INTERNAL CAPITAL MARKET EFFICIENCY OF BELGIAN HOLDING COMPANIES

Axel Gautier et Malika Hamadi

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1. INTRODUCTION

There is a large debate to determine whether diversified firms create or destroy value. So far, most of the literature concentrates on US conglomerate firms.[1] Determining if the conglomerate's internal capital market (the conglomerate's capital budgeting procedure) is efficient or not is central to this debate.

To evaluate the effectiveness of the conglomerate's capital budgeting process, the empirical analyses either compare the investment

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1. Exceptions are Lins and Servaes (2002) for emerging markets; Lins and Servaes (1999) for international evidence from UK, Japan, and Germany; Doukas, Holmen, and Travelos (2002) for Swedish firms; Fleming, Oliver, and Skourakis (2003) for diversified firms in Australia; Siaens and Walravens (1993), Praet (2002), and Colmant, Detournay, and Servaty (2003) for Belgian holding companies.

levels of a conglomerate division with a stand alone counter-part (Scharfstein, 1998 and Maksimovic and Philips, 2002) or analyze if internal transfers are driven by efficiency (Shin and Stulz, 1998). In this paper, we apply the Shin and Stulz's methodology to a sample of Belgian holding companies (BHCs).

Diversified companies in Europe are organized as holding companies and not as conglomerate firms. There are two main differences between a holding company and a conglomerate firm. First, each business segment of a holding company is organized within an independent firm rather than a conglomerate division and as such it is subject to the same accounting obligations as any other firm. The holding company has no discretion in reporting the segment data nor in defining segments. US conglomerates are required to report segment data only if it accounts for ten percent or more of its consolidated profits, assets, or sales, and their managers have some discretion in disclosing segment level data.[2] Second, voting rights and cash flow rights are separated in holding companies. US conglomerates hold typically 100 percent of their subsidiaries with a well-defined corporate policy while holding companies can exert control over a subsidiary with a diluted participation in the ultimate business enterprise. Holding companies, however, differ from US closed-end funds and UK investment trusts by their implication in the management of the subsidiaries they own.[3]

In this paper, we investigate whether BHCs create an internal capital market (ICM) and if they do, whether their internal capital market is efficient. For this, we closely follow Shin and Stulz (1998). We construct a sample of BHCs and their subsidiaries and test (1) if holding companies transfer resources between their subsidiaries and (2) whether these transfers are driven by efficiency.

To answer our first question, we check if the group cash flow is a determinant of the investment spending of group members. More specifically, we estimate the investment cash flow sensitivity with respect to both subsidiary own cash flow and group cash flow. If the latter is positive, the holding companies effectively transfer resources between their subsidiaries.

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2. Villalonga (2004b) shows that these institutional constraints together with the managerial discretion give a false picture of diversified companies.

3. See Colmant, Detournay, and Servaty (2003), and Wymeersch (1994).

In our estimations, we find that both the subsidiary own cash flow and the group cash flow are determinants of investment. Consequently, we conclude that BHCs effectively transfer resources between their subsidiaries, but not all the holding companies operate an ICM. The investment sensitivity to group cash flow is positive and significant only if the holding company's subsidiaries are affiliated to a coordination center. Coordination centers perform financial and managerial services for their multinational group on an attractive fiscal basis. The activities of a coordination center that are allowed by Belgian law consist of traditional group lending activities as well as advertising, collection and dissemination of information, insurance and reinsurance, scientific research, relations with national and international authorities, accounting and administrative data processing activities, leasing, reinvoicing, factoring, netting and cash pooling. These activities are restricted to be performed to the sole benefit of all or part of the group companies. For example, the members of a group that is related to a coordination center can borrow from the coordination center (or the coordination center can be used to transfer funds from one member to another) with a significant tax advantage compared to borrowing from a financial intermediary. Loaned funds from coordination centers may come from the capital of the coordination centers, from financial institutions, or from affiliated companies. Tychon (1997) reports that while coordination centers are financing about 40 percent of investments in the manufacturing industry, they are only using from 10 to 20 percent of investment credits allowed by financial intermediaries. This is a confirmation of their role as a financial intermediary inside multinational groups. The coordination centers are used by BHCs to transfer their resources between their subsidiaries, that is, to operate an internal capital market. Conversely, without a coordination center, the holding company's subsidiaries can only rely on their own resources to finance their investments. We have not found significant transfers in holding companies without coordination centers.

The positive answer to the first question confirms previous empirical results, in particular, those of Praet (2002) and Deloof (1998). Praet shows that the investment in the subsidiary of a holding company depends less on its own cash flow than in a comparable family-owned company as expected when an internal capital market is created. Deloof (1998) documents that BHCs have an active ICM and that the holding

companies effectively transfer resources between their subsidiaries. In particular, he shows that firms belonging to a corporate group for which the investment is partially financed by an internal capital market are not equally subject to financing constraints as firms that must borrow from banks. However, the instruments used for making these transfers are not clearly identified,[4] and it is not clear whether these transfers aim to increase the holding company's value. This paper contributes to this literature by testing if the ICM is efficient.

To answer our second question, we proceed in three steps. First, according to Shin and Stulz (1998), and Stein (1997), the internal capital market is efficient if the investments depend on the relative performances of the subsidiaries and on the holding company's total cash flow irrespective of its origin within the firm. This hypothesis is clearly rejected as we observe that the origin of cash flow remains an important determinant of investment within holding companies. In other words, the investment of a subsidiary is more sensitive to its own cash flow than to the holding company cash flow. Second, if the holding company is financially constrained, it cannot finance all its investment projects. Efficiency implies that when assessing which projects will be financed, the headquarter bases its decisions not only on the project's risk and return but also on the relative merits of the project compared to the other projects available in the holding company. Stein (1997) defines this form of redistribution as winner-picking. It implies that investment spending in a subsidiary should be positively affected by its investment opportunities but negatively affected by the other group member's investment opportunities. The data does not confirm this hypothesis. We investigate this point further by estimating separately the determinant of investment in low and high performance subsidiaries. We find that low performing subsidiaries rely more on group financing and less on their own financing than high performing subsidiaries. This can be used as an evidence against the efficient ICM hypothesis. Last, according to Fazzari, Hubbard, and Petersen (1988), the investment cash flow sensitivity is a measure of the firm's credit constraint. In Belgium, the external capital markets are poorly developed. Market capitalization of Belgian firms accounted only for 45 per-

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4. But financial fixed investment is not the way used by BHCs to transfer surplus on the internal capital market (Deloof (1998)).

cent of GDP in 1996. Holding companies then act as substitutes for capital markets. Bank loans and intra-group loans are the major sources of external financing (Deloof, 1998, 2001). Following Fazzari, Hubbard, and Petersen (1988), the investment cash flow sensitivity depends on the credit constraints faced by the firm. We then split the sample according to the financing constraint faced by the holding company. If the ICM is efficient, it is expected that holding companies with a higher financing constraint redistribute more resources. In the estimations, we do not observe significant differences between the investment-group cash flow sensitivity in the two sub-samples. Hence, we cannot conclude that BHCs operate an efficient ICM.

In the literature, the question of internal capital market efficiency is closely linked to the possible existence of a conglomerate discount. In their seminal paper, Berger and Ofek (1995) find that US diversified firms trade on average at a 12-15 percent discount compared to a portfolio of stand-alone firms replicating the conglomerates' divisions. Lamont and Polk (2002) report similar evidence that diversification destroys value by analyzing the relation between diversity and the firm's value.[5,6] In Belgium, it is well-known that BHCs trade at a significant discount compared to their net asset values. Colmant, Detournay, and Servaty (2003) report an average discount of 23 percent for the period 1983-2002 with important variations across holding companies and over time.[7]

Given this apparent negative link between diversification and value, the literature tries to identify specific features of diversified firms that could explain this puzzling evidence. Since, in a diversified firm, the divisions operate in different business segments, economies of scale and scope are absent and negative synergies cannot explain the lost value. Then, a large strand of the literature explains the differences between a conglomerate's division and a focused firm by the conglomerate's capital budgeting procedure.

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5. See also the evidence of Lang and Stulz (1994).

6. For Villalonga (2004a, 2004b), this apparent conglomerate discount is an artifact from the data and she provides new evidence that turns the conglomerate discount to a premium. Campa and Kedia (2002) control for the endogeneity of diversification decisions and they have not found evidence that diversification by itself destroys value.

7. See also Siaens and Walravens (1993).

On the one hand, Berger and Ofek (1995), Lamont (1997) – for diversified oil companies –, Scharfstein (1998), and Scharfstein and Stein (2000) argue that conglomerate firms inefficiently cross-subsidize low performing segments with the resources of high performing ones. Scharfstein (1998) uses a matching sample method, that is, he compares a conglomerate division with a stand alone counterpart and finds evidence of inefficient cross-subsidization in multi-division firms. In high productivity segments, a conglomerate division invests systematically less than its stand-alone counterpart, while in low productivity segments, a conglomerate division invests more.[8] Praet (2002) applies the matching sample method to BHCs and finds that (i) the subsidiaries of holding companies have lower performance than family owned companies, but (ii) subsidiaries of holding companies do not invest less (nor more) than family owned companies.

On the other hand, Williamson (1975), Stein (1997), and Gertner, Scharfstein, and Stein (1994) argue that the allocation of capital inside a firm, by the corporate headquarter, is more efficient than the allocation of capital by an outside investor (a bank for example) due to the superior information of the firm's insiders. Conglomerates are then able to create value thanks to their more efficient capital budgeting procedures, but Inderst and Laux (2005), Brusco and Panunzi (2005), and Gautier and Heider (2002) show that an efficient redistribution of resources is associated with additional agency costs. Scharfstein and Stein (2000), and Rajan, Servaes, and Zingales (2000), however, argue that the allocation of capital inside conglomerate is not driven by efficiency but by power struggles. If the conflicts between the divisional managers and the corporate owner cannot be solved by incentive contracts, the capital allocation is distorted to reduce these conflicts.

Clearly, whether or not internal capital markets are efficient is a debated issue. This paper contributes to this literature by analyzing the question with a new set of data. The sample we use contains only data from holding companies and their subsidiaries. We then avoid a possible selection bias which is often associated with the matching sample method. An important assumption of the matching sample method is

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8. Chevalier (2004) explains the apparent patterns of cross-subsidization by a selection bias in the sample, that is, conglomerates' subsidiaries have different characteristics than focused firms.

that the process of conglomeration is exogenous, that is, all firms/subsidiaries are equally likely to be part of a conglomerate. This is not true if the decision to diversify a firm depends on some of the firm's specific characteristics. In this case, some firms do decide to diversify, while others, with different characteristics, remain focused.[9] Chevalier (2004) provides evidence that diversification is indeed endogenous.[10]

2. EMPIRICAL METHODOLOGY

Concerning BHCs, we raise the following questions. (1) Do BHCs operate an internal capital market to transfer their resources amongst their subsidiaries? And if yes, (2) is the internal capital market efficient? Internal capital market efficiency meaning that the holding company's resources are invested in the most profitable subsidiaries. To answer these two questions, we estimate the following equation:

$$\frac{I_{iK}(t)}{TA_i(t)} = \alpha_1 \frac{CF_{iK}(t)}{TA_i(t)} + \alpha_2 \sum_{j \neq i \in K} \frac{CF_j(t)}{TA_i(t)} + \alpha_3 \theta_{iK}(t)$$
$$+ \alpha_4 \theta_K(t) + \alpha_5 \log TA_K(t) + \alpha_6 \frac{FFA_i(t)}{TA_i(t)} + \eta_K + \varepsilon_{iK}(t)$$

where the variables are defined as follows.

- $\frac{I_{iK}(t)}{TA_i(t)}$ is the investment in fixed assets of the subsidiary i of holding company K at year t divided by its total assets at year t.

- $\frac{CF_{iK}(t)}{TA_i(t)}$ is the cash flow of the subsidiary i of holding company K at year t divided by its total assets at year t.

- $\sum_{j \neq i \in K} \frac{CF_j(t)}{TA_i(t)}$ is the sum of the cash flow of the subsidiaries $j \neq i$ of holding company K at year t scaled by the total assets of subsidiary i at year t.

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9. See Maksimovic and Phillips (2002), and Agrawal and Samwick (2003).

10. Following this argument, the conglomerate discount reflects the differences between the underlying characteristics of firms that have (endogenously) decided to be part of a conglomerate.

- $\theta_{iK}(t)$ is a measure of the investment opportunities of subsidiary i at year t. We use the subsidiary's return on assets (ROA) to approximate the investment opportunities in subsidiary i.[11]

- $\theta_K(t)$ is a measure of the investment opportunities of holding company K outside subsidiary i at year t. It is approximated by the highest ROA of subsidiary $j \neq i \in K$. The highest ROA represents the best use of resource in the holding company outside subsidiary i.

- $\log TA_K(t)$ is the log of the total assets of all subsidiaries j of holding company K. It is a proxy for the holding company size. This variable is used as a control variable.

- $\frac{FFA_i(t)}{TA_i(t)}$ is the investment in financial fixed assets of the subsidiary i of holding company K at year t divided by its total assets at year t. It is used as another control variable.

- η_K is a holding company specific effect (unobserved effect).

- $\varepsilon_{iK}(t)$ is an error term.

The estimated equation is similar to Shin and Stulz (1998), but there are three main differences. First, Shin and Stulz measure the investment opportunities by sales growth and the segment's Tobin's q.[12] Compared to the Tobin's q, the measure we use for the investment opportunities (ROA) does not take the risk into account. Moreover, it measures past profitability, and this can only be used as a proxy for future opportunities. Nevertheless, we are not able to compute the segment's Tobin's q for the subsidiaries of BHCs, since almost all the subsidiaries are not listed in the stock market. In our sample, only 12 subsidiaries (35 observations) are listed. Second, we add a variable $\theta_K(t)$ that measures the holding company opportunity outside subsidiary i. Last, we scale all the variables by the total assets at time t. We check the robustness of our results by estimating an equation where all the variables are scaled by the total assets at $t-1$.

If BHCs operate an internal capital market, the investment in a subsidiary i should depend on both its own cash flow and the cash flow of

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11. We also use the sales growth to measure the investment opportunities.

12. They use the median q of specialized firms in the segment's industry.

the other subsidiaries of the holding company. A positive sign for the coefficient α_2 will then mean that BHCs have an active internal capital market. Conversely, if the holding company does not transfer resources between its subsidiaries, the investment in subsidiary i should be independent of the group cash flow: $\alpha_2 = 0$.

According to Shin and Stulz (1998), an internal capital market is efficient if "investment by a segment depends only on firm cash flow after controlling for its investment opportunities, a dollar of cash flow should have the same impact on the investment by a segment irrespective of its source within the firm" (pages 534-535). This means that the subsidiaries' investments should depend on the *total* resources available in the holding company.[13] Shin and Stulz's definition of efficiency corresponds to $\alpha_1 > 0$, $\alpha_2 > 0$, and $\alpha_1 = \alpha_2$.

If the firm is credit constrained – it does not have free cash flow[14] – the holding company cannot finance all the subsidiaries' investment projects with its scarce resources; hence, the top management should make critical choices concerning the use of the resources. These choices are efficient if the investment levels are driven only by the subsidiaries opportunities. A holding company with limited resources has an efficient internal capital market if the holding company's headquarter organizes a winner picking/loser sticking contest, where according to Stein (1997), "individual projects must compete for the scarce funds, and the headquarters' job is to pick the winners and the losers in this competition" (page 111). Winners and losers are determined by their relative investment opportunities. "Specifically, the extent to which any given project gets funded in an internal capital market will depend not only on that project's own *absolute* merits but also on its merits *relative* to other projects in the company's overall portfolio" (Stein (1997), page 112). Hence, if the holding company is credit constrained and if the internal capital market is efficient, we should observe $\alpha_3 > 0$ and $\alpha_4 < 0$. In this formulation, we exclude the case in which one subsidiary attracts all the resources of the holding company. In other

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13. By scaling the subsidiary's own cash flow and the group cash flow by the total assets of subsidiary i, we make the two variables comparable.

14. See Jensen (1986).

words, the efficient allocation of funds inside a holding company is not of the type "winner takes all". If the holding company has free cash flow, it could finance all its investment projects, and hence, we should observe $\alpha_3 = 0$ and $\alpha_4 = 0$.

The case where $\alpha_1 \geqslant \alpha_2 > 0$ is not necessarily incompatible with ICM efficiency. There are two reasons for this. For Brusco and Panuzzi (2005), $\alpha_1 > \alpha_2$ is not incompatible with an efficient internal capital market when there are agency problems between the management of the holding company and the managers of its subsidiaries. An agency problem arises when (i) the managerial reward is tied to the perform-ance of its subsidiary and (ii) the manager can influence the cash flow level by exerting an unobservable effort. If the holding company's management pools all the subsidiaries' cash flows, managerial incen-tives to exert effort are weak since the manager receives for investment only a fraction, α_1, of any additional resource produced in its subsi-diary. The internal capital market expropriates a fraction of manageri-al effort. Pooling all the holding company's resources reduces the incentive to create these resources. If the holding company's manage-ment raises α_1 above α_2, resources might be less efficiently allocated ex-post, but it stimulates resource production by the manager by lea-ving a larger fraction of the resources created for investment. Making the investment of a subsidiary dependent on the realized cash flow in this subsidiary stimulates the managerial incentives to produce cash flow.

Moreover, the firm's cash flow can also be a proxy for the firm's investment opportunity. Accordingly, the case where $\alpha_1 > \alpha_2$ within a holding company simply reflects that investment depends on opportu-nities measured by cash flow. Correlation between cash flow and investment opportunity could lead us to over estimate the influence of cash flow on investment levels. Hence, we cannot exclude that the case where $\alpha_1 > \alpha_2$ reflects poor measures of opportunities.

3. DATA SOURCE

We use the "Centrale des Bilans" database of the National Bank of Belgium (NBB). It contains the annual accounts and other accounting data of all Belgian firms. Ownership and participation data are also

recorded. The data covers the period 1991-1996. In 1991, the disclosure law became applicable to all firms listed without exception.[15]

To construct the database, we select all Belgian listed companies that report to be a holding company. The definition of a holding company is given by the Belgian Stock exchange.[16]

The NBB's database contains financial data of BHCs and their Belgian and Luxembourg subsidiaries. It also contains ownership data on subsidiaries outside Belgium and Luxembourg but no financial data. Our sample then consists of financial data of BHCs and their Belgian and Luxembourg subsidiaries. We include control variables to take into account the missing information on foreign subsidiaries. In particular, we add control variables for the number and the proportion of foreign subsidiaries.

3.1. Sample description

Our sample consists of all the Belgian and Luxembourg subsidiaries of all Belgian listed holding companies that satisfy the following criteria.

1. The subsidiary should report annual accounts to the NBB. Subsidiaries that are found in the statements of ownership (the holding company's participation record) but not when we search for their annual accounts are excluded from the sample.

2. Subsidiaries in the financial sector (NACE code beginning by 8) and in other services sectors as education for example (NACE code beginning by 9) are excluded from the sample.

3. We eliminate the subsidiaries for which the holding companies do not have control. A holding company controls a subsidiary for sure if it has at least a 50 percent shareholding directly and/or indirectly. If there is a direct and an indirect shareholding by the mother company in the subsidiary, we take the sum of

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15. The disclosure law was adopted in 1989, and before this date, the Belgian corporate ownership was a black box, no data were available and little was known about it. Some firms, under condition, were not obliged to disclose their ownership data. By the end of 1991 the notification to the Banking Commission was compulsory for all firms.

16. Sector 27 in the Belgium stock exchange classification.

both. However, through pyramidal structure, a mother company can achieve much control over the subsidiary with only a small indirect shareholding. For example, if a holding company A holds 50 percent in a subsidiary A1 and 20 percent in a subsidiary A2, and if A1 holds 30 percent in A2, the sum of direct and indirect shareholding of A2 is 35 percent, but the holding company effectively exerts control over A2. Thereby, we assume that the holding company exerts the control if it has at least 20 percent of direct and indirect shareholding in a subsidiary. Although, the mother company can achieve much control over the subsidiary with only a small indirect shareholding through pyramids, we have chosen 20 percent because it represents a critical threshold. Under Belgian law, if the shareholding in a company reaches 20 percent of voting rights upward or downward, the shareholder must attach to his notification to the Banking Commission and to the target company, the policy statement explaining the strategic intent with regard to the target. Two remarks are in order: first, the results are qualitatively the same for the 20 percent threshold and for the 50 percent threshold, and hence, including the subsidiaries where the ownership stake is in between 20 percent and 50 percent, does not change the results but instead increases the sample size; and second, in the sample, the mean ownership stake is 82.4 percent, and in more than 75 percent of the subsidiaries, the holding company exerts control with more than half of the shares.

4. If after the steps described above, a holding company remains with only one subsidiary, we exclude it from the sample. As our study is about ICM and transfers between subsidiaries, a holding company with only one subsidiary is meaningless.

The selection procedure described above results in a sample for the period from 1991 to 1996 consisting of 434 observations. The unit of observation is a subsidiary i of holding company K at time t. In our sample, the average number of holding company's subsidiaries is four, and the max is 25. The mean investment in fixed assets represents five percent of the total assets. Note that ten percent of the companies per year have a zero investment level. Table 1 presents the univariate analysis of the sample.

Table 1. – *Univariate analysis.*

Variables	Mean	25th perc.	50th perc.	75th perc.
Investment				
$I_{iK}(t)/TA_i(t)$	0.0507	0.0001	0.0142	0.0508
Own cash flow				
$CF_{iK}(t)/TA_i(t)$	–0.0789	–0.0099	0.0448	0.0989
Other cash flow				
$\sum_{j\neq i\in K} CF_j(t)/TA_i(t)$	–0.1282	–0.0407	0.1531	0.4088
Own ROA				
$\theta_{iK}(t)$	–7.759609	–2.28186	1.66005	6.28500
Highest ROA				
$\theta_K(t)$	11.2747	3.0850	7.8885	16.5597
Financial fixed assets				
$FFA_i(t)/TA_i(t)$	0.1867	0.0006	0.0084	0.3455
Group size				
$TA_K(t)$ (in million €)	1163	33	136	506
Sales growth				
$\frac{S_{iK}(t)-S_{iK}(t-1)}{S_{iK}(t-1)}$	0.5127	–0.06701	0.04208	0.2934
Ownership				
(in %)	82.40	64.90	99.62	100

$i, j \in K$ refers to subsidiary i, j of holding company K. t refers to time.
  $TA_i(t)$ is the total asset of $i \in K$ at t.
  $I_{iK}(t)$ is the investment in fixed assets of $i \in K$ at t.
  $CF_{iK}(t)$ is the cash flow of $i \in K$ at t.
  $\sum_{j\neq i\in K} CF_j(t)$ is the sum of the cash flow of $j \neq i, j \in K$ at t.
  $\theta_{iK}(t)$ is the return on assets (ROA) of $i \in K$ at t.
  $\theta_K(t)$ is the highest ROA of $j \in K$ at t with $j \neq i$.
  $FFA_i(t)$ is the investment in financial fixed assets of $i \in K$ at t.
  $TA_K(t)$ is all total asset of all $j \in K$ at t in million euros.
  $S_{iK}(t)$ is the sales of $i \in K$ at t.
  Ownership is the sum of the direct and the indirect percentage of shares
  held by the mother company in its subsidiaries.

4. EMPIRICAL RESULTS

We conduct panel data estimations with fixed effects. A fixed effects model is better suited to our study because it may allow for correcting for unobserved (time-invariant) firm heterogeneity effects. The fixed effect captures specific unobserved firm characteristics.

Table 2 contains the results of the first estimation. The variables own cash flow and other cash flow are both positive and significant.[17] Group cash flow seems to be a significant determinant of the subsidiaries' investment. It confirms that BHCs operate an internal capital market and that they transfer resources for investment amongst their subsidiaries.[18] Investment is partially financed by the group resources in BHCs. The control variables for foreign subsidiaries are not significant and not reported in the tables. Then, the holding company's specific effect (η_K) captures all the impact of foreign subsidiaries on the Belgian subsidiaries' investment.

The estimated ratio $\frac{\alpha_1}{\alpha_2}$ is approximately equal to six, meaning that the own resources are six times more important than the group resources for explaining investment.[19] There is a significant dependence of the investment on the origin of cash flow. The estimation's results are qualitatively similar when all the variables are scaled by the total assets at $t-1$. In this specification, the estimated ratio $\frac{\alpha_1}{\alpha_2}$ is approximately equal to 12.5 (see table 2). It therefore implies that the allocation of resources inside the holding company departs from a winner picking contest where the scarce resources are allocated to the most efficient investment projects independently of their origin within the

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17. And comparable to the estimated investment cash flow sensitivity of other studies; the estimated investment (own) cash flow sensitivity ranges from 0.12 to 0.15 in Shin and Stulz (1998), from 0.20 to 0.47 in Van Cayselle (2002) and is equal to 0.007 for holding company's subsidiaries in Praet (2002).

18. Praet (2002) establishes the same by showing that the investment cash flow sensitivity is lower for a holding company's subsidiary than for a family owned company. Similarly, Deloof (1998) shows that the investment cash flow sensitivity is lower for subsidiaries that can finance their investment by borrowing on the internal capital market than for firms that have to borrow on external capital market (typically bank financing).

19. Shin and Stulz (1998) find a comparable ratio of six for US conglomerates.

Table 2. – *Panel data regression with fixed effects*
of the investment of all subsidiaries from 1991 to 1996 as a linear
function of listed explanatory variables
(P-values are in parentheses).

Variables	scaled by $TA_i(t)$	scaled by $TA_i(t-1)$
Own cash flow	0.1093 (0.0009)	0.5003 (0.0000)
Other cash flow	0.0184 (0.0000)	0.0393 (0.0001)
Own ROA	–0.0009 (0.0027)	–0.0106 (0.0000)
Highest ROA	–0.0008 (0.0022)	0.0015 (0.8042)
FFA	–0.0726 (0.0028)	2.4163 (0.0234)
Group size	–0.0246 (0.3237)	–0.6026 (0.6155)
Ownership	0.0001 (0.7674)	
R^2	16.56%	28.69%
N	434	279

holding company. Holding companies do not pool all their resources before reallocating them to investment projects but rather leave a significant fraction of resources for investment within the subsidiaries. Group financing accounts for only a relatively small fraction of the investment compared to own financing. A limited financing from the group is also a tool for the holding company's management to increase the incentives to create resources at the subsidiary level.[20] Our estimations do not confirm the efficiency hypothesis of Shin and Stulz

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20. See Brusco and Panunzi (2005).

(1998).

Now that it is established that BHCs have a significant group financing of investment, a natural question is to see if all the holding companies operate an internal capital market. In table 3, we report separated estimations for holding companies that have and do not have a coordination center. For the subsidiaries that are not affiliated to a coordination center, the variable other cash flow is not significant while it is significant for subsidiaries related to a coordination center. Group financing accounts for investment only if the holding company has a coordination center. The data suggests that holding companies that are not affiliated to a coordination center do not operate an internal capital market. A coordination center seems necessary for a holding company to transfer its resources between its subsidiaries. Without a coordination center, there is no evidence that the holding company operates an internal capital market, and the investment of a subsidiary is not explained by the holding company's resources.[21] Likewise, the variable group cash flow is not significant for holding companies with less than five Belgian subsidiaries. The two estimations of table 3 recover more or less the same reality since out of the 243 subsidiaries from holding companies with more than four subsidiaries, 205 are affiliated to a coordination center. To summarize, we do not find evidence that all the holding companies operate an ICM.

Group financing is limited, but is it efficient? To answer this question, we look at the coefficients of the variables measuring investment opportunities. Surprisingly, the investment opportunity of a subsidiary has a negative impact on its investment. The estimated coefficient of own ROA is negative and significant. This suggests that internal transfers are not efficient and that holding companies cross-subsidize low

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21. The question that can be raised is whether the decisions to transfer resources among group members and to create a coordination center are linked. We cannot answer this question with precision because no coordination center was created during the sample period and therefore we cannot observe a holding company's behavior before and after the creation of its coordination center. Note however that intra-group transfers are not the sole purpose of coordination centers and that not all the holding companies have the opportunity to create a coordination center. There are conditions in terms of employment, size, and the multi-national character of the group that should be met, and some of the holding companies in our sample do not satisfy the required conditions.

Table 3. – *Panel data regression with fixed effects*
of the investment of all subsidiaries from 1991 to 1996 as a linear
function of listed explanatory variables
(P-values are in parentheses).

Variables	Holding companies with		Coordination center	
	2 to 4 subsidiaries	5 or more subsidiaries	Yes	No
Own cash flow	0.0371	0.5033	0.4379	0.0864
	(0.0989)	(0.0000)	(0.0000)	(0.0896)
Other cash flow	–0.0034	0.0182	0.0204	0.0051
	(0.5628)	(0.0120)	(0.0003)	(0.4864)
Own ROA	–0.0003	–0.0049	–0.0043	–0.0007
	(0.1525)	(0.0001)	(0.0000)	(0.1070)
Highest ROA	–0.0003	–0.0004	–0.0004	–0.0008
	(0.1450)	(0.4454)	(0.1830)	(0.0706)
FFA	–0.0307	–0.0537	–0.0357	–0.0894
	(0.0813)	(0.1314)	(0.2891)	(0.0083)
Group size	–0.0034	–0.0349	–0.0384	0.0409
	(0.8428)	(0.5733)	(0.2526)	(0.3228)
R^2	54.35%	17.73%	20.47%	18.83%
N	191	243	251	183

performing subsidiaries with the resources of high performing ones. However, high investment opportunities elsewhere in the holding company have a negative impact on the investment, but this variable is not always significant. Moreover, when the variables are scaled by the total assets at $t - 1$, the coefficient is positive but not significant. The higher the return on the assets of the holding company's most profitable subsidiary, the lower the investments in the other holding company's subsidiaries. This suggests that highly profitable segments attract the group's resources. The presence of highly profitable segments in the holding company reduces the investment of the relatively less profi-

22. We also obtain a negative sign when we use an alternative specification, where the holding company's opportunities are measured by the mean ROA and not by the highest ROA.

table segments.[22]

These results could partially be explained by the high correlation between the cash flow and the investment opportunities. The variables own ROA and own cash flow are highly correlated – around 89 percent –. High correlation can lead to an overestimation of the coefficient α_1. To control for this, we add an interaction variable between own cash and own ROA, but the variable is not significant and its addition does not change the results.

To control whether there is a collinearity problem between these variables, we perform the test proposed by Besley, Kuh, and Welsch (1980). We use this test for a pooled OLS. According to the criteria of Besley, Kuh, and Welsch, there is no collinearity problem. However, because we find a high condition index (8.65) associated with the variables Own Cash flow, Own ROA, and Highest ROA, it is possible that the coefficients' weights for these variables are not well estimated; hence, we run a RIDGE regression to overcome the possible collinearity problem. With the RIDGE regression, the coefficients are smaller, but their signs are always the same.

As another proxy for growth opportunities, we use sales growth instead of own ROA. Integrating this variable reduces the sample to 216 observations due to the lag introduced and the missing values of this variable. With this reduced sample, the results turn out to be inconclusive. The estimated coefficients of all variables are not statistically significant. The main reason for this is not the inclusion of the sales growth variable but rather the reduction in the sample size.[23] Therefore, the results of these estimations are not reported in the paper.

To investigate further the efficiency of the ICM, we split the sample into two sub-samples. In the first sample, we keep the subsidiaries with a ROA above the median the remaining subsidiaries are put in a second sample. Highly profitable subsidiaries attract more group resources than lower profitable ones if the coefficient α_2 is larger for the first sub-sample than for the second. As shown in table 4, it is not the case: the estimated coefficient α_2 is three times larger for the subsidiaries with a ROA below the median than for the subsidiaries with a

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23. The coefficients are not significant in the reduced sample even without the sales growth variable.

Table 4. – *Panel data regression with fixed effects*
of the investment of all subsidiaries from 1991 to 1996 as a linear
function of listed explanatory variables
(P-values are in parentheses).

Variables	Subsidiaries with		Holding companies with	
	ROA > median	ROA < median	Low credit constraint (high ratio $\frac{CF_K}{TA_K}$)	High credit constraint (low ratio $\frac{CF_K}{TA_K}$)
Own cash flow	0.2827	0.1389	0.3066	0.1241
	(0.0002)	(0.0070)	(0.0117)	(0.0103)
Other cash flow	0.0103	0.0364	0.0129	0.0214
	(0.0019)	(0.0004)	(0.0200)	(0.0036)
Own ROA	–0.0016	–0.0012	–0.0021	–0.0011
	(0.0010)	(0.0139)	(0.0045)	(0.0121)
Highest ROA	–0.0003	–0.0013	–0.00001	–0.0011
	(0.3000)	(0.0015)	(0.9814)	(0.0025)
FFA	–0.0066	–0.1128	–0.0258	–0.1286
	(0.7541)	(0.0218)	(0.4559)	(0.0021)
Group size	–0.1153	0.0358	–0.0585	0.0290
	(0.0000)	(0.4010)	(0.0904)	(0.4883)
R^2	28.94%	27.78%	19.94%	22.21%
N	217	217	217	217

ROA above. We observe that subsidiaries with low opportunities rely relatively more on group financing than subsidiaries with high opportunities. This could be interpreted either as a sign of inefficient cross-subsidization or as a sign of correlation between resources and opportunities. In this second scenario, low performing subsidiaries lack financial resources and rely on the resources of highly performing ones. To validate this hypothesis, we should observe that high performing divisions are less credit constrained than low performing ones. Accordingly, high ROA subsidiaries should have a lower investment own cash flow sensitivity; the data show that it is not the case. Hence, we cannot conclude that the holding companies' internal transfers are

efficient.

Moreover, the investment total (group+own) cash flow sensitivity is greater for subsidiaries with a low ROA. Fazzari, Hubbard, and Petersen (1988) measure the firm's credit constraint by its investment cash flow sensitivity. Accordingly, if the holding company has an efficient ICM, we should observe a lower credit constraint for the more efficient subsidiaries; however, we find the reverse in the data.

To investigate further the role of credit constraints, we split again the sample in two sub-samples. The first one contains the holding companies that are relatively less credit constrained, the second one contains the holding companies that are relatively more credit constrained. Group financing is expected to be more important in holding companies facing stronger credit constraint. Results are reported in table 4.

To measure credit constraint, we use the ratio of holding company's total cash flow to holding company's total assets. This ratio measure the availability of internal funds compared to total assets. In our estimation, we find that the coefficient of group cash flow is similar in the two sub-samples but more significant for highly constrained firms. Again, this is an evidence against the efficient ICM hypotheses.

We conclude our empirical analysis by mentioning two last points. First, there is a crowding out of investment in fixed assets by the investment in financial assets. The investment in financial assets reduces the investment in fixed assets. This effect is particularly important for low ROA subsidiaries (see table 4). Even if the hypothesis is rejected by Deloof (1998), investment in financial fixed assets could be used by a holding company to transfer resources between subsidiaries. In that sense, it is not a surprise to observe negative sign for the variable FFA.

Second, we investigate the role of ownership in the investment decisions. Holding companies, unlike US conglomerates, do not control all their subsidiaries with 100 percent of the shares. Consequently, the investment decisions of the subsidiaries could be affected by the cash-flow right the holding company has in the subsidiaries. If a holding company has comparable investment opportunities in two subsidiaries with different cash flow rights, it will invest first in the subsidiary where the holding company has the highest cash flow right.[24]

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24. See Bertrand, Mehta and Mullainathan (2002).

To control that, we split our sample into two sub-samples. The first one contains the data on the subsidiaries where the holding company has 100 percent of the shares and the second one the data on the subsidiaries where the holding company has less than 100 percent (but more than 20 percent, following our data selection process). Against the tunneling hypothesis, we find a comparable investment group cash flow sensitivity in the two sub-samples (results are reported in table 5). Finally, if we add ownership as an explanatory variable in the regressions, the estimated coefficient is not significant (see the ownership variable in table 2).

Table 5. – *Panel data regression with fixed effects*
of the investment of all subsidiaries from 1991 to 1996 as a linear
function of listed explanatory variables (P-values are in parentheses).

	Subsidiaries with	
Variables	100% Ownership	Less than 100% Ownership
Own cash flow	0.5376	0.0749
	(0.0000)	(0.0204)
Other cash flow	0.0159	0.0167
	(0.0138)	(0.0129)
Own ROA	−0.0053	−0.0006
	(0.0000)	(0.0466)
Highest ROA	−0.0007	−0.0005
	(0.1800)	(0.0370)
FFA	−0.0592	−0.0143
	(0.2152)	(0.5634)
Group size	−0.0182	−0.0394
	(0.6954)	(0.1331)
R^2	23.54%	27.71%
N	187	247

5. Concluding remarks

Our estimations confirm that BHCs transfer resources between their subsidiaries on an internal capital market, hence, the answer to our first question is affirmative. We also show that coordination centers play an important role in the setting up of an active internal capital market. The holding companies use their coordination centers to transfer resources *for investments in fixed assets* amongst their subsidiaries.

To investigate whether the ICM is efficient, we proceeded in three steps. First, we check if the investment decision depends only on the total cash flow of the group. Clearly, the answer is negative as the investment cash flow sensitivity is higher for the subsidiary own cash flow than for the group cash flow. Second, we check if high performance subsidiaries rely more on group cash flow for investment than low performance subsidiaries. The data show that it is not the case. Last, we check if holding company with higher financing constraint relies more on group cash flow for investment and again the answer is negative. Hence, we cannot conclude that BHCs operate an efficient internal capital market.

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