		(0.029)	
High intra-group loans	0.000		0.024	*	0.012		-0.015		0.016	
	(0.009)		(0.013)		(0.012)		(0.011)		(0.018)	
Age	-0.001		0.001		0.001		-0.013	**	0.001	
	(0.005)		(0.006)		(0.007)		(0.006)		(0.009)	
Size	0.008	***	0.006	*	0.006	*	0.011	***	0.010	**
	(0.003)		(0.004)		(0.003)		(0.004)		(0.004)	
EBITDA/Assets ⁺	-0.560	***	-0.563	***	-0.690	***	-0.806	***	-0.784	***
	(0.053)		(0.058)		(0.065)		(0.066)		(0.067)	
Turnover/Assets ⁺	-0.001		-0.003		-0.005		-0.001		0.002	
	(0.006)		(0.006)		(0.007)		(0.007)		(0.008)	
CAPEX/Assets ⁺	0.023		-0.022		0.129	***	0.174	***	0.219	***
	(0.041)		(0.058)		(0.049)		(0.049)		(0.054)	
Turnover growth ⁺	0.000		-0.002		0.000		-0.001		-0.007	**
	(0.002)		(0.002)		(0.002)		(0.001)		(0.003)	
Constant	-0.306	***	-0.147	**	-0.347	***	-0.280	***	-0.311	*
	(0.049)		(0.061)		(0.061)		(0.062)		(0.159)	
Observations	3,109		2,844		2,651		2,476		2,260	
R ²	0.240		0.178		0.220		0.245		0.202	

As a robustness check, we repeated the exercise for the OCF/A ratio and the results are shown in Table 2.10. As it can be seen there are not important differences in comparison to the analysis of the ROA changes. As before, business group cash holdings have a positive and statistically significant impact on performance, although their effect vanishes over time. Total diversification, on the other hand, still negatively impacts performance, although this effect is only statistically significant in Year +5 relatively to Year -1. In this same year, related diversification positively and significantly affects performance, now measured through OCF/A.

Again, firm size and the pre-crisis level of investment (proxied by CAPEX/Assets) have a positive and statistically significant contribution for performance while the pre-crisis ROA (proxied by EBITDA/Assets) has a negative one.

To conclude, multivariate results show that changes in post-crisis operating performance of business group companies are mainly positively influenced by business group cash holdings, firm size and the pre-crisis level of investment, confirming the univariate results, the existence of internal capital markets and that firms benefit from the business group “deep pockets”.

Table 2.10: Operating cash flows/total assets change (OLS estimation)

This table reports the multivariate regressions for post-crisis OCF/A (Operating cash flows/total assets) change from Year -1 to Year +1, Year +2, Year +3, Year +4 and Year +5 for our sample of business group companies. Business group cash holdings correspond to the logarithm of the sum of the previous year-end cash and cash equivalents of all the companies that belong to a certain business group. Total diversification is the total entropy index of diversification in the previous year. Related diversification is the related entropy index of diversification in the previous year. High intra-group loans is a dummy variable that is equal to 1 for firms with intra-group loans above the median and 0 otherwise. Age is the logarithm of the age of the company in the year before the peak of the crisis (Year -1=2008) and is defined as 2008 minus the year of incorporation. Size is the logarithm of the book value of total assets in the year before the peak of the crisis (Year -1=2008). A dummy variable that controls for industry fixed effects is included as well. Regressions are estimated using the OLS method. Explained variables are winsorised between 0.01 and 0.99 percentiles as are also the variables signed with +. Robust and clustered (by business group) standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Dependent variable: OCF change after the peak of the crisis	From - 1 to + 1	From - 1 to + 2	From - 1 to + 3	From - 1 to + 4	From - 1 to + 5
Business group cash holdings	0.005 ** (0.002)	0.006 *** (0.002)	0.006 *** (0.002)	0.005 (0.003)	0.001 (0.002)
Total diversification	-0.009 (0.008)	-0.012 (0.009)	-0.008 (0.010)	-0.001 (0.015)	-0.023 * (0.013)
Related diversification	0.012 (0.020)	-0.002 (0.018)	-0.040 * (0.021)	-0.019 (0.032)	0.049 * (0.030)
High intra-group loans	0.006 (0.009)	0.013 (0.012)	0.010 (0.010)	-0.012 (0.010)	0.009 (0.016)
Age	-0.003 (0.004)	0.000 (0.006)	-0.009 (0.005)	-0.014 ** (0.006)	0.000 (0.008)
Size	0.008 *** (0.003)	0.005 * (0.003)	0.008 *** (0.003)	0.011 *** (0.003)	0.006 (0.004)
EBITDA/Assets ⁺	-0.554 *** (0.044)	-0.547 *** (0.050)	-0.641 *** (0.050)	-0.769 *** (0.059)	-0.760 *** (0.056)
Turnover/Assets ⁺	0.003 (0.004)	0.003 (0.005)	-0.005 (0.005)	-0.001 (0.006)	0.001 (0.005)
CAPEX/Assets ⁺	0.939 *** (0.040)	0.982 *** (0.063)	1.137 *** (0.037)	1.123 *** (0.043)	1.117 *** (0.051)
Turnover growth ⁺	0.003 (0.002)	0.000 (0.001)	0.001 (0.002)	0.001 (0.001)	-0.004 (0.002)
Constant	-0.250 *** (0.043)	-0.228 *** (0.051)	-0.129 (0.084)	-0.255 *** (0.054)	-0.215 (0.158)
Observations	2,668	2,843	2,649	2,474	2,260
R ²	0.447	0.345	0.459	0.413	0.358

2.7 Conclusions

In this paper we investigate the impact of internal capital markets in the post-crisis operating performance of business group companies.

We show that business group firms did not decline their operating performance so much as their stand-alone counterparts after the financial crisis of 2008-2009. We attribute this evidence to some intrinsic features of business groups such as internal capital markets, captured through the total cash holdings of the business group and the amount of each affiliate's intra-group loans, and diversification.

Univariate results show that firms belonging to groups with larger cash holdings, highly related diversified or with higher amounts of intra-groups loans are more efficient.

However, from these three features of business groups, multivariate results based on OLS estimates mostly support the positive impact of the total cash holdings of the business group in the post-crisis operating performance. This evidence suggests that the access to internal capital markets and to the group deep pockets is, definitely, a great advantage of business groups as stressed by Boutin et al. (2013). As suggested by Gertner and Scharfstein (2013) in an attempt to reconcile all the competing views in the literature on business groups, they could destroy value in normal times by, for example, cross-subsidising weaker firms but, in times of crises, they provide cushion and insurance to their members. In fact, it seems that this effect vanishes as the distance to the peak of the crisis increases.

On the other hand, total diversification decreases performance, which is consistent with the findings of Bettis (1981) and Bae et al. (2011) who observe that unrelated diversification reduces value, while related diversification positively impacts performance in certain periods. Finally, benefitting from large amounts of intra-group loans has a brief, but timely effect on performance, supporting the views of Gopalan et al. (2007) and Buchuk et al. (2014).

To sum up, this work provides evidence that internal capital markets inside business groups clearly protect member firms from bad states of nature, given that having access to the cash holdings of the entire business group positively impacts post-crisis operating performance, which does not decrease so much than in stand-alone firms.

For future research, it would be interesting to deepen this analysis in order to observe the consistency of the results by industry or size of the business groups. Furthermore, although

there are already some studies on the role of management in the efficiency of internal capital markets (e.g., De Motta, 2003; Glaser et al., 2013), additional research would be welcome, particularly addressing how the quality of managers impact the differences in performance between business group and stand-alone firms.

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Appendix

In this Appendix, we provide two tables. Table 2.11 shows the distribution of the business group affiliates by industry classification while Table 2.12 exhibits the yearly GDP growth between 2008 and 2014 for a set of countries and world regions of interest.

Table 2.11: Breakdown of the sample of business group firms by industry classification (2008)

Industry classification	Number of firms
Wholesale and retail trade; repair of motor vehicles and motorcycles	1,511
Real estate activities	1,281
Manufacturing	1,061
Professional, scientific and technical activities	863
Construction	821
Administrative and support service activities	398
Accommodation and food service activities	384
Transportation and storage	370
Agriculture, forestry and fishing	364
Information and communication	348
Human health and social work activities	330
Arts, entertainment and recreation	111
Sewerage, waste management and remediation activities	94
Mining and quarrying	61
Education	59
Other service activities	56
Total	8,112

Table 2.12: GDP growth from 2008 to 2014

	2008	2009	2010	2011	2012	2013	2014
World	1.8%	-1.7%	4.4%	3.1%	2.4%	2.5%	2.7%
High Income	0.3%	-3.4%	3.0%	1.8%	1.3%	1.3%	1.9%
United States	-0.3%	-2.8%	2.5%	1.6%	2.2%	1.7%	2.4%
Japan	-1.0%	-5.5%	4.7%	-0.5%	1.7%	1.4%	0.0%
Euro Area	0.4%	-4.5%	2.1%	1.5%	-0.9%	-0.3%	1.1%
Portugal	0.2%	-3.0%	1.9%	-1.8%	-4.0%	-1.1%	0.9%
Spain	1.1%	-3.6%	0.0%	-1.0%	-2.6%	-1.7%	1.4%
France	0.2%	-2.9%	2.0%	2.1%	0.2%	0.6%	0.6%
Germany	1.1%	-5.6%	4.1%	3.7%	0.5%	0.5%	1.6%
Italy	-1.1%	-5.5%	1.7%	0.6%	-2.8%	-1.7%	0.1%
United Kingdom	-0.6%	-4.3%	1.9%	1.5%	1.3%	1.9%	3.1%
Brazil	5.1%	-0.1%	7.5%	3.9%	1.9%	3.0%	0.1%
Russian Federation	5.2%	-7.8%	4.5%	4.3%	3.5%	1.3%	0.7%
India	3.9%	8.5%	10.3%	6.6%	5.6%	6.6%	7.2%
China	9.7%	9.4%	10.6%	9.5%	7.9%	7.8%	7.3%
South Africa	3.2%	-1.5%	3.0%	3.3%	2.2%	2.3%	1.6%
Saudi Arabia	8.4%	1.8%	4.8%	10.0%	5.4%	2.7%	3.6%

3 The impact of business group affiliation on post-crisis spending, financial constraints, investment and cash

Abstract

Using a comprehensive dataset of business group and non-business group Portuguese firms, we analyse the period 2008-2014, greatly impacted by the global financial and the sovereign debt crises, and demonstrate that internal capital markets work. Business group firms are less financially constrained than their matched stand-alone counterparts and being a business group firm positively impacts investment. Moreover, we add to the debate on investment-cash flow sensitivity by showing that it still exists and that stand-alone firms rely more on their own cash flows to invest, as they exhibit larger investment-cash flow sensitivities than business group firms. Finally, we find that being a business group firms decreases the individual level of cash holdings, which is consistent with the mechanics of internal capital markets as member firms can benefit from the resource flexibility of the business group instead of holding cash.

JEL Classification: G01; G32

Keywords: Business groups, cash-cash flow sensitivity, financial constraints, financial crisis, internal capital markets, investment-cash flow sensitivity

3.1 Introduction

This paper addresses the role of business group affiliation and the resulting access to internal capital markets in the overcoming of the financial constraints triggered by the global financial crisis of 2008-2009 and the subsequent Portuguese sovereign debt crisis of 2011. Because these are periods characterised by frictions in external capital markets and higher external financing costs, they provide the ideal setting to study not only the financial flexibility brought by internal capital markets (Hovakimian, 2011; Almeida et al., 2015; Kuppuswamy and Villalonga, 2016), but also the effects of corporate finance decisions on investment and other sources of corporate spending such as the constitution of cash stocks, dividends, employment and marketing (Campello et al., 2010).

The main aim of the present work is to test the existence of a relationship between internal capital markets, proxied by business group affiliation, and financial constraints. As stressed by Cestone and Fumagalli (2005), it is well known that groups create internal capital markets.

Authors that analysed this issue seem to converge to the same conclusion that firms with access to internal capital markets face fewer financial constraints (Hoshi et al, 1991; Shin and Park, 1999; Campello, 2002; Fan et al, 2016; Larrain et al, 2019) and, thus, the first hypothesis (H1) is that business group firms are less financially constrained. Then, assuming that less constrained firms decrease their capital expenditures less (Campello et al., 2010), our second hypothesis (H2) is that being a member of a business group positively impacts investment in periods of crises, which is consistent with Almeida et al. (2015). The third hypothesis (H3) is that stand-alone firms exhibit higher investment-cash flow sensitivities (Lensink et al, 2003) given that, contrarily to the business group firms, they cannot benefit from transfers of member firms and so they rely more on their own cash flows to invest. Finally, besides studying the investment-cash flow sensitivity, this paper also adds to the literature on the cash-cash flow sensitivity (Almeida et al., 2004; Riddick and Whited, 2009; Bao et al., 2012) and assesses the impact of business group membership on cash savings. According to de Haas and van Lelyveld (2010), subsidiaries of robust parent banks grow faster, as well as subsidiaries from parent banks that keep fewer liquid assets. On the other hand, if business group firms benefit from internal capital markets, are less constrained and invest more, we expect that business group affiliation decreases cash savings, in line with Locorotondo et al. (2014), and so this our fourth hypothesis (H4).

Both business group and stand-alone firms decreased their mean and median levels of

expenditures in the aftermath of the global financial crisis of 2008-2009 and until 2011-2012, years in which Portugal was hit by the sovereign debt crisis. However, decreases for stand-alone firms are sharper in certain categories of spending, namely investment, which we proxy by capital expenditures. Business group firms are larger, older and less than stand-alone firms. Hence, due to the considerably different number of firms in each one of the categories, we draw from the universe of stand-alone firms a one-to-one sample of more comparable stand-alone firms based on the matching technique developed by Leuven and Sianesi (2003).

Using a dataset composed by business group and matched stand-alone firms, we first assess if business group firms are, indeed, less financially constrained than stand-alone firms. For that purpose, a logit model, where the dependent variable is the financial constraints' status (constrained or unconstrained), is employed, with the financial constraints' status being measured by the WW (from Whited and Wu, 2006) index, one of the measures traditionally used when evaluating financial constraints (see Farre-Mensa and Ljungqvist, 2016). We find that business group firms are less constrained than their independent counterparts, reinforcing the previous evidence that business group affiliation mitigates financial constraints (Hoshi et al, 1991; Shin and Park, 1999; Campello, 2002; Fan et al, 2016; Larrain et al, 2019).

Then, to study the impact of business group affiliation on capital expenditures and address investment-cash flow sensitivity and cash-cash flow sensitivity, Fixed Effects and the Blundell and Bond's (1998) system GMM estimates are applied.

Investment-cash flow sensitivities are commonly viewed as another way of measuring financial constraints, although there is no consensus in the literature about whether or not they could be seen as an accurate measure of credit constraints. We show that the investment-cash flow sensitivity exists and is greater for stand-alone firms. That is, stand-alone firms rely more on their own cash flows to invest than business group firms do, which is usually seen as proxy for financial constraints. We also extend the traditional investment-cash flow regressions to consider business group affiliation and find that business group membership positively impacts investment.

Finally, the topic of cash-cash flow sensitivity is also analysed. As in the case of investment-cash flow sensitivity, we also broaden the traditional cash-cash flow regressions to take into account business group affiliation. It is shown that being a business group firm decreases the accumulation of cash holdings, in particular for unconstrained firms.

Our article contributes to the literature by providing additional evidence on the relationship between business group membership, financial constraints and investment during financial crises, as well as on the role of business groups in the accumulation of cash holdings. Namely, it extends the conclusion of Almeida et al. (2015) that business groups mitigate the negative impacts of crises, drawn from the Asian crisis of 1997, to a European country after the global financial crisis of 2008-2009. In fact, we show that business groups firms are less financially constrained and invest more than stand-alone firms during this period. Furthermore, this study enlarges the extant research regarding investment-cash flow sensitivities and cash-cash flow sensitivities by bringing further insights, namely that they continue to exist and are positive and statistically significant, answering to the doubts presented in several papers such as Chen and Chen (2012) and Riddick and Whited (2009).

After this introduction, the paper is as follows. Section 3.2 presents the literature review and the hypotheses to be tested. Section 3.3 displays the data sources and provides some descriptive statistics on business group and stand-alone firms' spending. Section 3.4 describes the empirical methodology of construction of the financial constraints' measures used in the analysis and how investment-cash flow and cash-cash flow sensitivities are addressed. Section 3.5. shows the univariate results on the evolution of investment, cash holdings and dividends during the period between 2008 and 2014 and also provides information on the financial constraints of the firms studied. Section 3.6. exhibits the multivariate results about the likelihood of financial constraints, the investment-cash flow sensitivities and the cash-cash flow sensitivities. Finally, Section 3.7 concludes.

3.2 Literature review and hypotheses development

Campello et al. (2010) point out that constrained firms exhibited a larger decrease of the planned expenditures in the aftermath of the global financial crisis. They surveyed more than a thousand of Chief Financial Officers (CFOs) around the world and concluded that firms which couldn't raise external financing delayed their investments, sold more assets and reduced their capital, marketing and tech expenditures. Their classification of constrained firms relies on a qualitative classification drawn from their survey. That is, firms were classified as constrained if they were "somewhat" or "very affected" by the financial crisis according to their CFOs. However, there are several definitions and metrics to measure financial constraints.

As mentioned by Farre-Mensa and Ljungqvist (2016), there are two definitions of financial constraints. The first one considers that a firm is financially constrained when it faces an inelastic supply of external capital i.e., an additional unit of external capital increases its cost so much that it will be impossible for the firm to obtain external financing. The second one suggests that a firm is considered financially constrained whenever there is a difference between its internal and external costs of capital, leading the firm to never choose external financing whenever internal funding is cheaper. However, as they point out, this last definition is broader than the first one and, in the limit, any firm with a difference between internal and external costs of financing would be classified as constrained, as pointed out by Kaplan and Zingales (1997), which is not necessarily true.

Throughout the existing literature it is possible to find “raw” measures of financial constraints and other “more sophisticated” measures, which, in turn, take into account some of the “raw” measures. By “raw” measures we mean dividend payouts, firm size and credit rating (see, for example, Almeida and Campello, 2007, Hovakimian, 2011 and Farre-Mensa and Ljungqvist, 2016). According to these measures, a firm is considered less constrained than other if it pays dividends, is larger and has a credit rating. By more sophisticated measures of financial constraints we mean the KZ index from Kaplan and Zingales (1997) and Lamont et al. (2001), the WW index from Whited and Wu (2006) and the SA (or HP) index from Hadlock and Pierce (2010). The higher the index, the more constrained the firm is.

Regarding the association between financial constraints and business group affiliation there are not many studies on the matter, a gap our study fills. The literature on internal capital markets usually points out that fund transfers between firms within the same business group help to ease financial constraints and alleviate the negative consequences of a financial crisis (Almeida et al., 2015; Kuppuswamy and Villalonga, 2016). Campello (2002), Fan et al (2016) and Larrain et al. (2019) also demonstrate that internal capital markets mitigate credit constraints. So, in accordance to this literature, we are able to predict the following hypothesis:

Hypothesis 1 (H1): Business group firms are less financially constrained than stand-alone firms.

Moreover, Almeida et al. (2015) show that firms from Korean business groups (chaebol firms) managed to invest more than their stand-alone counterparts after the 1997 Asian financial crisis and Ang et al. (2015) highlight that business group firms decreased investment less than similar stand-alone companies during the global financial crisis. During this period, investment from business group affiliates relied not only on their own cash flows but also on the cash flows of the other firms in the same business group, they say, validating once more the effectiveness of internal capital markets. Therefore, it is expected that:

Hypothesis 2 (H2): Business group membership positively impacts investment in periods of crises.

Another interesting discussion in the extant research refers to the so-called investment-cash flow sensitivity and their effectiveness as a true measure of financial constraints. The literature on the relationship between investment and cash flow started with Fazzari et al. (1988), who argue that the investment of constrained firms should be more sensitive to their cash flows. However, in a response to their article, Kaplan and Zingales (1997) point out that investment-cash flow does not provide a good measure of financial constraints because there were actually the least financially constrained companies from their sample those which relied more on cash flow to invest. Chen and Chen (2012) support the views of Kaplan and Zingales (1997) and reinforce that investment-cash flow sensitivities cannot be used as a financial constraint measure in the sense that they have been decreasing over time and financial constraints have not. In addition, Agca and Mozumdar (2007) show that investment-cash flow has decreased over time, indeed, but it is still a fact, not fiction, while Cleary et al. (2007) introduce more novelty to this issue by stressing that investment-cash flow sensitivities are actually U-shaped, with investment increasing with cash flows if they are large and decreasing otherwise.

On the other hand, Hoshi et al. (1991) corroborate the results of Fazzari et al. (1988) by demonstrating that investment by stand-alone firms is more sensitive to cash flow and Shin and Park (1999) document that investment-cash flow sensitivity for chaebol firms “is low and insignificant”, but “high and significant for non-chaebol firms”. Adding to this empirical evidence, Bond et al. (2003) find that cash flows and profits are more significant for investment in the U.K., which is also the country with larger financial constraints in their

analysis. Finally, Lensink et al. (2003) observe that investment-cash flow sensitivities are greater for the stand-alone companies of their dataset of Indian firms, while George et al. (2011) shows that investment-cash flow sensitivity exists, but does not significantly differ between business group and non-business group firms.

Other works continue suggesting that investment-cash flow sensitivities do provide a good measure of financial constraints. For example, La Rocca et al. (2016) find evidence that the investment-cash flow sensitivity actually increased for a sample of Italian firms during the global financial crisis of 2008 and it was greater for financially constrained firms. And Mulier et al. (2016), for a sample of unlisted European SMEs, also find that higher investment-cash flow sensitivities are associated to financially constrained firms.

Lastly, Moshirian et al. (2017) refer that investment-cash flow sensitivity is explained by asset tangibility and increases with it. They also underline that there is little evidence on the patterns of the investment-cash flow sensitivity outside the U.S., other gap our study fills. Typically, business group firms are larger, as highlighted, for example, by Boutin et al. (2013) and Almeida et al. (2015). Thus, it is expected that business groups have higher asset tangibility in comparison to their stand-alone counterparts and, according to Moshirian et al. (2017), higher investment-cash flow sensitivities. However, Almeida and Campello (2007) find that asset tangibility rises the investment-cash flow sensitivity, but only for financially constrained firms, suggesting again a relationship between investment-cash flow sensitivities and financial constraints. Because tangible assets are used as collateral in loans, asset tangibility is usually associated to financially unconstrained firms.

As depicted above, the issue of investment-cash flow sensitivities remains quite puzzling and so its study is very timely. Although there is no consensus in the extant literature, there is enough evidence to forecast that:

Hypothesis 3 (H3): Stand-alone firms exhibit higher investment-cash flow sensitivities.

Investment-cash flow sensitivities and financial constraints are usually studied alongside with the evolution of cash holdings as their precautionary motives may suggest the existence of financial constraints. In fact, as referred by Almeida et al. (2004), constrained firms tend to

save more cash from their cash flows and thus there is a cash-cash flow sensitivity, which they actually find to be positive and statistically significant. Contrarily to Almeida et al. (2004), Riddick and Whited (2009) and Bao et al. (2012) document that the cash-cash flow sensitivity is negative and statistically significant and justify with the fact that firms use cash flows to invest, not to accumulate cash. Nevertheless, Almeida et al. (2021) revisit their previous work and underline that the conclusions from Almeida et al. (2004) remain up to date (i.e., cash-cash flow sensitivity is positive), even after some extensions and robustness checks in response to previous works.

On the other hand, still regarding this issue of keeping liquid assets, but now with respect to business group membership, de Haas and van Lelyveld (2010) demonstrate that member firms of strong banking groups grow faster and the same applies to subsidiaries from parent banks that hold smaller amounts of liquid assets. Also, Locorotondo et al. (2014) find that business group firms keep significantly fewer amounts of cash when compared to similar stand-alone companies. The rationale for this result lies in the fact that business group firms do not need accumulating cash for precautionary motives, given that they can access the internal capital markets of the group. Hence, we expect that:

Hypothesis 4 (H4): Business group affiliation decreases cash savings.

3.3 Data sources and sample description

3.3.1 Business group definition and data source

As in Boutin et al. (2013), a business group is defined as a set of companies controlled, directly or indirectly, by the same company, which is the head of the group. Formal definitions of control require that the head of the group holds, directly or indirectly, at least 50% of the voting rights in another company.

We use individual data from the Central Balance Sheet Database (CBSD) of Banco de Portugal. Annual data from this database relies on Informação Empresarial Simplificada (IES⁷), which is a mandatory survey conducted by Banco de Portugal, Portuguese Ministries

⁷ Through IES, Portuguese companies report their annual financial statements (balance sheet, income statement, statement of changes in equity and statement of cash flows), as well as extra detailed information regarding the financial statements (e.g., for companies reporting investments in affiliated companies in the

of Finance and Justice, and Instituto Nacional de Estatística - INE (Statistics Portugal).

For this work, and in order to delimit business group firms, we focus on the information available regarding the group structure of each company. The first fiscal year for which IES information is available is 2006. Also, although it is possible to identify non-resident business group affiliates through IES, just resident affiliates were considered because complete economic and financial data is only available for them.

After excluding financial firms and utilities, we end up with around 8,000 business group companies and a universe of more than 370,000 non-financial corporations in 2008. In 2011, it was possible to identify more than 10,000 business group companies and a universe of more than 380,000 non-financial corporations.

3.3.2 Descriptive statistics

One of our aims with this work aim is to assess if crises have a different impact on the expenditures of business group affiliates and stand-alone companies and, for that, we observe the growth rates of some categories of spending (dividends⁸, employee costs, capital expenditures and marketing expenditures) and other accounting figures of interest, namely cash holdings, total assets and total sales in two different moments of time. Right after the beginning of the global financial crisis of 2008-2009 (fiscal year of 2008) and right after the request of financial assistance by Portugal in response to the sovereign debt crisis (fiscal year of 2011). Table 3.1 shows the mean and median values for some categories of expenses, cash holdings, total assets and total sales in 2008 and 2011 by business group affiliation. Business group firms are larger and have significantly higher mean and median expenses.

balance sheet, the identification of affiliated companies is required). This information is available in IES Annex A. In addition to the Annex A, IES also comprises plant- or establishment-level information on each non-financial company inquired (Annex R). Besides information on non-financial corporations, IES also provides information about banks and insurance companies, which, respectively, fill Annex B and Annex C, as well as Annex S and Annex T for establishment-level information. Data provided by companies is subject to quality control at Banco de Portugal.

⁸ Our measure of dividends could overvalue the cash dividend that was actually paid as we rely on a “accounting approach”. That is, we calculate dividends as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. We do not have information on dividends actually paid for the whole sample period.

Table 3.1: Firms' expenditures, assets and sales – Total sample

The table shows mean and median values for firms' expenditures, cash holdings, assets and sales by business group affiliation. Dividends are calculated as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. Capital expenditures are calculated as property, plant and equipment in the end of the period minus property, plant and equipment in the beginning of the period plus amortisation. Cash holdings include cash and cash equivalents. *, **, *** indicate statistical significance at the .10, .05 and .01 levels, respectively, for the mean and median differences between stand-alone and business group firms. Significance levels of mean and median differences are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test).

Variable	Business group affiliation	Number of firms		Mean		Median	
		(units)		(€ thousand)		(€ thousand)	
		2008	2011	2008	2011	2008	2011
Dividends	Stand-alone firm	121,153	134,436	101	142	8	7
	Business group firm	3,186	4,549	1,340	1,264	85	70
				***	***	***	***
Employee costs	Stand-alone firm	286,047	291,493	129	116	29	26
	Business group firm	5,295	7,448	2,264	1,940	376	281
				***	***	***	***
Capital expenditures	Stand-alone firm	198,998	147,275	94	59	7	5
	Business group firm	4,787	5,816	3,005	1,009	90	35
				***	***	***	***
Marketing expenditures	Stand-alone firm	190,080	148,575	11	11	0	0
	Business group firm	4,385	5,348	327	235	6	5
				***	***	***	***
Cash holdings	Stand-alone firm	346,035	349,680	84	85	9	7
	Business group firm	7,297	9,899	652	825	31	23
				***	***	***	***
Total assets	Stand-alone firm	364,591	371,137	991	898	113	96
	Business group firm	7,634	10,283	22,398	21,514	2,383	2,031
				***	***	***	***
Total sales	Stand-alone firm	364,591	371,137	633	550	79	62
	Business group firm	7,634	10,283	13,442	11,309	651	500
				***	***	***	***

Results from the table are in line with Gopalan et al. (2014) who find that group firms pay higher dividends than stand-alone firms. Also, several studies refer that cash holdings increase in times of crisis for precautionary motives (e.g. Song and Lee, 2012) or due to the absence of investment opportunities (e.g. Koo and Maeng, 2019). Indeed, while capital expenditures decreased in mean and median levels between 2008 and 2011, cash holdings increased in mean levels.

3.3.3 Control group selection

Given that business group and stand-alone firms differ too much in terms of number of firms and amount of expenditures, cash holdings, assets and sales, we matched business group firms with non-business group firms by past performance (measured by EBITDA/Total Assets in the previous year), industry (three-digit NACE Rev. 2 code⁹) and size class (following the Commission Recommendation of 6 May 2003¹⁰) according to the procedure developed by Leuven and Sianesi (2003). Barber and Lyon (1996) point out that “in developing models of expected operating performance (...) it is important to match sample firms to control firms on the basis of a sample firm’s industry, size, or past performance”. Table 3.2 shows the results for the matched firms. A one-to-one matching is performed as it can be seen by the number of firms in terms of total assets and total sales. However, regarding the other variables, not all the matched firms exhibit amounts in each one of them.

Although closer to the business group firms’ sample regarding past performance, industry and size, as well as concerning the variables shown in the Table 3.2 by comparison with Table 3.1, matched stand-alone firms are still smaller and these results are restated by the statistical tests. However, contrarily to what happens in Table 3.1, one is not able to reject the null hypothesis at the 1% level for all the mean and median differences presented, which confirms that although the samples are still different, they are more equal than before. Almeida et al. (2015) also present a control group that is somewhat different in terms of size. Moreover, reaching completely equal samples maybe would be possible, but attaining it would imply losing thousands of observations.

⁹ Details on the NACE Rev.2 classification are available at:

<https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>

¹⁰ According to the Commission Recommendation of 6 May 2003, “The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million”. This classification is also used by Gebauer et al. (2018) who study the relationship between corporate debt and investment in five stressed euro area countries (Greece, Italy, Portugal, Slovenia and Spain).

Table 3.2: Firms' expenditures, assets and sales – Matched sample

The table shows mean values for firms' expenditures, cash holdings, assets and sales by business group affiliation. Dividends are calculated as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. Capital expenditures are calculated as property, plant and equipment in the end of the period minus property, plant and equipment in the beginning of the period plus amortisation. Cash holdings include cash and cash equivalents. *, **, *** indicate statistical significance at the .10, .05 and .01 levels, respectively, for the mean and median differences between stand-alone and business group firms. Significance levels of mean and median differences are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test).

Variable	Business group affiliation	Number of firms		Mean		Median	
		(units)		(€ thousand)		(€ thousand)	
		2008	2011	2008	2011	2008	2011
Dividends	Stand-alone firm	3,094	4,555	1,188	1,173	24	18
	Business group firm	3,186	4,549	1,340	1,264	85	70
						***	***
Employee costs	Stand-alone firm	5,260	7,399	1,463	1,338	169	136
	Business group firm	5,295	7,448	2,264	1,940	376	281
				***	***	***	***
Capital expenditures	Stand-alone firm	4,723	5,796	997	595	37	20
	Business group firm	4,787	5,816	3,005	1,009	90	35
				***	*	***	
Marketing expenditures	Stand-alone firm	4,348	5,329	199	148	1	1
	Business group firm	4,385	5,348	327	235	6	5
				**	**	***	***
Cash holdings	Stand-alone firm	7,238	9,801	774	1,256	25	21
	Business group firm	7,297	9,899	652	825	31	23
						***	***
Total assets	Stand-alone firm	7,634	10,283	10,537	11,445	680	565
	Business group firm	7,634	10,283	22,398	21,514	2,383	2,031
				***	***	***	***
Total sales	Stand-alone firm	7,634	10,283	9,032	7,331	331	231
	Business group firm	7,634	10,283	13,442	11,309	651	500
				***	***	***	***

Given the previous results we will now assess the relationship between the observed trends and the existence of financial constraints for both the business group and the matched stand-alone firms.

3.4 Empirical methodology

To assess if firms are financially constrained, we use four measures of financial constraints:

dividend distribution, the KZ Index, the WW Index and the SA Index.

According to the dividend distribution measure, a firm is considered financially constrained if it does not distribute dividends and not constrained otherwise (Fazzari et al, 1988; Farre-Mensa and Ljungqvist, 2016)

The version of the KZ Index we use comes from Lamont et al. (2001). Also, instead of the Tobin's Q, we use Sales Growth as suggested by Asker et al. (2015), because our sample is mainly composed by private firms for which it is not possible to calculate Tobin's Q:

$$KZ\ index = -1.001909 \times \frac{CF}{PPE_{t-1}} + 0.2826389 \times Q + 3.139193 \times \frac{D}{(D+E)} - 39.3678 \times \frac{Dividends}{PPE_{t-1}} - 1.314759 \times \frac{Cash}{PPE_{t-1}},$$

where

$CF = Cash\ Flow;$

$PPE = Property, Plant and Equipment;$

$Q = Sales\ Growth$

$D = Debt;$

$E = Equity$

The WW Index is from Whited and Wu (2006) and is calculated as follows:

$$WW\ index = -0.091 \times \frac{CF}{TA} - 0.062 \times Dividend\ dummy + 0.021 \times \frac{LTD}{TA} - 0.044 \times \log(TA) + 0.102 \times Industry\ Q - 0.035 \times Q,$$

where

$CF = Cash\ Flow;$

$TA = Total\ Assets;$

$Dividend\ dummy = 1\ if\ the\ firm\ pays\ dividends\ and = 0\ otherwise;$

$LTD = Long - Term\ Debt;$

$Industry\ Q = Industry\ Sales\ Growth$

Industries are defined according to the three-digit NACE Rev. 2 classification

Finally, the SA Index is from Hadlock and Pierce (2010) and is defined as follows:

$$SA\ index = -0.737 \times \log(TA) + 0.043 \times \log(TA)^2 - 0.04 \times Age,$$

where

$TA = Total\ Assets;$

$Age = Age\ of\ the\ firm\ (current\ year - year\ of\ foundation)$

After the computation of the KZ, the WW and the SA Index, firms are classified as financially constrained (on a yearly basis) if their index value is above the previous year median and not constrained otherwise, in line with Giroud and Mueller (2015). Finally, to assess the determinants of financial constraints, logit regressions drawn from Kaplan and Zingales (1997) are run and extended to address the effects of business group affiliation on financial constraints' status.

To address the investment-cash flow sensitivity, we estimate the traditional investment equations that come from Fazzari et al. (1988) and extended them in order to include not only the effects of Tobin's q and cash flow on investment, but also the effects of business group affiliation on investment. Below it is shown an example of this kind of regressions taken from Moshirian et al. (2017), where I , K and CF denote, respectively, physical investment, physical assets and cash flow, and q is the market-to-book ratio, a proxy for Tobin's q . The investment-cash flow sensitivity is given by β_2 .

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 q_{i,t-1} + \beta_2 \frac{CF_{i,t}}{K_{i,t-1}} + \varepsilon_{i,t}$$

Since our sample of Portuguese non-financial corporations mostly comprises private firms, we define q as sales growth, as suggested by Asker et al. (2015). According to them, besides the Tobin's q , sales growth is also used as a proxy for a company's investment opportunities by several studies (e.g., Shin and Stulz, 1998; Bloom et al, 2007; Michaely and Roberts, 2012) and can be calculated for any firm regardless of its stock market listing status.

To examine the impact of business group affiliation on investment, a dummy variable taking the value of 1 if the firm belongs to a business group and the value of 0 otherwise is added

to this baseline regression.

Because investment-flow sensitivities and financial constraints are usually studied alongside with the evolution of cash holdings and their precautionary motives are suggestive of financial constraints, we also present some regressions based on Almeida et al. (2004) to handle this issue. In particular, we estimate their baseline and their augmented regression models for the change in cash holdings and included a dummy variable set to 1 if the firm belongs to a business group and 0 otherwise to assess the impact of business group affiliation on cash holdings' change. Because we have no information on acquisitions, the augmented regression model was estimated without this independent variable. Thus, our baseline and augmented regressions models are as follows:

- Baseline regression model:

$$\Delta CashHoldings_{i,t} = \alpha_0 + \alpha_1 q_{i,t} + \alpha_2 CF/K_{i,t} + \alpha_3 Size_{i,t} + \alpha_4 BG_{i,t} + \varepsilon_{i,t}$$

- Augmented regression model:

$$\Delta CashHoldings_{i,t} = \alpha_0 + \alpha_1 q_{i,t} + \alpha_2 CF/K_{i,t} + \alpha_3 Size_{i,t} + \alpha_4 I/K_{i,t} + \alpha_5 \Delta ShortDebt_{i,t} + \alpha_6 \Delta NWC_{i,t} + \alpha_7 BG_{i,t} + \varepsilon_{i,t}$$

Where:

CashHoldings is cash scaled by beginning of period net fixed assets¹¹;

q is sales growth;

CF/K is cash flow divided by beginning of period net fixed assets;

Size is the logarithm of total assets;

I/K is investment (capital expenditures) divided by beginning of period net fixed assets;

ShortDebt is short-term debt divided by beginning of period net fixed assets;

NWC is noncash net working capital divided by beginning of period net fixed assets;

BG is a dummy variable which is equal to 1 if the firm is a business group

¹¹ Net fixed assets is the net property, plant and equipment from firms' balance sheets, as in Cleary (1999) and Hovakimian (2009)

member and 0 otherwise.

3.5 Univariate results

Table 3.3 shows the summary statistics for the sample of business group and matched stand-alone firms in 2008. After this year and until 2014, the Portuguese GDP experienced sharp decreases in the aftermath of the global financial crisis of 2008-2009 and the sovereign debt crisis that followed.

Even when taking into account matched stand-alone firms, mean and median total assets, net fixed assets and sales are higher for business group firms and differences in their levels are statistically different from zero at the 1% level. Also, business group firms are older. These results are consistent with the literature on business group affiliation (Lensink et al., 2003; Claessens et al., 2006; Khanna and Yafeh, 2007; Gopalan et al., 2014). Another conclusion one can draw from the table is that, even across the business group firms' sample, firms diverge very much as means are systematically higher than medians. This suggests the presence of very large groups alongside with smaller ones. Mean dividends deflated by net fixed assets are higher in business group firms, as well as leverage, in line with Gopalan et al. (2014).

Matched stand-alone firms exhibit higher mean and median levels of cash flow and cash deflated by net fixed assets. As they do not benefit from the insurance provided by business group affiliation, these results are in accordance to the precautionary motive of cash holdings (Song and Lee, 2012).

Table 3.3: Summary statistics

This table presents the summary statistics for the sample of business group firms and matched stand-alone firms for the year of 2008. Dividends are calculated as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. Leverage is defined as debt over total assets. By debt we mean bond and loan financing. Cash flow is net income plus depreciation and amortisation. Cash is equal to balance sheet cash and cash equivalents. Financial slack is calculated as in Hovakimian (2009) and Cleary (1999): sum of cash and marketable securities, 0.7 times accounts receivable, 0.5 times inventories, less the accounts payable, divided by net fixed assets. Investment is defined as capital expenditures which are calculated as property, plant and equipment in the end of the period minus property, plant and equipment in the beginning of the period plus amortisation. K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. Sales growth is defined as the change in sales from the previous year's level, divided by the previous year's sales. Investment growth is defined as the change in investment from the previous year's level, divided by the previous year's investment. Age is the age of the firm. ROA is lagged operating return on assets, with operating return being measured by EBITDA. Significance levels of mean and median differences between stand-alone and business group firms are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test), respectively. *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively. To reduce the influence of outliers in the analysis, variables are winsorised between 0.10 and 0.90 percentiles.

	Business group firms and matched stand-alone firms		Business group firms		Matched stand-alone firms		Difference (Business group - Matched stand-alone firms)			
	Mean	Median	Mean	Median	Mean	Median	Mean		Median	
Total assets (€ million)	4.917	1.255	6.201	2.383	3.634	0.680	2.567	***	1.703	***
Net fixed assets (€ million)	1.209	0.236	1.546	0.445	0.892	0.131	0.654	***	0.314	***
Sales (€ million)	2.962	0.467	3.343	0.651	2.582	0.331	0.761	***	0.320	***
Dividends/K	1.543	0.253	1.562	0.251	1.524	0.257	0.038		-0.006	
Leverage	0.193	0.073	0.227	0.126	0.159	0.030	0.068	***	0.096	***
Cash flow/K	0.450	0.183	0.446	0.164	0.453	0.203	-0.007		-0.039	***
Cash/K	1.321	0.173	1.167	0.118	1.464	0.244	-0.297	***	-0.126	***
Financial slack/K	3.497	0.519	3.261	0.394	3.722	0.643	-0.461	***	-0.249	***
Investment/K	0.333	0.178	0.329	0.179	0.337	0.178	-0.008		0.001	
Sales growth	0.025	0.013	0.018	0.012	0.031	0.013	-0.013	**	-0.001	
Investment growth	0.772	-0.112	0.750	-0.099	0.793	-0.128	-0.043		0.029	
Age	14.983	12.000	15.637	13.000	14.328	11.000	1.309	***	2.000	***
ROA	0.053	0.045	0.053	0.045	0.053	0.045	0.000		0.000	
Observations	15,268		7,634		7,634					

Financial slack is calculated according to Cleary (1999) and Hovakimian (2009). It is the sum of cash and marketable securities, 0.7 times accounts receivable, 0.5 times inventories, less the accounts payable, divided by net fixed assets. It is used as a measure of internal liquidity, with higher levels of financial slack possibly meaning liquidity constraints. Results for our sample show that mean and median levels of financial slack scaled by net fixed assets are greater in stand-alone firms. Hence, as predicted by H1, this suggests that stand-alone firms are more financially constrained than business group firms.

Figure 3.1 shows the evolution of mean and median levels of investment (deflated by net fixed assets) by year and business group affiliation. The mean levels of investment decrease for both business group and stand-alone firms, but stand-alone firms seem to experience steeper declines for years 2011 and 2012, in the aftermath of the sovereign debt crisis and the Portuguese request of financial assistance. Also, median levels from 2011 to 2014 are slightly higher in business group firms. This evidence suggests that business groups provide shield to their members during crises.

The financial crisis and the lack of investment opportunities (proxied by sales growth) determined the decrease of investment. But, in the absence of investment opportunities, what did firms do to their cash flows? Did they save for precautionary motives or did they distribute dividends? Almeida et al. (2004) point out that constrained firms should accumulate cash after economic downturns and Han and Qiu (2007) refer that constrained firms rise their cash holdings in times of higher volatility. Bates et al. (2009) and Song and Lee (2012) also find evidence of the precautionary motive in the increase of cash holdings.

Figure 3.1: Investment/K over the period between 2008 and 2014

This figure shows the evolution of the mean and median Investment/K over the period between 2008 and 2014 by business group affiliation. Investment is defined as capital expenditures which are calculated as property, plant and equipment in the end of the period minus property, plant and equipment in the beginning of the period plus amortisation. K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. We run a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test) by year to evaluate the significance levels of mean and median differences between stand-alone and business group firms. Mean differences are statistically significant at least at the 0.10 level for all the years with the exception of 2012. Median differences are only statistically significant (at the 0.01 level) for the years of 2009 and 2010. Bars in the first chart represent lower and upper levels of the 95% confidence interval.

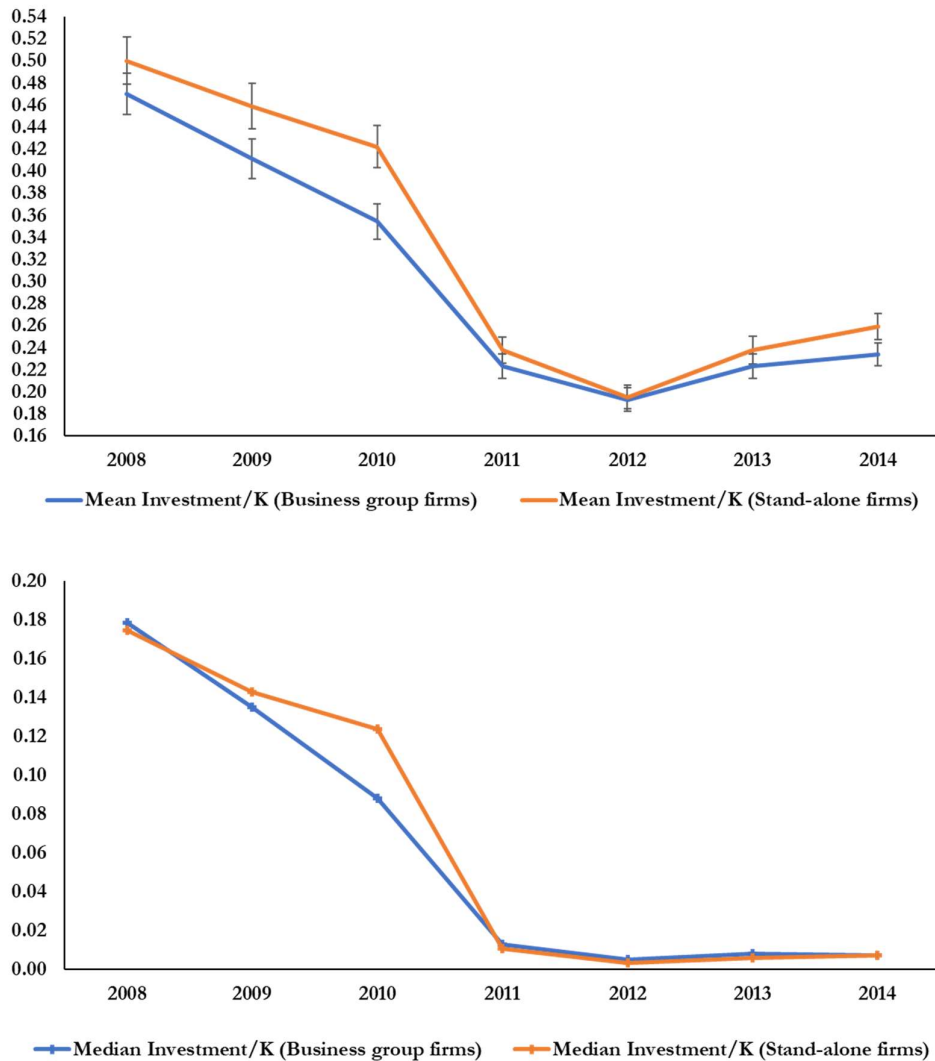
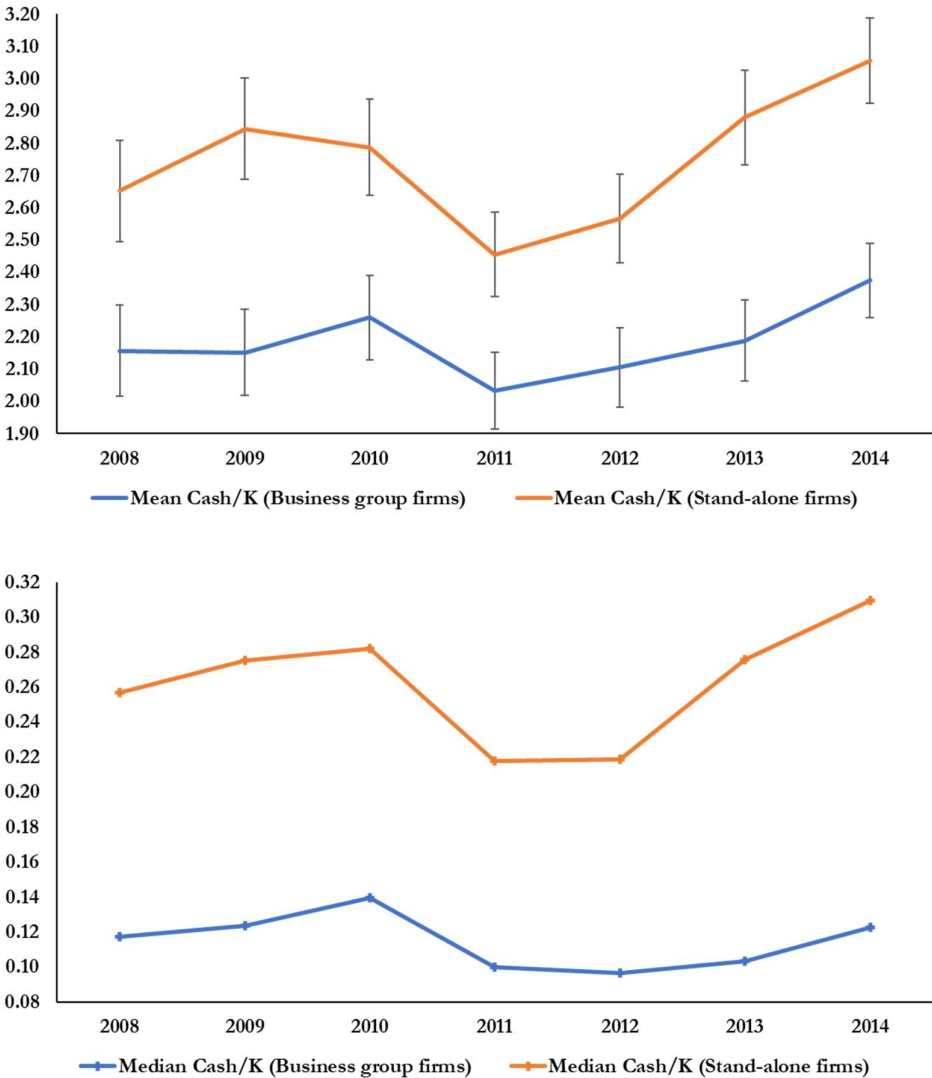


Figure 3.2 actually shows that stand-alone firms, seen as more financially constrained than business group firms (H1), increased their median and mean levels of cash (deflated by net fixed assets) during the period between 2008 and 2014, in spite of the sharper decline in

mean and median levels in 2011. Again, this decay was smoother for business group firms.

Figure 3.2: Cash/K over the period between 2008 and 2014

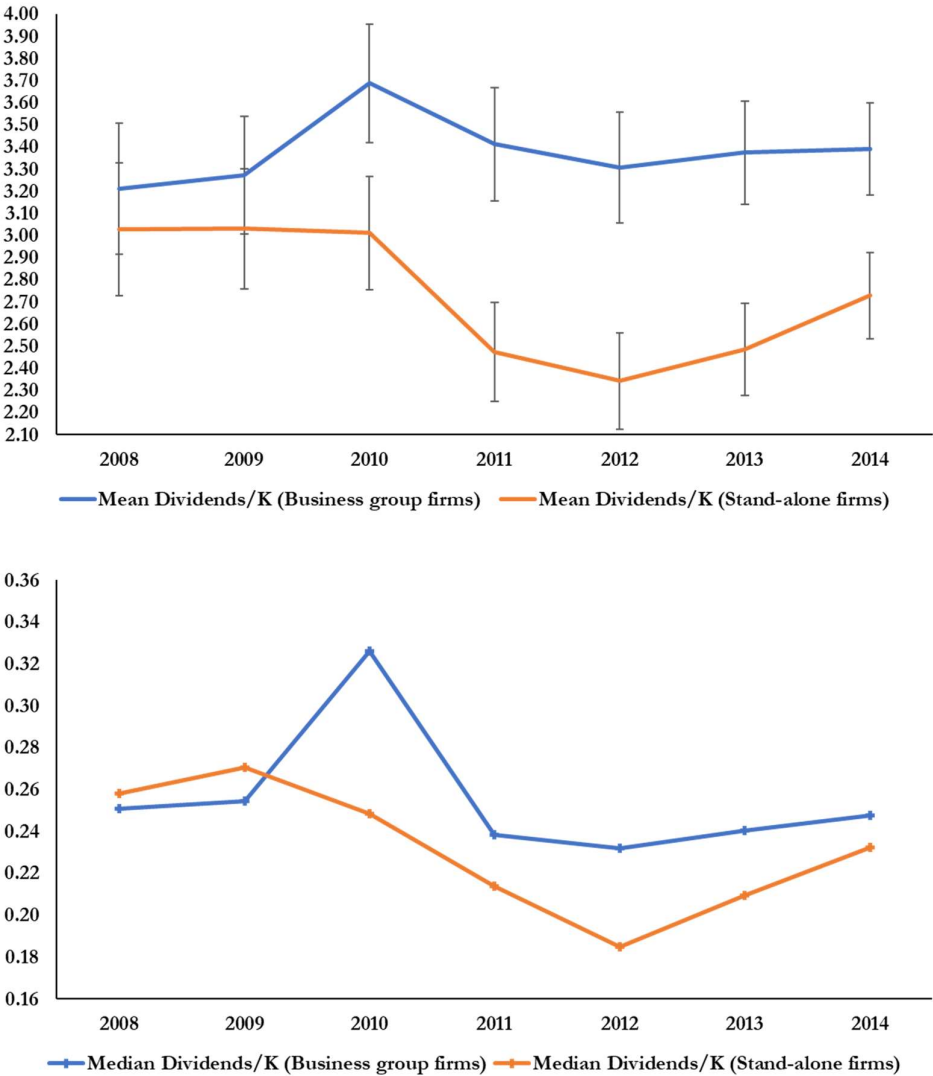
This figure shows the evolution of the mean and median Cash/K over the period between 2008 and 2014 by business group affiliation. Cash is equal to balance sheet cash and cash equivalents. K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. We run a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test) by year to evaluate the significance levels of mean and median differences between stand-alone and business group firms. Both mean and median differences are statistically significant at the 0.01 level for all the years. Bars in the first chart represent lower and upper levels of the 95% confidence interval.



On the other hand, mean and median levels of dividends scaled by the beginning of the period property, plant and equipment (Figure 3.3) are higher for business group firms and grew over the period 2008-2014, which is consistent with the hypothesis that these companies are less financially constrained than stand-alone firms (H1).

Figure 3.3: Dividends/K over the period between 2008 and 2014

This figure shows the evolution of the mean and median Dividends/K over the period between 2008 and 2014 by business group affiliation. Dividends are calculated as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. We run a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test) by year to evaluate the significance levels of mean and median differences between stand-alone and business group firms. Mean differences are statistically significant at the 0.01 level from 2010 to 2014 while median differences are statistically significant at the 0.01 level from 2010 to 2013. Bars in the first chart represent lower and upper levels of the 95% confidence interval.



These findings are corroborated by the works of Floyd et al. (2015), who show that corporate dividends are resilient and that the global financial crisis had a shy impact on them, and of Gopalan et al. (2014), who highlight that group firms usually pay more dividends than stand-alone firms. Both Floyd et al. (2015) and Koo and Maeng (2019) suggest that dividend distribution and cash holdings, respectively, increase due to the lack of investment opportunities.

To evaluate the degree of financial constraints of business group and stand-alone firms, we now do a brief assessment of the four measures of financial constraints previously presented, namely the KZ Index, the WW Index, the SA Index and the no dividend distribution dummy. As explained above, firms are considered financially constrained if the individual values of the indexes lie above the median sample or if they don't distribute dividends.

Table 3.4 reports cross-tabulations of the four measures for the period between 2008 and 2014 and indicates whether or not different indexes return the same financial constraints' status.

Table 3.4: Cross-tabulations of the measures of financial constraints

This table shows cross-tabulations of the four measures of financial constraints used in this work to demonstrate the degree to which the measures generate overlapping classifications. The values report the share of the firms with the same classification of constrained or unconstrained according to each pair of measures. For example, using the WW Index to assess financial constraints returned the same results as the KZ Index in 69.3% of the observations during the period 2008-2014 and using the No dividend distribution criteria returned the same results as the SA Index in 52.8% of the observations.

Classification criteria	Measure of financial constraints			
	KZ Index	WW Index	SA Index	No dividend distribution
KZ Index	1.000			
WW Index	0.693	1.000		
SA Index	0.374	0.164	1.000	
No dividend distribution	0.738	0.585	0.528	1.000

The KZ Index and the WW Index provide the same classification of financially constrained or unconstrained firm in 69.3% of the cases. On the other hand, the weaker measure seems to be the SA Index, which only returns the same results as the KZ Index in 37.4% of the

cases and the same results as the WW Index in 16.4% of the cases. In line with Farre-Mensa and Ljungqvist (2016), it is clear that using the same coefficients from the original works could produce biased results. Hadlock and Pierce (2010) use a sample of firms from the United States, which are much larger than the Portuguese firms from our sample. Hence, using the same coefficients of their work could lead to an unrealistic number of constrained firms.

In addition, Table 3.5 presents the percentage of firms classified as constrained according to each measure by year and business group affiliation.

Table 3.5: Percentage of financially constrained firms

This table reports the percentage of business group firms and stand-alone firms that are financially constrained according to the KZ Index from Lamont et al. (2001), the WW Index from Whited and Wu (2006), the SA Index from Hadlock and Pierce (2010) and the no dividend distribution criteria. As in Giroud and Mueller (2015), firms whose index lies above (below) the median in the year before are classified as financially constrained (unconstrained). According to the no dividend distribution criteria, a firm is classified as financially constrained if it does not distribute dividends.

Measure of financial constraints								
	KZ Index		WW Index		SA Index		No dividend distribution	
Year	Business group firms	Stand-alone firms	Business group firms	Stand-alone firms	Business group firms	Stand-alone firms	Business group firms	Stand-alone firms
2008	25%	27%	10%	25%	84%	69%	62%	60%
2009	23%	24%	10%	25%	84%	69%	56%	57%
2010	23%	27%	10%	27%	84%	68%	55%	54%
2011	28%	31%	11%	28%	83%	66%	59%	56%
2012	24%	27%	10%	26%	83%	66%	56%	56%
2013	22%	25%	10%	24%	83%	67%	49%	48%
2014	30%	29%	13%	29%	79%	65%	52%	48%

It seems that, indeed, the SA Index overestimates the percentage of constrained firms. As explained above, by using the same coefficients of the original work, biased results could be achieved. Thus, evaluating the financial constraints' status through this measure is not cautious. On the other hand, the dividend distribution measure identifies as constrained around a half or more of the firms, which also seems an exaggerated figure. Hence, we will

rely on the WW index to continue the analysis as it is more consistent than the KZ index (Whited and Wu, 2006; Schauer et al., 2019) and it returns a fraction of financially constrained firms much more comparable to that of Campello et al. (2010) and Schauer et al. (2019). The former identifies as constrained 20% of the firms from their U.S. sample and 15% of the firms from their European sample, while the latter classify as constrained 19% of the firms from their German sample. Regarding our sample and, for example, the year of 2008, there were 10% of business group firms financially constrained and 25% of stand-alone firms financially constrained according to the WW index.

3.6 Multivariate results

3.6.1 Logit regressions

To test our first hypothesis that business group firms are less financially constrained than stand-alone firms (H1), we run some logit regressions that are shown in Table 3.6. As in Kaplan and Zingales (1997), we estimate four different specifications without and with year fixed effects. The absence of year fixed effects does not significantly change results. We also borrow from them all the independent variables used and add a dummy variable to address the impact of business group affiliation on the financial constraints' status, which is one of the main aims of this work.

The most important result of Table 3.6 is that belonging to a business group decreases the probability of being financially constrained given that the coefficients associated to the business group dummy variable are negative (-1.14). Therefore, we can conclude that business group firms are, in fact, less financially constrained than stand-alone firms and accept H1. This result is according with the extant literature on internal capital markets which suggests that the flows of funds across business groups mitigates credit constraints and with the conclusions by Lensink et al. (2003) who demonstrate that business group firms face fewer financial constraints than stand-alone firms using investment-cash flow sensitivities.

Regarding the other variables of the logit regressions, we also show that the likelihood of a firm being financially constrained especially increases with leverage (in all specifications) and decreases with the amount of internally generated cash flows, which is consistent with Kaplan and Zingales (1997) and Hadlock and Pierce (2010), who also replicated Kaplan and Zingales' (1997) ordered logits. On the other hand, we find that investment opportunities

(proxied by q , here defined as sales growth) decrease the probability of being financially constrained, contrarily to Kaplan and Zingales (1997) and Hadlock and Pierce (2010). However, Kaplan and Zingales' (1997) results are counter-intuitive as they are expecting a negative sign for the coefficient of q , like in our case. Regarding dividends, our results are opposite to those from Kaplan and Zingales (1997) as we find a positive coefficient meaning that they increase the probability of being financially constrained. Hadlock and Pierce (2010) also observe positive coefficients for dividends in some specifications, but they are not statistically significant. Adding to this debate, Floyd et al. (2015) conclude that the global financial crisis had a weak impact on dividends, with firms showing reluctance in cutting them even in the presence of losses and Michaely and Roberts (2012) find that public firms smooth dividends in an extent that the existence of financing frictions would not recommend. Therefore, it may actually be possible that the distribution of dividends causes an increase in the probability of being financially constrained, especially in such a troubled period like 2008-2014.

Concerning cash, our findings show that it increases the likelihood of being financially constrained, which is contrary to Kaplan and Zingales (1997), but in line with Hadlock and Pierce (2010), who stress that this result is according to the precautionary motive of cash holdings, that is, financially constrained firms accumulate more cash (Almeida et al., 2004; Song and Lee, 2012).

Table 3.6: Logit regressions for the prediction of the financial constraints' status

This table reports the logit regressions for the prediction of the financial constraints' status for the sample of business group firms and matched stand-alone firms for the period between 2008 and 2014. The dependent variable is the financing constraints' status (Constrained=1; Not constrained=0) measured by the WW Index from Whited and Wu (2006). CF/K is cash flow scaled by the beginning of the period property, plant and equipment. q is the annual sales growth and it is our proxy for investment opportunities. Capital is defined as Total Debt plus Equity. Dividends/K is dividends scaled by the beginning of the period property, plant and equipment. Cash/K is cash scaled by the beginning of the period property, plant and equipment. Dividends are calculated as net income plus retained earnings in the beginning of the fiscal year minus retained earnings in the end of the fiscal year. Cash is equal to balance sheet cash and cash equivalents. BG is a dummy variable which assumes the value of 1 if the firm belongs to a business group and the value of 0 otherwise. The variables signed with + are winsorised between 0.10 and 0.90 percentiles. Standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively.

Dependent variable is the financial constraints' status (Constrained=1; Not constrained=0) measured by the WW Index from Whited and Wu (2006)								
Variables	(1)		(2)		(3)		(4)	
CF/K ⁺	-0.435	***	-0.456	***	-0.439	***	-0.460	***
	(0.019)		(0.019)		(0.019)		(0.020)	
q ⁺	-1.395	***	-1.533	***	-1.428	***	-1.570	***
	(0.062)		(0.065)		(0.063)		(0.065)	
Debt/Capital ⁺	0.933	***	0.870	***	0.935	***	0.877	***
	(0.057)		(0.057)		(0.057)		(0.057)	
Dividends/K ⁺	0.137	***	0.173	***	0.137	***	0.173	***
	(0.008)		(0.009)		(0.008)		(0.009)	
Cash/K ⁺	0.107	***	0.078	***	0.107	***	0.077	***
	(0.010)		(0.011)		(0.010)		(0.011)	
BG			-1.138	***			-1.143	***
			(0.046)				(0.046)	
Constant	-3.528	***	-3.043	***	-3.744	***	-3.274	***
	(0.049)		(0.051)		(0.088)		(0.090)	
Year fixed effects	No		No		Yes		Yes	
Log likelihood	-9,106.342		-8,769.138		-9,076.169		-8,736.653	
Pseudo R ²	0.123		0.155		0.126		0.158	
Observations	43,659		43,659		43,659		43,659	

3.6.2 Investment regressions

To test our second hypothesis that business group membership positively impacts investment in periods of crises (H2) and our third hypothesis that stand-alone firms exhibit higher investment-cash flow sensitivities (H3), several equations were estimated for the period comprised between 2008 and 2014. The baseline equation to address these hypotheses is, as presented by Moshirian et al. (2017):

$$\frac{I_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 q_{i,t-1} + \beta_2 \frac{CF_{i,t}}{K_{i,t-1}} + \varepsilon_{i,t}$$

The cash flow sensitivity is given by the coefficient of β_2 . I denotes investment, defined as capital expenditures, as in Hovakimian (2009), K is net fixed assets, which is the net property, plant and equipment from firms' balance sheets, and q , originally Tobin's Q, is here proxied by sales growth. This regression comes from Fazzari et al. (1988) and it has been widely used across the literature on investment-cash flow sensitivities, with slight changes according to research motivations. For example, in this work we extend the baseline regression in order to include business group and recession dummies and some interaction terms, as well as controls for the cost of capital and financial flexibility for robustness purposes (Table 3.7).

The business group dummy is equal to 1 if a firm belongs to a business group and equal to 0 otherwise, while the recession dummy is equal to 1 in years in which the Portuguese GDP fell (2009, 2011, 2012 and 2013) and equal to 0 otherwise. To compute the weighted average cost of capital (WACC) we employ the capital asset pricing model (CAPM) to determine the cost of equity and the cost of debt is calculated with the interest expenses of firms. While using the CAPM, risk-free rate is proxied by the Germany 30-Year Bond Yield and average levered betas and the market risk premium are drawn from KPMG (2014). Finally, we use net debt, defined as total debt minus cash and cash equivalents, scaled by total assets, to control for financial flexibility. As mentioned by Arslan-Ayaydin et al. (2014), "firms can attain financial flexibility through both their debt financing and cash holdings policies".

Financial flexibility and its importance to corporate investment in a context of a financial crisis has been addressed by several papers (e.g., Childs et al., 2005; Arslan-Ayaydin et al., 2014; Ferrando et al., 2017). Childs et al. (2005) refer that financial flexibility leads firms to choose short-term debt and thus decreases agency costs. In addition, Arslan-Ayaydin et al. (2014) and Ferrando et al. (2017) show that financially flexible firms invest more and are able

to mitigate the negative impacts of a crisis on investment.

All the different specifications presented in Table 3.7 are estimated using the Fixed Effects method and the Blundell and Bond's (1998) system GMM method, which is more robust given that it copes with endogenous variables (Flannery and Hankins, 2013). As underlined by Roberts and Whited (2013), endogeneity causes inconsistent estimates and so does not allow a reliable statistical inference.

To ascertain the validity of our second hypothesis that business group membership positively impacts investment in periods of crises, a business group dummy is included in most of the specifications and it is positive and statistically significant in the majority of the situations, especially when Blundell and Bond's (1998) system GMM method is used. This result confirms H2 and is consistent with Almeida et al. (2015) who stress that business group firms invest more than their matched stand-alone counterparts in the aftermath of the Asian crisis of 1997.

Results also confirm that stand-alone firms exhibit higher investment-cash flow sensitivities (H3). On the one hand, models in specification (7) show that being a business group firm does not amplify the significant effect of cash flow on investment and, on the other hand, models in specifications (10) and (11) actually demonstrate that the investment-cash flow sensitivity is higher for stand-alone firms given that the coefficient associated with the independent variable CF/K is larger by around two percentage points. This result is in line with the conclusions drawn by Lensink et al. (2003). And considering that stand-alone firms are more financially constrained than their business group counterparts, this result is also according to Almeida and Campello (2007), La Rocca et al. (2016) and Mulier et al. (2016), who show that investment-cash flow sensitivities are higher for constrained firms.

In addition, we demonstrate that investment opportunities, proxied by sales growth, and cash flow are key to investment regardless of the estimation method used, which is in line with the extant literature (e.g., Agca and Mozumdar, 2017). Models in specification (2) repeat models in specification (1) but taking into account year and industry dummies and the same conclusions hold. Hence, year and industry dummies are seldom used throughout the remaining specifications.

Table 3.7: Investment regressions

This table reports the investment regressions for the sample of business group firms and matched stand-alone firms for the period between 2008 and 2014. The dependent variable is Investment/K, where Investment is defined as capital expenditures and K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. q is the annual sales growth and it is our proxy for investment opportunities. CF/K is cash flow scaled by the beginning of the period property, plant and equipment. Age is the logarithm of the age of the company and Size is the logarithm of the book value of total assets. These two variables control for firms' characteristics. BG is a dummy variable which assumes the value of 1 if the firm belongs to a business group and the value of 0 otherwise. Recession is a dummy variable which assumes the value of 1 if the Portuguese GDP fell in a given year and the value of 0 otherwise. During the period between 2008 and 2014, the Portuguese GDP fell in 2009, 2011, 2012 and 2013. WACC is the weighted average cost of capital and Net Debt is a control for financial flexibility, being calculated as total debt minus cash and cash equivalents deflated by total assets. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). The dependent variable is winsorised between 0.10 and 0.90 percentiles as are also the variables signed with +. Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Variables	All (1)		All (2)		All (3)		All (4)		All (5)		All (6)	
	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB
q ⁺	0.110 *** (0.005)	0.033 *** (0.007)	0.083 *** (0.005)	0.027 *** (0.007)	0.083 *** (0.005)	0.027 *** (0.007)	0.070 *** (0.005)	0.020 *** (0.007)	0.070 *** (0.005)	0.020 *** (0.007)	0.063 *** (0.005)	0.019 *** (0.007)
CF/K ⁺	0.053 *** (0.002)	0.052 *** (0.004)	0.048 *** (0.002)	0.049 *** (0.004)	0.048 *** (0.002)	0.049 *** (0.004)	0.051 *** (0.002)	0.049 *** (0.004)	0.051 *** (0.002)	0.049 *** (0.004)	0.050 *** (0.002)	0.048 *** (0.004)
Age							-0.231 *** (0.007)	-0.117 *** (0.015)	-0.232 *** (0.007)	-0.117 *** (0.015)	-0.233 *** (0.007)	-0.124 *** (0.016)
Size							0.039 *** (0.004)	0.076 *** (0.008)	0.039 *** (0.004)	0.076 *** (0.008)	0.039 *** (0.004)	0.075 *** (0.008)
BG					0.016 *** (0.006)	0.019 * (0.011)			0.008 (0.006)	0.022 ** (0.011)	0.004 (0.006)	0.021 * (0.011)
Recession											-0.034 *** (0.002)	-0.008 ** (0.003)
BG*CF/K												
BG*Recession												
WACC												
Net Debt												
Constant	0.187 *** (0.001)	0.127 *** (0.003)	0.267 *** (0.042)	0.189 ** (0.084)	0.258 *** (0.042)	0.212 ** (0.084)	0.217 *** (0.066)	-0.708 *** (0.130)	0.215 *** (0.066)	-0.727 *** (0.131)	0.241 *** (0.065)	-0.685 *** (0.132)
Year dummies	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Industry dummies	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Observations	87,871	39,322	87,871	39,322	87,871	39,322	87,658	39,287	87,658	39,287	87,658	39,287

Table 3.7 (continued): Investment regressions

This table reports the investment regressions for the sample of business group firms and matched stand-alone firms for the period between 2008 and 2014. The dependent variable is Investment/K, where Investment is defined as capital expenditures and K, which denotes net fixed assets, is the beginning of the period property, plant and equipment. q is the annual sales growth and it is our proxy for investment opportunities. CF/K is cash flow scaled by the beginning of the period property, plant and equipment. Age is the logarithm of the age of the company and Size is the logarithm of the book value of total assets. These two variables control for firms' characteristics. BG is a dummy variable which assumes the value of 1 if the firm belongs to a business group and the value of 0 otherwise. Recession is a dummy variable which assumes the value of 1 if the Portuguese GDP fell in a given year and the value of 0 otherwise. During the period between 2008 and 2014, the Portuguese GDP fell in 2009, 2011, 2012 and 2013. WACC is the weighted average cost of capital and Net Debt is a control for financial flexibility, being calculated as total debt minus cash and cash equivalents deflated by total assets. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). The dependent variable is winsorised between 0.10 and 0.90 percentiles as are also the variables signed with +. Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Sample	All (7)		All (8)		All (9)		Stand-alone (10)		Business group (11)	
	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB
q ⁺	0.070 *** (0.005)	0.020 *** (0.007)	0.063 *** (0.005)	0.018 *** (0.007)	0.064 *** (0.005)	0.017 ** (0.007)	0.068 *** (0.010)	0.022 (0.023)	0.061 *** (0.006)	0.017 ** (0.008)
CF/K ⁺	0.062 *** (0.004)	0.053 *** (0.009)	0.050 *** (0.002)	0.048 *** (0.004)	0.050 *** (0.002)	0.050 *** (0.004)	0.065 *** (0.005)	0.067 *** (0.012)	0.046 *** (0.003)	0.048 *** (0.005)
Age	-0.231 *** (0.007)	-0.117 *** (0.015)	-0.233 *** (0.007)	-0.124 *** (0.016)	-0.234 *** (0.008)	-0.121 *** (0.017)	-0.250 *** (0.015)	-0.074 (0.049)	-0.233 *** (0.010)	-0.127 *** (0.018)
Size	0.040 *** (0.004)	0.076 *** (0.008)	0.039 *** (0.004)	0.075 *** (0.008)	0.039 *** (0.005)	0.075 *** (0.008)	0.046 *** (0.010)	0.095 *** (0.023)	0.038 *** (0.006)	0.071 *** (0.009)
BG	0.015 ** (0.006)	0.025 ** (0.011)	0.003 (0.007)	0.015 (0.012)	0.003 (0.006)	0.021 * (0.011)				
Recession			-0.036 *** (0.004)	-0.015 ** (0.008)	-0.032 *** (0.002)	-0.007 * (0.004)	-0.033 *** (0.004)	-0.005 (0.008)	-0.031 *** (0.003)	-0.007 * (0.004)
BG*CF/K	-0.014 *** (0.005)	-0.005 (0.009)								
BG*Recession			0.003 (0.005)	0.009 (0.009)						
WACC ⁺					-0.003 *** (0.001)	-0.002 (0.001)	-0.002 (0.002)	-0.003 (0.003)	-0.004 *** (0.001)	-0.002 (0.002)
Net Debt ⁺					-0.003 (0.011)	0.035 * (0.019)	0.053 ** (0.021)	0.072 (0.045)	-0.019 (0.013)	0.029 (0.021)
Constant	0.204 *** (0.066)	-0.730 *** (0.130)	0.242 *** (0.066)	-0.680 *** (0.131)	0.265 *** (0.073)	-0.702 *** (0.141)	0.197 (0.151)	-1.186 *** (0.411)	0.284 *** (0.092)	-0.609 *** (0.148)
Year dummies	No	No	No	No	No	No	No	No	No	No
Industry dummies	No	No	No	No	No	No	No	No	No	No
Observations	87,658	39,287	87,658	39,287	80,507	37,569	39,774	8,629	40,733	28,940

Investment- q sensitivity is larger for stand-alone firms too, which is consistent with the findings of Ozbas and Scharfstein (2010). Moreover, the coefficients associated with the dummy variable *Recession* are negative and statistically significant, meaning that recessions hinder investment, in line with Hovakimian (2011). Finally, we find a negative impact of the WACC on investment, which is consistent to the standard theory (Frank and Shen, 2016) and a positive and statistically significant impact of net debt deflated by total assets, but only for Blundell and Bond's (1998) system GMM estimates when all firms are considered (model 9) and fixed effects estimates when stand-alone are taken into account (model 10). This last conclusion is according to Gebauer et al. (2018) who stress that although the relationship between corporate debt and investment is non-linear, it seems that the investment-debt sensitivity increased after the financial crisis of 2008 when internal funds become scarcer and thus investment had to be funded with external financing, which is particularly true in the case of stand-alone firms.

3.6.3 Cash regressions

To address the fourth hypothesis that business group affiliation decreases cash savings (H4), we follow Almeida et al. (2004) and extend their work on cash-cash flow sensitivities in order to take into account business group affiliation.

So, we first develop a baseline regression model and then an augmented regression model comprising more variables. The baseline regression model only includes three independent variables referring to investment opportunities (q), cash flow and size, like in Almeida et al. (2004), plus the business group dummy and an interaction term between the business group dummy and cash flow to assess if business group affiliation amplifies the cash-cash flow sensitivity. The augmented regression model adds to this baseline regression model the variables investment, proxied by capital expenditures, the change in short-term debt and the change in noncash net working capital, all of them scaled by the beginning of the period property, plant and equipment.

Results for the baseline regression model are in specifications (1) to (5) of Table 3.8. In addition, specifications (6) to (10) show the results for the augmented regression model. As in the case of investment-cash flow sensitivities, all the specifications are estimated using the Fixed Effects method and the Blundell and Bond's (1998) system GMM method, as a robustness check.

We demonstrate that business group affiliation has a statistically significant negative impact on the change in cash holdings in both the baseline and the augmented regressions models when Blundell and Bond's (1998) system GMM estimates are used (models 2 and 7). This result mainly comes from the unconstrained firms' subsample (models 3 and 8) because the coefficient for the business group dummy is positive, although not statistically significant, in the constrained firms' subsample (models 4, 5, 9 and 10). This evidence confirms H4 and is in line with Locorotondo et al. (2014), who also points out that business group firms exhibit lower amounts of cash holdings in comparison to similar stand-alone firms. Given that they can access the internal capital markets of the business group, they do not need to accumulate so much cash as stand-alone firms. In fact, as mentioned by Gertner and Scharstein (2013), a "common characteristic of internal capital markets is that business units do not have direct access to the excess cash flow they generate. Instead, they must upstream the cash and seek funds for capital investment through the capital allocation process".

Moreover, we observe that investment opportunities have a positive and statistically significant impact on the change in cash holdings during the period between 2008 and 2014 in almost all the specifications, which is consistent with Almeida et al. (2004), Riddick and Whited (2009) and Bao et al. (2012). The exception is in the case of constrained firms and when Blundell and Bond's (1998) system GMM estimates are used (models 4, 5, 9 and 10). In line with Kaplan and Zingales (1997), it is possible that investment opportunities could not contribute to significantly increase cash holdings in constrained firms as due to the scarcity of internal funds they are not able to carry on those projects or, being able to do so, funding investment with internal funds does not allow the accumulation of cash.

This trade-off between investment and the accumulation of cash becomes clearer when using the augmented regression model. As it can be seen in specifications (6) to (10), investment has a negative effect on the change in cash holdings, which is coherent with the findings of Almeida et al. (2004) and Bao et al. (2012).

Cash flow, in its turn, has a positive and statistically significant impact on the change in cash holdings, even after using system GMM estimates. Especially in financially constrained firms, given that the coefficient associated with CF/K is larger (models 4 and 9). These results confirm the findings of Almeida et al. (2004) and Almeida et al. (2021) and therefore one can conclude that cash-cash flow sensitivity exists and it is positive, although Riddick and Whited (2009) and Bao et al. (2012) find a negative relationship after using the GMM method

developed by Erickson and Whited (2000).

Our results also show a negative relationship between the change in short-term debt and the change in cash holdings, which is contrary to Almeida et al. (2004) and Bao et al. (2012), but in line with Kahl et al. (2015). As referred by Bao et al. (2012), the precautionary motive of cash holdings leads firms to increase them to fund new short-term liabilities and so a positive relationship between the change in short-term debt and the change in cash holdings would be expected. Nevertheless, as concluded by Kahl et al. (2015), short-term debt (namely commercial paper) and cash holdings seem to be perfect substitutes given that, in their study, cash holdings decrease before the use of commercial paper and increase after the firms leave the commercial paper market, supporting our results. This complementarity between cash and short-term debt also suggests financial flexibility.

Finally, regarding the impact of size and noncash net working capital on the change in cash holdings, our findings are according to Almeida et al. (2004) and Bao et al. (2012).

Table 3.8: Cash regressions

This table reports the cash regressions for the sample of business group firms and matched stand-alone firms for the period between 2008 and 2014. The dependent variable is $\Delta\text{CashHoldings}$ scaled by the beginning of the period property, plant and equipment. This table resembles the work of Almeida et al. (2004). q is the annual sales growth and it is our proxy for investment opportunities. CF/K and I/K are, respectively, cash flow and investment (capital expenditures) scaled by the beginning of the period property, plant and equipment. Size is the logarithm of the book value of total assets. BG is a dummy variable which assumes the value of 1 if the firm belongs to a business group and the value of 0 otherwise. $\Delta\text{ShortDebt}$ is change in short-term debt scaled by the beginning of the period property, plant and equipment and ΔNWC is change in noncash net working capital scaled by the beginning of the period property, plant and equipment. Financial constraints status is based on the WW Index. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). The dependent variable is winsorised between 0.10 and 0.90 percentiles as are also the variables signed with +. Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Dependent variable is $\Delta\text{CashHoldings}$ scaled by the beginning of the period property, plant and equipment														
Sample	All (1)		All (2)		Unconstrained firms (3)		Constrained firms (4)		Constrained firms (5)					
Variables	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB	FE	BB
q^+	0.131 *** (0.010)	0.103 *** (0.014)	0.131 *** (0.010)	0.103 *** (0.014)	0.129 *** (0.010)	0.107 *** (0.014)	0.162 *** (0.053)	0.045 (0.056)	0.157 *** (0.053)	0.047 (0.056)				
CF/K^+	0.052 *** (0.005)	0.057 *** (0.008)	0.052 *** (0.005)	0.057 *** (0.008)	0.051 *** (0.006)	0.054 *** (0.009)	0.065 *** (0.020)	0.078 *** (0.022)	0.099 ** (0.041)	-0.006 (0.108)				
Size	0.084 *** (0.008)	0.203 *** (0.018)	0.084 *** (0.008)	0.203 *** (0.018)	0.087 *** (0.010)	0.238 *** (0.022)	0.124 *** (0.028)	0.128 *** (0.030)	0.122 *** (0.028)	0.129 *** (0.030)				
I/K^+														
$\Delta\text{ShortDebt}^+$														
ΔNWC^+														
BG			-0.011 (0.012)	-0.054 ** (0.025)	-0.012 (0.013)	-0.057 ** (0.026)	0.092 (0.086)	0.044 (0.115)	0.081 (0.089)	0.066 (0.128)				
$\text{BG}*\text{CF}/K$									-0.042 (0.045)	0.086 (0.108)				
Constant	-1.217 *** (0.120)	-3.116 *** (0.275)	-1.213 *** (0.120)	-3.073 *** (0.276)	-1.296 *** (0.145)	-3.676 *** (0.350)	-1.500 *** (0.328)	-1.651 *** (0.386)	-1.475 *** (0.328)	-1.681 *** (0.390)				
Observations	93,391	42,496	93,391	42,496	77,913	39,149	15,478	3,347	15,478	3,347				

Table 3.8 (continued): Cash regressions

This table reports the cash regressions for the sample of business group firms and matched stand-alone firms for the period between 2008 and 2014. The dependent variable is $\Delta\text{CashHoldings}$ scaled by the beginning of the period property, plant and equipment. This table resembles the work of Almeida et al. (2004). q is the annual sales growth and it is our proxy for investment opportunities. CF/K and I/K are, respectively, cash flow and investment (capital expenditures) scaled by the beginning of the period property, plant and equipment. Size is the logarithm of the book value of total assets. BG is a dummy variable which assumes the value of 1 if the firm belongs to a business group and the value of 0 otherwise. $\Delta\text{ShortDebt}$ is change in short-term debt scaled by the beginning of the period property, plant and equipment and ΔNWC is change in noncash net working capital scaled by the beginning of the period property, plant and equipment. Financial constraints status is based on the WW Index. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). The dependent variable is winsorised between 0.10 and 0.90 percentiles as are also the variables signed with $+$. Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Dependent variable is $\Delta\text{CashHoldings}$ scaled by the beginning of the period property, plant and equipment																				
Sample	All (6)				All (7)				Unconstrained firms (8)				Constrained firms (9)				Constrained firms (10)			
Variables	FE		BB		FE		BB		FE		BB		FE		BB		FE		BB	
q^+	0.148	***	0.112	***	0.147	***	0.112	***	0.141	***	0.117	***	0.221	***	0.051		0.218	***	0.053	
	(0.010)		(0.014)		(0.010)		(0.014)		(0.010)		(0.014)		(0.056)		(0.054)		(0.056)		(0.054)	
CF/K^+	0.095	***	0.095	***	0.095	***	0.095	***	0.087	***	0.091	***	0.140	***	0.126	***	0.168	***	0.035	
	(0.006)		(0.009)		(0.006)		(0.009)		(0.006)		(0.009)		(0.024)		(0.021)		(0.044)		(0.088)	
Size	0.096	***	0.258	***	0.096	***	0.258	***	0.093	***	0.306	***	0.151	***	0.148	***	0.150	***	0.148	***
	(0.009)		(0.018)		(0.009)		(0.018)		(0.010)		(0.022)		(0.032)		(0.030)		(0.032)		(0.030)	
I/K^+	-0.084	***	-0.069	***	-0.084	***	-0.069	***	-0.071	***	-0.073	***	-0.200	***	-0.030		-0.203	***	-0.031	
	(0.013)		(0.021)		(0.013)		(0.021)		(0.014)		(0.022)		(0.066)		(0.078)		(0.066)		(0.078)	
$\Delta\text{ShortDebt}^+$	-0.008	***	-0.015	***	-0.008	***	-0.015	***	-0.008	***	-0.016	***	-0.022	**	-0.021	**	-0.022	**	-0.021	**
	(0.002)		(0.003)		(0.002)		(0.003)		(0.002)		(0.003)		(0.010)		(0.010)		(0.010)		(0.010)	
ΔNWC^+	-0.094	***	-0.096	***	-0.094	***	-0.096	***	-0.094	***	-0.096	***	-0.104	***	-0.099	***	-0.104	***	-0.098	***
	(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.004)		(0.010)		(0.010)		(0.010)		(0.010)	
BG					-0.019		-0.053	**	-0.014		-0.057	**	-0.044		0.074		-0.057		0.105	
					(0.012)		(0.023)		(0.012)		(0.024)		(0.091)		(0.113)		(0.094)		(0.120)	
$\text{BG}*\text{CF}/K$																	-0.034		0.093	
																	(0.049)		(0.088)	
Constant	-1.406	***	-3.997	***	-1.398	***	-3.955	***	-1.404	***	-4.757	***	-1.771	***	-1.969	***	-1.754	***	-2.001	***
	(0.128)		(0.281)		(0.128)		(0.281)		(0.153)		(0.340)		(0.366)		(0.384)		(0.367)		(0.386)	
Observations	85,474		40,019		85,474		40,019		72,767		37,204		12,707		2,815		12,707		2,815	

3.7 Conclusions

This paper provides a comparison between business group and similar stand-alone firms regarding financial constraints, investment, investment-cash flow and cash-cash flow sensitivities in the aftermath of the global financial crisis of 2008-2009 and the subsequent sovereign debt crisis.

Following and extending the ordered logits by Kaplan and Zingales (1997), we present additional evidence that business group firms are less financially constrained than their matched stand-alone firms. Moreover, given that business group firms enjoy access to internal capital markets and are less financially constrained, they exhibit higher levels of investment and rely less on their own cash flows to invest. By using and augmenting the traditional investment-cash flow sensitivity equations we confirm that business group membership positively impacts investment in the aftermath of financial crises, as demonstrated by Almeida et al. (2015), and investment-cash flow sensitivity is lower for business group firms. Finally, we also address the effects of business group membership on the change in cash holdings and create an extended version of the regression models previously developed by Almeida et al. (2004). Besides confirming that the cash-cash flow sensitivity remains positive, we also document that being a business group firm is linked to a decrease in cash holdings, which is again consistent with the mechanics of internal capital markets as member firms do not need to individually accumulate cash if they can benefit from the internal capital market of the group.

This work extends the existing literature by explicitly address the relationship between internal capital markets, proxied by business group affiliation, and financial constraints, not only through investment-cash flow sensitivities, but also by assessing their impact on financial constraints' measures. It also corroborates previous evidence that internal capital markets mitigate the negative effects of crisis on investment, which is particularly true in small countries such as Portugal. Moreover, it is one of the few to consider the impact of business group membership on cash savings and, finally, it adds to the debate around investment- and cash-cash flow sensitivities, concluding that these sensitivities still exist and are positive.

For future research, it would be interesting to deeply analyse the investment- q sensitivity for stand-alone and constrained firms in order to find whether or not investment opportunities only positively account for investment if there are indeed enough financing to carry on them.

On the other hand, it would also be relevant to address the impact of asset lumpiness on corporate investment behaviour. Finally, with respect to the dynamics of cash holdings, our results are not completely conclusive regarding the impact of business group affiliation and internal capital markets on the accumulation of cash by constrained firms given that, although not statistically significant, it seems that belonging to a business group can help these more troubled firms to increase their own cash holdings. Hence, we have here another avenue for additional investigation.

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4 Business group affiliation and product market competition

Abstract

Evidence on the impact of business group affiliation on product market competition is limited. This work provides additional information on the influence of business groups on market concentration, entry and exit of recent entrants. Using a wide-ranging dataset from Portugal and industry-level regressions, we show that the presence of business group firms decreases market concentration. In addition, we find a U-shaped relationship between the market share of business group firms and entry. These two findings taken together suggest that business groups compete intensively until reaching a desirable market share, which provokes entry deterrence. Furthermore, our results indicate that entry is not only affected by the market share held by business group firms, but also by the cash held by the business groups of entrant firms, confirming previous research that underlines the importance of internal capital markets on overcoming barriers to entry. Finally, we do not find a significant relationship between business groups and the exit rate of recent entrants. Data suggests that industry-level variables such as profitability and capital intensity explain exit better.

JEL Classification: G32; G38; L11; L41

Keywords: Business groups, entry, exit, internal capital markets, market concentration, product market competition

4.1 Introduction

The literature about business groups has been growing lately. However, there are not many studies regarding the role of business group firms on product market competition, as highlighted by Khanna and Yafeh (2007) and Pattnaik et al. (2018), with the first referring that “Empirical evidence on the hypothesis that business groups restrict competition is surprisingly scarce”. This work fills this gap by assessing the impact of business group affiliation on market concentration and its influence on firm entry and exit. Therefore, this study is very important for managers and competition and antitrust authorities. Also, we don’t solely focus on manufacturing industries as previous works (e.g., Barrios et al., 2005; Boutin et al., 2013), but on almost all industries (only utilities and financial firms are excluded from our analysis). The need for more studies regarding the services’ sector is a claim made by Forte (2016), who also underline the importance of extending the research on the impact of foreign direct investment (FDI) on market concentration, entry and exit of firms.

Using a comprehensive dataset on Portuguese non-financial firms between 2008 and 2014, we find that market concentration, measured by the 4-firm concentration ratio (CR4) and the Herfindahl-Hirschman Index (HHI), slightly increased during this period, but the difference is not statistically significant. We also perform an assessment of the top and bottom concentrated industries, as well as an analysis of the top and bottom entry sectors, in line with Boutin et al. (2013). Less (or bottom) concentrated industries are associated with a large number of firms (thousands), while high (or top) concentrated industries are associated with a small number of firms (tens). Regarding entry, the industries with larger entry rates usually exhibit lower levels of concentration and, concerning the exit or recent entrants, we observe that a relevant portion of firms that entered the market in 2008 left the market until 2014, with this fraction being larger among stand-alone firms.

Because there are few studies on the impact of business groups on market structure, we borrow some more from the extant literature on the impact of FDI and multinationals on market concentration, entry and exit to develop the research hypotheses given that multinationals form business groups. Several works point out that business groups and multinationals decrease competition (e.g., Carney et al, 2018) and increase market concentration (e.g., Blomstrom, 1986). However, this conclusion is not definitive given that FDI brings knowledge and technology spillovers to the host economy that can decrease

competition in the short-run, but increase it in the long-run, as demonstrated by Barrios et al. (2005).

Moreover, there are also research papers regarding the impact of business group affiliation on market entry and exit. For example, Boutin et al. (2013) show that firms belonging to cash-rich business groups are more likely to enter in a market and less likely to exit, and Pattnaik et al. (2018) observe that business groups simultaneously ease and limit entry depending on the extent of their presence in a market. Concerning exit, De Backer and Sleuwagen (2003) mention that FDI provokes the exit of domestic plants and Bandick (2010) conclude that multinationals decrease the survival rate of non-exporting non-multinational firms. In addition, Boutin et al. (2013) find that firms that enter markets where incumbents belong to cash-rich business groups are more likely to exit in a period of three to five years after entry.

We perform industry-level regressions using the Fixed (or Random) Effects method and the Blundell and Bond's (1998) system GMM method to deal with endogeneity. Our results suggest that business groups decrease market concentration and that there is a U-shaped relationship between business groups and entry, reaching the conclusion that business groups simultaneously deter and foster entry, in line with Barrios et al. (2005). Finally, we also show that there is not a relationship between the presence of business groups in the market and the exit of recent entrants. According to our data, exit is mostly explained by firm-level variables such as the return on assets (ROA) and capital intensity, which negatively impact the exit rate of recent entrants, as well as by the "deep pockets" of the incumbents, regardless of their "business group status"¹², which positively impact the exit of recent entrants.

This paper contributes to the extant literature by providing more evidence on the relationship between business groups and product market competition, answering to the claims of the academics who refer that research on this topic is infrequent. Furthermore, we focus on almost all industries and not only in manufacturing. Finally, by concentrating in a small country, we believe that this work also enriches the debate about the eventual anticompetitive effects of business groups, which are not supported by the results. In fact, we do not find evidence that business groups, *per se*, increase market concentration and accelerate the exit of recent entrants, although we support that they may simultaneously limit and encourage entry.

¹² By "business group status" we mean being a business group or a stand-alone firm.

The remainder of this paper is organised as follows: Section 4.2 presents a literature review on the relationship between business groups, competition, entry and exit and the hypotheses to be tested. Section 4.3 describes the data and provides some statistics, while Section 4.4 explains the empirical methodology that we follow to test the hypotheses. Section 4.5 shows the results and Section 4.6 concludes the paper.

4.2 Literature review and hypotheses development

Numerous studies (e.g., Khanna and Yafeh, 2007; Boutin et al., 2013; Pattnaik et al., 2018) refer that the literature on the relationship between business group affiliation and product market competition is limited, a gap this study helps to fill. Addressing product market competition implies analysing market concentration. As pointed out by the Organisation for Economic Co-operation and Development (OECD)¹³, “market concentration measures the extent to which market shares are concentrated between a small number of firms. It is often taken as a proxy for the intensity of competition”. The more concentrated a market is, the less competitive it is.

Discussion about the determinants of market concentration is old. Encaoua and Jacquemin (1982), using data from French industrial groups, underline that business groups increase market concentration due to the market power exerted by them. However, the internal coordination that the business groups provide makes possible achieving economies of scale and bring together the necessary capital requirements and organisation to exploit and develop technological opportunities and international operations. Blomstrom (1986), using data from Mexico, shows that multinationals are an independent source of concentration, given that their presence positively impacts concentration even after controlling for the variables that are commonly used to explain it, such as market size, market growth, economies of scale and capital and advertising intensities. He adds that this positive impact possibly is related to the introduction of more sophisticated technologies and higher capital intensity. Barrios et al. (2005), using data for Ireland, find that FDI has, at first, “competition effects”, leading to entry deterrence and, afterwards, positive market externalities such as R&D and innovation that develop local firms and foster entry. Weinstein and Yafeh (1995), using data on Japan’s corporate groups, demonstrate that they intensify competition, contrary to the conventional

¹³ <https://www.oecd.org/competition/market-concentration.htm>

wisdom. Rutkowski (2006), using data for several Central and Eastern European Countries, and Forte and Sarmiento (2014), using data for Portugal, find that FDI actually reduces market concentration.

More recently, Carney et al. (2018) stress that business groups can limit competition and Azar et al. (2018) show that when competitors are held by the same investors¹⁴, market concentration is higher than that that would be predicted by using the traditional measures of market concentration.

Taking all this mixed evidence, we post our first hypothesis as:

Hypothesis 1 (H1): Business groups impact market concentration.

Among the alternative measures to assess market concentration there are the concentration ratios (e.g., CR4) and the HHI, with the concentration ratios being more widely used, as demonstrated by Forte (2016).

Besides analysing the role of business groups on market concentration, another aim of this work is to find out if business group affiliation acts, itself, as a barrier to entry in a given market. White (2012) presents three main categories of barriers: the ownership of an exclusive resource, the existence of economies of scale, and the extent of needed investments and their degree of “sunkness”. Accordingly, Motta (2004) points out that the higher the sunk costs, the lesser the probability of entry will occur and distinguishes between exogenous and endogenous sunk costs. Exogenous sunk costs are the investments that the firm has to incur to produce and distribute the goods, while endogenous sunk costs refer to R&D and advertising. Hence, it is very common to link entry in a certain market to the level of cash holdings that the incumbent firms have (e.g., Boutin et al., 2013) or to the size of the investments made by a business group firm (e.g., Pattnaik et al., 2018).

Mahmood and Lee (2004) find an inverted U-shaped relationship between the market share of business group firms and innovation and refer that the market share of business groups functions as a barrier to entry in a given industry. According to them, this happens because

¹⁴ Also known as “common ownership”.

of their access to “deep pockets”, multimarket contact¹⁵ and agreements between firms that are both buyers and suppliers. Moreover, business groups are also prone to have special access to licenses and favors and are powerful lobbyists due to their wider scope and scale, which acts as a barrier to entry. However, Weinstein and Yafeh (1995) refer that it is not collusion, but the aggressive competition between business group members that deters entry in a given market. They also add that competition among business group firms is even more intense than between stand-alone firms.

Khanna and Yafeh (2007) point out that business groups can drop the rivals out of the market or prevent entry because of their “deep pockets”, “first mover advantage” and political ties. Boutin et al. (2013) study the impact of business group affiliation on the entry rates in French manufacturing industries and find that the cash held by a business group acts, indeed, as a barrier to entry in a market. On the other hand, they also show that firms belonging to a cash-rich group enter in a given market more easily. This happens, they refer, because business groups’ “deep pockets” alleviate financial constraints, making easier the access to funds needed to develop their operating activities. Finally, Pattnaik et al. (2018) points out that the level of investments made by business group firms acts as a barrier to entry not only concerning stand-alone firms, but also regarding affiliated firms from small and medium-sized groups. However, the relationship is not linear, but quadratic, meaning that business groups can simultaneously hinder and help entry depending on the size of their presence in a market. Once again, due to the existence of mixed results, we expect that:

Hypothesis 2 (H2): Business groups influence market entry.

De Backer and Sleuwaegen (2003), using data from Belgian manufacturing industries, find that FDI limit entry and leads to the exit of domestic firms. However, this effect can be inverted in the long-run due to positive externalities like learning and other linkage effects between domestic and foreign firms. Bandick (2010), using data from the Swedish manufacturing sector, observe that non-exporting non-multinational firms are more likely to exit the market due to the presence of foreign multinationals. Boutin et al. (2013) not only

¹⁵ Multimarket contact refers to the hypothesis developed by Bernheim and Whinston (1990) that conglomerates meeting in different markets are more likely to enter in collusive agreements, which harms competition.

find that entry is positively affected by the cash held by the business group of the entrant firm, but also that cash held by incumbent business groups accelerates exit. Furthermore, they present evidence that the higher the market concentration, measured by the HHI, the higher the exit. Finally, Sarmiento and Forte (2019), using data from Portugal, study the impact of the foreign presence on firms' exit and demonstrate that the presence of multinational enterprises in a market increases the domestic firms' likelihood of exit. Given this empirical evidence, we predict that:

Hypothesis 3 (H3): Business groups increase the exit of recent entrants.

4.3 Data sources and sample description

We use individual data from the Central Balance Sheet Database (CBSD) of Banco de Portugal. Annual data from this database relies on Informação Empresarial Simplificada (IES¹⁶), which is a mandatory survey conducted by Banco de Portugal, Portuguese Ministries of Finance and Justice, and Instituto Nacional de Estatística - INE (Statistics Portugal).

For this work, and in order to delimit business group firms, we focus on the information available regarding the group structure of each company. The first fiscal year for which IES is available is 2006. Also, although it is possible to identify non-resident business group affiliates through IES, just resident affiliates were considered because complete economic and financial data is only available for them.

Also, we exclude financial firms and utilities. To assess concentration, we use the CR4 and the HHI. The CR4 is the fraction of sales that is generated by the four firms with the largest sales of a given industry (White, 2012), while the HHI is the sum of the squares of market shares of the firms in a given industry (Motta, 2004). The CR4 varies between 0 and 1 (or 0 and 100 if percentage values instead of fractions are used) and the HHI varies between 0 and

¹⁶ Through IES, Portuguese companies report their annual financial statements (balance sheet, income statement, statement of changes in equity and statement of cash flows), as well as extra detailed information regarding the financial statements (e.g., for companies reporting investments in affiliated companies in the balance sheet, the identification of affiliated companies is required). This information is available in IES Annex A. In addition to the Annex A, IES also comprises plant- or establishment-level information on each non-financial company inquired (Annex R). Besides information on non-financial corporations, IES also provides information about banks and insurance companies, which, respectively, fill Annex B and Annex C, as well as Annex S and Annex T for establishment-level information. Data provided by companies is subject to quality control at Banco de Portugal.

1 (or 0 and 10,000 if percentage values instead of fractions are used). According to the horizontal merger guidelines of the Department of Justice of the United States, “the Agencies generally classify markets into three types: Unconcentrated Markets: HHI below 1,500, Moderately Concentrated Markets: HHI between 1,500 and 2,500, Highly Concentrated Markets: HHI above 2,500”¹⁷. On the other hand, the European Commission is “unlikely to identify horizontal competition concerns in a merger with a post-merger HHI between 1,000 and 2,000 and a delta¹⁸ below 250, or a merger with a post-merger HHI above 2,000 and a delta below 150”¹⁹.

Industries are defined according to the three-digit NACE Rev. 2 classification. Because these figures could not be completely meaningful if the number of firms in an industry is low, only industries with 30 or more firms (Santos et al., 2018) were considered²⁰.

Given these restrictions, there were considered 206 three-digit NACE Rev.2 industries for 2008 and 213 for 2014 (as shown in Table 4.1). According to the data available on Portuguese firms, both mean and median CR4 and HHI slightly increased in 2014 relative to 2008, although the difference is not statistically significant. Nevertheless, relying on a larger time span, Grullon et al. (2019) and Bajgar et al. (2019) actually find evidence that concentration has increased over time in Europe and North America, although the increase seems larger in North America (Bajgar et al. 2019).

The fraction of business group firms and their market share are also presented in Table 4.1. Although the fraction of business group firms has increased, their market share decreased. However, only the increase in the fraction of business group firms is statistically significant. Finally, because the level of investments needed to entry in a market could act as a barrier to entry, the variable *Tangibility*, defined as the ratio of tangible assets to total assets, as in Boutin et al. (2013), is also included in the table, but remained unchanged in the considered period.

¹⁷ <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c>

¹⁸ Delta is the post-merger change in HHI.

¹⁹ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52004XC0205%2802%29>

²⁰ For robustness purposes, we rerun regressions taking into account industries with more than 20 (instead of 30) or more than 40 (instead of 30) firms and the main results hold.

Table 4.1: Concentration measures

This table presents some concentration measures for the years 2008 and 2014. CR4 is the fraction of sales that is generated by the four firms with the largest sales of a given industry and its upper limit is equal to 1. HHI is the sum of the squares of market shares of the firms in a given industry and its upper limit is equal to 10,000. Fraction of BG firms is the ratio between the number of business group firms and the total number of firms by industry and its upper limit is equal to 1. Market share of BG firms is the fraction of sales of a given industry that is generated by business group firms and its upper limit is equal to 1. Tangibility is the ratio of tangible assets to total assets, as in Boutin et al. (2013), and its upper limit is equal to 1. *, **, *** indicate statistical significance at the .10, .05 and .01 levels, respectively, for the mean and median differences between 2008 and 2014. Significance levels of mean and median differences are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test).

		CR4	HHI	Fraction of BG firms	Market share of BG firms	Tangibility
2008	Number of industries	206	206	206	206	206
	Mean	0.38	950.05	0.05	0.75	0.31
	Median	0.31	395.14	0.03	0.81	0.27
2014	Number of industries	213	213	213	213	213
	Mean	0.39	999.72	0.08	0.66	0.31
	Median	0.33	427.32	0.05	0.69	0.28
Difference (2014-2008)	Mean	0.01	49.67	0.03 ***	-0.09	0.00
	Median	0.02	32.18	0.02 ***	-0.12	0.01

Table 4.2 shows the top and bottom 10 concentrated industries in Years 2008 and 2014 ranked by the HHI. Some industries seem to be structurally highly or lowly concentrated as they keep appearing in the same top and bottom rankings in both years. Also, lowly concentrated activities are usually associated with a larger number of firms, which is expected.

Table 4.2: Top and bottom concentrated industries

This table presents the top and bottom concentrated industries for the years 2008 and 2014. CR4 is the fraction of sales that is generated by the four firms with the largest sales of a given industry and its upper limit is equal to 1. HHI is the sum of the squares of market shares of the firms in a given industry and its upper limit is equal to 10,000. Fraction of BG firms is the ratio between the number of business group firms and the total number of firms by industry and its upper limit is equal to 1. Market share of BG firms is the fraction of sales of a given industry that is generated by business group firms and its upper limit is equal to 1. Tangibility is the ratio of tangible assets to total assets, as in Boutin et al. (2013), and its upper limit is equal to 1. *, **, *** indicate statistical significance at the .10, .05 and .01 levels, respectively, for the mean and median differences between 2008 and 2014. Significance levels of mean and median differences are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test).

Year 2008							
3-digit code	Name	Number of firms	CR4	HHI	Fraction of BG firms	Market share of BG firms	Tangibility
Top 10 concentrated industries							
261	Manufacture of electronic components and boards	92	0.95	7,304.21	0.04	0.05	0.53
811	Combined facilities support activities	48	0.94	6,652.42	0.06	0.01	0.18
619	Other telecommunications activities	270	0.82	5,278.84	0.09	0.82	0.20
291	Manufacture of motor vehicles	30	0.98	5,008.53	0.03	0.03	0.40
879	Other residential care activities	55	0.90	4,979.02	0.00	0.00	0.57
221	Manufacture of rubber products	130	0.76	4,722.20	0.02	0.02	0.19
821	Office administrative and support activities	258	0.90	4,662.75	0.03	0.87	0.48
262	Manufacture of computers and peripheral equipment	34	0.93	4,394.13	0.03	0.00	0.05
511	Passenger air transport	70	0.82	3,913.00	0.16	0.74	0.49
021	Silviculture and other forestry activities	260	0.65	3,578.35	0.04	0.61	0.31
	Mean	125	0.87	5,049.35	0.05	0.32	0.32
	Median	81	0.90	4,850.61	0.04	0.04	0.32
Bottom 10 concentrated industries							
862	Medical and dental practice activities	9,144	0.08	28.48	0.01	0.12	0.36
681	Buying and selling of own real estate	16,214	0.06	26.85	0.06	0.25	0.23
869	Other human health activities	5,164	0.07	26.22	0.04	0.17	0.27
494	Freight transport by road and removal services	10,001	0.06	24.50	0.01	0.12	0.35
561	Restaurants and mobile food service activities	15,408	0.08	24.14	0.01	0.07	0.46
477	Retail sale of other goods in specialised stores	19,967	0.07	23.39	0.01	0.08	0.20
472	Retail sale of food, beverages and tobacco in specialised stores	5,773	0.05	15.68	0.00	0.03	0.31
433	Building completion and finishing	5,260	0.04	14.33	0.00	0.03	0.15
452	Maintenance and repair of motor vehicles	6,479	0.03	12.03	0.01	0.05	0.22
563	Beverage serving activities	12,173	0.03	7.84	0.00	0.04	0.45
	Mean	10,558	0.06	20.35	0.02	0.10	0.30
	Median	9,573	0.06	23.77	0.01	0.08	0.29

Year 2014

3-digit code	Name	Number of firms	CR4	HHI	Fraction of BG firms	Market share of BG firms	Tangibility
Top 10 concentrated industries							
531	Postal activities under universal service obligation	34	1.00	9,940.62	0.03	1.00	0.23
612	Wireless telecommunications activities	47	0.99	9,031.99	0.11	0.96	0.65
323	Manufacture of sports goods	54	0.96	8,569.74	0.04	0.93	0.08
262	Manufacture of computers and peripheral equipment	34	0.97	6,659.01	0.12	0.82	0.06
242	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	34	0.91	6,485.92	0.21	0.84	0.18
221	Manufacture of rubber products	120	0.79	4,995.51	0.11	0.81	0.41
772	Renting and leasing of personal and household goods	267	0.77	4,827.37	0.03	0.70	0.54
611	Wired telecommunications activities	154	0.97	4,687.13	0.10	0.99	0.32
511	Passenger air transport	66	0.81	4,273.38	0.24	0.89	0.30
811	Combined facilities support activities	199	0.69	3,497.15	0.08	0.73	0.47
	Mean	101	0.89	6,296.78	0.11	0.87	0.32
	Median	60	0.94	5,740.72	0.11	0.87	0.31
Bottom 10 concentrated industries							
750	Veterinary activities	978	0.05	31.10	0.02	0.06	0.50
681	Buying and selling of own real estate	18,189	0.07	30.43	0.09	0.31	0.34
477	Retail sale of other goods in specialised stores	19,950	0.08	29.16	0.01	0.17	0.19
466	Wholesale of other machinery, equipment and supplies	4,005	0.06	28.46	0.04	0.21	0.14
873	Residential care activities for the elderly and disabled	977	0.04	27.65	0.02	0.04	0.73
472	Retail sale of food, beverages and tobacco in specialised stores	6,212	0.06	20.73	0.00	0.03	0.29
561	Restaurants and mobile food service activities	16,644	0.07	20.69	0.02	0.16	0.47
452	Maintenance and repair of motor vehicles	6,934	0.05	14.67	0.01	0.06	0.27
433	Building completion and finishing	4,659	0.03	13.75	0.01	0.03	0.15
563	Beverage serving activities	12,848	0.02	4.65	0.01	0.03	0.46
	Mean	9,140	0.05	22.13	0.02	0.11	0.35
	Median	6,573	0.06	24.19	0.02	0.06	0.32
Difference (2014 – 2008)							
Top	Mean	-24	0.02	1,247.43	0.06	0.55	0.00
	Median	-21	0.04	890.11	0.07*	0.83	-0.01
Bottom	Mean	-1,418	-0.01	1.78	0.00	0.01	0.05
	Median	-3,000	0.00	0.42	0.01	-0.02	0.03

The evolution of mean and median values of the CR4 and HHI of the top concentrated industries seems to demonstrate that concentration have increased between 2008 and 2014. However, the difference is not statistically significant, again. Furthermore, mean levels of the fraction of business group firms and the market share of these firms are larger in top concentrated industries suggesting that there is a larger presence of business group firms in the most concentrated industries.

Regarding entry of firms, Table 4.3 shows the top and bottom 10 entry industries in 2008 and 2014. As in Boutin et al. (2013), entrant firms at year t in a given industry are those which were not active in year $t-1$. The sectors are ranked by entry rate to control for the size of each market. Entry rates are defined, again, as in Boutin et al. (2013). That is, they are the fraction of a given industry's total sales that is generated by entrant firms.

Table 4.3: Top and bottom entry industries

This table presents the top and bottom entry industries for the years 2008 and 2014. Entry rate is the fraction of a given industry's total sales that is generated by entrant firms, as in Boutin et al. (2013), and its upper limit is equal to 1. Fraction of BG entrants is the ratio between the number of entrants that belong to a business group and the total number of entrants by industry and its upper limit is equal to 1. HHI is the sum of the squares of market shares of the firms in a given industry and its upper limit is equal to 10,000. Market share of BG firms is the fraction of sales of a given industry that is generated by business group firms and its upper limit is equal to 1. Tangibility is the ratio of tangible assets to total assets, as in Boutin et. (2013), and its upper limit is equal to 1. *, **, *** indicate statistical significance at the .10, .05 and .01 levels, respectively, for the mean and median differences between 2008 and 2014. Significance levels of mean and median differences are based on a two-sample t test and a two-sample Wilcoxon rank-sum test (Mann-Whitney U-test).

Year 2008							
3-digit code	Name	Entry rate	Number of entrants	Fraction of BG entrants	HHI	Market share of BG firms	Tangibility
Top 10 entry industries							
722	Research and experimental development on social sciences and humanities	0.1303	19	0.0000	1,160.95	0.03	0.09
856	Educational support activities	0.1159	44	0.0000	1,268.22	0.00	0.47
861	Hospital activities	0.1077	33	0.1515	276.53	0.06	0.37
873	Residential care activities for the elderly and disabled	0.0899	114	0.0000	69.29	0.02	0.69
465	Wholesale of information and communication equipment	0.0852	133	0.0075	412.33	0.14	0.06
012	Growing of perennial crops	0.0808	160	0.0438	186.21	0.16	0.51
721	Research and experimental development on natural sciences and engineering	0.0718	53	0.0566	506.44	0.15	0.27
691	Legal activities	0.0689	131	0.0000	210.58	0.00	0.15
823	Organisation of conventions and trade shows	0.0586	184	0.0217	91.35	0.09	0.36
014	Animal production	0.0579	130	0.0231	160.49	0.26	0.43
	Mean	0.0867	100	0.0304	434.24	0.09	0.34
	Median	0.0830	122	0.0146	243.56	0.08	0.37
Bottom 10 entry sectors							
245	Casting of metals	0.0002	4	0.0000	665.03	0.06	0.35
235	Manufacture of cement, lime and plaster	0.0002	2	0.0000	3,023.78	0.96	0.18
233	Manufacture of clay building materials	0.0001	6	0.0000	467.19	0.23	0.46
236	Manufacture of articles of concrete, cement and plaster	0.0001	11	0.0909	239.82	0.34	0.34
103	Processing and preserving of fruit and vegetables	0.0001	9	0.0000	372.73	0.41	0.32
854	Higher education	0.0001	2	0.0000	898.15	0.21	0.58
273	Manufacture of wiring and wiring devices	0.0000	2	0.0000	1,370.76	0.57	0.20
212	Manufacture of pharmaceutical preparations	0.0000	9	0.1111	474.89	0.54	0.21
852	Primary education	0.0000	6	0.0000	188.64	0.13	0.58
265	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	0.0000	2	0.0000	2,057.74	0.60	0.17
	Mean	0.0001	5	0.0202	975.87	0.41	0.34
	Median	0.0001	5	0.0000	569.96	0.38	0.33

Year 2014

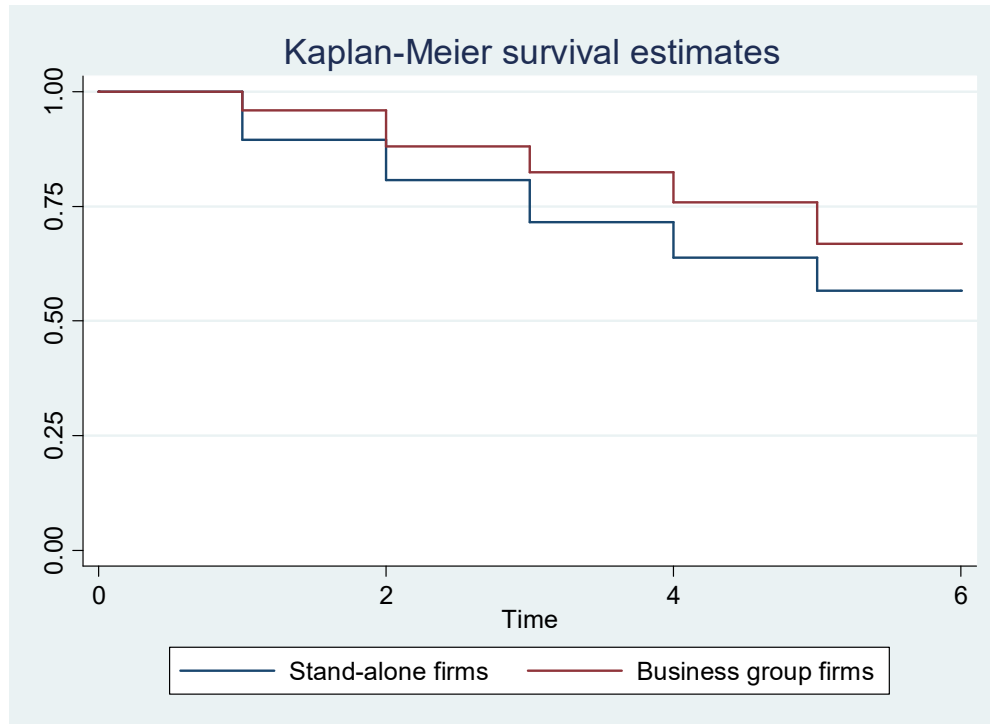
3-digit code	Name	Entry rate	Number of entrants	Fraction of BG entrants	HHI	Market share of BG firms	Tangibility
Top 10 entry sectors							
204	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	0.1058	10	0.0000	552.21	0.11	0.25
454	Sale, maintenance and repair of motorcycles and related parts and accessories	0.0688	44	0.0000	125.10	0.04	0.19
023	Gathering of wild growing non-wood products	0.0587	15	0.0667	3,354.98	0.01	0.72
799	Other reservation service and related activities	0.0568	30	0.0000	885.20	0.34	0.10
881	Social work activities without accommodation for the elderly and disabled	0.0473	44	0.0227	427.32	0.18	0.54
900	Creative, arts and entertainment activities	0.0468	181	0.0000	218.50	0.12	0.48
478	Retail sale via stalls and markets	0.0461	58	0.0000	173.09	0.00	0.22
21	Silviculture and other forestry activities	0.0431	47	0.0000	1,584.65	0.44	0.64
822	Activities of call centres	0.0431	16	0.0625	2,174.42	0.80	0.12
324	Manufacture of games and toys	0.0430	3	0.0000	2,656.88	0.00	0.33
	Mean	0.0560	45	0.0152	1,215.24	0.20	0.36
	Median	0.0471	37	0.0000	718.71	0.12	0.29
Bottom 10 entry sectors							
612	Wireless telecommunications activities	0.0000	8	0.2500	9,031.99	0.96	0.65
233	Manufacture of clay building materials	0.0000	4	0.0000	631.59	0.48	0.45
871	Residential nursing care activities	0.0000	3	0.0000	3,348.94	0.70	0.53
503	Inland passenger water transport	0.0000	2	0.0000	2,927.99	0.70	0.73
281	Manufacture of general - purpose machinery	0.0000	2	0.0000	2,346.11	0.19	0.15
109	Manufacture of prepared animal feeds	0.0000	2	0.5000	346.73	0.43	0.27
171	Manufacture of pulp, paper and paperboard	0.0000	2	0.0000	1,078.56	0.89	0.26
243	Manufacture of other products of first processing of steel	0.0000	1	0.0000	1,518.53	0.35	0.21
854	Higher education	0.0000	2	0.0000	1,092.00	0.57	0.62
879	Other residential care activities	0.0000	3	0.0000	1,131.95	0.00	0.83
	Mean	0.0000	3	0.0750	2,345.44	0.53	0.47
	Median	0.0000	2	0.0000	1,325.24	0.53	0.49
Difference (2014 – 2008)							
Top	Mean	-0.0307	-55	-0.0152	781.00	0.11	0.02
	Median	-0.0359	-85	-0.0146	475.15	0.04	-0.08
Bottom	Mean	-0.0001	-2	0.0548	1,369.57	0.12	0.13
	Median	-0.0001	-3	0.0000	755.28	0.15	0.16

The mean and median level of both the entry rates and the number of entrants in the top 10 entry industries is greater in 2008 than in 2014, suggesting once more that concentration is increasing. Moreover, the mean and median HHI is larger in bottom entry industries, indicating that entry is more difficult in more concentrated industries, which is in line with the literature (e.g., Boutin et al., 2013). The market share of business group firms is greater in bottom entry sectors, signalling that the presence of business groups in a given industry acts as a barrier to entry as pointed out by Mahmood and Lee (2004).

To assess the likelihood of exit of a firm from a given market, Kaplan-Meier survival estimates are calculated and shown in Figure 4.1. The estimates suggest that, from the total number of firms that entered in a given industry in 2008, business group firms are expected to survive more than stand-alone firms, supporting the existing literature. Indeed, after six years, almost 70% of the business group firms that entered in the market six years before remain in the market, while only less than 60% of stand-alone firms are able to do so. These figures are consistent with those by Boutin et al. (2013) who also shown that stand-alone entrants are less likely to survive than group-backed ones.

Figure 4.1: Kaplan-Meier survival estimates for stand-alone and business group firms

This figure presents the Kaplan-Meier survival estimates for the firms that entered in the market in the year of 2008 (Time=0) split by stand-alone and business group firms during the period between 2008 (Time=0) and 2014 (Time=6).



4.4 Empirical methodology

The presence of business groups in a given industry is usually captured through the market share of business group firms (e.g., Mahmood and Lee, 2004; Boutin et al., 2013). Moreover, Boutin et al. (2013) also use the total cash held by business groups, i.e., the sum of the cash holdings of business group firms.

To address the first hypothesis (H1) that business groups impact market concentration, we draw on the existing literature on the determinants of market concentration (e.g., Ornstein et al, 1973; Encaoua and Jacquemin, 1982; Curry and George, 1983; Blomstrom, 1986; Forte and Sarmiento, 2014; Forte, 2016) to define our set of regressors. Among the most common drivers of market concentration are economies of scale, capital intensity, advertising intensity, research and development, market size, market growth and export intensity. Usually,

economies of scale, capital intensity, research and development and export intensity seem to increase market concentration, given that the majority of the studies reviewed by Forte (2016) reach this conclusion. On the other hand, still relying on the literature review performed by Forte (2016), results for advertising intensity, market size and market growth are more diverse and so we here consider that they can simultaneously increase, decrease or have no statistically significant effect at all in concentration. Furthermore, because our goal is to test the impact of business group affiliation on market concentration, the main independent variable of interest is the market share of business group firms. The dependent variable, concentration, is proxied by the CR4. Therefore, the equation to be estimated to test H1 is as follows:

$$\begin{aligned}
 Conc_{i,t} = & \alpha_0 + \alpha_1 BG_{i,t} + \alpha_2 ES_{i,t} + \alpha_3 \log(CAP_INT)_{i,t} + \alpha_4 ADV_INT_{i,t} \\
 & + \alpha_5 R_D_{i,t} + \alpha_6 MG_{i,t} + \alpha_7 \log(MS)_{i,t} + \alpha_8 EXP_INT_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

Where:

Conc is the market share of the four firms with largest sales in each industry (CR4);

BG is the market share of business group firms in each industry;

ES is Economies of Scale and is defined, for each industry, as the average sales of the largest firms that are responsible for 50% of industry sales divided by industry sales;

CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales;

ADV_INT is advertising intensity and is defined as the sum of the advertising expenditures of the firms in the same industry divided by industry sales;

R_D is the sum of research and development expenses in the same industry divided by industry sales;

MG is market growth and is defined as the difference between the log of industry sales in year *t* and the log of industry sales in year *t-1*;

MS is market size and is proxied by industry sales;

EXP_INT is export intensity and is defined as the sum of the exports of the firms in the same industry divided by industry sales.

To test our second and third hypotheses that business groups influence market entry (H2) and that business groups increase the exit of recent entrants (H3), we mainly follow the work of Boutin et al. (2013) and, therefore, we use almost the same set of regressors of their study to address the impact of business group affiliation on entry (H2) and on exit (H3). In the case of H2, the dependent variable is the entry rate and, in the case of H3, the dependent variable is the exit rate, which are calculated similarly to Boutin et al. (2013). The entry rate in industry i in year t is defined as the ratio between the sales of entrants (new companies) and the total sales in industry i in year t while the exit rate of recent entrants in industry i in year t is the ratio of the sales of entrants that left the market to total sales in industry i and year t .

Besides considering only the market share of business group firms, we take into account it and its square, given that the relationship between entry and the market share of business groups could be quadratic as some studies point out that business groups can simultaneously encourage and deter entry (e.g., Pattnaik et al., 2018). Then, as in Boutin et al. (2013), we consider as determinants of entry the industry's operating return on assets (ROA), capital intensity, tangibility, market growth, market size, efficiency (proxied by Total Factor Productivity – TFP), the cash of the incumbent firms and the cash of the business groups to which entrant firms are affiliated.

Hence, the entry equation used to test H2 is the following:

$$\begin{aligned} Entry_{i,t} = & \alpha_0 + \alpha_1 BG_{i,t} + \alpha_2 BG_{i,t}^2 + \alpha_3 ROA_{i,t} + \alpha_4 \log(CAP_INT)_{i,t} \\ & + \alpha_5 TANG_{i,t} + \alpha_6 MG_{i,t} + \alpha_7 \log(MS)_{i,t} + \alpha_8 TFP_{i,t} \\ & + \alpha_9 Incumbent\ Cash_{i,t} + \alpha_{10} Entrant\ BG\ Cash_{i,t} + \varepsilon_{i,t} \end{aligned}$$

Where:

Entry is the ratio between the sales of entrants and the total sales in the industry;

BG is the market share of business group firms in each industry;

ROA is operating return on assets and is defined as EBITDA deflated by total assets in the industry;

CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales;

TANG is tangibility and is calculated as fixed tangible assets scaled by total assets in the industry;

MG is market growth and is defined as the difference between the log of industry sales in year t and the log of industry sales in year $t-1$;

MS is market size and is proxied by industry sales;

TFP is our efficiency measure and it is the industry median Total Factor Productivity (TFP). TFP for each firm within the industry is estimated according to the Olley and Pakes (1996) method;

Incumbent Cash is the cash held by the incumbent firms in the industry;

Entrant BG Cash is the cash held by the business groups to which entrant firms are affiliated.

To explain exit and, consequently, to test H3, the same set of regressors is used, in line with Boutin et al. (2013):

$$\begin{aligned} Exit_{i,t} = & \alpha_0 + \alpha_1 BG_{i,t} + \alpha_2 BG_{i,t}^2 + \alpha_3 ROA_{i,t} + \alpha_4 \log(CAP_INT)_{i,t} \\ & + \alpha_5 TANG_{i,t} + \alpha_6 MG_{i,t} + \alpha_7 \log(MS)_{i,t} + \alpha_8 TFP_{i,t} \\ & + \alpha_9 Incumbent\ Cash_{i,t} + \alpha_{10} Entrant\ BG\ Cash_{i,t} + \varepsilon_{i,t} \end{aligned}$$

Where:

Exit is the ratio of the sales of entrants that left the market to total sales in industry.

All the hypotheses are tested using industry-level regressions and estimates are based on Fixed or Random Effects (depending on the results of the Hausman test) and on the Blundell and Bond's (1998) system GMM method, which is more robust given that it copes with endogenous variables (Flannery and Hankins, 2013). Each observation of the panel data regressions is a three-digit NACE Rev.2 industry with at least 30 firms in each year from 2008 to 2014, which leads to around 210 industries per year.

4.5 Results

Descriptive statistics are presented in Table 4.4 and it can be seen that the mean (median) value of CR4 is 39% (33%), meaning that the four firms with largest sales often control an

important fraction of the market share in each industry. However, the standard deviation is large (25%) and there is one industry in which the top four firms only dominate 2% of the market share. Considering the thresholds of the HHI previously presented, industries in Portugal were globally competitive and unconcentrated between 2008 and 2014, as the mean and median levels of the index were less or equal than 1,000.

The market share of business group firms in each industry (*BG*) is 68%, on average. Furthermore, the median is 75%, suggesting that the distribution is left skewed and business group firms play a very important role on the sales of each industry. Advertising expenses (*ADV_INT*) represent, on average, 1% of the sales of each industry, with a maximum of 13%.

The mean(median) entry rate is 2% (1%), which means that, on average, entrants (new companies) account for 2% of the sales in each industry. The average operating return on assets (*ROA*) is 7% and, on average, firms' fixed tangible assets account for almost a third (31%) of the total assets in each industry (*TANG*).

Mean, median and standard deviation values of the TFP show that it is very heterogenous across industries. It is calculated using the Olley and Pakes (1996) method. We assumed a Cobb-Douglas production function with two inputs: labor and capital. Labor is proxied by employee costs, while capital is proxied by fixed tangible assets. The labor coefficient that we obtain is 0.74 (with standard error 0.0016) and the capital coefficient is 0.08 (with standard error 0.0012). The labor coefficient is in line with that of Boutin et al. (2013) (0.79), while the capital coefficient is in line with Pavcnik (2002) (0.08). Mean and median figures of the TFP presented in Table 4.4 are consistent with Matos and Neves (2020), who study Portuguese firms, too. Also, as in Gonçalves and Martins (2016), other study regarding Portuguese firms, our estimates reject the hypothesis of constant returns to scale and are indicative of decreasing returns to scale.

Table 4.4: Descriptive statistics

This table shows the descriptive statistics for 1,482 industry-year observations between 2008 and 2014 (around 210 three-digit NACE Rev.2 industries per year). Industry values result from the sum of the individual values of all the firms in that industry. CR4 is the fraction of sales that is generated by the four firms with the largest sales of a given industry and its upper limit is equal to 1. HHI is the sum of the squares of market shares of the firms in a given industry and its upper limit is equal to 10,000. BG is the market share of business group firms in each industry and its upper limit is equal to 1. ES is Economies of Scale and is defined, for each industry, as the average sales of the largest firms that are responsible for 50% of industry sales divided by industry sales and its upper limit is equal to 1. CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales. ADV_INT is advertising intensity and is defined as the sum of the advertising expenditures of the firms in the same industry divided by industry sales. R_D is the sum of research and development expenses in the same industry divided by industry sales. MG is market growth and is defined as the difference between the log of industry sales in year t and the log of industry sales in year t-1. MS is market size and is proxied by industry sales. EXP_INT is export intensity and is defined as the sum of the exports of the firms in the same industry divided by industry sales. Its upper limit is equal to 1. Entry rate is the ratio between the sales of entrants and the total sales in industry and its upper limit is equal to 1. Exit rate is the ratio of the sales of entrants that left the market to total sales in industry and its upper limit is equal to 1. ROA is operating return on assets and is defined as EBITDA deflated by total assets in the industry. TANG is tangibility and is calculated as fixed tangible assets scaled by total assets in the industry. Its upper limit is equal to 1. TFP is the industry median Total Factor Productivity (TFP). TFP for each firm within the industry is estimated according to the Olley and Pakes (1996) method. Finally, Incumbent Cash is the cash held by the incumbent firms in the industry and Entrant BG Cash is the cash held by the business groups to which entrant firms are affiliated.

	Number of observations	Mean	Median	Maximum	Minimum	Standard Deviation
CR4	1,482	0.39	0.33	1.00	0.02	0.25
HHI	1,482	992.74	431.10	9,967.80	4.07	1,456.13
BG	1,482	0.68	0.75	1.00	0.00	0.26
ES	1,482	0.14	0.05	1.00	0.00	0.20
CAP_INT	1,482	0.82	0.35	15.13	0.00	1.46
ADV_INT	1,482	0.01	0.00	0.13	0.00	0.01
R_D	1,482	0.00	0.00	0.07	0.00	0.00
MG	1,469	-0.03	0.00	2.53	-6.73	0.38
MS (€ million)	1,482	1,401.09	524.39	23,910.23	0.41	2,763.11
EXP_INT	1,482	0.22	0.14	1.00	0.00	0.24
Entry rate	1,482	0.02	0.01	0.98	0.00	0.05
Exit rate	1,232	0.01	0.00	1.00	0.00	0.07
ROA	1,482	0.07	0.06	1.24	-0.16	0.08
TANG	1,482	0.31	0.28	0.87	0.00	0.18
TFP	1,382	4.88	1.56	309.44	0.06	19.69
Incumbent Cash (€ million)	1,482	162.60	46.08	4,883.74	0.19	411.80
Entrant BG Cash (€ million)	1,482	6.75	0.00	3,400.45	-0.09	103.11

4.5.1 Business group affiliation and market concentration

According to H1, business group affiliation can have a positive or a negative effect on market concentration. While some authors argue that business groups limit competition (e.g., Carney et al., 2018), others refer that they increase competition (Weinstein and Yafeh, 1995).

Table 4.5 shows that the market share of business group firms decreases concentration, measured by CR4. This result is robust given that it holds regardless of the method of estimation used (Fixed Effects or Blundell and Bond's (1998) system GMM method) and is consistent with the findings of Weinstein and Yafeh (1995) that business groups increase competition. A similar conclusion is found by Forte and Sarmiento (2014), who show that foreign presence²¹ reduces market concentration using the CR4 as the dependent variable, too. A rationale for this finding lies in the justifications presented by Barrios et al. (2005) who refer that positive market externalities brought by FDI such as more sophisticated technology can develop local industries and thus intensify competition.

The remaining statistically significant results in the table have support in the existing literature, as well. Economies of scale typically increase concentration and this is robust no matter what the estimation technique is. This evidence is in line with some of the works reviewed by Forte (2016). And the same applies to market growth, for which we also find a positive impact on market concentration. Finally, regarding export intensity, we find a positive and statistically significant effect on market concentration. This finding is according to Willmore (1989) and other studies reviewed by Forte (2016).

²¹ According to Forte and Sarmiento (2014), foreign presence is measured through the equity stake held by foreign firms in Portuguese firms. If that stake is larger than 10%, the foreign presence dummy from their study is equal to 1, otherwise is equal to 0. Therefore, there is some overlapping between the concepts of foreign presence and business group affiliation. As in Boutin et al. (2013), we define a business group as a set of firms controlled by a single company, the business group head. Control implies holding more than 50% of the voting rights in a company.

Table 4.5: Regression results for the impact of business group affiliation on market concentration

This table reports the regression results for the impact of business group affiliation on market concentration. The period range is 2008-2014 and observations are industries defined at the three-digit NACE Rev.2 (around 210 industries per year). Industry values result from the sum of the individual values of all the firms in that industry. CR4 is the fraction of sales that is generated by the four firms with the largest sales of a given industry and its upper limit is equal to 1. BG is the market share of business group firms in each industry. ES is Economies of Scale and is defined, for each industry, as the average sales of the largest firms that are responsible for 50% of industry sales divided by industry sales. CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales. ADV_INT is advertising intensity and is defined as the sum of the advertising expenditures of the firms in the same industry divided by industry sales. R_D is the sum of research and development expenses in the same industry divided by industry sales. MG is market growth and is defined as the difference between the log of industry sales in year t and the log of industry sales in year t-1. MS is market size and is proxied by industry sales. EXP_INT is export intensity and is defined as the sum of the exports of the firms in the same industry divided by industry sales. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Independent variables	Dependent variable is CR4	
	FE	BB
	(1)	(2)
BG	-0.019 *** (0.007)	-0.015 *** (0.006)
ES	0.639 *** (0.054)	0.549 *** (0.060)
log(CAP_INT)	-0.010 (0.007)	-0.008 (0.007)
ADV_INT	-0.063 (0.467)	-0.341 (0.493)
R_D	-0.025 (0.330)	-0.291 (0.403)
MG	0.012 *** (0.004)	0.013 ** (0.006)
log(MS)	0.008 (0.015)	0.010 (0.013)
EXP_INT	0.142 *** (0.043)	0.077 * (0.041)
Constant	0.105 (0.290)	-0.021 (0.251)
Year dummies	Yes	Yes
R ²	0.651	
Observations	1,461	1,246

4.5.2 Business group affiliation and entry rates

Regarding the impact of business groups on market entry (H2), Boutin et al. (2013) find that the higher the market share of business group affiliated incumbents in a specific industry the lower the number of entrants (new companies). On the other hand, they also demonstrate that the cash held by the business groups of incumbent firms limits entry, while the cash held by the business groups of entrant firms facilitates enter. So, the expectation is that business group affiliation simultaneously restrains (if already in the industry) and promotes entry (as new incumbent).

Our results for the determinants of the entry rate, defined as the market share held by entrants in the year of entry, as in Boutin et al. (2013) show that, in fact, there is a quadratic relationship between the entry rate and the market share of business group firms (Table 4.6). Perhaps due to endogeneity issues, these findings are only statistically significant when Blundell and Bond's (1998) system GMM method rather than Fixed Effects is used. There is a U-shaped relationship between the entry rate and the market share of business group firms, indicating that entry in a market decreases until business group firms hold a certain market share and increases after that point is reached. We believe that after competing so hard for a given market share that makes business group firms satisfied, competition softens and that allows entry by other firms which previously cannot enter the market due to the hard competition, explaining the U-shaped relationship.

Moreover, we show that the cash held by incumbent firms in the market discourage entry, while the cash held by the business groups of entrant firms encourage entry, confirming the results from Boutin et al. (2013). Findings on Table 4.6 are also consistent with the theoretical predictions by Cestone and Fumagalli (2005) who stress that group membership and the consequent access to internal capital markets increases the likelihood of entry under certain circumstances, namely when there are financial constraints. Therefore, H2 is confirmed.

To conclude, we document that the profitability of the market, proxied by its ROA, positively impacts entry, which is according to the standard industrial organisation theory, which postulates that profits attract firms, and with Boutin et al. (2013).

Table 4.6: Regression results for the impact of business group affiliation on entry rates

This table reports the regression results for the impact of business group affiliation on entry rates. The period range is 2008-2014 and observations are industries defined at the three-digit NACE Rev.2 (around 210 industries per year). Industry values result from the sum of the individual values of all the firms in that industry. Entry rate is the ratio between the sales of entrants and the total sales in industry. BG is the market share of business group firms in each industry. ROA is operating return on assets and is defined as EBITDA deflated by total assets in the industry. CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales. TANG is tangibility and is calculated as fixed tangible assets scaled by total assets in the industry. MG is market growth and is defined as the difference between the log of industry sales in year t and the log of industry sales in year t-1. MS is market size and is proxied by industry sales. TFP is the industry median Total Factor Productivity (TFP). TFP for each firm within the industry is estimated according to the Olley and Pakes (1996) method. Finally, Incumbent Cash is the cash held by the incumbent firms in the industry and Entrant BG Cash is the cash held by the business groups to which entrant firms are affiliated. All the regressions are estimated using the Fixed Effects method (FE) and the Blundell and Bond's (1998) system GMM method (BB). Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Independent variables	Dependent variable is Entry rate							
	(1)		(2)		(3)		(4)	
	FE	BB	FE	BB	FE	BB	FE	BB
BG	-0.001 (0.003)	0.001 (0.005)	-0.023 (0.024)	-0.055 * (0.033)	-0.024 (0.023)	-0.069 ** (0.033)	-0.031 (0.023)	-0.072 ** (0.033)
BG ²			0.022 (0.023)	0.054 * (0.031)	0.023 (0.022)	0.068 ** (0.031)	0.029 (0.021)	0.072 ** (0.031)
ROA	0.032 * (0.019)	0.062 * (0.035)	0.032 * (0.019)	0.060 * (0.036)	0.028 * (0.017)	0.057 * (0.030)	0.028 * (0.017)	0.058 ** (0.029)
log(CAP_INT)	0.007 (0.005)	0.035 ** (0.014)	0.007 (0.005)	0.036 *** (0.014)	0.012 ** (0.005)	0.044 *** (0.016)	0.013 *** (0.005)	0.044 *** (0.016)
TANG	0.013 (0.016)	-0.054 (0.046)	0.014 (0.016)	-0.057 (0.047)	-0.006 (0.017)	-0.076 (0.053)	-0.007 (0.016)	-0.075 (0.052)
MG	0.004 (0.003)	0.004 (0.003)	0.004 (0.003)	0.004 (0.003)	0.003 (0.002)	0.004 (0.002)	0.004 (0.002)	0.004 * (0.002)
log(MS)	-0.011 ** (0.005)	-0.006 (0.008)	-0.010 * (0.005)	-0.004 (0.008)	-0.002 (0.005)	0.018 ** (0.009)	-0.002 (0.005)	0.018 ** (0.009)
TFP	0.000 (0.000)	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)	-0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.001)
Incumbent Cash					-0.008 ** (0.003)	-0.019 *** (0.006)	-0.008 ** (0.003)	-0.019 *** (0.006)
Entrant BG Cash							0.000 ** (0.000)	0.000 * (0.000)
Constant	0.232 ** (0.105)	0.173 (0.154)	0.224 ** (0.104)	0.153 (0.152)	0.264 ** (0.105)	0.168 (0.145)	0.261 ** (0.105)	0.169 (0.147)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.066		0.066		0.075		0.080	
Observations	1,461	1,246	1,461	1,246	1,461	1,246	1,460	1,245

4.5.3 Business group affiliation and exit of recent entrants

Boutin et al. (2013) demonstrate that entrant firms that are not backed by a business group are more likely to exit the market after a window of three to five years, which is a finding that is also supported by the Kaplan-Meier survival analysis previously presented in the paper. This view, combined with the idea that business group firms yield market power led to the formulation of our third hypothesis that the presence of business groups in a specific industry increase the exit of recent entrants.

Table 4.7 displays the estimates that we obtain for the exit equation. Like Boutin et al. (2013), exit rate is defined as the yearly market share of entrant firms in 2008 that exited the market until 2014. Regressions are estimated using Random Effects (according to the Hausman test is preferred than Fixed Effects) and the Blundell and Bond's (1998) system GMM method.

Overall, our results do not support the third hypothesis that the larger the presence of business groups in a specific industry the higher the exit of new entrants, as the coefficients associated to both the market share of business group firms and its square, as well as to the cash held by the business groups of entrant firms are not statistically significant.

Boutin et al. (2013), although find statistically significant effects of the cash held by business groups on the exit of recent entrants, also do not find statistically significant effects for the market share of business group firms. And Silva and Moreira (2021), who study Portuguese firms too, suggest that there are other factors other than multinational ownership or foreignness impacting firm exit. In fact, our evidence suggests that industry profitability, proxied by the ROA, and capital intensity decrease the exit rate of recent entrants. On the other hand, the size of the market also decreases exit, but this effect is only significant when Random Effects are used. Finally, we also find that the cash held by incumbent firms encourages exit.

Table 4.7: Regression results for the impact of business group affiliation on the exit rates of recent entrants

This table reports the regression results for the impact of business group affiliation on entry rates. The period range is 2008-2014 and observations are industries defined at the three-digit NACE Rev.2 (around 210 industries per year). Industry values result from the sum of the individual values of all the firms in that industry. Exit rate is the ratio of the sales of entrants that left the market to total sales in industry. BG is the market share of business group firms in each industry. ROA is operating return on assets and is defined as EBITDA deflated by total assets in the industry. CAP_INT is capital intensity and is defined as the sum of the fixed tangible assets of the firms in the same industry divided by industry sales. TANG is tangibility and is calculated as fixed tangible assets scaled by total assets in the industry. MG is market growth and is defined as the difference between the log of industry sales in year t and the log of industry sales in year t-1. MS is market size and is proxied by industry sales. TFP is the industry median Total Factor Productivity (TFP). TFP for each firm within the industry is estimated according to the Olley and Pakes (1996) method. Finally, Incumbent Cash is the cash held by the incumbent firms in the industry and Entrant BG Cash is the cash held by the business groups to which entrant firms are affiliated. All the regressions are estimated using the Random Effects method (RE) and the Blundell and Bond's (1998) system GMM method (BB). Robust standard errors are reported under the coefficients in brackets and *, **, *** indicate statistical significance of the variable at the .10, .05 and .01 levels, respectively (t-test).

Independent variables	Dependent variable is Exit rate							
	(1)		(2)		(3)		(4)	
	RE	BB	RE	BB	RE	BB	RE	BB
BG	0.001 (0.001)	0.001 (0.001)	0.001 (0.002)	-0.005 (0.006)	0.002 (0.002)	-0.005 (0.006)	0.002 (0.002)	-0.005 (0.007)
BG ²			-0.000 (0.002)	0.005 (0.007)	-0.002 (0.002)	0.005 (0.006)	-0.001 (0.002)	0.005 (0.007)
ROA	-0.001 (0.001)	-0.007 ** (0.003)	-0.001 (0.001)	-0.007 ** (0.003)	-0.001 (0.001)	-0.007 ** (0.003)	-0.001 (0.001)	-0.007 ** (0.003)
log(CAP_INT)	0.000 (0.000)	-0.002 (0.001)	0.000 (0.000)	-0.002 * (0.001)	-0.000 (0.000)	-0.002 * (0.001)	-0.000 (0.000)	-0.002 * (0.001)
TANG	-0.001 (0.002)	-0.001 (0.007)	-0.001 (0.002)	-0.001 (0.007)	0.001 (0.002)	-0.000 (0.007)	0.001 (0.002)	-0.001 (0.007)
MG	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
log(MS)	0.000 (0.000)	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)	-0.000 *** (0.000)	-0.000 (0.001)	-0.000 *** (0.000)	-0.000 (0.001)
TFP	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Incumbent Cash					0.000 *** (0.000)	0.000 (0.000)	0.000 *** (0.000)	0.000 (0.000)
Entrant BG Cash						0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Constant	-0.002 (0.003)	-0.007 (0.018)	-0.002 (0.003)	-0.007 (0.018)	-0.001 (0.003)	-0.002 (0.020)	-0.001 (0.003)	-0.001 (0.020)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.008		0.008		0.028		0.030	
Observations	1,215	1,006	1,215	1,006	1,215	1,006	1,214	1,006

4.6 Conclusions

The existing literature on business groups recognises that research on the relationship between business group affiliation and product market competition is scarce. This article contributes to fill the gap by offering new evidence on the topic.

We provide some figures for the top and the bottom concentrated and entry sectors in Portugal during the period between 2008 and 2014. Also, we find that business group affiliation impacts market concentration and entry, but not the exit of recent entrants. In particular, it is shown that the market share of business group firms decreases market concentration, which is consistent with the findings of Weinstein and Yafeh (1995), who stress that business groups intensify rather than limit competition, and with Cestone and Fumagalli (2005), who show that business groups can reduce industry concentration under certain conditions.

Moreover, we observe a U-shaped relationship between the market share of business group firms and entry, meaning that entry decreases until business groups achieve a given market share, increasing afterwards. Again, this evidence is consistent with Weinstein and Yafeh (1995), who document that the strong competition between business group firms makes entry more difficult. When business group firms attain a market share with which they are satisfied, possibly this aggressive competition slightly decreases, leading to an increase on entry and so to the U-shaped relationship that we observe. However, we do not provide any evidence on the optimal market share for business groups neither on the possibility that competition softens after reaching that optimal level, letting this issue for future research. It is just a plausible interpretation for the U-shaped relationship that we, in fact, observe. On the other hand, in line with Boutin et al. (2013), the cash held by the business groups of entrant firms helps entry, while the cash held by incumbent firms makes entry more difficult.

In addition, we document that business group do not influence the exit of recent entrants, contrarily to Boutin et al. (2013). Although this could be a consequence of studying a small economy like Portugal, where the business groups are not so powerful as business groups in other countries, such France, we think that this is a relevant result of our study.

To sum up, we prove that business groups have implications on product market competition and our evidence is important for competition authorities. Results suggest that they are not the villains that harm the market structure. They soften market concentration, do not restrict entry in a linear way and do not lead to the exit of recent entrants.

For future research, besides evaluating if there is an optimal market share for business groups and if competition indeed softens after reaching that level, it would be interesting to study why the share of business groups seems to be larger in most concentrated industries.

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5 Conclusion

This Doctoral Thesis underlines the importance of internal capital markets inside business groups. As it is proved throughout these pages, internal capital markets have the ability of mitigating the consequences of negative shocks. They benefit operating performance and investment, reduce the likelihood of a firm being financially constrained, decrease the investment-cash flow sensitivity, lower market concentration and encourage entry.

In the first essay, presented in Chapter 2, we show that business group firms do not decrease their post-crisis operating performance so much as stand-alone firms. For this result, it is clear the contribution of the cash holdings of the entire business group, stating the importance of internal capital markets. Additionally, intra-group lending also seems to have a positive, although short-lived, impact on operating performance. Total diversification, on its turn, has a negative effect on post-crisis operating performance, while results for the impact of related diversification are mixed. For future research, it would be interesting reevaluating the effects of related diversification on performance by for example using alternative measures. It would also be relevant to disentangle the general results by industry or size of the business groups in order to observe if there is some industry in which they do not hold and search for the necessary justifications. Finally, assessing if the quality of management in business groups also plays a role for the more positive operating performance vis-à-vis stand-alone firms would be worthwhile.

The second essay, available in Chapter 3, reveals that stand-alone firms are more likely to be financially constrained and that they depend more on their own cash flows to invest. In fact, consistent with the mechanics of internal capital markets, business groups firms do not need to rely so heavily on their own cash flows to invest because they have other internal funds available. Therefore, being a business group firm positively impacts investment, but negatively accounts for the change in cash holdings, given that they do not need so much to save due to precautionary motives. Some avenues for future research that arise after the development of this chapter include examining the sensitivity of investment to investment opportunities for stand-alone firms and addressing the impact of lumpy assets on corporate investment behaviour. Concerning cash holdings, findings are not totally meaningful about the impact of business groups on the accumulation of cash by constrained firms as they show a positive, but not significant effect, and so here it is another avenue for future investigation

as we suspect that, in the case of constrained firms, business groups can, in fact, lead to an increase of cash holdings.

Finally, the third essay, displayed in Chapter 4, concludes that the presence of business groups in a market decreases concentration. Moreover, it is found a U-shaped relationship between the market share of business groups and entry, meaning that entry decreases until business groups achieve a certain market share and increases afterwards. This suggests that entry happens because business groups seem to be satisfied with that market share and soften competition. A possible avenue for future research is confirming this suggestion and thus assessing if there is, in fact, an optimal market share for business groups from which competition becomes softer. Also, we find that the cash held by the business groups of entrant firms positively influences entry, indicating that internal capital markets indeed contribute to the removal of barriers to entry. To the exit of recent entrants, only industry-specific factors are found relevant and no impacts associated to business groups are observed. All these results regarding the impact of business groups on market structure do not support the view that their presence is anticompetitive.