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Internal Capital Markets in Dutch Firms

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I. Introduction

Due to information problems and agency costs a firm may face difficulties in obtaining the required amount of funds to finance planned investment. In such instances the availability of internal financial resources becomes a driving force of investment rather than the expected profitability (cf. e.g. *Fazzari, Hubbard* and *Petersen* (1988)). Firms develop organizational structures to deal with such financial issues. In particular, internal capital markets in which various segments pool their financial resources allow headquarters to direct funds to the most profitable projects (*Stein* (1997)). Various studies provide evidence of the presence of internal capital markets. *Lamont* (1997) investigates firms having segments in both the oil and non-oil industry around the 1986 oil price shock. He shows that in 1985 some non-oil segments were subsidized by oil segments. These subsidized segments cut back investment sharply in 1986 when oil cash flow dwindled. Further evidence suggesting the existence of internal capital markets is found by *Shin* and *Stulz* (1998) who show that a segment's investment is affected by cash income generated by the other segments belonging to the same firm.

In this paper we investigate the functioning of the internal capital market in the Dutch corporate sector in three different settings. First, in line with *Shin* and *Stulz* (1998) we investigate the functioning of internal capital markets for diversified and undiversified firms. Using a data set

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on the finances of Dutch firms and the segments of which they consist covering the period 1995–1998, we analyse whether firms redistribute financial resources among different segments. We distinguish between diversified and undiversified firms, because diversification may enhance the ability to redistribute financial resources. Apart from *Shin* and *Park* (1999) other studies focussing on this issue employ US data. Hence, our study provides some insight whether previous results can be generalized towards firms operating in the Netherlands.

Secondly, *Hoshi, Kashyap* and *Scharfstein* (1991) show that the presence of a large bank in Japanese 'Keiretsu' alleviates financing constraints for the participating firms. Furthermore, *Van Ees* and *Garretsen* (1994) show for a sample of Dutch firms that financing constraints at the firm-level are associated with corporate ties to banks. We check wether internal capital markets function differently for firms that house a financial segment than for firms that do not. The conjecture in this case is that firm funds may be better distributed over the available segments and concomitant investment projects through the presence of a financial segment. Such a segment is for instance a financial holding company that directs internal funds to the investment projects it deems most valuable to the firm.

Thirdly, it may be argued that the internal capital market is most valuable when the firm experiences some form of financial stress. Therefore, *Peyer* and *Shivdasani* (2001) focus on the functioning of the internal reallocation of funds under exactly such stress scenarios. Specifically, their analysis examines the working of the internal capital market before and after a leveraged recapitalization. *Peyer* and *Shivdasani* show that increased leverage may have a detrimental impact on the working of internal capital markets. In particular, it seems to have the effect of shifting emphasis away from investment in projects with growth opportunities and towards investment in projects that generate cash on a relatively short term basis. The suggestion of these findings is that internal capital markets were working before the recapitalization to the extent that funds were being reallocated between segments. After the recapitalization, however, the increased debt burden detaches the financing connections between segments as each segment is now solely focussed on generating cash. This result can have important policy relevance in a bank based system such as the Netherlands. However, *Peyer* and *Shivdasani*'s (2001) results may be driven to a large extent by the specific sample used so that their results cannot readily be generalized. Specifically, the authors note that most of the firms they analyse may have conducted the

leveraged recapitalization as a response to some form of external pressure (most notably a takeover threat). To the extent that leverage was increased to levels well above targets, firms may have stressed short term cash flow generation to consecutively reduce leverage back to normal. The observed absence of the internal capital market then not only reflects the heavy debt burden, but also the desire to reduce leverage fast. We attempt to generalize *Peyer* and *Shivdasani*'s findings regarding the effects of the debt burden on the functioning of internal capital markets. We therefore focus on firms that are characterized by a historically and structurally heavy (or light) debt burden, rather than on firms experiencing some (externally induced) shock to leverage that they want to nullify. The firms we analyse are therefore less likely to be inclined to reduce the debt burden fast by directing investment to quick cash projects.

The plan of the paper is as follows. Section II. reviews the empirical model we estimate to investigate the presence of internal capital markets. In section III. we present results regarding firm diversification and the functioning of internal capital markets and in section IV. we investigate the role of financial segments. In section V. we discuss the impact of the debt burden. We conclude and provide some directions for further research in section VI.

II. Econometric Specification

The purpose of the present analysis is to investigate whether internal capital markets are actively used within Dutch firms. The focus is mainly on the presence or absence of redistribution of funds across segments within a firm. What we want to know specifically is whether and in which instances particular firms reallocate financial resources between different segments using the internal capital market. Regarding the measurement of financial interdependencies between segments we stress the sensitivity of segment investment to other segments' funds. To that end we follow *Shin* and *Stulz* (1998) and regress a segment's investment rate on the segment's own cash flow as well as on the aggregate cash flow of the other segments that are part of the same firm (for the remainder of the analysis we will simply refer to this as 'other cash flow'). Sensitivity of segment investment to other cash flow is the main piece of evidence for active internal reallocation of funds, i.e. for the presence and active use of internal capital markets. We do not have sufficient information to construct Tobin's Q at the segment level, which is

usually employed in empirical investment equations to proxy for investment opportunities. Instead, we include the sales growth rate as an indicator for investment opportunities.[1] Hence the basic investment equation we estimate is

$$(1) \qquad \frac{I_{i,j,t}}{A_{j,t-1}} = \alpha + \beta \frac{S_{i,j,t} - S_{i,j,t-1}}{S_{i,j,t-1}} + \gamma \frac{C_{i,j,t}}{A_{j,t-1}} + \delta \frac{C_{-i,j,t}}{A_{j,t-1}} + \eta_i + \varepsilon_{i,j,t}$$

where $I_{i,j,t}$ denotes gross investment of the ith segment of firm j during year t, $A_{j,t-1}$ is the book value of total assets of firm j at the end of year $t-1$ and $S_{i,j,t}$ measures sales of segment i of firm j during year t. $C_{i,j,t}$ stands for cash flow of segment i of firm j in year t and $C_{-i,j,t}$ indicates the sum of cash flows from all segments of firm j in year t excluding the cash flow of segment i of firm j. We estimate the investment equation depicted above using fixed effects where η_i accounts for unobserved segment heterogeneity (including in this specific instance the omitted additional information on segments' profit opportunities). $\varepsilon_{i,j,t}$ is a white noise error term with the usual properties.[2]

The variables we need for our analysis are investment, sales growth and cash flow measured at the segment level. At the firm level we need total assets to deflate segment investment and cash flow in the estimation of our equation (1). We measure investment as gross investment in tangible fixed assets, sales is measured as earnings from market sales of goods and services supplied to third parties and cash flow is earnings after interest, but before depreciation, dividends and taxes.[3] Furthermore, we need a measure of firm cash flow from which we can subtract segment cash flow so that we measure $C_{-i,j,t}$.

Firm cash flow can be constructed in two different ways. Strategy 1 is that we measure cash flow as reported by the firm and strategy 2 is that we add the cash flows of all the segments that constitute the firm. Ideally the difference between the two strategies should be trivial. In the composite database that we use, however, we have two particular problems. First, we have non-response at both the segment and the firm

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1 This indicator results for instance from a neo-classical specification of investment with costly adjustment and omission of factor prices (cf. *Bond* and *van Reenen* (1999)).

2 We find that inclusion of year dummies does not affect the results we present in later sections. Results including time dummies can be obtained from the authors upon request.

3 At the segment level taxes are not recorded. Hence no after-tax measure of earnings is available.

level. This implies that the sum of segment cash flows is not equal to firm cash flow if information on one or more segments is missing. Second, cash flow measured at the firm and segment level does not have the exact same interpretation. In particular, cash flow is measured as earnings after interest where earnings refers to sales of goods and services to third parties. Hence segment cash flow includes revenues from sales to other segments, while firm cash flow excludes such intra firm transactions. In our analysis we have opted for strategy 2 mainly for two reasons. First, we want to give cash flow the same interpretation, regardless of whether we are talking about firm cash flow or segment cash flow. Second, given the stratified sampling design of the segment level data, we know that the mismeasurement of firm cash flow as the sum of segments' cash flows is limited since missing observations are concentrated among the smaller segments (see the data appendix).[4] We estimate equation (1) for the period 1996–1998. Descriptive statistics for all variables are presented in table 1.

Table 1

Description of variables for the 1996–1998 MICRONOOM sample

	Mean	Standard deviation	10^{th} percentile	Median	90^{th} percentile	N
Investment	0.017	0.045	0.000	0.003	0.044	10005
Sales growth	0.067	0.198	–0.143	0.051	0.285	10005
Own cash flow	0.037	0.068	–0.000	0.012	0.122	10005
Other cash flow	0.102	0.110	–0.001	0.096	0.222	10005

Notes: Investment is measured as segment gross investment in tangible fixed assets; sales is measured as segment earnings from market sales of goods and services supplied to third parties; own cash flow is segment earnings after interest, but before depreciation, dividends and taxes; other cash flow is the sum of segment cash flow within a firm, excluding segment's own cash flow. Investment, own cash flow and other cash flow are deflated by the book value of end-of-previous-period total firm assets.

[4] We have also computed – but do not report – all the results we present later on for restricted samples where we require 50% and 75% of the non-financial segments of the firm to be observed and included in the analysis. Approximately half of the firm-years in our sample meet the 50% coverage criterion, only one in ten meet the 75% criterion. The qualitative results obtained from these restricted samples are the same as those reported in the tables for the full sample. Hence we have no reason to believe that missing observations lead to biases in the measurement of $C_{-i,j,t}$.

III. Firm Diversification

The importance of optimal internal distribution of funds across segments of a particular firm stems from sources that reduce the ability of the firm to access low cost external finance easily. Given costly or unavailable external finance, the limited pool of internal funds must be directed towards the most profitable uses, regardless of their segment of origination within the firm. Put differently, it is the presence of binding financing constraints at the firm level that makes the efficient working of the internal capital market important. Within such a setup, some firms may be better equipped to use the internal capital market than others.

Consider a firm that faces binding financing constraints and efficiently deploys the internal capital market to make the best use of the limited pool of available funds. Now assume that this firm is well-diversified. In this instance, a rise or fall in the cash flow of one of its segments should not reduce the investment of this particular segment. Segment investment should be maintained after such a change in segment cash flow so long as segment investment opportunities relative to those of the other segments remain unaltered.[5] Hence, the optimal rate of investment of a single segment within a diversified firm should be maintained after a fall in segment cash flow by redirecting funds generated elsewhere in the firm towards this segment. The empirical prediction is therefore that in this setup segment investment is sensitive to firm cash flow, not segment's own cash flow.[6] Assume, alternatively, that the firm we are looking at is undiversified. In this scenario, a shock to cash flow of any segment is likely to be correlated with changes in firm cash flow. A segment that would have had to cut back investment after a negative shock to cash flow in a hypothetical stand alone situation is likely to have to do this also when it is part of an undiversified firm.

Comparing diversified to undiversified firms, it thus appears that the scope for the internal capital market is larger for the former than for the latter type of firm. In estimating our equation (1), then, we expect segment investment for diversified firms to be more strongly related to firm cash flow than segment investment of undiversified firms and less so to

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[5] Save for the effect that this fall in segment cash flow has on firm cash flow.

[6] Of course, in the empirical analysis, segment cash flow may embody information regarding the relative profitability of the segment. Mismeasurement of investment opportunities therefore allows segment investment to be sensitive to segment cash flow even when internal capital markets are efficiently used.

segment's own cash flow. Additionally, as *Shin* and *Stulz* (1998) remark, the investment rate of the small segments is probably easier to maintain/subsidize than the investment rate of the large segments after a fall in segment cash flow. We check this conjecture by estimating segment investment equations for the smallest and largest segments of moderately and highly diversified firms separately.[7]

Table 2 presents regression results for segment investment equations within moderately and highly diversified firms. Diversification is defined in two different ways. In panel A firms are divided into moderately and highly diversified based on the count of the number of segments that constitute the firm.[8] In panel B the division is based on the count of the number of 2-digit activities in which the segments that constitute the firm are active.

From the estimates for all segments (columns 1 and 2) in panels A and B alike we observe that cash flow is the (single) driving force of segment investment. Additionally, the sensitivity of segment investment to own cash flow is higher, not lower, if the segment is part of a diversified firm. The difference in the sensitivity to own cash flow is statistically and economically significant in the panel B estimates. These findings are at odds with our theoretical conjectures. Regarding the sensitivity of segment investment to other cash flow, the findings in the first two columns of panels A and B suggest that there is little evidence of actively exploited internal capital markets in Dutch firms. Do note, however, that segments of diversified firms tend to be more sensitive to other cash flow. This differential, however, is only marginally significant between segments of a firm with less than five segments as compared to firms with five segments or more and insignificant when we define diversification in terms of economic activities.

Accommodating the possibility that internal capital markets have a different meaning for small and large segments, columns 3 to 6 present segment estimated investment equations for the smallest and largest segments of each firm separately. The positive observation from this exercise is that the patterns of own as well as other cash flow sensitivities point in the right direction in three out of four instances. That is to say, segments of moderately diversified firms exhibit, on average, a stronger

[7] Since we do not observe total assets at the segment level, smallest and largest segments are identified according to sales.

[8] Firms consisting of only one segment were removed from the data since the focus is on inter segment reallocation of funds.

Table 2

Estimates of segment investment equations for diversified and undiversified firms

Panel A: Firms characterized by number of segments

Count of segments	All segments		Largest segments only		Smallest segments only	
	2–4	5+	2–4	5+	2–4	5+
Sales growth	0.003	–0.002	–0.010	0.005	–0.007	–0.013
	(0.011)	(0.002)	(0.024)	(0.008)	(0.007)	(0.008)
Own cash flow	0.090	0.110	0.084	0.073	0.099	–0.016
	(0.035)	(0.019)	(0.059)	(0.037)	(0.039)	(0.116)
Other cash flow	–0.003	0.010	–0.039	0.105	–0.001	0.039
	(0.041)	(0.007)	(0.082)	(0.033)	(0.020)	(0.031)
Adj-R^2	0.096	0.154	0.042	0.041	0.098	0.000
N	2366	7639	516	1429	516	1429

Panel B: Firms characterized by number of economic activities

Count of activities	All segments		Largest segments only		Smallest segments only	
	1–4	5+	1–4	5+	1–4	5+
Sales growth	0.000	–0.002	0.007	–0.010	–0.016	–0.002
	(0.004)	(0.002)	(0.009)	(0.013)	(0.008)	(0.002)
Own cash flow	0.095	0.260	0.074	0.033	0.044	0.013
	(0.021)	(0.028)	(0.034)	(0.078)	(0.062)	(0.078)
Other cash flow	0.001	0.004	0.019	0.057	0.038	–0.011
	(0.016)	(0.006)	(0.040)	(0.045)	(0.026)	(0.010)
Adj-R^2	0.144	0.239	0.088	0.054	0.007	0.003
N	6866	3139	1543	402	1543	402

Notes: the dependent variable is segment investment as defined in table 1. All other variables are also defined as in table 1. Standard errors are in parentheses.

sensitivity to own cash flow and a weaker sensitivity to other cash flow while the opposite holds for segments of highly diversified firms. In panel A we observe that the sensitivity to own cash flow is positive and significantly different from zero for the smallest segments of moderately diversified firms, but insignificantly different from zero for the smallest

segments of highly diversified firms; for the largest segments we observe that segment investment is significantly and positively sensitive to other cash flow within highly diversified firms, but not within undiversified firms. In panel B we observe a significant and positive sensitivity of the large segments' investment to own cash flow within moderately diversified firms, but not within highly diversified firms.

The overall evidence for active inter segment redistribution of funds across segment is rather weak, a finding that is not in harmony with results presented by *Shin* and *Stulz* (1998) for US conglomerates. Noteworthy is also the finding that sales growth fails to contribute to the explanation of segment investment in an economically and statistically significant way.[9] Additionally, to the extent that internal capital markets are unequally important for small and large segments, our findings suggest that large, rather than small, segments benefit most from intra-firm reallocation of funds.

The findings so far do not necessarily imply that the potential benefits of the internal capital market is left unexploited in all Dutch firms, however. In particular, a subset of firms may still actively redistribute funds across segments. We attempt to characterize these firms in the next section by exploring the connection between organizational structure and internal capital markets. Moreover, insofar as we fail to observe active use of internal capital markets in the representative firm, we stress the short sample period and the fact that the years we analyse can be characterized by good general economic conditions. This may work against finding active internal capital markets.[10] Put differently, the short length

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9 We ran all the regressions including the lagged rather than the contemporary sales growth rate. We obtain similar patterns in parameter estimates from this alternative specification, although the considerable reduction in the number of data points, due to the increased use of lagged variables, reduces the statistical significance of the individual parameter estimates in some instances. Instead of using the sales growth variable at the segment level, we employed the contemporaneous and lagged sales growth at the corresponding two digit sector level as well. Again the results are broadly similar. The results from these regressions are not reported, but they are available upon request from the authors. Also note that we have used these alternative specifications for the regressions discussed later in sections 4 and 5. In all instances, the qualitative results are broadly similar to the findings reported using contemporary segment sales growth.

10 As noted before, the incentive to reallocate funds within the firm stems from binding financing constraints at the firm level. If we allow these constraints to be weak or absent for the sample years under analysis, then the incentive for making effective use of the internal capital market disappears. *Van Ees, Kuper* and *Sterken* (1997) in fact conclude that access to these external markets is relatively easy in periods of economic prosperity.

of the panel and the good economic credit climate probably create a much more conservative test for the presence of internal capital markets in this analysis compared to that of for instance *Shin* and *Stulz* (1998).

IV. Presence of a Financial Segment

Firm funds may be better distributed over the available segments and concomitant investment projects through the presence of a financial segment, such as a financial holding company that directs internal funds to the most profitable uses. In *Stein* (1997) and *Scharfstein* and *Stein* (2000), for example, the theoretical characterization of the organizational structure of the firm is that of a corporate headquarters that controls the finances of the firm and determines which segments receive funds for investment. However, not all firms have such a specific organizational structure. In fact, only about 20 percent of the firms in our sample contain a holding company. Hence we conjecture that those firms that do have a holding company are better equipped to coordinate the finances of its segments and reap the benefits of an internal capital market. To illustrate this impact, consider the large Dutch capital goods producer Stork that incorporates a financial holding in its organizational structure.[11] From the Stork 1995 annual report (page 9), we read that one of the priority areas concerns "exploiting the synergy potential within and between Strategic Business Units. This can be interpreted as: making better use of the 'internal Stork market'." The internal capital market that is employed as such is meant to create financial synergy. In management sciences this vocabulary is used to refer to companies sharing and leveraging financial resources (see for instance *de Wit* and *Meyer*, 1998, chapter 6).

Firm-level research has indicated that financial institutions acting as corporate house-banks may also alleviate financing constraints. *Hoshi* et al. (1991) find for a sample of Japanese firms that the presence of a large bank in 'Keiretsu' diminishes financing constraints for the participating firms relative to independent firms. *Van Ees* and *Garretsen* (1994), analysing Dutch data, also conclude that close ties to banks reduce the incidence of financing constraints. At the segment level, we might therefore hypothesize that segments clustered around a near-bank financial

[11] This information can be obtained from the Dun and Bradstreet files. Note that our data as well as the identity of the firms in our sample is confidential and cannot be used for illustrative purposes. These remarks apply to all further illustrations used in the paper.

segment are better able to pool their funds and therefore operate like an industrial group à la *Hoshi* et al. (1991).[12] Consider for illustrative purposes DSM, a Dutch multinational active in the chemical and pharmaceutical sectors. The DSM organizational structure contains a segment in sector 67, which includes activities related to or for the benefit of financial institutions. We interpret this as a near-bank financial segment for the purpose of this paper. From DSM's 1995–1998 annual reports we read that the organizational structure is decentralized with considerable freedom of operation at the segment level. At the same time, however, DSM states that the financing and liquidity management issues are a corporate responsibility, revolving around a system of internal bank accounts and cash-pools. Short term credit facilities are also arranged at the supra-segment level. This strongly suggests the active employment of an internal capital market.

For both Stork and DSM, we argue that the particular organizational structure that facilitates the use of internal capital markets revolves around the presence of the financial segment. Therefore, in our empirical testing, we focus on the organizational structure of a firm in terms of the presence or absence of such a segment. A financial segment in the empirical analysis is interpreted as any segment with an industry code (SBI93) of 65, 66 or 67. Sector 65 segments in our sample consist mainly of financial holding companies, while sector 67 segments contain activities related to or for the benefit of financial institutions, such as stockbrokers, credit intermediaries and pension fund managers.[13] The effect of a sector 65 financial segment is therefore conceivably similar to the Stork organizational structure as well as the presence of the corporate headquarters in *Stein*'s (1997) model. The presence of a sector 67 financial segment might function as some sort of firm-clearing house for segment finances, which follows more the practice at DSM and the intuition in *Hoshi* et al. (1991), where groups of firms are clustered around a 'house-bank'.

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12 To strengthen the connection between this research and *Hoshi* et al. (1991) it is useful to stress the fact that we are strictly speaking of 'a collection of enterprises' when we talk about firms and that we talk about 'enterprises' when we talk about segments. See also the discussion of the data in the appendix.

13 Commercial and central banks are also classified in sector 65, but such institutions do not appear as segments in the firms we analyse. Sector 66 financial segments (those active in insurance and pension fund activities) are identified within 53 firms only, 40 of which also house a sector 65 financial segment. The isolated effect of the sector 66 segment is therefore difficult to observe.

Table 3

Estimates of segment investment equations for firms with(out) financial segments

Panel A: Firms characterized by presence of any financial segment[a]

Any financial segment?	All segments		Largest segments only		Smallest segments only	
	No	Yes	No	Yes	No	Yes
Sales growth	0.002	–0.007	0.004	0.010	–0.001	–0.045
	(0.004)	(0.006)	(0.011)	(0.011)	(0.006)	(0.022)
Own cash flow	0.095	0.170	0.082	0.067	0.172	–0.256
	(0.019)	(0.046)	(0.039)	(0.055)	(0.050)	(0.299)
Other cash flow	–0.004	0.028	0.011	0.219	–0.006	0.142
	(0.012)	(0.021)	(0.040)	(0.071)	(0.021)	(0.083)
Adj-R^2	0.177	0.129	0.103	0.021	0.090	0.001
N	6828	3177	1406	539	1406	539

Panel B: Firms characterized by presence of financial holding company[b]

Financial holding?	All segments		Largest segments only		Smallest segments only	
	No	Yes	No	Yes	No	Yes
Sales growth	0.003	–0.024	0.007	–0.016	–0.000	–0.101
	(0.003)	(0.009)	(0.010)	(0.011)	(0.005)	(0.041)
Own cash flow	0.106	0.081	0.074	0.044	0.179	–0.208
	(0.019)	(0.058)	(0.038)	(0.041)	(0.047)	(0.626)
Other cash flow	–0.003	0.052	0.008	0.297	–0.005	0.143
	(0.011)	(0.029)	(0.039)	(0.055)	(0.019)	(0.121)
Adj-R^2	0.181	0.019	0.098	0.036	0.095	0.000
N	8124	1881	1592	353	1592	353

In table 3 we present the results of estimating equation (1) for segments of firms that do or do not house a financial segment. In panel A of table 3 the estimated segment investment equations are presented for all segments as well as for the largest and smallest segments separately. Segments are categorized as belonging to a firm which does or does not house any financial segment(s).[14] The results in panel A are encouraging regarding the presence of inter-segment reallocation of funds. Although

Continues Table 3

Panel C: Firms characterized by presence of segments for the benefit of or related to financial institutions[c]

Related financial segment?	All segments		Largest segments only		Smallest segments only	
	No	Yes	No	Yes	No	Yes
Sales growth	–0.000	–0.007	–0.000	0.025	–0.002	–0.072
	(0.003)	(0.010)	(0.009)	(0.020)	(0.005)	(0.043)
Own cash flow	0.088	0.298	0.073	0.085	0.154	–0.512
	(0.017)	(0.075)	(0.033)	(0.081)	(0.041)	(0.569)
Other cash flow	–0.002	0.038	0.027	0.258	–0.006	0.266
	(0.010)	(0.031)	(0.034)	(0.110)	(0.016)	(0.180)
Adj-R^2	0.169	0.166	0.092	0.031	0.091	0.004
N	8247	1758	1686	259	1686	259

Notes: the dependent variable is segment investment as defined in table 1. All other variables are also defined as in table 1. Standard errors are in parentheses.

[a] Does the firm house one or more segments with Dutch industry code (SBI93) 65, 66 or 67?
[b] Does the firm house one or more segments with Dutch industry code (SBI93) 65?
[c] Does the firm house one or more segments with Dutch industry code (SBI93) 67?

for all segments together we observe that own cash flow is the main determinant of segment investment, for the largest and smallest segments separately there are differences in the sensitivity to own and other cash flow in an economically meaningful way. In particular, we see that the presence of a financial segment within the firm reduces segment's investment sensitivity to own cash flow while at the same time it increases segment's investment sensitivity to other cash flow.

In panels B and C of the table, we isolate the presence of sector 65 and sector 67 financial segments in the organizational structure, respectively. The results in these panels show that, at the 10 percent significance level or better, segment investment of the smallest and largest segments is sensitive to own cash flow in the absence of one of these financial segments but not in their presence. At the same time segment investment is sensitive to other cash flow in the presence of a sector 65 or 67 financial segment, but not so in their absence. The exception applies to the smallest

14 Note that financial segments are not included in our data. We only know whether the firm houses such a segment. Also see the data appendix.

segments, for which the described pattern is observable, although other cash flow remains insignificant even in the presence of a financial segment. For all segments together, the described patterns in both own cash flow as well as other cash flow are observable when we characterize on the presence of a sector 65 financial segment, but not so when we characterize on the presence of a sector 67 financial segment.

Overall, we conclude from these results that financial segments foster the functioning of internal capital markets in Dutch firms. This finding is new in the internal capital market literature and emphasizes the argument that the benefits of internal capital markets in conglomerates are not self-evident. Rather, the findings presented above strongly suggest the need for an adequate organizational structure to harvest the potential benefits. At the same time it is important to realize that the presence of a financial segment does not proxy for a diversified firm, since we concluded from the previous section that the partial impact of diversification on the working of the internal capital market is meagre at best.

V. The Weight of the Debt Burden

Peyer and *Shivdasani* (2001) show that high rates of leverage may effectively disrupt the working of the internal capital market. In their investigation of segment investment before and after a leveraged recapitalization, they observe that segments behave more as stand alone units after the event. Specifically, *Peyer* and *Shivdasani* note that segment investment is driven more by segment own cash flow and no longer by other cash flow after the increase in leverage. They attribute this finding to the distortion of incentives that follows from high rates of leverage which induces firms to focus on the fast generation of cash rather than the careful exploit of (longer term) profit opportunities. *Peyer* and *Shivdasani* note also that a majority of the firms they analyse (18 out of 22) may have conducted the leveraged recapitalization as a response to some form of external pressure (most notably a take-over threat). To the extent that leverage was increased to levels above desired ranges, firms may have stressed short term cash flow generation to reduce leverage back to normal.[15] Hence their observed working of the internal capital market may primarily reflect the desire to reduce leverage fast.

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[15] In fact, *Peyer* and *Shivdasani* (2001) find that a subset of firms with low coverage ratios that subsequently reduce leverage considerably present the driving force behind the main conclusions of their paper. They also document that mean

We attempt to generalize *Peyer* and *Shivdasani*'s findings regarding the effects of the debt burden on the functioning of internal capital markets using the following empirical strategy. We use historical firm-level financial data to characterize the firm as carrying a relatively heavy or light debt burden. Hence we focus on firms that are characterized by a historically and structurally heavy (or light) debt burden rather than on firms experiencing some (externally induced) shock to leverage that they want to nullify. The firms that we analyse therefore do not seem to have succumbed to the desire to reduce the debt burden (by directing investment to quick cash projects). Hence the internal capital market effects we analyse stem from the debt burden itself, not the desire to reduce debt. We use information for the 1986–1994 period on firm-level interest coverage ratios (defined as Standard & Poor's EBITDA interest coverage) to characterize firms at the start of our estimation period as bearing a heavy or light debt burden. We employ three criteria for the weight of the debt burden that differ in strictness.[16] The first and most lenient criterion classifies a firm as heavily indebted when – in a balanced panel of firms observed during the 1992–1994 period – it records only below median interest coverage ratios.[17] The second criterion makes the further demand that the firm – in a balanced panel of firms observed during the 1989–1994 period – records at least four below median interest coverage observations.[18] The third and strictest criterion demands further that – in the 9-year balanced panel of firms from 1986–1994 – the firm has below median interest coverage in at least 6 years. We employ the historical balanced panels so that we can be sure that the relative position of the firm in any year is not influenced by entry or exit of atypical firms. Of course, this procedure introduces a survivorship element in the analysis, since firms that are continuously observed for a particular spell of years are probably those with healthy coverage ratios in an absolute

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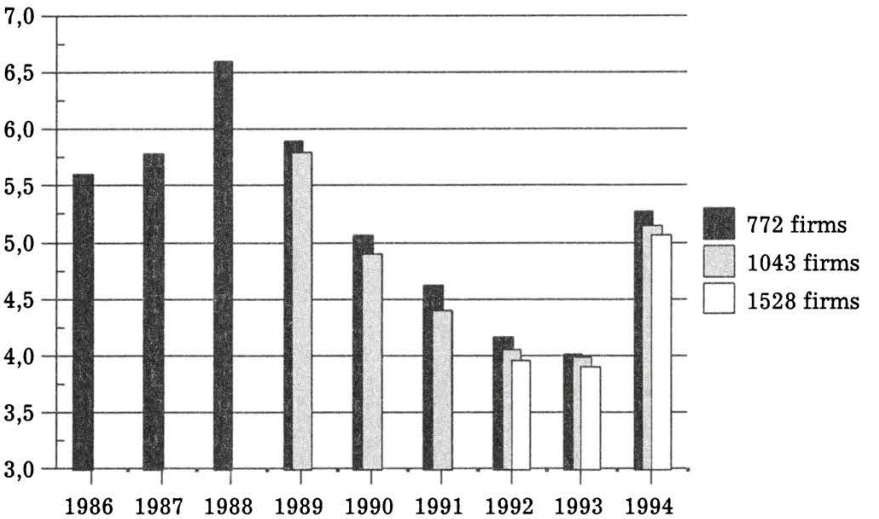
and median leverage in their sample is rapidly reduced during the first three years after the recapitalization.

16 We have also assessed the debt burden using historical information on the leverage ratio. This produces qualitatively similar results to those reported later using coverage.

17 The mirror image of these demands identify the lightly indebted firms and the same goes for the stricter criteria. In this case, three above median interest coverage ratios in a balanced panel of firms for 1992–1994 are required for a classification of lightly indebted.

18 We require the first criterion to be met so that we can be sure that the firm is heavily (or lightly) indebted at the start of our analysis period. In the absence of this compound requirement, a firm that is reducing (raising) its debt burden over the years and actually enters our analysis period with a light (heavy) debt burden is nevertheless still classified as heavily (lightly) indebted.



Note: Interest coverage is defined as Standard and Poor's EBITDA interest coverage (Earnings from continuing operations before interest, taxes, depreciation, and amortization divided by gross interest incurred before subtracting capitalized interest and interest income).

Figure 1: Median values of historical interest coverage for three balanced panels of firms

sense. Figure 1 plots the median coverage ratios for the three historical balanced panels. The survivorship aspect is visible in two ways. First, the longer the time period, the healthier the median average coverage ratio for any balanced panel. Second, in an absolute sense, interest coverage ratios ranging from 4 to well above 6 are quite healthy. For the interpretation of our results, therefore, this implies that the firms that we indicate as carrying a relatively heavy debt burden might be assigned a much lighter debt burden when compared with a broader sample of firms. Hence, our estimates are probably extremely conservative and observed patterns much stronger in general than obtained from this analysis.

Having characterized the debt burden of the firm, we subsequently investigate and compare the segment investment behaviour in firms with heavy and light debt burdens. The estimation results are presented in table 4. The estimated segment investment equations display the following pattern. For segments of heavily indebted (low coverage) firms, investment is significantly and positively related to own cash flow. For segments of lightly indebted (high coverage) firms, own cash flow has no statistically discernible impact on investment, but segment sales growth

Table 4

Estimates of segment investment equations for firms with historically high and low indebtedness

	Historical indebtedness 1992–1994[a]		Historical indebtedness 1989–1994[b]		Historical indebtedness 1986–1994[c]	
	High	Low	High	Low	High	Low
Sales growth	0.004	0.007	0.004	0.009	0.004	0.010
	(0.007)	(0.004)	(0.007)	(0.005)	(0.008)	(0.005)
Own cash flow	0.140	0.035	0.146	0.031	0.163	0.042
	(0.049)	(0.034)	(0.051)	(0.036)	(0.063)	(0.037)
Other cash flow	0.006	–0.004	0.006	–0.007	0.017	–0.007
	(0.026)	(0.013)	(0.026)	(0.015)	(0.038)	(0.014)
Adj-R^2	0.039	0.263	0.107	0.211	0.041	0.240
N	855	1191	821	1037	439	948

Notes: the dependent variable is segment investment as defined in table 1. All other variables are also defined as in table 1. Standard errors are in parentheses.

[a] Historical indebtedness is marked as low if the firm – in a balanced panel of firms observed from 1992 to 1994 – recorded only above median coverage ratios; it is marked high if only below median coverage ratios are recorded.

[b] Historical indebtedness is marked as low if the firm – in a balanced panel of firms observed from 1989 to 1994 – recorded at least four above median coverage ratios and if Historical indebtedness 1992–1994 is marked as low as well; it is marked high if at least four below median coverage ratios are recorded and if Historical indebtedness 1992–1994 is marked high as well.

[c] Historical indebtedness is marked as low if the firm – in a balanced panel of firms observed from 1986 to 1994 – recorded at least six above median coverage ratios and if Historical indebtedness 1989–1994 is marked as low as well; it is marked high if at least six below median coverage ratios are recorded and if Historical indebtedness 1989–1994 is marked high as well.

does. The latter did not contribute to the explanation of segment investment for segments of heavily indebted firms. These findings go a long way to corroborate with those of *Peyer* and *Shivdasani* (2001). In particular, we might conclude from our estimation results that segment investment within heavily indebted firms is focussed more on the generation of cash flow (to meet contractual interest payments) while segment investment in lightly indebted firms is more focussed on the exploit of profit opportunities.

Contrary to the *Peyer* and *Shivdasani* findings, however, we cannot conclude that segments of heavily indebted firms operate more on a stand-alone basis: other cash flow has no statistically or economically significant effect on segment investment regardless of the historical indebtedness of the firm.[19] We have already discussed the possible effect of

our short sample and generally good credit conditions during the sample period on the probability of finding evidence on internal capital markets (refer to section 2). Because firms are not induced to make use of the internal capital markets in our particular sample, we find variation in the debt burden to be uninformative regarding differences in segments' investment sensitivity to other segments' cash flows. Put differently, the absence of a meaningful *difference* in sensitivity to other cash flow may derive from our specific sample characteristics as well. Nevertheless, the observation that segments of heavily indebted firms collectively behave differently from segments of lightly indebted firms does suggest the presence of inter-segment financial connections.

VI. Conclusion

We have investigated the presence and functioning of internal capital markets within a unique database consisting of linked information on Dutch firms and the segments that constitute these firms. In particular we have focussed on the sensitivity of segment investment to funds generated by other segments that are part of the same firm. We have analysed segment investment for different types of firms: we have considered segments within moderately versus highly diversified firms; firms that do or do not house a financial segment; and firms characterized by a historically heavy or light debt burden.

Overall, we conclude that there is little evidence that segment investment is structurally dependent on funds generated elsewhere in the firm. Put differently, we do not find evidence that internal capital markets are widely used within Dutch firms. These findings apply to diversified as well as undiversified firms, for the smallest as well as the largest segments thereof and also to segments of firms that are historically heavily or lightly burdened with debt. These results contrast with findings derived from US databases, where other cash flow generally has a meaningful impact on segment investment. We feel that we have to emphasize again the fact that we have computed very conservative estimates regarding the degree to which segments (have to) rely on each other for the

[19] Please note that concentrating the analysis on the smallest and largest segments only is less relevant in this case than it was for analysing the impact of diversification. The reason being that the debt burden directly affects the working of the internal capital market rather than (more indirectly) extending the potential scope for inter-segment redistribution of funds. Nevertheless, we ran regressions for the smallest and largest segments as well and the general findings are quite similar to those reported in the table for all segments.

financing of their investment. In particular, the rationale for making effective use of the internal capital market stems from the unavailability of easy access to external finance at reasonable terms. Since our sample period (1995–1998) can be characterized by a healthy economic environment that is perhaps not so conducive to problems of asymmetric information that usually help to explain binding financing constraints, the incentive for intersegment reallocation of funds may be limited for the majority of the firms we analyse. Further analysis on the available US data over longer periods of time with the emphasis on the impact of general economic conditions and the overall availability of external finance would be of great help for a more distinct interpretation of our findings in this regard.

Another result that appears throughout the analysis is that segment's own cash flow is an important driving force of segment investment, in many instances more important than our measure of profit opportunities. For segments belonging to firms with a historically light debt burden, however, we obtain the opposite result. In these firms, segment investment is solely driven by sales growth, a finding that is in line with related studies on US data. At the same time, however, the focus of investment on profit potential within these firms does not lead to active intersegment subsidization of the fast growing segments. For segments of historically heavily indebted firms, in contrast, investment is driven not by sales growth, but solely by segments' own cash flows.

We find highly interesting and innovative results concerning the use of internal capital markets in firms that house a financial segment. In these firms we do find statistically discernible and economically meaningful redistribution of funds across segments. We have attempted to isolate the impact of a financial segment as stemming from the presence of either a financial holding (a headquarters à la *Stein* (1997)) or a financial segment that is related to a financial institution (a house-bank à la *Hoshi* et al. (1991)). The results suggest that both types of financial segments foster the mechanism of internal reallocation of funds across the different segments of the same firm. The presence of a financial segment is thus associated with the active use of internal capital markets, possibly through the organizational structure of the firm. Further research is needed, however, to identify the exact causal connections in this regard.

Lastly, we want to shortly address a general concern with analyses that focus on differential cash flow sensitivities in investment equations: the possibility that structural mismeasurement of profit opportunities may

impose the observed differentials and hence drive the conclusions. *Whited* (2001) in this regard shows that measurement error in Q accounts for most of the differential sensitivity of investment to (other) cash flow and Q itself between segments of conglomerates and standalone firms. Our analysis, however, does not stress behavioural differences between conglomerates' segments and standalone firms. Rather, we emphasize differences in the investment equation for segments belonging to conglomerates with a specific organizational or financial structure. It is therefore unclear to what extent the *Whited* (2001) critique applies to the presented findings. See *Gilchrist* and *Himmelberg* (1995) for an illustration of how mismeasurement influences cash flow sensitivities of investment, but cannot account for the observed differences between various groups of firms. Further research is therefore required to improve the understanding of the impact of measurement error on the specific research strategy employed above.

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Data Appendix

The data we use in our empirical analysis are collected at three different sources by Statistics Netherlands (CBS). Balance sheet information on firms is obtained from the SFGO, a survey concerning the roughly 2,500 large enterprise groups in the Netherlands. Segment production and income statement information is obtained from the Structural Business Statistics (or Production Survey, PS) which, in conjunction with a segment level survey on tangible investment (Investment Survey, IS) provides the necessary information for estimating segment investment equations. The MICRONOOM database provides the unique linking of segments to firms, the crucial touch for our analysis.

Within the SFGO the statistical unit of analysis is the 'group of enterprises'. A group of enterprises – which we refer to as 'firm' – results from consolidating the Dutch activities of a collection of legally connected enterprises. The SFGO collects detailed information on balance sheet and income statement items of all non-financial firms. Please note that the financial enterprises are not included in the consolidation of firms' finances. Furthermore, the statistical information covers all the activities of enterprises operating within the Dutch borders, thus including foreign enterprises operating in the Netherlands but excluding Dutch enterprises operating abroad. SFGO questionnaires are sent to the entire population of large firms (i.e. with balance sheet length $\geq$ HFL 25 million). The response rate generally lies between 80 and 90 percent, covering some 95 percent of the total population value of the most important variables. Firm financial information is available from 1977 to 1998.

Within the PS the statistical unit of analysis is the 'enterprise', to which we refer as 'segment'. The PS is also aimed at covering non-financial activities. The survey does not provide information on segments' balance sheet items, but is focussed instead on a very detailed reproduction of income statement items. The PS is not designed to cover 100 percent of the population. It relies on stratified sampling instead. Only the population of the largest segments (100+ employees) is covered in full. Medium sized segments (10–99 employees) are represented by random samples such that 50–75 percent of the population is covered. For the small segments (1–9 employees) this coverage ratio lies between 10 and 20 percent. It should be noted that the largest segments constitute one half to two thirds of the total population value (i.e. sum over all segments in all size classes) of most of the important variables. The setup is similar for the Investment Survey, which focusses exclusively on segment

investment. The PS and IS information required for the present analysis is available from 1995 to 1998.

Firms and segments are linked within the MICRONOOM database using information from the Business Registration files. Legal entities provide the crucial linking device. Each firm as well as each segment is a legal entity or is built from a structure of legal entities. Regarding the firm, this usually takes the form of mother-daughter relationships, while for segments legal entities are grouped together when they very clearly exist in order to engage in a specific economic activity (segments always represent an economic, rather than a legal unit). For example, a chain of supermarkets may constitute one legal entity (a Retail activity), a chain of alcohol shops another (also a Retail activity) and a supermarket distribution centre a third (a Transport activity). If the specific distribution centre has as its main task the supply of the chain of supermarkets, then the first and the third legal entities are combined into one segment (and given the supplement Retail activity). The chain of alcohol shops constitutes a separate segment (remains Retail activity). Now suppose that both segments are owned by the same financial holding company. Then the legal links between the segments and the holding company facilitate the construction of one firm that in this case consists of four legal entities, three segments (of which only the two nonfinancial segments actually appear in the data) and is active in the retail sector. This firm-segment linking algorithm is available from 1995 to 1998.

Summary

Internal Capital Markets in Dutch Firms

Using Dutch segment-level data for the 1995-1998 period, we investigate the presence of internal capital markets. Our findings are as follows. First, we find little evidence of internal capital markets in diversified firms. Second, the investment of a segment of a firm that houses a financial holding or a segment related to financial institutions exhibits significant sensitivity to the cash flows of the firm's other segments, but is insignificantly related to its own cash flow. This finding does suggest the presence of an internal capital market. Third and last, segments of heavily indebted firms display a significant sensitivity of investment to their own cash flows only and the investment of segments of lightly indebted firms is solely related to the segments' investment opportunities. (JEL G20, G31, G32, L20)

Zusammenfassung

Interne Kapitalmärkte in niederländischen Unternehmen

Unter Verwendung von Daten auf Segmentebene für den Zeitraum 1995–1998 untersuchen wir die Präsenz von internen Kapitalmärkten. Wir gelangen zu folgenden Schlußfolgerungen: Erstens haben wir für diversifizierte Unternehmensgruppen wenig Beweise für die Existenz von internen Kapitalmärkten gefunden. Zweitens zeugen die Investitionen eines Unternehmenssegments, das eine Financial Holding oder ein mit einem Finanzinstitut in Beziehung stehendes Segment beinhaltet, von beachtlicher Sensitivität gegenüber den Geldströmen der anderen Unternehmenssegmente, nicht jedoch gegenüber den eigenen Geldströmen. Diese Erkenntnis deutet auf die Existenz eines internen Kapitalmarktes hin. Drittens und letztens zeugen Investitionen von Segmenten stark verschuldeter Unternehmen von einer beachtlichen Sensitivität lediglich gegenüber den eigenen Geldströmen, und die Investitionen von Segmenten leicht verschuldeter Unternehmen werden ausschließlich zu den Investitionsmöglichkeiten der betreffenden Segmente in eine Beziehung gesetzt.

Résumé

Marchés internes des capitaux dans les entreprises hollandaises

En utilisant des données hollandaises au niveau sectoriel pour la période allant de 1995 à 1998, les auteurs examinent la présence de marchés internes de capitaux. Leur recherche montre d'abord qu'il y a une faible évidence de marchés internes de capitaux dans les firmes diversifiées. Ensuite, elle révèle que l'investissement d'un secteur d'une firme qui abrite un holding financier ou d'un secteur lié aux institutions financières montre une sensibilité significative aux cash flows des autres secteurs de la firme, mais qu'il est lié de façon insignifiante à son propre cash flow. Les résultats suggèrent la présence d'un marché interne de capitaux. Finalement, l'étude montre que des secteurs de firmes fortement endettées affichent une sensibilité significative de l'investissement par rapport à leurs propres cash flows et que l'investissement sectoriel de firmes légèrement endettées est seulement lié aux opportunités d'investissement du secteur.