Financing Constraints, Corporate Diversification, and Stock Market Anomalies: The European Case

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Submitted by: Rozália Pál

Dekan: Prof. Dr. Wolfgang Berens

1. Gutachter: Prof. Dr. Martin T. Bohl
2. Gutachter: Prof. Dr. Mark Trede

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1 INTRODUCTION

Capital sources, financing and investment are among the highly relevant topics of financial economics since they are at the basis of economic prosperity and growth. Each of these topics deserves thorough analysis and consideration in order to understand the dynamics of the corporate world and business environment. In this thesis some of the corporate finance and capital market issues are addressed ranging from financing constraints to corporate diversification and institutional investors' influence on stock market anomalies.

The focus of this study is the euro area, the UK and Eastern European countries, in particular Poland and Hungary. The selection of European countries is motivated by the fact that the findings of the empirical literature that focus mostly on the US market may not be relevant for the European case and that the underlying theories fail to explain the European financial system. A detailed study of the non-financial corporations and institutional investors of these European countries may give valuable insights into some particularities of the European corporate world and stock markets.

The thesis consists of four articles that can be read individually. They explore different streams of the empirical literature documenting new results that shed light on several aspects overseen by the previous research. The results of the present research appear to challenge findings documented in the previous literature and propose some new approaches of investigation. The first article deals with the constraints of financing sources, given imperfect market conditions. The second article explores the access to finance especially by small and medium-sized enterprises (SMEs) that could be the engine of economic growth. The third article investigates not only the financing but also the investment side of the corporations in a special case, when a company diversifies its investments in alternative industry sectors. The fourth article focuses on the efficiency of the stock market. A well-functioning and efficient financial market makes possible the channelling of financing sources to the best investment opportunities and in this way facilitates economic prosperity and growth.

Corporate finance theory suggests that financial market imperfections, like asymmetric information or managerial agency problems, constrain the ability of firms to fund their investment projects. Some firms forgo investment rather than access capital markets and consequently the firm will under-invest relative to its first best level.[1] Access to finance is a

[1] For theoretical discussion see Stiglitz and Weiss (1981), Williamson (1986), Bester (1985).

significant growth constraint and research of this field has a number of important policy implications. A special interest is oriented towards small and medium-sized enterprises, given their large share in the private sector and the premises that they could be the engine of growth if they are not inhibited by market imperfections and institutional weaknesses (see Beck et al., 2005).

The literature focusing on financing constraints is mostly based on different measures of investment-cash flow and growth-cash flow sensitivities, which are assumed to indicate financing constraints. The sensitivity should show how extensively a firm needs to rely on internal funds to finance its investment projects. However, following the Kaplan and Zingales' (1997, 2000) critique, it has been shown that the higher sensitivity of corporate investment to cash flow is not an appropriate indicator of financing constraints. The sensitivity may be magnified not only by the presence of financing constraints but also by growth opportunities and by the debt financing of the firm (see, for instance, Ericson and Whited (2000), Alti (2003), Cleary, Povel and Raith, 2004; Moyen, 2004). Having these caveats in mind, other indicators of financing constraints need to be considered.

In the first article, "Financing Constraints and Firms' Cash Policy in the Euro Area," a more recent methodology is used. This methodology is proposed by Almeida, Campello and Weisbach (2004), and focuses on the cash flow sensitivity of cash holdings. This article contributes to the above literature by developing a new firm classification based on micro data that can be used to detect the presence of financial constraints in the euro area. The classification distinguishes between unconstrained, relatively and absolutely constrained firms. Moreover, the sources of the correlation between corporate cash flow and cash savings are checked by conducting the analysis in a dynamic framework.

Contrary to previous evidence based mainly on US firms, the results of this study suggest that the propensity to save cash out of cash flows is significantly positive regardless of firms' financing conditions. This implies that even for firms with favourable external financing conditions, the internal cash flow is used in a systematic pattern for inter-temporal allocation of capital. The results indicate that the cash flow sensitivity of cash holdings cannot be used for testing financing constraints of euro area firms.

The second article, entitled "Is the growth of euro area SMEs constrained by financing barriers?," deals with the same issue as the first article. However, in this study the financing constraints are investigated with a new methodology and applied to a much larger data set including micro and small firms. The relationship between financing conditions and firms'

growth across firm sizes is analysed on the basis of newly created indicators particular to the euro area, which reflect the sector-specific financing need and growth opportunities. It is noteworthy that our sample is one of the most comprehensive euro-area balance-sheets databases, relying on more than one million firm-years in the period from 1993 to 2004.

This study presents new evidence for generally worse financing conditions of micro and small firms. The correlation between sector-specific growth opportunities and firms' realised growth increases by size, which suggests that, in the short run, larger firms can adapt faster to the time-varying industrial growth opportunities, given that they are not restricted by the availability of financial resources. In the long run, the time-invariant technological need of external finance plays a larger role in explaining the relative importance of the firm size across sectors. Small firms generally do not specialise in sectors with a high inherent reliance on external financing. Based on this we can also conclude that they tend to be more financially constrained than large firms.

The next topic of this thesis deals with a firm's investment across business segments. Theoretical arguments suggest that when firms are operating in more than one industry it may have both value-enhancing and value-reducing effects. One potential benefit of corporate diversification can be a more efficient resource allocation through an internal capital market, especially when the external capital market is relatively less developed (Hubbard and Palia, 1999; Matsusaka and Nanda, 2002). Other arguments include the greater debt capacity as a result of the coinsurance effect, lower taxes arising from the tax code's asymmetric treatment of gains and losses, managerial economies of scale and increased market power resulting from cross-subsidized predatory pricing (Maksimovic and Philips, 2002; Burch, Nanda and Narayananuse, 2002). The potential costs of diversification are value-decreasing investments, inefficient allocation of capital among divisions of diversified firms and cross-subsidization of less profitable subsidiaries (Rajan, Servaes and Zingales, 2000). The theoretical and empirical research with contradicting results stresses the need for further empirical investigations.

The third article of this thesis, "Discount or Premium? New Evidence on Corporate Diversification of UK Firms," investigates whether the corporate diversification in the UK is a profitable investment and beneficial for shareholders. It is shown by this study that previous results on the UK conglomerates relying on the standard pooled OLS technique are biased caused by the endogenous diversification decision. The empirical results indicate that the diversification status is determined by firm characteristics, changes in mergers and acquisitions activities as well as macroeconomic developments. After controlling for the endogeneity of

diversification in its effect on the market value, it turns out to be beneficial to diversify, increasing the firm value by about 30%. Moreover, while US studies with similar positive findings explain the lower market value of conglomerates relative to undiversified firms by firm-specific characteristics, we find for the UK conglomerates significant macroeconomic effects. In particular, less favourable macroeconomic conditions hinder firm's growth, decrease their market value and affect positively their decision to operate as a diversified firm.

The last topic of this thesis explores a special case of stock market efficiency. Since the late 1970s, researchers have discovered several seasonal patterns in stock returns that constitute a challenge to the efficient markets hypothesis. Institutional investors can be characterized as informed traders who speed up the adjustment of stock prices to new information, thereby rendering the stock market more efficient. Institutions can obtain an informational advantage by exploiting economies of scale in information acquisition and processing. The marginal costs of gathering and processing information are lower for institutional than for individual traders. In addition, institutional investors may be better trained and have superior resources than individual investors. Moreover, for many years it has been common practice of companies to inform securities analysts in advance about company-specific news, and only recently have regulatory measures been launched (namely the SEC's Regulation FD) to prevent this habit. Hence, institutional investors' trading decisions may be more strongly information-driven than those of individual investors.

The fourth article, "Institutional Investors and Stock Market Efficiency: The Case of the January Anomaly," was motivated by the history of the Hungarian and Polish stock markets, which provides a unique institutional environment to investigate the influence of individual and institutional investors on the January anomaly. In Poland, the pension system reform in May 1999 separates the history of the stock market into a period of predominantly individual trading and a period dominated by institutional trading. Similarly, in Hungary, private pension funds were founded in 1997 and started their financial activities in 1998. Before 1998, primarily small individual investors populated the Hungarian stock market.

This last article focuses on some aspects of stock market anomalies. If stock returns exhibit exploitable regularities, then smart traders, who are institutional investors, are expected to take advantage of these patterns, thereby earning abnormal profits. Consequently, on stock markets with a sufficiently large number of smart traders, anomalies are supposed to disappear as the trading of this investor group arbitrages away seasonal patterns in stock returns.

Based on the findings of this study, it is empirically confirmed that there is a significant

January effect in Polish and Hungarian stock returns driven by the trading behavior of individuals. Due to the lack of capital gains taxes we cannot rely on the tax-loss-selling hypothesis as a rational explanation for the January effect. Instead, the findings suggest that higher stock returns in January during the period before the pension system reforms in both countries are the result of possibly sentiment-driven investment decisions by individual investors. The empirical results also show that the increase in institutional trading on the Polish and the Hungarian stock markets had a significant dampening effect on the magnitude of the January anomaly. This evidence is comparable to the results found in Kamara (1997) and Chan, Leung, and Wang (2004) for the Monday effect as well as Gompers and Metrick (2001) for the size effect in the U.S. The price effect of irrational trading patterns seems to be partly eliminated by rational investors.

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2 FINANCING CONSTRAINTS AND FIRMS' CASH POLICY IN THE EURO AREA

2.1 Motivation and literature overview on financing constraints

The effect of financing conditions on corporate behaviour has been extensively investigated in the finance literature. The theoretical model of Myers and Majluf (1984) shows that firms may give up valuable investment opportunities when internal sources of funds are not sufficient (see also Myers, 1984). Opposite to the perfect market environment of Modigliani and Miller (1958)[2], in the real world firms make investment decisions not only looking at the profitability of the project, but also on the availability and costs of external financing. The amount of external sources may be limited or may not even exist and, in extreme cases, the amount of investment may even be limited by the availability of internal sources. Consequently, a considerable number of empirical studies argue that the fluctuation of internal sources helps to explain the investment decisions of companies. More specifically, the higher sensitivity of investment or firms' growth to internal sources was taken as evidence for the presence of financing constraints (see for instance Fazzari et al., 1988 and 2000, and Carpenter and Petersen, 2002). However, after the contradicting results presented by Kaplan and Zingales (1997 and 2000), several studies have criticised the empirical test based on the cash flow sensitivity. One of the arguments has been that the investment-cash flow sensitivity is non-monotonic and therefore a higher sensitivity cannot be interpreted as evidence for the presence of higher financing constraints. Even financially successful firms may rely systematically on internal sources of financing because of factors not related to the unavailability of low cost external funds and consequently they may exhibit high investment-cash flow sensitivity. Additional critiques have been put forward by Ericson and Whited (2000), Alti (2003) and Bond et al. (2004), all arguing that the cash flow already contains information about a firm's investment opportunities. The significance of the cash flow sensitivity of investment may then provide additional information on expected profitability rather than on the severity of the financing constraints.

Having these caveats in mind, we search for an alternative way of testing the presence of

[2] In a perfect market environment, investment decisions are taken exclusively on the basis of the expected profitability of the investment project.

financing constraints. We follow the methodology of Almeida, Campello and Weisbach (2004, hereafter ACW) that focuses on the analysis of the cash flow sensitivity of cash holdings. ACW argue that their approach overcomes the problem of the previous literature in the sense that the predictions of the model for financially unconstrained firms are not influenced by future investment opportunities. In particular, in their theoretical model the unconstrained firms' change in cash holdings should depend neither on current cash flows nor on future investment opportunities. Therefore, the liquidity demand of unconstrained firms is indeterminate and this constitutes the basis for empirical predictions to be tested. However, it is important to notice that their model is not able to test the degree of the financing constraints, as is recognised by the authors themselves.[3]

In this paper, we implicitly investigate the usefulness of the financial constraints model proposed by the ACW for a sample of euro-area firms. First, we identify a priori groups of firms experiencing different financing conditions. Then we look for the firms with the best financing conditions and check whether the liquidity demand test is able to distinguish them from the rest of the sample. Hence, we challenge the link between the outcome of the ACW's (2004) theoretical model and the empirical test hypothesis. Our approach is similar to the investigation conducted by Kaplan and Zingales (1997). By selecting firms under different financing conditions, we give a higher importance to the a priori classification of firms according to their respective degree of financing constraints. In the second stage of our investigation, we check the determinants of the liquidity demand under alternative financing conditions. While Kaplan and Zingales (1997) use information from the firms' management reports and financial statements for their a priori classification, we define different scenarios by combining information on the financing gap and on the firms' reliance on external capital. Based on this information, we distinguish absolutely constrained, relatively constrained and unconstrained firms.

Our approach, similar to the Kaplan and Zingales' investigation, is subject to the criticism that endogenous variables are used for the classification. The variables used in our classification can be affected by the same factors that determine firms to be constrained. This could influence the empirical results in the sense that only those firms that we defined a priori as constrained should assign a positive cash flow sensitivity, if the empirical test hypothesis is

[3] Formulated as follows: "… The reason why the degree of financial constraints does not affect cash levels is that varying the degree of constraints affects both benefits and the costs of holding cash in an offsetting manner, so a relatively more constrained firm will not necessarily save any more or less cash than a less constrained one." See ACW, p. 1785-1786.

properly defined. An additional problem, resulting from the endogenous character of the variables and present in general in the financing constraints literature, is that variables are determined by more than one factor. For example, lower investments could be the result of unavailable external financing sources but also of worse investment opportunities. We try to reduce such problems by combining several financial variables for three consecutive years. For example, if a firm has a financing gap (i.e. total investment is higher than its cash flow) but it decreased its leverage for three consecutive years, it hardly could be the case that this firm does not need external financing because of a lack of profitable projects. Neither can it be argued that this firm has decided to reimburse credit because it has a surplus left after covering the financing costs of all profitable projects with its retained earnings. Therefore, we consider such a firm as absolutely constrained since it is most probably unable to get new external financing and therefore it is forced to allocate its internal sources to the reimbursement of its debt. In the regression analysis, the endogeneity problem is controlled with instrumental variables and system GMM estimation.

Following the ACW theoretical model, we define a priori as unconstrained those firms that are able to get new external financing or whose internal funds are sufficient for all their investments. The ACW theoretical model assumes that unconstrained firms can always invest under their first best level and that there is no use and no costs of holding cash. However, such perfect market conditions are hard to achieve in reality. Even firms under the best financing conditions operate in an imperfect market environment and, just as predicted by the theoretical model in the constrained case, the sensitivity is positively determined by future investment opportunities. We also find that constrained firms hold higher cash reserves than other firms, consistent with the precautionary motive of holding cash. But despite the differences in cash level, all firms in our sample exhibit significantly positive cash flow sensitivity and have a mean reverting cash balance, regardless of their financing conditions.

Our results suggest that all firms save cash out of their cash flow in a systematic way, since they operate under market imperfections where liquidity is relevant for the intertemporal allocation of capital. This is in line with the transaction cost motive of holding cash. The fixed costs of borrowing induce firms to raise external funds infrequently and to use cash holdings as a buffer. Hence, regardless of the financing constraints, there is an optimal amount of cash holdings. In the theoretical model proposed by ACW, unconstrained firms are defined as firms operating in perfect market conditions where liquidity reserves as well as financing decisions become irrelevant. The explanation of our findings is that none of the firms in our sample

operates in such a perfect market environment and that not even firms with the best financing conditions can be considered as "unconstrained" based on the definition used by the theoretical ACW model. The sensitivity measure is positively related to growth opportunities captured by the cash flow variable and is not influenced by the degree of financing constraints. Consequently, we conclude that the empirical model proposed by ACW cannot be used as a test of the financing conditions of euro area firms, since it cannot be interpreted in the light of the corresponding theoretical model.

Our study also contributes to the empirical cash holdings literature that focuses mostly on the determinants and implications of holding cash (see for instance Opler et al., 1999, and Ferreira and Vilela, 2004). We try to capture the importance of different variables on the sensitivity of cash holdings to cash flow under different financing conditions. While the ACW model takes into consideration only the effect of short-term debt on cash savings, we investigate the effect of several types of external sources, i.e. trade credit, short-term debt and long-term debt. Complementary to the ACW's instrumental variables approach, we develop a system GMM model (see Arellano and Bond, 1991, and Blundel and Bond, 1998), which controls for biases due to unobserved firm-specific effects and endogenous variables through the lagged values of the variables taken as instruments. The system GMM model checks also the mean reverting pattern of cash savings, which could suggest a desired level of cash positions.

The remainder of the paper is organized as follows. Section 2 describes the data sources and sample characteristics. Section 3 presents the cash flow sensitivity of cash holdings based on the ACW methodology. Section 4 describes the new scheme to identify financially constrained firms. It also investigates the relationship between financial constraints and firms' cash policy. The final section is the conclusion.

2.2 Data description

Our analysis is based on a sample of non-financial corporations in the euro area. Data on balance sheets as well as profit and loss statements are collected from the AMADEUS database of Bureau van Dijk. We select firms that provide consolidated balance sheets for the period 1994-2003. Furthermore, we select only firms that provide data on the variables used in the classification criteria for at least three consecutive years. After having applied several quality checks, the final sample consists of 2,190 firms with a total of 10,927 observations (see the

appendix for detailed sample construction). However, the number of observations in the regression analysis is reduced to 8,737 when we include in the model the lagged values of some variables.

We take into consideration the inter-group relationships specific to European companies by using consolidated accounts.[4] It is important to mention that for a huge number of European firms, especially for small firms, only unconsolidated balance sheets are available. We are aware of the limitation of our sample coverage in terms of firm size, which may introduce some selection bias (see the appendix for more information on the sample composition).

2.3 ACW's cash flow sensitivity of cash; the case of euro-area firms

ACW propose a theoretical model of corporate demand for liquid assets where firms are concerned about present and future investments. The authors show that firms that have limitations regarding their capacity to raise external finance hedge their future cash flow by saving cash. They derive that, in the presence of asymmetric information, cash holdings are increasing if future investment opportunities are more profitable relative to current ones:

$$\frac{\partial C^*}{\partial c_0} = \frac{f''(I_0)}{f''(I_0) + g''(I_1)}, \tag{1}$$

where C^* is the optimal cash policy, c_0 is the current cash flow of existing assets, $f(I_0)$ and $g(I_1)$ define the cash flow from the current and future investment respectively.

$$f(I_0) \equiv F(I_0) + qI_0, \tag{2}$$

$$g(I_1) \equiv G(I_1) + qI_1, \tag{3}$$

where $F(I_0)$ and $G(I_0)$ define the production functions, that are increasing, concave and continuously differentiable, q is the pay-off rate of investment liquidation and the investment levels I_0 and I_1 are less than their first best level because of financial constraints.

[4] For example, inter-company transactions of accounts payables/receivables and bonds payables/receivables could change totally the capital structure of the company, just as the inter-company profit could change the income statement.

Moreover, they argue that the financially unconstrained firms' value is not affected by their financial policy and there is no systematic relationship between changes in cash holdings and their current cash flows. The testable empirical implication of the "irrelevance of liquidity" suggested by the authors is that the cash flow sensitivity of cash holdings is not significantly different from zero. They also mention that the level of cash flow sensitivity of cash holdings for constrained firms does not quantify the degree of financial constraints and that it is more related to investment opportunities (see equation 1).

In this section, we test the empirical predictions of ACW's (2004) theoretical model for our sample of euro-area firms. For the sake of comparison, we use similar a priori classifications to those proposed by the ACW model to group firms with similar characteristics. We use firms' average real asset size over the sample period to rank them, and we define as small (large) firms those on the bottom (top) three deciles of the size distribution. However, we are aware of the sample selection bias, which is due to the use of consolidated balance sheets. Accordingly, in addition to asset size, we also use the size classification such as that adopted by the European Commission Standards. Firms are considered small- and medium-sized enterprises (SME) if they satisfy two out of the following three conditions: 1) the number of employees is equal or less than 250, 2) a maximum turnover of EUR 407 million and 3) a maximum balance sheet total of EUR 275 million. Since the payout ratio and bond and commercial paper ratings are not always available for unlisted firms, we use quotation as an alternative classification criterion to proxy rating. Firms listed at the stock exchange need to satisfy certain listing requirements, dispose a higher solvability and consequently should have more easy access to external finance from both financial institutions and markets.

The change in cash holdings is modelled as a function of a number of sources and uses of funds:

$$\begin{aligned}\frac{\Delta CH_{i,t}}{TA_{i,t-1}} = {} & \alpha_0 + \alpha_1 \frac{CF_{i,t}}{TA_{i,t-1}} + \alpha_2 \Delta \log S_{i,t} + \alpha_3 \Delta \log S_{i,t-1} + \alpha_4 \frac{\Delta TFA_{i,t} + Depr_{i,t}}{TA_{i,t-1}} + \alpha_5 \frac{\Delta IFA_{i,t}}{TA_{i,t-1}} \\ & + \alpha_6 \frac{\Delta FFA_{i,t}}{TA_{i,t-1}} + \alpha_7 \frac{\Delta NWC_{i,t}}{TA_{i,t-1}} + \alpha_8 \frac{\Delta SD_{i,t}}{TA_{i,t-1}} + \alpha_9 \log TA_{i,t} + \lambda_i + \mu_t + \nu_{i,t}\end{aligned} \tag{4}$$

where the dependent variable is the annual change in cash and marketable securities ($\Delta CH_{i,t}$) scaled by the amount of total assets at the beginning of the year ($TA_{i,t-1}$). Cash flow ($CF_{i,t}$) is defined as the earnings before extraordinary items plus depreciation. The amount of sales is a proxy for output and $\Delta \log S_{i,t}$ as well as $\Delta \log S_{i,t-1}$ are the first differences of the natural

logarithm of sales. $\Delta TFA_{i,t}$, $\Delta IFA_{i,t}$ and $\Delta FFA_{i,t}$ represent the changes in tangible, intangible and financial fixed assets respectively as a proxy for investment. The depreciation expenditures, denoted by $Depr_{i,t}$, are also taken in consideration in the tangible investments.[5] $\Delta NWC_{i,t}$ denotes the change in non-cash net working capital and is calculated as the annual change in inventory stocks and debtors (trade receivables) minus the change in trade credit (trade payables). $\Delta SD_{i,t}$ is the annual change in short-term debt. The above-mentioned variables are scaled by the beginning of the year total assets. The natural logarithm of total assets ($\log TA_{i,t}$), is a proxy for size. λ_i and μ_t are the parameters of the firm- and year-fixed effects and $v_{i,t}$ represents the error term.

Table 2.1, Panel A, describes the main variables used in the regression estimation of equation (4). The median firm has a yearly increase in cash holdings equal to 0.1% of total assets, a cash flow of 8.6% of total assets and a sales growth of 6.7%. From the set of fixed investment variables, the investment in tangible assets is the highest, representing 6% of the total assets. Investment in intangible and financial fixed assets is lower than 1%. The annual growth of net working capital represents on average 2.3% of total assets. Mean and median do not differ significantly which suggests that the coefficient estimates of the regression cannot be influenced significantly by the presence of outliers.

Table 2.1: Summary statistics of the variables used in regression analyses

Variables	Mean	Med.	Std. Dev.	Min.	Max
Panel A					
Change in cash holdings: $\frac{\Delta CH_{it}}{TA_{i,t-1}}$	0.006	0.001	0.063	-0.593	0.998
Cash flow: $\frac{CF_{it}}{TA_{it-1}}$	0.091	0.086	0.070	-0.497	0.499
Change in logarithm of sales: $\Delta \log S_{it}$	0.079	0.067	0.199	-0.998	0.970
Investment in tang. fixed assets: $\frac{\Delta TFA_{it} + Depr_{it}}{TA_{it-1}}$	0.082	0.060	0.104	-0.642	1.017
Investment in int. fixed assets: $\frac{\Delta IFA_{it}}{TA_{it-1}}$	0.009	0.000	0.057	-0.598	0.989
Investment in fin. fixed assets: $\frac{\Delta FFA_{it}}{TA_{it-1}}$	0.007	0.000	0.053	-0.736	0.892

[5] These variables correspond to the investment expenditures and acquisitions used by ACW (2004).

Table 2.1: Summary statistics of the variables used in regression analyses (Continued)

Variables	Mean	Med.	Std. Dev.	Min.	Max
Change in net work capital: $\frac{\Delta NWC_{it}}{TA_{it-1}}$	0.023	0.012	0.105	-0.847	2.682
Change in short term debt: $\frac{\Delta STD_{it}}{TA_{it-1}}$	0.019	0.004	0.103	-0.791	0.897
Logarithm of total assets: $\log TA_{it}$	11.641	11.323	1.570	3.045	19.150
Panel B					
Change in debtors +inventory: $\frac{\Delta DI_{it}}{TA_{it-1}}$	0.044	0.025	0.138	-0.872	2.812
Change in trade credit: $\frac{\Delta Cred_{it}}{TA_{it-1}}$	0.015	0.008	0.078	-0.591	1.592
Changes in long-term debt: $\frac{\Delta LTD_{it}}{TA_{it-1}}$	0.010	0.000	0.088	-0.782	0.985

Note: The sample comprises 2,190 firms from the euro-area with a total of 8,737 observations in the period 1994-2003. Panel A describes the main variables used in the regression estimation described by equation (4). The cash holdings refer to cash and marketable securities. Cash flow is defined as the earnings before extraordinary items plus depreciation. The first differences of the natural logarithm of sales capture the growth opportunities faced by the firm. The changes in tangible, intangible and financial fixed assets and the depreciation expenditures are the measures of investment. The change in non-cash net working capital is calculated as the annual change in inventory stocks and debtors minus the change in trade credit. Short-term debt is defined as liabilities to credit institutions or other borrowing (except trade credit) with a maturity of less than one year. Size is defined as the natural logarithm of assets. Panel B describes the additional variables used in the regression estimation described by equation (5). Long-term debt represents the financial debt with maturity above one year.

The main hypothesis to be tested through equation (4) is that small, unquoted firms face worse financing conditions relative to large, quoted firms. The empirical implication of this test hypothesis proposed by ACW is based on the cash flow sensitivity measures under alternative financing conditions. The hypothesis would be accepted if we find a significant positive sensitivity for the group of small, unquoted firms and an insignificant sensitivity for large, quoted firms. Expected profitability is controlled by current and past sales growth (see Manigart et al., 2002 and Bond et al., 2004).[6] We expect an increase in cash holdings whenever

[6] In ACW's (2004) equation, future investment opportunities and expected profitability are captured by Tobin's Q. Since market value cannot be defined for unlisted firms, we use sales growth instead.

the expected profitability of future investments is higher. As a proxy for investments, changes in tangible, intangible and financial assets plus depreciation are used. Firms can draw down on cash reserves in a given year in order to invest and we expect the estimates of α_4, α_5 and α_6 to be negative. The changes in net working capital and in short-term debt are included because they can be substitutes for cash. Consequently we expect that the net working capital to be negatively related to cash holdings' changes reflected by α_7 and that short-term debt coefficient (α_8) to be positive. Based on the predictions of economies of scale in cash management, it is usually assumed that bigger firms hold relatively less readily available cash, and therefore we expect a negative coefficient estimate for size variable (α_9).

We test the presence of endogeneity using the Hausman test, which is based on the difference between the OLS and the instrumental variables estimators. The null hypothesis can be rejected at the 1% significance level, which suggests that endogeneity should be controlled for. The set of instruments used in the regression are the country, time and industry dummies, the first and second lags of tangible fixed assets, the lagged intangible assets, the lagged financial fixed assets, lagged net working capital, lagged short-term debt and the lagged sales. We control for the unobserved individual heterogeneity by firm-fixed effects.

Table 2.2 presents the results of the regression. The first two columns present the estimates for small and large firms based on their total assets. Alternatively, columns three and four present the estimates for the small- and medium-sized enterprises (SME) and large enterprises (LE), classified on the basis of the European Commission Standards. The last two columns report the results for firms that have been selected on the basis of their listing at a stock exchange.

The cash flow sensitivity of cash savings (α_1) is significant for all firm-groups of size and quotation, (the group of unquoted firms is significant only at 10% level). The highly significant cash flow sensitivity of all firm-groups implies that the hypothesis of relatively worse financing conditions for small, unquoted firms is rejected. Growth opportunities captured by sales growth variables (α_2 and α_3) do not seem to affect liquidity demand. However, this result must be interpreted with caution. Future investment opportunities might be important for cash holding variation, but it could be captured by another variable than sales growth. In particular, the cash flow seems to be a better proxy for growth opportunities. This is in line with the ACW findings of the theoretical derivations in the presence of asymmetric information (see equation 1) suggesting that all firm-groups of size and quotation, to some degree, face

market imperfections. The coefficients of the different types of investments (α_4, α_5 and α_6) have the expected negative signs, but they are not significant, except for the estimate for the small and SMEs samples where some coefficients are significant under the 10% level. The coefficient of net working capital (α_7) has the expected negative sign and is significant for the sample of small firms, implying that net working capital is used as a substitute for cash holdings. Firms' cash savings are positively affected by an increase in short-term leverage (α_8). The coefficient is significant for most of the firm-groups with the exception of SMEs and unquoted firms. This implies that, for most of the firms, external financing plays an important role in their liquidity management. Contrary to our expectations, we find a positive significant size effect (α_9) for the small and SMEs sample indicating a higher growth in cash reserves for larger firms within the samples. One explanation could be that the large firms in our sample grow faster in general and consequently the increase in cash holdings is also higher. However, it is more likely that the size proxy captures some other effects not controlled in the regression. The significant coefficients of the intercepts of these two samples suggest also that some important variables could be omitted. For the sake of comparison we use in this section the empirical model proposed by ACW, however as a solution for omitted variables we propose in the next section a dynamic model with additional variables.

Table 2.2: Cash flow sensitivity based on size and quotation

$$\frac{\Delta CH_{i,t}}{TA_{i,t-1}} = \alpha_0 + \alpha_1 \frac{CF_{i,t}}{TA_{i,t-1}} + \alpha_2 \Delta \log S_{i,t} + \alpha_3 \Delta \log S_{i,t-1} + \alpha_4 \frac{\Delta TFA_{i,t} + Depr_{i,t}}{TA_{i,t-1}} + \alpha_5 \frac{\Delta IFA_{i,t}}{TA_{i,t-1}}$$
$$+ \alpha_6 \frac{\Delta FFA_{i,t}}{TA_{i,t-1}} + \alpha_7 \frac{\Delta NWC_{i,t}}{TA_{i,t-1}} + \alpha_8 \frac{\Delta SD_{i,t}}{TA_{i,t-1}} + \alpha_9 \log TA_{i,t} + \lambda_i + \mu_t + \nu_{i,t}$$

Dep. Var.: Cash savings	Small	Large	SME	LE	Unquoted	Quoted
α_0	-0.524	-0.476	-2.191	-0.282	-0.009	-0.453
	(-2.83)***	(-0.54)	(-2.93)***	(-0.67)	(-0.01)	(-0.72)
α_1	0.320	0.376	0.314	0.319	0.247	0.444
	(8.18)***	(2.78)***	(2.86)***	(3.01)***	(1.69)*	(2.88)***
α_2	0.005	-0.010	-0.044	0.012	0.092	-0.034
	(0.15)	(-0.10)	(-0.42)	(0.17)	(0.48)	(-0.35)
α_3	-0.066	0.005	-0.135	0.028	0.048	-0.009
	(-1.68)*	(0.03)	(-1.46)	(0.25)	(0.25)	(-0.06)
α_4	-0.097	-0.011	0.056	-0.011	-0.028	-0.039
	(-1.80)*	(-0.16)	(0.20)	(-0.18)	(-0.23)	(-0.46)
α_5	-0.075	-0.114	-1.404	-0.057	-0.219	-0.114
	(-0.51)	(-0.65)	(-1.67)*	(-0.41)	(-1.17)	(-0.61)
α_6	-0.102	-0.303	0.313	-0.258	-0.411	-0.236
	(-1.31)	(-1.50)	(0.81)	(-1.44)	(-1.20)	(-0.92)
α_7	-0.232	-0.117	0.057	-0.121	-0.137	-0.108
	(-6.62)***	(-1.07)	(0.40)	(-1.48)	(-0.86)	(-0.90)
α_8	0.186	0.170	-0.391	0.162	0.089	0.177
	(6.01)***	(1.65)*	(-1.36)	(1.80)*	(0.55)	(1.78)*
α_9	0.053	0.033	0.223	0.021	-0.002	0.033
	(2.74)***	(0.49)	(2.85)***	(0.58)	(-0.02)	(0.65)
Hausman	39.64	57.37	45.21	133.11	120.17	36.47
(prob.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	2444	2810	1294	7443	6337	2400
R^2	0.05	0.02	0.01	0.03	0.01	0.05

Table 2.2: Cash flow sensitivity based on size and quotation (Continued)

Note: The sample comprises 2,190 firms from the euro area with a total of 8,737 observations in the period 1994-2003. Firms are defined as small (large) firms allocated in the bottom (top) three deciles of the size distribution. SME and LE define small- and medium-sized enterprises and large enterprises based on the European Commission Standards. IV estimates with t statistics corresponding to heteroskedastic-consistent standard errors are reported. The used instruments are the country and industry dummies and the initial stock of each asset: the first and second lag of tangible fixed assets, lagged intangible assets, lagged financial assets, lagged net working capital, lagged short-term debt and lagged sales. All regressions include time dummies (not reported in the table). The unobserved individual heterogeneity is controlled for by the firm-fixed effect. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

The significant estimate for the cash flow sensitivity of cash for the sample of large and quoted firms is in contradiction with the American evidence. ACW find insignificant cash flow sensitivity for the large US firms, with high payout ratios and with bonds or commercial paper having been rated during the sample period. However, the firms defined as unconstrained using the Kaplan-Zingales (hereafter KZ) index seem to exhibit significant sensitivity.[7] Furthermore, more recent studies bring supporting evidence that the KZ index is more reliable for the a priori financing constraints classification than other firm characteristics, like dividend payout ratio or size. Moyen (2004), for instance, by using a simulated sample of 2000 firms over 10 years, shows that the constrained model produces similar results to those presented by Kaplan and Zingales (1997). Also Cleary (1999) supports Kaplan and Zingales' results for a larger sample of firms and with a classification scheme based on an index of financial constraints. All these results indirectly cast some doubts on the interpretation of the empirical findings of the ACW model.

The estimated significant cash flow sensitivity of large and quoted firms could be interpreted in two ways. First, large and quoted European firms could face the same external financing barriers as small, unquoted firms. Obviously, size and quotation are not the proper classification criteria to investigate the euro-area firms under various financing conditions. Consequently, we would need an alternative methodology to identify firms that most probably face relatively worse/better financing conditions. The second interpretation would be that the empirical test based on the cash flow sensitivity of cash savings is not able to capture the

[7] Firms at the bottom (top) three deciles of the KZ index ranking are considered financially unconstrained (constrained), where the index is defined as:

$$KZindex = -1.002 \times Cashflow + 0.283 \times Q + 3.139 \times Leverage - 39.368 \times Dividends - 1.315 \times CashHoldings$$

behaviour of firms under different financing conditions. But then, we face the same problem as under the first interpretation, i.e. the lack of a reliable methodology to identify the financing conditions of euro-area firms. As a solution, we provide a purely empirical approach. In the next section, we introduce a more precise a priori classification of firms by ranking them in three groups based on the relationship between their financing needs and sources of funds (internal and external).

In the subsequent section (subsection 2.4.2), we check the validity of the first interpretation, i.e. the financing conditions with respect to firms' size and quotation, by classifying firms under different financing conditions and then by looking at the distribution of firms with financing problems according to differences in size and quotation.

We investigate the second interpretation in more details in subsection 2.4.3. As can be seen from equation (1), the degree of financial constraints does not affect the level of the sensitivity. A relatively more constrained firm will not necessarily save more cash than a less constrained one. However, the proposed model should be able to detect the unconstrained firms based on the prediction that cash flow sensitivity of cash is not significantly different from zero for unconstrained firms. Hence, in our sample we look for firms with the best financing conditions and check whether the liquidity demand test is able to distinguish them from the rest of the sample. In addition, we provide an explanation for the sources of correlation between cash flow and cash savings other than the financing condition of the firm and investigate other determinants of the cash holdings.

2.4 Financing constraints and the cash policy

In this section a new classification scheme of financing conditions is described and an in-depth analysis of the determinants of corporate cash policy is presented. With the help of this methodology we can answer the two main questions. First, whether the small, unquoted firms face relatively worse financing conditions relative to large, quoted firms, and second, whether firms with the best financing conditions can afford to have an irrelevant cash policy as suggested by ACW.

2.4.1 Classification scheme

The literature on financing conditions suggests that the sensitivity results depend

crucially on the a priori criteria used to identify whether a firm experiences financing constraints or not. For instance, Fazzari et al. (1988) and subsequent studies (for a literature overview see Schiantarelli, 1995, and Hubbard, 1997) define a priori four groups of firms based on the dividend payout ratio relying on the assumption that firms with lower payout ratios are more financially constrained. However, Kaplan and Zingales (1997, 2000) question the interpretation of the empirical results based on the Fazzari et al. (1988) classification scheme. They classify firms based on the availability and demand for funds using information from the managers' report and financial accounts and they find regression results that contradict the previous literature. Moyen (2004) also shows that different measures used for the a priori classification (payout policy, asset size, bond ratings, commercial paper ratings, KZ index) pick up firms with very different characteristics and behaviours. While it is usual to consider as financially constrained firms those firms that face difficulties in obtaining external finance, there is no clear way described in the empirical literature to identify them.

In this subsection, we introduce a new scheme that can be used to detect the presence of financing constraints. The classification takes into account information derived from balance sheet and profit and loss accounts. As Schiantarelli (1995) argues, one of the weaknesses of the previous literature is that firms are partitioned in groups with different financial status based on a single indicator, which may or may not be a sufficient statistic to assess the existence of financing constraints. Being aware of this shortfall, we try to use all the available information relying on accounting items. Our interpretation is then based on the interrelation of several financial variables within some scenarios. According to these scenarios, we decide whether the firm is relatively more or less financially constrained.

Following Vermeulen (2002), we distinguish absolutely constrained, relatively constrained and unconstrained firms. Absolutely constrained firms are those that cannot get external finance, relatively constrained are those that can access only expensive external sources, and unconstrained firms are those that get new debt financing and pay, on average, the lowest financing costs available on the market. We construct our scenarios based on the interrelation of total investment, financing gap, financial debt and issuance of new shares obtained in the given year, and average interest payments on debt relative to interest rates charged in the local credit market. We also use a broader definition of the financing gap than the one defined by Vermeulen.[8] Our definition is more related to the definition of Shiam-

[8] Vermeulen (2002) defines the financing gap as the difference between fixed investment and cash flow. However, firms may have to invest also in inventories and accounts receivable.

Sunder and Myers (1999), considering the net increase in working capital as part of investment. The underlying idea is that if firms face financing gaps, they need to find other sources besides their current cash flow. Firms are considered as unconstrained when they face favourable external financing conditions, i.e. they can increase their leverage whenever it is needed with low financing costs relative to market conditions. We expect that the demand for financial debt decreases as its cost increases. Those firms that can get only expensive credits tend to use less external finance relative to the unconstrained firms and we consider those firms as constrained in the relative sense. And finally, we consider constrained in the absolute sense those firms that despite the financing gap do not get any credit or additional capital from the stock market. These firms need to use cash savings from the previous periods or liquidate current assets as additional source of finance. Table 2.3 summarises the criteria used in the classification.

The second column shows the percentage of firm-years from the total sample of the given category. Total investment is positive in most of the cases. We consider negative investment (decrease in fixed assets plus non-cash current assets) as a sign of constraints since the firm is liquidating (relatively constrained type-4 and absolutely constrained type-2). In this case, we distinguish relatively or absolutely constrained firms based on their relation to external finance (given from the changes in total debt).

Table 2.3: Firm-years' classification

Financing condition (% from total)	Total investment	Financing gap	Changes in total debt	Issue of new shares	Interest payments
Absolutely constrained firm-years					
1. (25%)	≥ 0	≥ 0	≤ 0	≤ 0	-
2. (9%)	< 0	-	≤ 0	-	-
Relatively constrained firm-years					
1. (9%)	≥ 0	< 0	< 0	-	-
2. (36%)	≥ 0	≥ 0	> 0	-	$\geq RIR_{c,t}$
3. (1%)	≥ 0	≥ 0	≤ 0	> 0	-
4. (2%)	< 0	-	> 0	-	-
Unconstrained firm-years					
1. (3%)	≥ 0	< 0	≥ 0	-	-
2. (14%)	≥ 0	≥ 0	> 0	-	$\leq RIR_{c,t}$

Note: $RIR_{c,t}$ represents the retail interest rate of the given country and year reported by ECB statistics.

The third column reports the financing gap, which is positive in most of the cases, indicating that the firms' total investment is higher than the current cash flow. The two exceptions are the unconstrained type-1 and relatively constrained type-1. The first category covers the case when firms invest less than their current cash flow and they do not need external sources. We consider as relatively constrained those firms that invest less than their current cash flow and at the same time reimburse their credit. It is not certain if their investment is constrained by reimbursement or if they do not invest because of a lack of profitable investment opportunities. For the purpose of the study, we have to be rigorous in considering a firm as unconstrained and whenever there is a sign of possible constraints we define firms as relatively constrained.[9]

In the fourth column, we look at the changes in total debt in order to see whether firms receive external finance whenever there is a need for it (positive total investment and financing gap). Unconstrained type-2 and relatively constrained type-2 firms get financial debt, as external sources. To distinguish these two types of firms, we consider the average interest payment on debt as the cost of credit showed in the last column. Being aware of the existence of country specificities in using data for firms located in various countries, we use as a benchmark the country-specific retail interest rates ($RIR_{c,t}$) .

If a firm is not taking external finance despite having a positive financing gap, it is considered as absolutely constrained (absolutely constrained type-1). In case a firm with a positive financing gap does not take credit but still is able to issue shares, such as presented in column five, we consider it relatively constrained (relatively constrained type-3). We implicitly assume that issuing shares is more costly than debt financing because of the presence of asymmetric information, as suggested by the pecking order theory of Myers (1984).

After having classified each observation (firm-year), we apply a long-term view. For this, we look at the above-mentioned characteristics for three consecutive years. First, firms are defined as absolutely constrained if for three consecutive years they are categorised as absolutely constrained. Second, when firms are categorised as constrained (a combination of relatively and absolutely constrained or only relatively constrained firm-years) for three years, then they are considered constrained in the relative sense. Third, unconstrained firms are those

[9] For a robustness check we reproduce the main results of the paper using an alternative classification, where all firms with negative financing gap are considered unconstrained. Results do not change significantly and they are available upon request.

that are not included in the previous two categories. A firm is considered unconstrained if the financial constraints (absolute or relative) are present for a maximum of two consecutive years only. The final outcome of the classification is presented in Table 2.4 and the dynamic regression analysis presented in the next subsection is based on this long-term view classification.

Table 2.4: Firms' classification

Final outcome	No. of observation (firm-years)	No. of firms	% o firms
Absolutely constrained firms			
	3,440	532	24%
Relatively constrained firms			
	5,906	1238	57%
Unconstrained firms			
	1,581	420	19%

2.4.2 Firms' characteristics and financial constraints

We test the equality of the mean values of the different variables across the various firm-groups using a t-test. Summary statistics are presented in Table 2.5. Based on the t-statistics, there is no significant difference in the mean value of cash flow among the three groups of firms. Hence, profitability cannot be considered as a cause of being constrained. Investments in fixed assets, the second variable, is negatively related to financial constraints. This suggests that firms with similar cash flows invest differently based on the external financing conditions. Since constrained and unconstrained firms are equally profitable and have comparable internal sources (cash flow), unconstrained firms take more credit and invest more.

Table 2.5: Summary statistics across firm groups

Variables	Mean	Median	Std. Dev.	P-value ($U = R$)	P-value ($R = A$)
1. Cash flow				0.452	0.060
U	0.091	0.083	0.076		
R	0.092	0.087	0.069		
A	0.089	0.085	0.069		
2. Investment rate				0.000	0.000
U	0.117	0.076	0.154		
R	0.101	0.072	0.132		
A	0.082	0.057	0.124		
3. Sales growth				0.000	0.000
U	0.106	0.085	0.393		
R	0.074	0.074	0.296		
A	0.048	0.052	0.239		
4. Leverage ratio				0.000	0.312
U	0.326	0.315	0.175		
R	0.250	0.233	0.151		
A	0.247	0.220	0.167		
5. Paid interest rate				0.000	0.104
U	0.065	0.052	0.063		
R	0.125	0.087	0.115		
A	0.121	0.084	0.115		

Note: The sample period is 1994-2003 including 2,190 firms located in the euro area with a total of 10,927 observations. Cash flow is defined as profits after tax plus depreciation. Investments are calculated as the yearly increase in fixed assets plus depreciation. Both, investments and cash flow, are deflated by the beginning of period total assets. Sales growth is calculated as the first difference of the logarithm of annual sales. Leverage ratio is the ratio of total debt to total assets. Paid interest rate is calculated as the ratio of the amount of interest paid divided by total debt. We assign the letter U for unconstrained firms, R for relatively constrained firms and A for absolutely constrained firms. We test the hypothesis that the mean value of the variables of one group is not significantly different across firm groups using a t-test. P values of the t-test are presented in the last two columns.

Looking at the third variable presented in Table 2.5, it is easy to detect a positive relationship between the absence of financial constraints and firms' sales growth. The evidence

provided by the existing literature on the US for the constraints-growth relationship is contradictory. Our results are in line with the findings of Cleary (1999), which shows that firms that cut dividends, and therefore are considered as constrained firms, have lower market-to-book ratio and sales growth. Whited and Wu (2004) also show that constrained firms have lower investment and sales growth.[10] Mizen and Vermeulen (2005) analyse European firms and argue that high sales growth is an indicator of financial health and future profitability that opens up access to external finance. If we take into consideration the endogenous character of this relationship, it can be argued that less constrained firms do not have to give up profitable investment projects because of insufficient funds, so unconstrained firms can grow faster (see Carpenter and Petersen, 2002).

Unconstrained firms, despite of the higher leverage that they display, face lower financing costs. The bankruptcy costs of leverage suggest a positive relationship, in the sense that higher leverage increases the bankruptcy cost and the higher risk should be compensated by higher financing costs. However, reliable firms with less volatile earnings should be able to increase leverage at low costs. The higher leverage of unconstrained firms is in line with the results obtained by Faulkender and Petersen (2003), which show that firms may be rationed by lenders, leading some firms to appear to be under-leveraged relative to unconstrained firms. Absolutely constrained firms pay a high cost for the credit obtained prior to the period under consideration and this could likely be the reason why they do not take any further credit obligations.[11] The presented patterns of selected variables confirm the validity of our classification.

Figure 1 shows that absolutely constrained firms have the highest percentage of cash savings. This confirms both the precautionary and the transaction cost hypotheses that firms facing difficulties in accessing external finance sources tend to hold higher cash levels over time (see Deloof, 2001, Ferreira and Vilela, 2004, and Whited and Wu, 2004).

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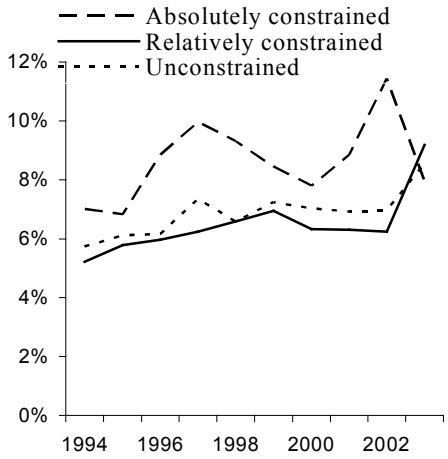
[10] They use for the a priori classification an index measuring the shadow cost associated with raising new equity, which is the cost of external finance relative to internal finance.

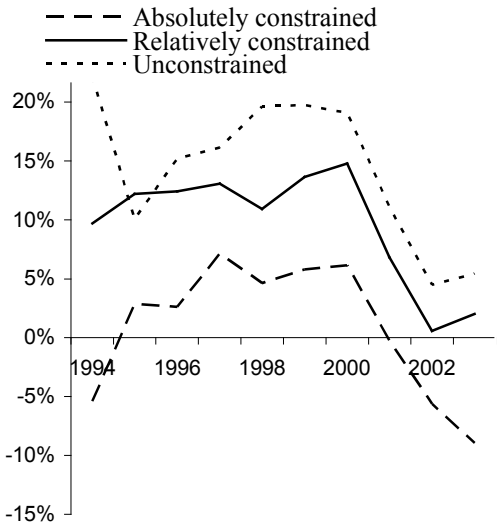
[11] It is worth noticing that in our classification, the cost of credit is not used as a criterion to define absolutely constrained firms.

Figure 2.1: Cash holdings[1]



Source: Bureau van Dijk and ECB calculation
Note: (1) cash and cash equivalent / total assets

Figure 2.2: Firms' growth[2]



Source: Bureau van Dijk and ECB calculation
Note: (2) first difference of total assets/ beginning of period total assets

It is important to notice that the cash savings of relatively constrained and unconstrained firms are not significantly different. The relatively significant amount of cash savings of unconstrained firms could be explained by the higher sales growth of this group of firms (see Opler et al., 1999). Another explanation is related to the specific characteristics of the European financial system. The most important external sources of finance for European companies are credits obtained from financial intermediaries instead of capital obtained from the stock market. Taking into consideration the penalty interest rates of delayed repayments, it is more costly for leveraged firms to be short of liquid assets. Additionally, liquidity could also be a criterion that can be used for obtaining credits, since firms with stable liquidity are usually considered as less risky.

Looking at Figures 2.1 and 2.2, we can see the impact of general macroeconomic conditions on firms' behaviour with respect to cash savings and firms' growth. Cash holdings are lower in periods of favourable economic conditions and higher firms' growth (the 1996-2000 period), while in periods of higher uncertainty and downturns the proportion of savings to total assets is increasing (after 2000). We can also conclude that absolutely constrained firms' cash flows fluctuate more strongly. These results are in line with the dynamics of liquidity management as a response to macroeconomic shocks in the US such as presented by ACW.

Table 2.6 shows the distribution of financially constrained firms among samples of different size and quotation. All groups of large, small, quoted and unquoted firms consist of similar percentages of absolutely constrained and relatively constrained firms. A slightly higher percentage of LEs are absolutely constrained compared to SMEs. These figures suggest that firm size and quotation cannot be used as indicators of financial status of euro-area firms particular to our sample.[12]

Table 2.6: Financial constraints by size and quotation

		A	*R*	*U*	Total
Small	No. of firms	213	511	154	878
	% from Small	24%	58%	18%	100%
Large	No. of firms	177	404	144	725
	% from Large	24%	56%	20%	100%
SME	No. of firms	107	327	101	535
	% from SME	20%	61%	19%	100%
LE	No. of firms	482	1076	357	1915
	% from LE	25%	56%	19%	100%
Quoted	No. of firms	120	282	99	501
	% from Quoted	24%	56%	20%	100%
Unquoted	No. of firms	412	956	321	1689
	% from Unquoted	24%	57%	19%	100%

Note: Firms are defined as small (large) firms allocated in the bottom (top) three deciles of the size distribution and quoted firms are firms listed at a stock exchange. SME and LE defines the small and medium size enterprises and large enterprises based on the European Commission Standards. We assign the letter U for unconstrained firms, R for relatively constrained firms and A for absolutely constrained firms.

The results also confirm the previous evidence on the financing conditions of European firms. Mizen and Vermeulen (2005) find that firm size cannot be used as an indicator of

[12] The results for SMEs may be peculiar to the selected sample of firms, where on average the number of employees is 126 and the mean total assets is about 30 million euro. A different sample with very small firms might provide some differences in financing conditions among size and quotation groups.

financial status for a sample of German and UK firms. Chatelain et al. (2001) show that only in the case of Italian firms, investment expenditures of SMEs react more to cash flow movements than those of large firms. Similarly, Vermeulen (2002) finds no sign of worse financing conditions for unlisted French and Spanish firms relative to those listed on the market. A possible explanation for similarities across size and quotation groups is given by Mizen and Vermeulen (2005). Since the debt obtained from financial institutions is the most important external financing source of European firms, the classification based on the small-large and listed-unlisted characteristics do not separate European firms into those that obtain external financing relatively easier or harder. This is unlike the case for the American firms, where large quoted firms rely mostly on capital obtained from the stock market and the small firms face significantly worse financing conditions whenever their access to the stock market is denied. This could explain the different results obtained based on the European and the US market.

2.4.3 Cash flow sensitivity of cash holdings

In this subsection we investigate the sources of cash flow sensitivity and its relation to the financing constraints. First, we estimate the ACW model for the three firm-groups based on the regression model described by equation (4). Second, we develop a dynamic model of inter-temporal allocation of uses and sources of funds, incorporating in the model as explanatory variables all types of debt, such as trade credits, short- and the long-term debt.

In the previous subsections, we identified the firm-group with optimal financing conditions for our sample as the unconstrained firms. Based on ACW's liquidity irrelevance hypothesis, we expect that for this firm-group the estimated cash flow sensitivity of cash to be not significantly different from zero.

Table 2.7 reports the results by fitting the instrumental variable model (equation 4) for each firm-group. The model is estimated with fixed effects and robust standard errors. The three columns report the estimates for absolutely, relatively constrained and unconstrained firms.

Table 2.7: Cash flow sensitivity of cash and financial constraints. Instrumental variable estimation with fixed effects

$$\frac{\Delta CH_{it}}{TA_{it-1}} = \alpha_0 + \alpha_1 \frac{CF_{it}}{TA_{it-1}} + \alpha_2 \Delta \log S_{it} + \alpha_3 \Delta \log S_{it-1} + \alpha_4 \frac{\Delta TFA_{it} + Depr_{it}}{TA_{it-1}} + \alpha_5 \frac{\Delta IFA_{it}}{TA_{it-1}} \alpha_6 \frac{\Delta FFA_{it}}{TA_{it-1}} + \alpha_7 \frac{\Delta NWC_{it}}{TA_{it-1}}$$
$$+ \alpha_8 \frac{\Delta SD_{it}}{TA_{it-1}} + \alpha_9 \log TA_{it} + \mu_i + \lambda_t + v_{it}$$

Dep. Var.: Cash savings	*A*	*R*	*U*
α_0	-0.289	-0.217	-0.568
	(-2.92)***	(-3.16)***	(-3.01)***
α_1	0.332	0.282	0.567
	(5.71)***	(5.51)***	(4.7)***
α_2	0.014	0.025	-0.054
	(0.46)	(0.68)	(-1.13)
α_3	0.029	-0.004	-0.089
	(0.73)	(-0.17)	(-1.32)
α_4	-0.027	0.006	0.124
	(-0.28)	(0.07)	(0.84)
α_5	-0.137	-0.078	0.052
	(-0.81)	(-0.49)	(0.22)
α_6	0.029	-0.374	-0.270
	(0.17)	(-1.78)*	(-0.68)
α_7	-0.145	-0.153	0.038
	(-1.03)	(-1.64)*	(0.22)
α_8	0.176	0.131	0.022
	(1.19)	(1.87)*	(0.11)
α_9	0.023	0.017	0.045
	(2.71)***	(3.04)***	(2.85)***
Hausman test	50.85	57.36	63.72
(prob.)	(0.00)	(0.00)	(0.00)
N	2908	4668	1161
R^2	0.03	0.04	0.02

Table 2.7: Cash flow sensitivity of cash and financial constraints. Instrumental variable estimation with fixed effects (Continued)

Note: The sample comprises 2,190 firms from the euro-area with a total of 8,737 observations in the period 1994-2003. We assign the letter U for unconstrained firms, R for relatively constrained firms and A for absolutely constrained firms. IV estimates with t statistics corresponding to heteroskedastic-consistent standard errors are reported. The used instruments are the country and industry dummies and the initial stock of each asset: the first and second lag of tangible fixed assets, lagged intangible assets, lagged financial assets, lagged net working capital, lagged short-term debt and lagged sales. All regressions include time dummies (not reported in the table). The unobserved individual heterogeneity is controlled for by firm-fixed effects. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

The sensitivities to the internal sources (α_1) are highly significant for all subsamples and their magnitude is the highest in the case of the unconstrained firms. These results are in line with the US evidence obtained by ACW (2004) using the KZ index as a priori classification and in contradiction with the rest of ACW's (2004) empirical results. The significant cash flow sensitivity of unconstrained firms suggests that none of the firms can invest irrespectively of financing decisions.

Similar to the results based on the different subsamples of sizes and quotation presented before, sales growth does not seem to capture the future growth opportunity (α_2 and α_3). The coefficients of the investments in tangible, intangible and financial fixed assets (α_4, α_5 and α_6) have in most of the cases the expected negative sign but they are statistically not significant (except α_6 that is significant at 10% level). Net working capital (α_7) is negatively related to the cash holding changes, but it becomes significant at the 10% level only for the sample of relatively constrained firms. An increase in short-term debt (α_8) results in a significant (at 10% level) increase in savings in the case of relatively constrained firms, that is, of firms having access to external finance but paying a relatively higher cost for it. We estimate a significant positive size effect (α_9), which we explain through the particularity of our sample that large firms grow faster and consequently their cash reserves grow at a higher rate than for smaller firms. However, as mentioned before, the size proxy could capture some other effects not controlled in the regression. The estimated significant coefficients of the intercepts support this argument. Hence, in the followings we propose a dynamic model with additional control variables.

The null hypothesis of the Hausman test can be rejected at the 1% significance level, which suggests that one should control for endogeneity. The selected instruments are those

described for the previous estimation of equation (4).

As a next step, we propose a dynamic model with two-step system GMM estimation. We check the liquidity demand hypothesis in a dynamic framework using a technique that has been widely used in the investment sensitivity literature. The model allows past realisations of the lagged cash savings to affect its current cash savings. The long-term debt variable is also included as an additional external source of funds. We believe that these additional variables contribute significantly to the explanation of liquidity demand. The lagged dependent variable could reveal the mean reverting pattern of cash savings suggesting a desired level of cash positions. Long-term debt obligations could play an important role in cash policy mainly for two reasons. First, in the presence of a long-term investment project, firms can decide to allocate the obtained credit over time and not to invest the entire available amount in the first year. Hence, the amounts not invested in the first year could be held under the category of cash and cash equivalent. Second, highly leveraged firms have higher monthly interest obligations and the obligation of debt repayment in the future. As a result, cash management should play an important role in fulfilling their financial obligations. There are also differences in the uses of short- versus long-term external funds. While short-term debts could be used by firms to increase the cash reserves or to be invested in current assets, long-term debts are mostly associated with long-term investments. Moreover, the accessibility of short- and long-term debt could be influenced by different firm characteristics but both could play an important role in the cash policy of a firm. We expect a higher effect of long-term debt on the liquidity demand for unconstrained firms that are able to obtain such sources of funds. The proposed model to be estimated is:

$$\begin{aligned}\frac{\Delta CH_{i,t}}{TA_{i,t-1}} = {} & \delta_0 + \delta_1 \frac{\Delta CH_{i,t-1}}{TA_{i,t-2}} + \delta_2 \frac{CF_{i,t}}{TA_{i,t-1}} + \delta_3 \Delta \log S_{i,t} + \delta_4 \Delta \log S_{i,t-1} + \delta_5 \frac{\Delta TFA_{i,t} + Depr_{i,t}}{TA_{i,t-1}} \\ & + \delta_6 \frac{\Delta IFA_{it}}{TA_{i,t-1}} + \delta_7 \frac{\Delta IFA_{i,t-1}}{TA_{i,t-2}} + \delta_8 \frac{\Delta FFA_{i,t}}{TA_{i,t-1}} + \delta_9 \frac{\Delta DI_{i,t}}{TA_{i,t-1}} + \delta_{10} \frac{\Delta Cred_{i,t}}{TA_{i,t-1}} + \delta_{11} \frac{\Delta SD_{i,t}}{TA_{i,t-1}} \\ & + \delta_{12} \frac{\Delta LTD_{i,t}}{TA_{i,t-1}} + \delta_{13} \log TA_{i,t} + \sum \delta_j D_{year} + \sum \delta_k D_{industry} + \sum \delta_l D_{country} + \varepsilon_{i,t}\end{aligned} \quad (5)$$

In addition to the variables defined under the instrumental variable estimation model, we include in equation (5) the first lag of the dependent variable ($\Delta CH_{i,t-1}$), the first lag of intangible fixed investment ($\Delta IFA_{i,t-1}$) and the long-term debt ($\Delta LTD_{i,t}$). Past investment in research and development (as part of intangible assets) is included since it may indicate the growth potential of the company in addition to the sales growth variable. Instead of including

net working capital, we separate it into short-term uses and sources of funds, i.e. debtors (trade receivables) plus inventories ($\Delta DI_{i,t}$) and trade credit (trade payable) ($\Delta Cred_{i,t}$). Summary statistics of these additional variables are presented in Panel B of Table 2.1. Inventory stocks and debtors on the asset side increase more, with an average of 4.4 % of total assets, than trade credits, which increase on average by 1.5% of total assets. The change in long-term debt to total assets is on average 1%, while the increase in short-term debt to total assets is on average about 2%. Although the degree of economic development is fairly similar across countries in the euro area, differences in the institutional environment, in the importance of the banking sector and in affiliation to different business groups may play a role on firms' behaviour.[13] Hence, we control for such country-specific effects by including country dummy variables. For the possibility that firms belonging to some particular industries have a higher desire to save cash, we also include industry dummies as a control variable.

The dynamic GMM model controls for bias due to unobserved firm-specific effects and endogeneity through the lagged variables taken as instruments. The lagged dependent variable takes into account the adjustment of the actual cash holdings to their previous levels. Such adjustment could also indicate the existence of an active cash management policy. If firms have not adopted such a policy, we should expect an insignificant coefficient of the lagged cash savings. Under the irrelevance hypothesis, there is no unique optimal cash policy for unconstrained firms, and savings should fluctuate in an undetermined manner. A positive significant coefficient of the lagged dependent variable would imply the existence of a target cash level, inconsistent with the irrelevant liquidity hypothesis.

Table 2.8 presents the results obtained from the estimation of the GMM model. The significant negative values of the lagged dependent variable (δ_1) for all type of financing conditions point to the existence of a mean-reversion of cash savings, which, in turn, implies a target cash level and systematic cash savings. The cash flow sensitivity of cash (δ_2) has the highest coefficient for unconstrained firms. The sensitivity measures are positive and significant at the 1% level for all type of firms, however the magnitude of the coefficient is lower than those estimated with the previous model. The lower values could be explained by the additional explanatory variables and the treatment with a different set of instruments.

[13] For instance, Deloof (2001) finds that Belgian firms' intra-group relations reduce the need for liquid reserves and Ferreira and Vilela (2004) find that firms in EMU countries with superior investor protection hold less cash.

Table 2.8: Cash flow sensitivity of cash and financial constraints. Dynamic system GMM

$$\frac{\Delta CH_{it}}{TA_{it-1}} = \delta_0 + \delta_1 \frac{\Delta CH_{it-1}}{TA_{it-2}} + \delta_2 \frac{CF_{it}}{TA_{it-1}} + \delta_3 \Delta \log S_{it} + \delta_4 \Delta \log S_{it-1} + \delta_5 \frac{\Delta TFA_{it} + Depr_{it}}{TA_{it-1}} + \delta_6 \frac{\Delta IFA_{it}}{TA_{it-1}} + \delta_7 \frac{\Delta IFA_{it-1}}{TA_{it-2}}$$
$$+ \delta_8 \frac{\Delta FFA_{it}}{TA_{it-1}} + \delta_9 \frac{\Delta DI_{it}}{TA_{it-1}} + \delta_{10} \frac{\Delta Cred_{it}}{TA_{it-1}} + \delta_{11} \frac{\Delta SD_{it}}{TA_{it-1}} + \delta_{12} \frac{\Delta LTD_{it}}{TA_{it-1}} + \delta_{13} \log TA_{it} + \sum \delta_j D_{year} + \sum \delta_k D_{industry} + \sum \delta_l D_{country} + \varepsilon_{it}$$

Dependent var.: $\frac{\Delta CH_{it}}{TA_{it-1}}$	*A*	*R*	*U*
δ_0	-0.009	-0.067	0.130
	(-0.33)	(-1.43)	(1.56)
δ_1	-0.112	-0.137	-0.137
	(-3.74)***	(-2.82)***	(-2.79)***
δ_2	0.191	0.190	0.388
	(2.57)***	(2.63)***	(3.08)***
δ_3	-0.006	-0.006	-0.014
	(-0.49)	(-0.43)	(-0.76)
δ_4	0.011	0.019	-0.003
	(1.24)	(1.46)	(-0.30)
δ_5	-0.071	-0.090	-0.182
	(-1.85)*	(-1.80)*	(-2.75)***
δ_6	-0.040	-0.015	-0.106
	(-0.53)	(-0.22)	(-1.13)
δ_7	0.006	-0.034	0.021
	(0.13)	(-0.83)	(0.42)
δ_8	-0.100	-0.130	-0.265
	(-0.89)	(-1.51)	(-2.45)**
δ_9	-0.078	-0.146	-0.097
	(-2.03)***	(-2.65)***	(-1.19)

Table 2.8: Cash flow sensitivity of cash and financial constraints. Dynamic system GMM (Continued)

	A	*R*	*U*
δ_{10}	0.137	0.185	0.144
	(2.43)***	(2.24)**	(1.15)
δ_{11}	0.022	0.067	0.120
	(0.69)	(1.29)	(1.68)*
δ_{12}	0.050	0.056	0.227
	(1.54)	(1.09)	(2.85)***
δ_{13}	0.000	0.004	-0.008
	(0.11)	(1.12)	(-1.23)
N	2908	4668	1161
Hansen test - $\chi 2$	199.08	191.31	137.33
(prob.)	(0.71)	(0.82)	(1.00)
AR(1) – z statistic	-6.09	-5.37	-3.31
(prob.)	(0.00)	(0.00)	(0.00)
AR(2) – z statistic	-0.44	-0.36	-1.54
(prob.)	(0.66)	(0.73)	(0.13)

Note: The sample comprises 2,190 firms from the euro-area with a total of 8,737 observations in the period 1994-2003. We assign the letter U for unconstrained firms, R for relatively constrained firms and A for absolutely constrained firms. Two-step system GMM estimates are presented with finite-sample correction to the two-step covariance matrix (robust standard errors). The GMM instruments are the second to third lags of the variables. All regressions include time, industry and country dummies (not reported in the table). t-statistics are reported in parenthesis. *, ** and *** indicate statistical significance at the 10%. 5% and 1% level, respectively.

None of the proxies for future investment opportunities measured by sales growth (δ_3), lagged sales growth (δ_4) and lagged investment in intangible assets (δ_7) are significant. Again, the insignificance of sales growth and intangible assets for the rest of the sample should be interpreted with more caution. It is more likely that these variables do not capture efficiently the future investment opportunity, rather than that savings are unaffected by future investment opportunities. Cash savings are used for inter-temporal allocation of investment in fixed assets of unconstrained (significant at 1% level), relatively and absolutely constrained firms

(significant at 10% level) as detected by the significantly negative coefficients of the tangible investment proxy (δ_5). Investment in intangible assets (δ_6) has the expected negative sign but is not significant. Investment in financial assets (δ_8) affects significantly (at 5% level of significance) the cash savings of unconstrained firms.

The sensitivities of cash savings to current operations (inventories and trade debt, δ_9 and trade credit, δ_{10}) show the expected signs. They have a significant influence on the cash savings for absolutely and relatively constrained firms. The cash savings of absolutely and relatively constrained firms are affected neither by changes in short-term debt nor by long-term debt changes. The cash savings of unconstrained firms are positively affected by an increase in long-term debt. The insignificant effect of debt in the case of absolutely constrained firms is not surprising, since, based on our classification criteria, they do not get new external sources in most of the years. For relatively constrained firms, which are able to obtain debt financing, changes in leverage do not influence significantly their cash reserves. The significant debt sensitivity of unconstrained firms is consistent with our expectation and it indicates that cash savings are used for inter-temporal allocation of both internal and external sources of funds. Firms can decide to allocate the obtained credit over time and not to invest the entire available amount in the first year. In addition, an increase in leverage of the firm could result in an increase of liquidity in order to fulfil the higher interest obligations and credit repayment in the future. Contrary to the estimates of the instrumental variables model, the estimated size effect and intercepts are not significant, which reconfirm the problem of the previously estimated ACW's (2004) empirical model, caused by omitted variables.

All regression models are accepted based on the Hansen test that confirms the validity of the selected instruments. The first-difference equation residuals are first-order autocorrelated ($AR(1)$), just as expected based on the model specification. The rejection of higher order autocorrelation ($AR(2)$) indicates that the selected instruments are exogenous and the parameter estimates are consistent. Based on the two-step GMM estimation the robust covariance matrix is provided with finite sample correction of standard errors.

In general, our results point to the fact that even firms under the best financing conditions operate in an imperfect market environment and save cash out of their realised profits proportional to future investment opportunities. Firms' cash savings adapt to an optimal level and are positively affected by internal sources, irrespective of the difficulties to raise external financing sources. We find also evidence that the amount of external financing determines the

cash savings evolution for unconstrained firms. Firms without significant financing barriers still face higher external than internal costs of financing and they save cash in a systematic way to achieve an optimal inter-temporal allocation of financial resources. Since the cash flow already contains information about the firms' future investment opportunities, unconstrained firms exhibit the highest sensitivity. Hence, the cash flow sensitivity does not reveal information on the financing condition of the firm.

2.5 Conclusions

This paper has developed a new classification scheme that can be used to detect the presence of financial constraints. Based on this new classification, we find that financially constrained firms that are unable to obtain external financing or face higher costs of borrowing invest at a lower rate and grow more slowly. They also hold relatively higher cash positions that grow substantially also under depressed economic conditions, confirming the precautionary cost hypotheses of holding cash. The cash savings of unconstrained firms are positively affected by an increase in long-term debt. The significant debt sensitivity of unconstrained firms indicates that cash savings are used for inter-temporal allocation of both internal and external sources of funds. Firms can decide to allocate the obtained long-term credit over time. In addition, an increase in leverage of the firm could result in an increase of liquidity in order to fulfil the higher interest obligations and credit repayment in the future. We find that the distribution of financially constrained firms does not depend on the firm's size or its listing at a stock exchange. However, for a proper investigation of SMEs, a better coverage of small firms is needed than that provided in this paper.

We provide evidence that all types of euro-area firms, regardless of their financing conditions, save their internal sources in a systematic pattern. The liquidity irrelevance hypothesis presented by Almeida et al. (2004) holds only for firms operating under perfect market conditions where internal and external financing sources are interchangeable. Such conditions can be hardly found, since even for those firms that are able to raise external sources under the best market conditions, there is a wedge between the internal and external costs of financing. Our results show that all firms are constrained to a certain degree by the imperfect market environment and consequently all of them have a determined cash policy.

For firms under the best financing conditions, that we categorise as unconstrained, we estimate the highest cash flow sensitivity of cash holdings. This result, which appears puzzling

at first sight, can be explained as follows. First, similar to the findings of ACW (2004), when market imperfections are present, greater cash flow sensitivity of cash savings does not reflect higher financial constraints. The level of sensitivity is affected, apart from the precautionary savings, by future investment opportunities captured partly by the cash flow variable. Hence, the highest sensitivity of unconstrained firms simply reflects the high growth opportunities of this group of firms. While constrained firms save cash to hedge the fluctuations in their cash flow, unconstrained firms may save to boost future investments. Second, the cash flow sensitivity of cash should be interpreted in the light of the flow of external financing. We find a significant relationship between cash savings and the flow of long-term external sources. This can be explained by the fact that unconstrained firms use more intensively external financing sources, mostly long-term debt, to fund additional investments. In this case, cash holdings play an important role to balance the external and internal financing sources and the repayment obligations and interest costs. All these factors make liquidity relevant even for firms with the best financing conditions. We can conclude that the significance of cash flow sensitivity of cash savings does not provide reliable evidence to distinguish euro-area firms experiencing different financing conditions.

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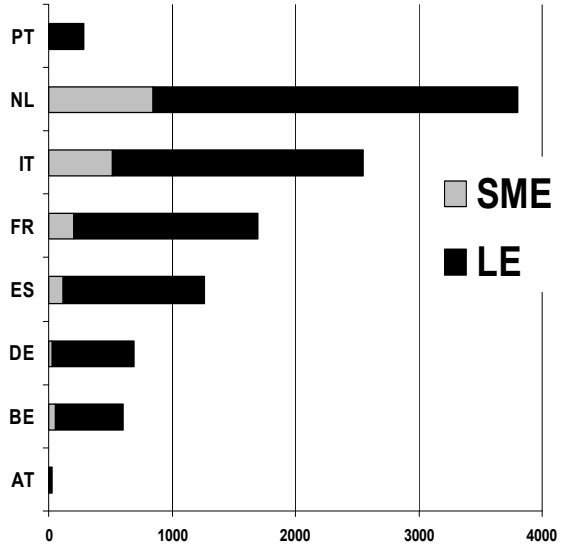
Appendix -Data and sample selection

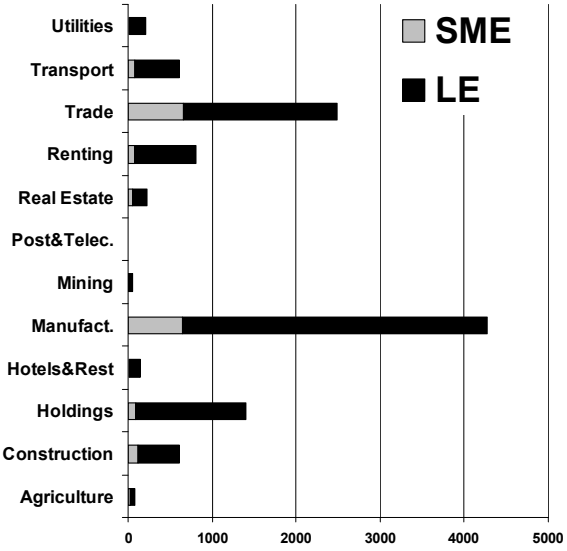
Data on balance sheets and profit and loss statements are collected from the AMADEUS database of Bureau van Dijk. We start from a sample of non-financial firms providing consolidated items (15,972 firms). For the sample period 1994-2003, we selected firms that provided information on the number of employees, total assets or turnover (12,519 firms). The sample size is further reduced when we included the following quality checks. First we checked that the reported balance-sheet items were positive and that the sum of the subcategories of a balance-sheet item did not differ more than 10% from the reported value of the item (9,164 firms). Then, we selected those firms reporting in their accounts values for our variables of interest (cash holdings, sales, tangible fixed assets, other fixed assets, intangible fixed assets, current assets, loans, long term debt and the interest paid) (6,825 firms). Finally, we retained only those firms reporting data for at least three consecutive years (2,821 firms). Our final sample consists of 2,190 firms after 1% trimming based on variables of cash flow and change in cash holdings.

Figure A2.1: Size and country composition



Source: Bureau van Dijk and ECB calculations
Total sample 2,190 firms

Figure A2.2: Industry-composition



Source: Bureau van Dijk and ECB calculations
Total sample: 2,190 firms

Note: SME and LE define the small and medium size enterprises and large enterprises respectively based on the European Commission Standards. SMEs are firms that satisfy two out of the following conditions: maximum number of 250 employees, maximum turnover of 407 million euro and maximum balance sheet total of 275 million euro.

3 IS THE GROWTH OF EURO AREA SMES CONSTRAINED BY FINANCING BARRIERS?

3.1 Background and literature overview on financial dependence, growth opportunity and growth

Corporate finance theory suggests that financial market imperfections like asymmetric information constrain the ability of firms to fund their investment projects. The financing constraints literature is mostly based on different measures of investment-cash flow and growth-cash flow sensitivities, which are assumed to indicate financing constraints. The sensitivity should show how extensively a firm needs to rely on internal funds to finance its investment projects. However, following the Kaplan and Zingales' critique (1997; 2000), it has been shown that the higher sensitivity of corporate investment to cash flow is not an appropriate indicator of financing constraints. The sensitivity may be magnified not only by the presence of financing constraints but also by growth opportunities and by the debt financing of the firm (see, for instance, Cleary, Povel and Raith, 2004; Boyle and Guthrie, 2003; Moyen, 2004). Having these caveats in mind, other indicators of financing constraints need to be considered.

We propose an alternative way to investigate the financing conditions of firms by focusing on firms' ability to take advantage of their sector-specific growth opportunities and investigating whether firms can get the external sources induced by their technological demand for external financing. We assume that firms belonging to sectors that are more dependent on external financing sources or that have higher growth opportunities grow relatively faster in an environment of favourable financing conditions than firms which are less dependent on external financing sources or have lower growth opportunities. We assume that listed euro-area firms face the most favourable conditions to realise their financing need and growth opportunities and we call them benchmark indicators. The relationship between financing conditions and firms' growth across firm sizes is investigated on the basis of these newly created indicators for the euro area, which reflect the sector-specific financing need and growth opportunities. With these benchmark indicators we analyse the financing conditions of different size groups and any significant deviation from the benchmark we take as a sign of financing barriers causing distortions in their realised growth. A significantly positive relationship

between firms' realised growth and the benchmark indicators is taken as empirical evidence for favourable financing conditions. By contrast, in the presence of financing constraints, the firms' realised growth is assumed to be limited by restrictions in the availability of financing, a fact that is even more emphasised in industries with strong growth opportunities. In the long run, we investigate the time-invariant technology-induced need of external finance in explaining the relative importance of the firm size across sectors.

There is extensive empirical evidence on the relationship between financing conditions, investment and firms' growth. For instance, Demirguc-Kunt and Maksimovic (1998) show that firms in countries with developed financial institutions obtain more external financing than in countries with less developed institutions, which has, in turn, a positive effect on firms' growth (see also La Porta et al., 1998; Rajan and Zingales;1998). Moreover, Beck, Demirguc-Kunt and Maksimovic (2005) find small firms to be the most affected by imperfections in the financial and legal system. In particular, focusing on small and medium-sized enterprises, which form an important part of the corporate landscape in the euro area, it is often argued that small firms, even with promising growth opportunities, find it difficult to raise external capital obtained with favourable terms and that they would finance their growth to a large extent through retained earnings (see, for instance, Carpenter, Fazzari and Petersen, 1994; Yalcin, Bougheas and Mizen, 2002; Carpenter and Petersen, 2002). The lack of external capital obtained with favourable terms is mostly explained by higher asymmetric information, lower available collateral and a higher idiosyncratic risk of small firms compared to larger ones.

Small and medium sized enterprises (SMEs) are considered to be the engine of economic development but market and institutional failures impede their growth (see Snodgras and Biggs, 1996; Beck et al., 2005). Studies that discuss the growth constraints faced by SMEs and the role of financial and institutional development to overcome these constraints explore the differences across countries including in their studies both developed and developing countries (see for instance Berger and Udell; 1998, 2006; Galindo and Schiantarelli, 2003; Demirguc-Kunt et al. 2006; Klapper et al., 2006). In this study we focus on euro-area countries, where cross-country differences in financial development are relatively lower and we emphasize the cross-size differences that facilitate our understanding of the financing and growth of euro-area non-financial firms. It is noteworthy that our final sample is one of the most comprehensive euro-area balance-sheets databases covering about 230,000 of micro and small firms over 10 years.

In this paper we find evidence that in the long run small and micro firms generally do not

specialise in sectors with high inherent reliance on external financing, showing that they tend to be more financially constrained than large firms. We also find that in the short run, medium-size and large firms can adapt faster to the time-varying industry growth opportunities, from which we can conclude that their growth is not impeded by the availability of financial resources. Results provided in this study are in contradiction with some previous European evidence. Mizen and Vermeulen (2005) find that firm size cannot be used as an indicator of financial status for a sample of German and UK firms. Chatelain et al. (2001) show that only in the case of Italian firms, investment expenditures of SMEs react more to cash flow movements than those of large firms. Similarly, Vermeulen (2002) finds no sign of worse financing conditions for unlisted French and Spanish firms relative to those listed on the market. The insignificant differences in the financing conditions of small and large firms concluded from previous studies could be explained either by an unreliable methodology of investment sensitivity of cash or by the less comprehensive database of micro and small firms.

Our results are in line with the finding of studies based on firm-level survey data (The World Business Environment Survey) covering more than 80 countries and a large number of small firms. Shiffer and Weder (2001) find that small firms face higher growth obstacles than medium-size or large firms. Beck et al. (2006) show that size, age and ownership are the most reliable predictors of firms' financing constraints.[14]

The rest of the paper is organised as follows. Section 2 introduces the data and size classification. Section 3 briefly discusses some stylised facts of euro-area firms across size-groups. Our principal investigations and empirical results are reported in section 4. Section 5 contains some robustness checks, and the final section concludes the paper.

3.2 Data

For the investigation of the relationship between financing conditions and growth of non-financial enterprises in the euro area, we use a comprehensive sample of firm-level data of euro-area listed and unlisted non-financial enterprises, excluding firms in the agriculture, forestry, fishing and mining sectors, collected from the AMADEUS database of the Bureau van Dijk. AMADEUS is especially useful because of its large coverage of firms not listed on the

[14] For a literature overview, see Beck and Demirguc-Kunt (2006).

stock market and includes very small firms.[15]

The original data set contains financial information on about 2.6 million private and publicly owned firms across eleven euro-area countries in the period 1990-2004 (see appendix). For our analysis, we exclude the first three years because of the poor coverage and lose one additional year by constructing the variables of interest as the first difference of the balance sheet items. By imposing several quality checks, 1% trimming based on the main variables and a minimum of 3 consecutive years, the size of our final sample is reduced further to 259,929 firms with about one million observations. It predominantly consists of unquoted firms with only 4,391 observations of quoted firms (see appendix).

Whenever available, we use the consolidated annual accounts as these are considered to be most suitable for providing information about the financial situation of a company with subsidiaries. However, a large number of euro-area non-financial firms provide only unconsolidated accounts. To control for double accounting within these two samples, those subsidiaries which are owned by a parent company (more than 24.9% ownership) are identified on the basis of subsidiaries and ownership information and excluded from the sample. This is a problem not taken into consideration by previous studies (see for instance Chatelain et. al., 2002; Wagenvoort, 2003).

As there is a one-to-one match between the three-digit SIC and NACE sector classification for most of the sectors, we rely on the three-digit SIC-NACE correspondence table whenever it is possible. In addition, for comparability with previous findings on investigations across industry sectors, we construct a classification similar to the one used in Rajan and Zingales (1998).[16] This classification is mainly based on the two-digit SIC code and results in 47 sectors.

Size classes are defined following the European Commission classification[17], i.e. the

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[15] At the same time, a major shortcoming of AMADEUS is the different coverage across euro area countries.

[16] Our classification differs slightly. First, we combine some subgroups within the manufacturing sector based on a minimum number of 10 firms per industry. It results in 29 different manufacturing sectors while Rajan and Zingales consider 36 manufacturing sectors. Second, in addition to the manufacturing sector we analyse other sectors as well.

[17] For the definition of micro small and medium-sized enterprises see the enterprise and industry publications of the European Commission: "The new SME definition, user guide and model declaration, based on the Commission Recommendation" (2003/361/EC).

classification criteria are based on the number of employees and on a joint condition of either total assets or turnover. Since many firms in the sample do not report their number of employees, total assets and turnover are used as a joint condition to classify such firms and retain them in the sample (see Table 3.1).

Table 3.1: Definition of size classes

Type of firms	Employees		Total Assets		Turnover
Micro	< 10	and	< 2 mio. EUR	or	< 2 mio. EUR
Small	< 50	and	< 10 mio. EUR	or	< 10 mio. EUR
Medium	< 250	and	< 50 mio. EUR	or	< 50 mio. EUR
Large	> 250	or	> 50 mio. EUR	or	> 50 mio. EUR
If the number of employees is missing:					
Micro			< 2 mio. EUR	and	< 2 mio. EUR
Small			< 10 mio. EUR	and	< 10 mio. EUR
Medium			< 50 mio. EUR	and	< 50 mio. EUR
Large			> 50 mio. EUR	or	> 50 mio. EUR

In addition to our main sample of listed and unlisted firms, we create a second sample of listed non-financial firms only, based on the Thomson Financial DataStream database. This sample is used for constructing two benchmark indicators: the sector-specific indexes of growth opportunities and external financing need, following the approach by Rajan and Zingales (1998). By using listed euro-area firms for constructing the benchmark indicators, we assume that listed firms in the euro area have generally a wide spectrum of financing instruments available and are thus largely financially unconstrained.

The sample of about 2,300 firms and about 25,000 observations contains financial information of publicly owned non-financial corporations across euro-area countries in the period from 1985 to 2004. For the benchmark sample we use the same sector breakdown as described for the AMADEUS sample and we exclude the years before 1993 because of poor coverage. The final sample for the calculation of the benchmark indicator on growth opportunities consists of 18,841 firm-year observations and 1,742 firms. For the calculation of the benchmark indicator on financing needs it consists of 14,139 firm-year observations and 1,168 firms.

3.3 Financing conditions and growth across firm sizes in the euro area - some stylised facts

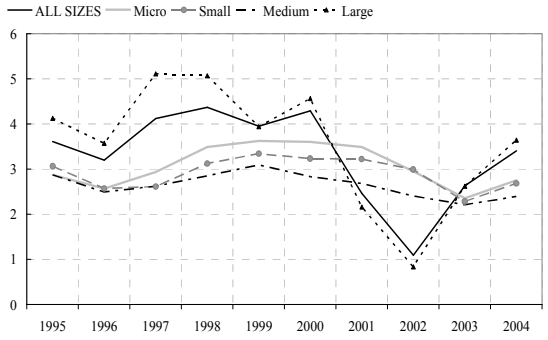
In this section we investigate briefly some stylised facts for various firm sizes, which might provide insight into financing constraints and growth. The pecking order theory of Myers (1984) suggests that firms prefer raising funds from retained earnings, since due to asymmetric information and/or transaction costs the cost of external financing is generally higher (see also Myers and Majluf, 1984). Hence, a higher profitability of a firm can thus be considered as an indicator of better financing conditions, the general ability of a firm to invest in positive net value projects and of fewer barriers to a firm's growth. At the same time, however, higher internal funds in the form of cash reserves might indicate that firms face higher transaction costs of raising outside funds or to convert other assets into cash. Following the precautionary reason of holding cash, one can expect that liquid funds are higher if there is a higher probability of a shortage of funds in the future.

Looking at the return on assets ratio (ROA) presented in Figure 3.1 we find evidence that large firms are significantly more profitable than other firm size groups. We therefore expect large firms to be in a better position to realise their growth opportunities within a given sector. As can be seen in the graphs, the profitability of large firms is more volatile which also suggests that these firms can adapt better to growth opportunity shocks. This is also in line with our assumption that listed firms, which are predominantly large in the euro area, are the most unconstrained firms. We find a less clear distinction in the profitability between micro, small and medium-sized firms.

At the same time, we also find evidence that small firms hold relatively higher levels of cash and cash equivalents (see Figure 3.2), whereas the cash holdings of the medium-sized firms are more comparable with the level of cash holdings of large firms. Assuming that cash holdings have a higher importance for firms with less access to external financing sources and are used to protect against unexpected shortfalls in cash flow, motivated by the costly liquidation of assets in order to obtain readily available cash, we can conclude that small firms are likely to be more financially constrained. An alternative explanation could be that firms with higher current liabilities are liable to face greater uncertainty regarding short-term refinancing and therefore hold more cash for an unexpected need to reduce their debt. The precautionary reason of holding cash is also emphasised by the empirical literature. Faulkender (2002) shows that small US firms with a higher cost of financial distress and greater

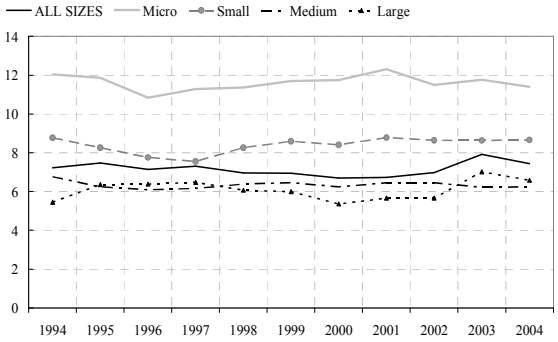
information asymmetries hold more cash than larger firms (see also Deloof, 2001; Ferreira and Vilela, 2004; Opler et. al.,1999).

Figure 3.1: Return on assets (ROA) (%)



Sources: AMADEUS, ECB calculations

Figure 3.2: Cash holdings to total assets (%)

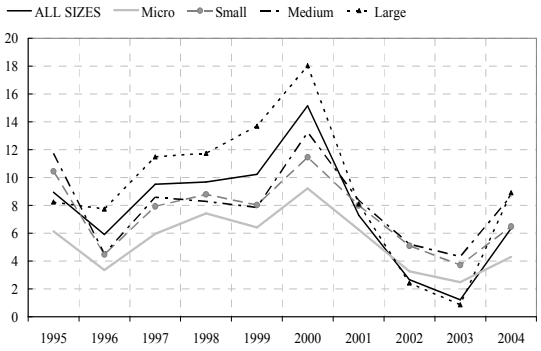


Sources: AMADEUS, ECB calculations

Note: The annual growth is calculated as the first difference of sales (total assets) divided by the beginning of year sales (total assets). Ratios are calculated for each size group by first aggregating the financial items of all firms belonging to that group for each year and, as a second step, yearly ratio of the four size groups and the whole sample is calculated. Calculations are based on the sample of 4,806,876 observations with about 1 million firms.

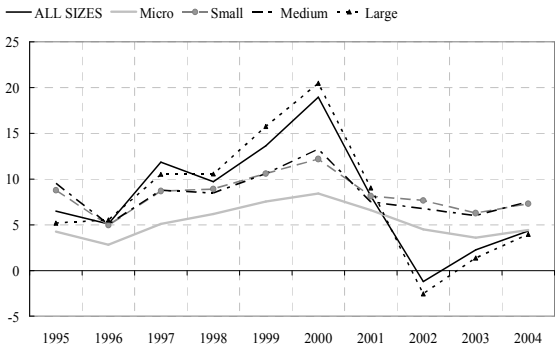
In line with our hypothesis that there should be a positive relationship between financing conditions and firms' ability to realise their sector-specific growth opportunities and financing need, we find evidence that large firms grow faster on average. Figures 3.3 and 3.4 show that firms' size is generally positively related to the annual growth rate of sales and total assets. At the same time, the development in total assets has been more cyclical for large than for small firms in 2001 and 2002. The declining rate of growth of firms' total assets during 2001 and 2002 reflects the decrease in sales, investment and profitability at that time, which was most pronounced for large firms.

Figure 3.3: Annual growth of sales (%)



Sources: AMADEUS, ECB calculations

Figure 3.4: Annual growth of total assets (%)



Sources: AMADEUS, ECB calculations

Note: The annual growth is calculated as the first difference of sales (total assets) divided by the beginning of year sales (total assets). Ratios are calculated for each size group by first aggregating the financial items of all firms belonging to that group for each year and, as a second step, yearly ratio of the four size groups and the whole sample is calculated. Calculations are based on the sample of 4,806,876 observations with about 1 million firms.

3.4 Barriers in growth across size groups – methodology and empirical results

The importance of financing sources and their effect on firms' value and its growth is documented in different branches of the corporate finance literature focusing on the capital structure, financing constraints and financial development across countries. However, it is difficult to establish with confidence the direction of the causal mechanism of financing and growth, i.e., to decide whether unavailability of financing sources are responsible for the lower growth, or whether firms lack the profitable investment projects and consequently do not need external financing. In order to control for this causality problem we follow the Rajan and Zingales (1998) basic assumption that financing development, and in our case the financing condition of the firm, should disproportionately affect firms belonging to different industries. The industry-specific characteristics are captured with benchmark indicators. The assumptions of our study can be summarised as follows. First, industries typically dependent on external financing can grow faster than the rest of the industries only if financing sources are available. Second, the industry-specific characteristics can capture the growth potential, i.e. the profitable investment projects. Industries with good investment projects can grow faster than other

industries only when the necessary financing can be obtained. Based on these two assumptions we build our main test hypothesis of financing conditions across size groups presented below. In subsections 4.1 and 4.2 we describe the calculation of the industry-specific financing need and growth opportunities. The summary statistics of the main variables are presented in subsection 4.3. The main test of the financing conditions across size-groups is conducted with alternative econometric models that are presented in subsection 4.4.

3.4.1 Benchmark indicators

We follow the approach originated by Rajan and Zingales (1998) and assume that there are technological reasons why some industries depend more on external finance than others. However, we extend this approach in two ways. First, instead of using the Rajan and Zingales' (1998) index calculated based on the US data, we calibrate the approach specifically to the euro area. We use a sample of euro-area listed companies for the construction of the two alternative benchmark indicators. Second, in addition to the manufacturing sector investigated by Rajan and Zingales (1998), our study includes each non-financial sector.

Since listed euro-area firms have access to a variety of financing sources (both securities and loans) and can take the best advantage of global growth opportunities through international markets, we assume that these firms face the least frictions in accessing external finance. Consequently, the reliance on external financing of the firms belonging to a given industry should reflect the industry's need for external finance. In a similar manner, we suppose that growth differences across industry sectors of listed euro-area firms reflect the reallocation of capital to firms in the sectors with the best growth opportunities. We also assume that a global shock to growth opportunities is best captured by listed firms, as they are in the best position to adapt to such a shock and realise changed growth opportunities.

The benchmark financing need indicator is based on the amount of investment of a representative (median) largely unconstrained euro-area firm, which cannot be financed internally through cash flow, and hence has to be financed externally. It is calculated as:

$$ExtFinDep_{ind} = Median_{ind}\left[\left(\sum_{t} Inv_{t,i} - \sum_{t} CF_{t,i}\right) / \sum_{t} Inv_{t,i}\right] \quad (1)$$

$ExtFinDep_{ind}$ denotes the external financing dependence and it is defined broadly as the

difference between fixed investment and firms' available internal funds divided by the fixed investment. Investment in non-financial fixed assets ($Inv_{t,i}$) is calculated as the first difference in tangible and intangible fixed assets plus depreciation. Net cash flow ($CF_{t,i}$) is defined as cash flow (profit for the period plus depreciation) minus the increase in non-cash current assets (inventories plus receivables) plus the increase in trade credit. The ratio is calculated in two steps. First, the firm-level financing need is computed by aggregating the investment and net cash flow over the whole sample period (1994-2004). The aggregation over the years smoothes temporal fluctuations. In a second step we calculate the sector median, which we consider as the sector-specific technological demand for external financing.

The second benchmark indicator that we use represents the sector-specific growth opportunities, proposed by Fisman and Love (2004).

$$GOp_{ind} = Median_{ind}\left(\sum_{t}\left(\ln Sales_{t,i} - \ln Sales_{t-1,i}\right)/\max(t)\right) \quad (2)$$

GOp_{ind} denotes the benchmark growth opportunities indicator and it reflects the sector-specific growth of a representative (median) largely unconstrained euro-area firm based on the sample of listed non-financial enterprises in the euro area. The index is calculated as the sector median of firms' average sales growth ($\ln Sales_{t,i}$) over the sample period.

3.4.2 The relationship between the two benchmark indicators

We expect a positive relationship between the two benchmark indicators. More precisely, based on the assumption that listed firms face the best financing conditions of the economy, the sales growth of these firms can adapt quickly to changes in global growth opportunities as it should be best supported by the availability of external capital. Hence, listed firms should have a high ability to realise their growth opportunities as they have the best chances to realise their external financing need. External capital can be obtained through debt financing or equity financing. It should be noted that the financing need indicator captures both sources while it does not comprise the financing from the internal cash flow of the current activity.

Figure 3.5: Financing need –benchmark

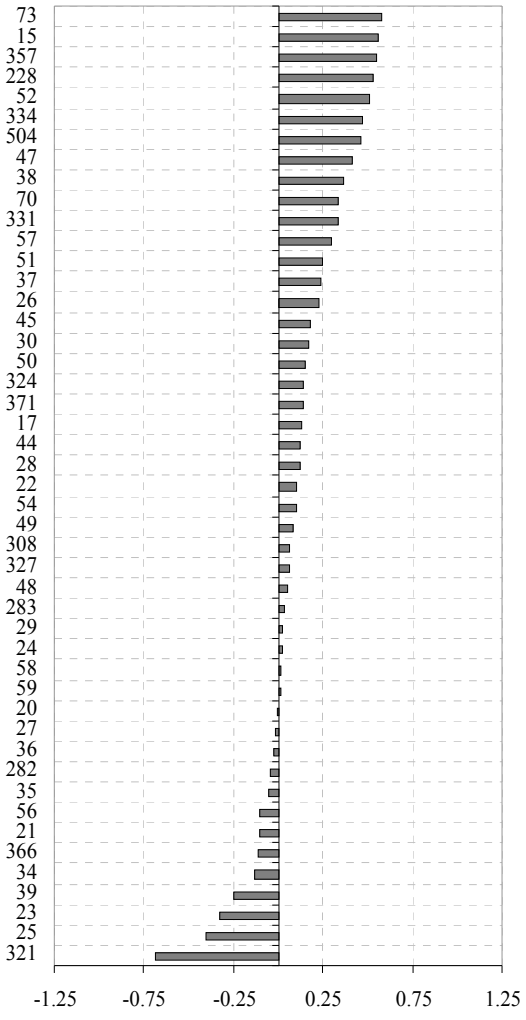
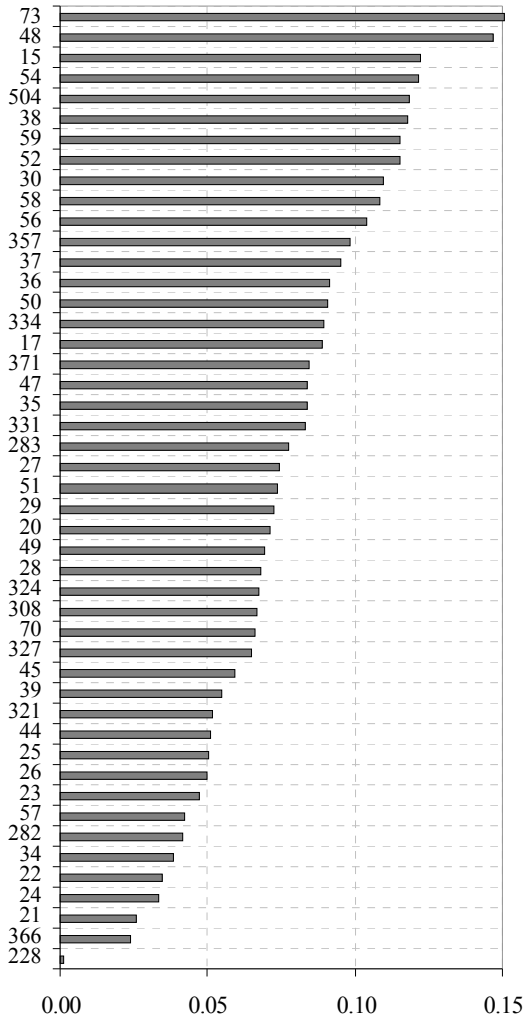


Figure 3.6: Growth opportunities-benchmark



Sources: Thomson Financial DataStream, ECB calculations

Note: The financing need indicator is calculated with the aggregated items over the period 1994-2004 for each firm. The growth opportunities indicator is calculated as the averaged yearly sales growth for each firm. As a second step the sector specific median is calculated for both indicators.

Figures 3.5 and 3.6 point indeed to the expected positive relationship of the two indicators. For the purpose of our investigation the ranking of the industries is more important than their absolute value. On the first position, with the highest growth opportunities and financing need is the *Business services* sector. The *General building contractors* sector (that belongs to the construction sector) has a high ranking in both classifications. The

Communications sector has the highest growth opportunities ranking with about 15% annual growth taken as an average of the period 1993-2004. However, based on the financing need indicator it seems that the firms in this sector rely less intensively on external financing, which could be owing to exceptionally high realised profits. By contrast, firms in the *Office and Computing* manufacturing sector have a high need of financing. 55% of their investments in tangible and intangible assets are financed by other sources than their realised profit. The high need for external financing sources is also reflected by the relatively higher average sales growth of about 10% per year. On the lower part of the financing need ranking list are the *Glass*, *Furniture* and *Apparel* manufacturing sectors showing a financing surplus (negative financing need). The surplus, however, most probably does not result from high profits, but rather from low investment. These industries are also ranked on the lower part based on the growth opportunities, all facing a sales growth not higher than an annual 5%.

The rank correlation of the two benchmark indicators presented in Table 3.2 shows a significant positive correlation of about 0.40, thus confirming the expected positive relationship between the two indicators.

Table 3.2: Spearman rank correlation of benchmark indicators and firms' realised growth across firm sizes

	Fin. Need Benchmark	Growth Op. Benchmark	Firms' Realised Growth			
			Micro	Small	Medium	Large
Fin.Need - Benchmark	1.00					
Growth Opp. - Benchmark	0.40*	1.00				
Realised Growth-Micro	0.19	0.19	1.00			
Realised Growth-Small	0.19	0.39*	0.64*	1.00		
Realised Growth-Med.	0.30*	0.46*	0.42*	0.65*	1.00	
Realised Growth-Large	0.22	0.49*	0.31*	0.36*	0.54*	1.00

Note: * indicates statistical significance at 5 % level.

In order to gain some insights into the relationship between firms' realised growth and the

sector-specific benchmark financing need and growth opportunities, their rank correlations are presented in Table 3.2. The realised growth is calculated for each of the 47 industries as the weighted average of the firms' growth. The table presents the realised growth across firm sizes and relates it to the two benchmark indicators. In the case that the correlation between the realised growth of the firm size group and the benchmark indicators is low, this might give an indication of financial constraints. According to our hypothesis this would imply that firms in this firm size group are on average less able to realise their growth opportunities or financing need than a financially unconstrained firm.

It turns out that the benchmark financing need indicator is less correlated with the firms' growth and is significant only in the case of medium-sized firms. This might be the case as the ability to adapt to growth opportunity shocks dominates in the short term, whereas mainly in the long term the technological financing need is relevant and determines the shares of the firm size across sector. The correlation among firms' growth and the sector-specific benchmark growth opportunities increases with size. These results support our hypothesis that larger firms can adapt faster to growth opportunities, given that they are less financially constrained.

3.4.3 Summary statistics

Table 3.3 presents the summary statistics for our sample. Panel A reports the values of the variables for the overall sample while panel B focuses on the differences across size groups. All in all, we have 1.4 million observations.

On average the rate of growth of firms is 9% while the median is 4%, indicating that there is a tail of considerably higher values. Looking at panel B, we can see that larger firms grow faster than smaller ones and that their distribution is more homogenous. We use as a measure of the financial systems' performance (financial development indicator) the amount of bank credit to the private sector as a percentage of GDP. A larger market for bank loans indicates that more intermediation and thus more monitoring of loans and pooling of resources take place in a financial system. On average the bank loans to GDP is 0.84 and it varies from 0.35 to 1.55 across countries. From panel B, we do not see big differences in the financial development indicator across size groups and this is indirect evidence that size groups are distributed evenly across countries. Total assets are, as expected, increasing by size group. The variable Young is a dummy variable that takes value 1 when firms are younger than 10 years and 0 otherwise. On average, 40% of firms are considered young and the proportion is higher for smaller firms.

Looking at leverage variables (short-term and long-term debt to total assets), we do not find much difference across size groups.[18] On average the ratio of long-term debt to total assets is 0.08 while that of short-term is slightly higher at 0.10.

With respect to the cost of financing, we find that the average interest rate borne, as indicated by the ratio of interest paid to total debt, by micro and small firms is generally higher than that of large firms. On average the interest rate is 21% for small firms and 16% for large firms. As firms might not only be constrained by the amount of credit received but also by the price of credit, this might also be an indication of the higher relevance of financial constraints for small firms.

Table 3.3: Summary statistics by size groups

Panel A: All firms	No. of Obs.	Mean	Median	Std. Dev.	Min	Max
Firms' Growth (% change in total assets)	1,421,753	0.09	0.04	0.24	-1.00	1.45
Industrial Financing need	1,421,753	0.16	0.13	0.22	-0.69	0.58
Industrial growth opportunity shocks	1,421,753	0.09	0.08	0.05	-0.08	0.30
Bank loans to GDP	1,421,753	0.84	0.86	0.13	0.35	1.55
Logarithm of total assets	1,393,776	6.95	6.78	1.41	4.16	11.16
Young	1,421,753	0.41	0.00	0.49	0.00	1.00
Sales growth	1,392,332	0.08	0.05	0.23	-0.51	1.46
Trade Credit to total assets	1,421,753	0.21	0.18	0.19	0.00	30.86
Short-term debt to total assets	1,421,753	0.10	0.05	0.15	0.00	27.52

[18] It should be noted, however, that in a less restricted sample of about 4 million observations and value-weighted averages we find that smaller firms have a relatively lower long-term debt-to-assets ratio. As long-term debt is the most important external source to fund long-term investment projects, this could be an indication that smaller firms face higher financing constraints than large firms. Small firms either try to compensate a possible lack of long-term external capital by short-term debt or they need to reduce their fixed investments. Moreover, small firms rely to a larger extent on trade credit in relation to their total assets than large firms.

Table 3.3: Summary statistics by size groups (Continued)

Panel A: All firms	No. of Obs.	Mean	Median	Std. Dev.	Min	Max
Long-term debt to total assets	1,421,753	0.08	0.00	0.17	0.00	37.68
Cash flow tot total assets	1,393,202	0.09	0.08	0.08	-0.20	0.38
Interest paid to total debt	630,679	0.20	0.14	0.19	0.01	1.00
Adjustment term	739,900	-0.50	-0.54	0.56	-1.91	1.56

Panel B: Size groups	Micro		Small		Medium		Large	
	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
Firms' Growth (% change in total assets)	0.07	0.02	0.09	0.04	0.10	0.07	0.10	0.06
Industrial Financing need	0.17	0.13	0.16	0.13	0.14	0.13	0.16	0.13
Industrial growth opportunity shocks	0.10	0.09	0.09	0.08	0.08	0.07	0.08	0.08
Bank loans to GDP	0.86	0.86	0.84	0.86	0.81	0.82	0.86	0.83
Logarithm of total assets	5.91	5.89	7.45	7.43	9.08	9.18	10.21	10.47
Young	0.55	1.00	0.41	0.00	0.20	0.00	0.18	0.00
Sales growth	0.08	0.04	0.08	0.05	0.09	0.06	0.10	0.07
Trade Credit to total assets	0.19	0.15	0.21	0.18	0.26	0.24	0.21	0.18
Short-term debt to total assets	0.09	0.05	0.10	0.05	0.15	0.11	0.13	0.08
Long-term debt to total assets	0.10	0.00	0.08	0.00	0.05	0.00	0.07	0.00
Cash flow tot total assets	0.10	0.09	0.09	0.08	0.07	0.06	0.08	0.07
Interest paid to total debt	0.21	0.15	0.20	0.14	0.17	0.11	0.16	0.09
Adjustment term	-0.53	-0.59	-0.50	-0.54	-0.35	-0.34	-0.27	-0.28

3.4.4 Financing constraints test based on the benchmark indicators

Before testing the financing conditions across size groups we regress firms' growth (Model I) and firms' size (Model II) relying on the financial development multiplied with the growth opportunity and financing need. The crucial difference between the two benchmark

indicators is that the growth opportunity is a time-varying indicator capturing the technological innovations while the financing need is a time-invariant proxy of technological need of external sources. Consequently, we separate the role of the across-country financial development into the short- and long-run effects. Fisman and Love (2004) show that the long-term effect is better captured by the relationship of financing need and the size of the industry (the shares of the industry in the total output of the country). In our case of firm-level data, the size refers to firms' size, which is the accumulated past growth rates of the firms. The short-term relationship is proposed to be captured by the effect of growth opportunities on firms' growth.

The long-run relationship is estimated with model 1:

$$\log TA_{i,t} = \alpha_1 + \alpha_2\left(ExtFinDep_l \times F.Dev_{k,t}\right) + \alpha_3 Young_{i,t} + \alpha_j \sum_{j=1}^{11} Year_j + \alpha_k \sum_{k=1}^{11} Country_k + \alpha_{j\times k} \sum_{j\times k=1}^{121} Year_j \times Country_k + \alpha_l \sum_{l=1}^{47} Industry_l \quad (3)$$

The dependent variable is the logarithm of total assets of firm i and time t ($\log TA_{i,t}$), the proxy for firms' size. External financing dependence ($ExtFinDep_l$) is the benchmark indicator of industry sector l, calculated in subsection 3.1. Financial development ($F.Dev_{k,t}$) is the proxy of the financial system performance of the country k and time t, measured by the bank loans to GDP. We select this indicator from the set of financial system performance measures (size of the capital market, financial innovations and market completeness) since it could affect both listed and unlisted firms. We control for the age of the firm through a dummy variable ($Young_{i,t}$) that equals 1 if the age of the firm is less than 10 years. In addition, we control for year, country, industry and year-industry effects. The time-country aspects identify the cyclical behaviour of each economy. Table 3.4 presents the results for model 1. *t s*tatistics are reported in parentheses.

Table 3.4: Estimation results of Model 1. Dependent variable: firms' size

	(1)	(2)	(3)	(4)
$GrowthOp_l \times Fin.Dev_k$	0.178	0.196		
	(0.93)	(1.15)		
$ExtFinDep_l \times Fin.Dev_k$			0.276	0.369
			(2.16)**	(3.14)***
$Young_{i,t}$		-0.615		-0.615
		(-62.2)***		(-62.2)***
R^2	0.37	0.41	0.38	0.41
N	1,421,753	1,421,753	1,421,753	1,421,753

Note: All regressions include the year, country, industry and year-industry dummies (not reported in the table). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

As expected, the estimate for the external financing dependence-financial developments coefficient is positive significant with and without the dummy variable controlling for firm age (columns 1 and 2). We estimate alternative specifications where instead of external financing dependence we use the growth rate indicators and we find an insignificant relationship (columns 3 and 4). Based on these results we can conclude that the size of the firm is determined in the long run by the financing conditions, since firms are larger in industries with higher external financing dependence in countries with better financial development. Based on the results of columns 3 and 4, we can see that time-varying growth opportunities do not influence significantly the firms' size.

As a next step, the short-term relationship is estimated with model 2:

$$Growth_{i,t} = \alpha_1 + \alpha_2\left(GOp_l \times Fin.Dev_{k,t}\right) + \alpha_3 Young_{i,t} + \alpha_j \sum_{j=1}^{11} Year_j + \alpha_k \sum_{k=1}^{11} Country_k + \alpha_{j\times k} \sum_{j\times k=1}^{121} Year_j \times Country_k + \alpha_l \sum_{l=1}^{47} Industry_l \quad (4)$$

where $Growth_{i,t}$ is the percentage change of the total assets of the firm i between time $t-1$ and t. The main variable of interest here is the growth opportunity-financial development coefficient, where GOp_l represents the growth opportunity of industry l. Results are presented in Table 3.5.

Table 3.5: Estimation results of Model 2. Dependent variable: firms' growth

	(1)	(2)	(3)	(4)
$GrowthOp_l \times Fin.Dev_k$	0.073	0.074		
	(2.82)***	(3.89)***		
$ExtFinDep_l \times Fin.Dev_k$			0.045	0.039
			(2.42)**	(2.12)**
$Young_{i,t}$	0.040			0.040
	31.66			(31.64)***
R^2	0.38	0.40	0.41	0.46
N	1,421,753	1,421,753	1,421,753	1,421,753

Note: All regressions include the year, country, industry and year-industry dummies (not reported in the table). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

The results of columns 1 and 2 indicate a significant positive correlation among industry-specific growth opportunities and realised growth of the firm, which is higher in countries with more available bank loans (higher financial development). When we use the alternative industry benchmark, the external financing dependence instead of the growth opportunity, the coefficient is still positive but its magnitude is lower and it is less significant (see columns 3 and 4). We can draw two important conclusions. First, firms are growing faster in the industries with good growth opportunities in countries with higher financial development. Second, the time-varying growth opportunity shock indicator is a better proxy for the firms' growth than the external financing dependence. The results of model 1 and model 2 support the findings of Fisman and Love (2004) that financially developed economies are specialised in financially dependent industries in the long run, and allocate resources to industries with high growth opportunities in the short run.

The main focus of the study, however, is the across-size differences in firm's growth and whether it is constrained by financing sources. The results of model 1 provide evidence that in the long run the firms depending on external financing can reach a greater size in countries with better financing conditions. This suggests that size is an endogenous variable, conditional on the availability of sources. Model 2 shows that firms grow faster in industries with good growth opportunities in better financing conditions. Further on, we investigate with more details the growth of different size-groups, whether firms of different sizes can take advantage

of industrial growth opportunities in a similar manner and how important the country's financial development for each size-group is. Based on our hypothesis, whenever a given size-group is not able to follow the industry-specific growth opportunities, there is a sign of constraints. In such cases firms of the given group are growing unrelated or less dependent on the growth opportunities (good investment projects) and we conclude that such distortions are caused by inelastic financing sources, unable to adapt to growth opportunity shocks.

With the help of Model 3 we can investigate the growth dependence on the time-varying growth shocks across size-groups:

$$\begin{aligned} Growth_{i,t} = {} & \alpha_1 + \alpha_2\left(GOp_l \times F.Dev_{k,t} \times Mic_{i,t}\right) + \alpha_3\left(GOp_l \times F.Dev_{k,t} \times S_{i,t}\right) + \\ & \alpha_4\left(GOp_l \times F.Dev_{k,t} \times M_{i,t}\right) + \alpha_5\left(GOp_l \times F.Dev_{k,t} \times L_{i,t}\right) + \\ & \alpha_6\left(GOp_l \times Mic_{i,t}\right) + \alpha_7\left(GOp_l \times S_{i,t}\right) + \alpha_8\left(GOp_l \times M_{i,t}\right) + \\ & \alpha_9\left(GOp_l \times L_{i,t}\right) + \alpha_{10}\left(Young_{i,t} \times Mic_{i,t}\right) + \alpha_{11}\left(Young_{i,t} \times S_{i,t}\right) + \alpha_{12}\left(Young_{i,t} \times M_{i,t}\right) + \\ & \alpha_{13}\left(Young_{i,t} \times L_{i,t}\right) + \alpha_{14}\left(\ln TA_{i,t} \times Mic_{i,t}\right) + \alpha_{15}\left(\ln TA_{i,t} \times S_{i,t}\right) + \alpha_{16}\left(\ln TA_{i,t} \times M_{i,t}\right) + \\ & \alpha_{17}\left(\ln TA_{i,t} \times L_{i,t}\right) + \alpha_j \sum_{j=1}^{11} Year_j + \alpha_k \sum_{k=1}^{11} Country_k + \alpha_{j\times k} \sum_{j\times k=1}^{121} Year_j \times Country_k + \alpha_l \sum_{l=1}^{47} Industry_l \end{aligned} \quad (5)$$

The dependent variable is the percentage change of the total assets of the firm i between time $t-1$ and t. The dummy variables $Mic_{i,t}$, $S_{i,t}$, $M_{i,t}$ and $L_{i,t}$ denote the micro, small, medium and large firms, respectively, as defined according to the classification described in section 2 (see Table 3.1). We use as an additional control variable the size of the firm measured by the logarithm value of total assets.

All variables are estimated separately for each size group with four size dummies. For our interpretation the most important are the coefficient estimates from α_6 to α_9, showing whether the industrial growth opportunities are reflected in the growth of the size-group. Results are presented in Table 3.6.

Table 3.6: Estimation results of Model 3. Dependent variable: firms' growth

	(1)	(2) Only unquoted firms
$GrowthOp_l \times Fin.Dev_k \times Micro_{i,t}$	0.030	0.023
	(0.44)	(0.34)
$GrowthOp_l \times Fin.Dev_k \times Small_{i,t}$	0.250	0.239
	(4.12)***	(3.97)***
$GrowthOp_l \times Fin.Dev_k \times Medium_{i,t}$	-0.104	-0.054
	(-1.16)	(-0.62)
$GrowthOp_l \times Fin.Dev_k \times Large_{i,t}$	-0.107	0.138
	(-1.7)	(2.3)***
$GrowthOp_l \times Micro_{i,t}$	-0.052	-0.046
	(-0.89)	(-0.81)
$GrowthOp_l \times Small_{i,t}$	-0.093	-0.085
	(-1.67)	(-1.54)
$GrowthOp_l \times Medium_{i,t}$	0.332	0.285
	(4.18)***	(3.66)***
$GrowthOp_l \times Large_{i,t}$	0.551	0.283
	(8.48)***	(4.53)***
$Young_{i,t} \times Micro_{i,t}$	0.055	0.055
	(26.61)***	(26.83)***
$Young_{i,t} \times Small_{i,t}$	0.062	0.062
	(117.78)***	(125.39)**
$Young_{i,t} \times Medium_{i,t}$	0.050	0.049
	(178.72)***	(191.41)***
$Young_{i,t} \times Large_{i,t}$	0.022	0.020
	(115.81)***	(85.29)***
$\ln TA_{i,t} \times Micro_{i,t}$	0.044	0.045
	(19.73)***	(20.52)***

Table 3.6: Estimation results of Model 3. Dependent variable: firms' growth (Continued)

	(1)	(2) Only unquoted firms
$\ln TA_{i,t} \times Small_{i,t}$	0.038	0.038
	(17.84)***	(18.49)***
$\ln TA_{i,t} \times Medium_{i,t}$	0.033	0.033
	(17.31)***	(17.94)
$\ln TA_{i,t} \times Large_{i,t}$	0.026	0.027
	(17.62)***	(18.49)***
R^2	0.16	0.16
N	1,421,753	1,417,362

Note: All regressions include the year, country, industry and year-industry dummies (not reported in the table). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

The first column presents the coefficients estimated from the whole sample and in the second column the results are based on the sample of unlisted firms. Since the benchmark growth opportunity indicator is based on the euro-area listed firms, the exclusion of listed firms from the main sample could influence mostly the coefficient estimates of medium and large firms. We estimate a positive significant relationship among the growth and the industrial growth opportunity only for medium and large firms with a coefficient of 0.33 and 0.55, respectively. Even more interesting are the estimated coefficients of the first four variables (α_4 to α_7), where only the coefficient of small firms is positive and significant. Based on these estimates we can conclude that growth of the very small firms is unrelated to growth opportunities shocks, and they are unable to adapt even if the country's financial development is favourable. Small firms are able to grow faster in industries of good growth opportunities, but only in countries with a developed financial system. And finally, the medium and large firms are able to take advantage of growth opportunity shocks irrespective of the country's financial development. This could be explained by the less significant differences of financial development across countries. However, most probably the results are driven by the possibility of these firms to access financing sources of different countries through the international stock market, or through their subsidiaries operating in other countries. The coefficient of the

industrial growth opportunity is decreasing as expected, when listed firms are excluded from the sample but it stays positive and significant (column 2).

The main results do not change significantly, reconfirming that large firms are in better conditions to take advantage of the technology-based industrial growth opportunities. There is a positive size effect and it is slightly higher for smaller firms. Young firms grow faster irrespective of the size group to which they belong.

3.5 Robustness checks

3.5.1 Alternative specification

To check the sensitivity of the estimated coefficients, we propose an alternative specification adjusting for the co-integration of the firms' growth with its sales' growth. Additionally, we add some firm-level financial ratios as explanatory variables that could influence the firm's growth. These variables also shows how sensitive is the growth to alternative financing sources, like short- and long-term debt and internal finance.

The model is specified as:

$$\begin{aligned} Growth_{i,t} &= \alpha_1 + \alpha_2 (GOp_l \times F.Dev_{k,t} \times Mic_{i,t}) + \alpha_3 (GOp_l \times F.Dev_{k,t} \times S_{i,t}) + \\ &\alpha_4 (GOp_l \times F.Dev_{k,t} \times M_{i,t}) + \alpha_5 (GOp_l \times F.Dev_{k,t} \times L_{i,t}) + \alpha_6 (GOp_l \times Mic_{i,t}) + \\ &\alpha_7 (GOp_l \times S_{i,t}) + \alpha_8 (GOp_l \times M_{i,t}) + \alpha_9 (GOp_l \times L_{i,t}) + \alpha_{10} (\ln TA_{i,t} \times Mic_{i,t}) + \\ &\alpha_{11} (\ln TA_{i,t} \times S_{i,t}) + \alpha_{12} (\ln TA_{i,t} \times M_{i,t}) + \alpha_{13} (\ln TA_{i,t} \times L_{i,t}) + \alpha_{14} Young_{i,t} + \\ &\alpha_{15} SalesGr_{i,t} + \alpha_{16} AdjTerm_{i,t-2} + \alpha_{17} \Delta STD_{i,t} + + \alpha_{18} \Delta LTD_{i,t} + \alpha_{19} CF_{i,t} + \\ &\alpha_j \sum_{j=1}^{11} Year_j + \alpha_k \sum_{k=1}^{11} Country_k + \alpha_{j\times k} \sum_{j\times k=1}^{121} Year_j \times Country_k + \alpha_l \sum_{l=1}^{47} Industry_l \end{aligned} \quad (6)$$

As additional control variable an adjustment term ($AdjTerm_{i,t-2}$) is included that controls for the long-term relationship between growth and sales growth. It is calculated as the difference among second lag of total assets and sales and since it is a correction term, we expect a negative sign of coefficient. $SalesGr_{i,t}$ denotes the sales growth. $\Delta STD_{i,t}$ is the yearly change of short-term debt scaled by the total assets, $\Delta LTD_{i,t}$ is the annual change in long-term debt divided by total assets and $CF_{i,t}$ denotes the current cash flow. The estimated results are presented in Table 3.7 for the whole sample and for the sample of only unlisted firms.

Table 3.7: Estimation results of Model 4. Dependent variable: firms' growth

	(3)	(4) Only unquoted firms
$GrowthOp_l \times Fin.Dev_k \times Micro_{i,t}$	0.130	0.121
	(2.0)**	(1.85)*
$GrowthOp_l \times Fin.Dev_k \times Small_{i,t}$	0.248	0.236
	(3.8)***	(3.71)***
$GrowthOp_l \times Fin.Dev_k \times Medium_{i,t}$	-0.324	-0.311
	(-3.8)***	(-3.72)***
$GrowthOp_l \times Fin.Dev_k \times L\arg e_{i,t}$	-0.112	-0.082
	(-2.0)**	(-1.50)
$GrowthOp_l \times Micro_{i,t}$	-0.136	-0.130
	(-2.3)**	(-2.15)**
$GrowthOp_l \times Small_{i,t}$	-0.203	-0.193
	(-3.6)***	(-3.47)***
$GrowthOp_l \times Medium_{i,t}$	0.328	0.317
	(4.3)***	(4.32)***
$GrowthOp_l \times L\arg e_{i,t}$	0.271	0.251
	(4.8)***	(4.58)***
$\ln TA_{i,t} \times Micro_{i,t}$	0.058	0.058
	(59.1)***	(60.17)***
$\ln TA_{i,t} \times Small_{i,t}$	0.047	0.047
	(73.1)***	(74.44)***
$\ln TA_{i,t} \times Medium_{i,t}$	0.040	0.040
	(79.6)***	(80.82)***
$\ln TA_{i,t} \times L\arg e_{i,t}$	0.033	0.033
	(62.5)***	(63.66)***
$Young_{i,t}$	0.022	0.022
	(17.0)***	(16.84)***

Table 3.7: Estimation results of Model 4. Dependent variable: firms' growth (Continued)

	(3)	(4) Only unquoted firms
$SalesGrowth_{i,t}$	0.354	0.354
	(52.2)***	(51.87)***
$AdjTerm_{i,t-2}$	-0.061	-0.061
	(-63.8)***	(-64.53)***
$\Delta ShortTDebt_{i,t}$	0.544	0.544
	(15.2)***	(15.14)***
$\Delta LongTDebt_{i,t}$	0.430	0.430
	(6.8)***	(6.77)***
$CashFlow_{i,t}$	0.162	0.161
	(24.4)***	(24.58)***
R^2	0.34	0.34
N	729,524	728,381

Note: All regressions include the year, country, industry and year-industry dummies (not reported in the table). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Sales growth is positively related to firms' growth with a coefficient of 0.35 and the adjustment term is negative, as expected. From the set of financial variables included, the long-term debt has the highest influence on the firms' growth with a coefficient estimate of 0.55. Different from the previous estimations the micro and small firms' growth are negatively correlated to the growth opportunity, and its magnitude is reduced in the countries with better financing development. More importantly, the main results are in line with the previous interpretation, i.e. the medium and large firms' growth is positively related to the industrial growth opportunities, indicating the elasticity of their financing sources that makes it possible to adapt to the time-varying industry shocks.

3.5.2 Alternative test of financing constraints across size-groups

As a robustness check on whether firms' size matters for growth, we computed the

percentage of firms that use external financing to fund growth, especially long-term external financing. We follow Demirgüç-Kunt and Maksimovic's (1998; 2002) approach based on the "percentage of sales" financial planning model (see also Higgins, 1977). According to this model, it is possible to estimate for each firm the maximum rate of growth at which it can grow when only internal funds or short-term borrowing are available.[19] In particular, we can calculate the following three ratios:

(a) the maximum internally financed growth rate as: $IG_t = ROA_t /(1 - ROA_t)$, where ROA_t is the firm's return on assets;

(b) the maximum growth rate that can be attained if the firm uses only short-term external financing is defined as: $SFG_t = ROLTC_t /(1 - ROLTC_t)$, where $ROLTC_t$ is the return on long-term capital (assets that are not financed by new short-term credit).

(c) the maximum sustainable growth rate: $SG_t = ROE_t /(1 - ROE_t)$, where ROE_t is the return on equity. This indicator measures the growth rate of firms that obtain long-term financing (debt and/or equity) by issuing public or privately placed securities or by borrowing from the financial sector.

We calculate the proportion of firms that grow at rates that exceed those estimated rates across size groups. The outcomes are presented in Table 3.8, which confirms our previous findings. Large firms are on average growing more than predicted by their availability of internal or external financing means. Among micro firms, only 45% of firms can exceed the growth rate financed by internal sources, and this percentage increases by size to 60% for large firms. In a similar manner, among micro firms about 37% of the firms exceed the growth rate financed by short-term credit and internal sources, while from the group of large firms about 51% of the firms finance their investments by long-term external capital. The results show that micro and small firms rely less on external sources, and consequently they grow more slowly.

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[19] In particular the external financing need of a firm at time t (EFN_t) growing at g_t percent a year is given by the equation: $EFN_t = g_t * Assets_t - (1 + g_t) * Earnings * b_t$, where b_t is the proportion of the firm's earnings that are retained for reinvestment at time t and it is assumed to be 1. The first term on the right-hand side is the required investment for a firm growing at g_t percent. The second term is the internally available capital for investment. The model makes several implicit assumptions about the relation between the firm's growth and the EFN_t (see Demirgüç-Kunt and Maksimovic, 2002, pp.346-347).

Table 3.8: Proportion of firms growing faster than predicted

	Proportion of firms that exceed their:		
	Internally financed growth rate	Max. short term-financed growth rate	Max. sustainable growth rate
Micro	45.22%	36.55%	31.81%
Small	55.02%	43.66%	37.67%
Medium	60.45%	50.38%	44.37%
Large	60.79%	50.76%	43.75%

3.6 Conclusions

We test whether firm size matters for an efficient reallocation of financial resources following a sector-specific positive growth shock. Such a response can only be efficient if firms' financial sources are elastic enough for the required investment, i.e. if firms are able to get additional external financing to realise their improved growth opportunities. Consequently such efficiency reveals some information on the financing conditions of the firm. In the long run, the role of time-invariant technological need for external finance is investigated in explaining the relative importance of the firm size across sectors. In this case firm size can be considered as an endogenous outcome of the "accumulated" financing constraints.

For large and medium firms we find that industries with higher growth opportunities are able to grow relatively faster compared with firms in other sectors, indicating an environment of favourable financing conditions. These firms are able to adapt to the time-varying industrial growth opportunity shocks in the short run and to specialise in industries with a high natural reliance on external financing on the long run.

By contrast, for the micro and small firms we find evidence for the presence of financing constraints. Firms' realised growth is limited by the availability of resources and, therefore, firms are less able to realise their sector-specific financing need or growth opportunities.

The country-specific financial development (banking sector) seems to overcome these constraints for small firms, but it does not facilitate the growth of micro firms. In this context, it seems relevant to investigate separately the group of micro and small firms with respect to the financing tools and policies able to facilitate their access to external finance. Using an indicator

of growth funding, we also find that micro and small firms finance a smaller share of their investment and working capital with external financial sources than large firms. In general, we can conclude that firm size does matter for the financing condition of the euro-area firm.

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Data Appendix

Table A3.1: Sample construction (AMADEUS)

	Description	No. of firms (1993-2004)	No of firm-years (1993-2004)
1.	Euro area	2,625,759	14,937,948
2.	Non-financial sectors, excluding agriculture, forestry, fishing and mining[20]	2,290,293	13,205,890
3.	Non-negative balance sheets items	2,280,066	12,992,609
4.	Consistent balance sheet items at 5%[21]	1,630,597	7,502,835
5.	Total assets and operating revenue not	1,457,036	6,484,567
6.	Determined sector classification (not missing NACE and SIC code)	1,224,975	5,602,635
7.	Active legal status[22]	1,168,846	5,354,892
8.	Controlled sample for double accounting (excluding subsidiaries owned by more than 24.9% by a firm from the sample)	1,078,013	4,806,876
9.	Trimming of data removing the upper and lower 1 percentile of the total asset distribution + Including only observations where three consecutive years of data are available	259,929	1,421,753

[20] Excluded sectors: A-Agriculture and related service activities, B-Fishing, operation of fish hatcheries and fish farms, C-Mining and quarrying, J-Financial intermediation, L-Public administration and defence, compulsory social security, M-Education, N-Health and social work, O-Other community, social and personal service activities, P-Private households with employed persons, Q- Extra-territorial organisations and bodies.

[21] It is checked if the sum of the sub-items equals the item provided in the database. When not all sub-items are provided, it is ensured not to be greater than the item to which it belongs, like cash and cash equivalent ✧ other current assets.

[22] Firms are selected with legal status defined as “Active”, “Active (default of payments)”, “Active (receivership)”. Firms are excluded under legal status defined as “Bankruptcy”, “Dissolved”, “Dissolved (demerger)”, “Dissolved (merger)”, “In liquidation”, “Inactive (no precision)”, “Credito incobrable”, “Naar buitenland”, “Not classified” or “Not defined”.

Table A3.2: Sample distribution by countries (AMADEUS)

		No. of firms	No. of firm-years
1.	Austria	38	144
2.	Belgium	3,926	26,638
3.	Finland	10,305	50,493
4.	France	137,229	768,511
5.	Germany	469	1,806
6.	Greece	5,687	31,269
7.	Italy	36,421	217,431
8.	Luxembourg	46	241
9.	Netherlands	648	4,208
10.	Portugal	536	2,218
11.	Spain	64,624	318,794

Table A3.3: Sample distribution by sectors (AMADEUS)

	No. of firms	No of firm-years
Construction	35,911	189,718
Manufacturing	77,418	448,834
Utilities	1,621	8,987
Wholesales and retail sales	101,106	542,248
Transport and communications	16,788	92,238
Services	27,085	139,728

Table A3.4: Sample description by quotation (AMADEUS)

	No. of firms	No of firm-years
Quoted	259,226	1,417,362
Unquoted	703	4,391

Table A3.5: Sample description by size (AMADEUS)

	No. of firms	No of firm-years	No. of employees (mean)	Total assets (mean)	Turnover (mean)
Micro	143,981	654,073	5.3	511.3	825.6
Small	91,798	578,395	21.8	2,606.7	4,141.7
Medium	20,198	160,450	87.6	13,104.2	17,730.7
Large	3,952	28,835	1,801.2	432,867.9	401,902.0

Table A3.6: Sample distribution by countries of the benchmark sample (Thomson Financial DataStream)

		Sample for financing need		Sample for growth opportunities	
		N -firms	N-firm-years	N-firms	N-firm-years
1.	Austria	30	427	39	484
2.	Belgium	46	590	71	760
3.	Finland	68	814	93	1,041
4.	France	297	3,637	484	5,188
5.	Germany	308	3,811	484	5,225
6.	Greece	116	1,147	200	1,740
7.	Ireland	20	320	23	343
8.	Italy	115	1,314	143	1,554
9.	Luxembourg	7	59	10	89
10.	Netherlands	69	1,006	84	1,185
11.	Portugal	29	332	38	435
12.	Spain	63	682	73	797

Table A3.7: Benchmark indicators: sector-specific financing need and growth opportunities (Thomson Financial DataStream)

Sectors	SIC code	Fin.Need Benchmark	Gr.Opp. Benchmark
General building contractors	15	0.56	0.12
Other contractors	17	0.13	0.09
Food products	20	-0.01	0.07
Beverages and Tobacco	21	-0.11	0.03
Textile	22	0.11	0.03
Spinning	228	0.53	0.00
Apparel	23	-0.31	0.05
Wood products	24	0.03	0.03
Furniture	25	-0.40	0.05
Paper and products	26	0.23	0.05
Printing and publishing	27	-0.02	0.07
Other chemicals	28	0.12	0.07
Synthetic resins	282	-0.04	0.04
Drugs	283	0.03	0.08
Petroleum and coal products	29	0.03	0.07
Rubber products	30	0.17	0.11
Plastic products	308	0.06	0.07
Glass	321	-0.69	0.05
Pottery	324	0.14	0.07
Non-metal products	327	0.04	0.07
Iron and steel	331	0.33	0.08
Nonferrous metal	334	0.47	0.09
Metal products	34	-0.14	0.04
Machinery	35	-0.06	0.08
Office and computing	357	0.55	0.10
Electric machinery	36	-0.02	0.09
Radio	366	-0.11	0.02
Transportation equipment	37	0.24	0.09
Motor vehicle	371	0.14	0.08

Table A3.7: Benchmark indicators: sector-specific financing need and growth opportunities (Continued)

Sectors	SIC	Fin.Need Benchmark	Gr.Opp. Benchmark
Professional goods	38	0.37	0.12
Other industries	39	-0.25	0.05
Water transportation	44	0.13	0.05
Transportation by air	45	0.18	0.06
Transportation services	47	0.41	0.08
Communications	48	0.09	0.15
Electric, gas, and sanitary	49	0.08	0.07
Wholesale trade--durable	50	0.15	0.09
Wholesales -Office eq. and	504	0.46	0.12
Wholesale trade--	51	0.25	0.07
General merchandise stores	52	0.51	0.12
Food stores	54	0.11	0.12
Apparel and accessory	56	-0.10	0.10
Furniture, home furnishings	57	0.30	0.04
Eating and drinking places	58	0.02	0.11
Miscellaneous retail	59	0.01	0.12
Hotels, rooming houses	70	0.33	0.07
Business services	73	0.58	0.15

4. DISCOUNT OR PREMIUM? NEW EVIDENCE ON CORPORATE DIVERSIFICATION OF UK FIRMS

4.1 Motivation

There is an ongoing debate in the finance literature whether corporate diversification decreases or increases the value of shareholders. Whereas a lower market value is documented for both cases, conflicting arguments result from the interpretation of the documented valuation discount. The basic question is whether the act of corporate diversification destroys value or whether the lower market valuation causes firms to diversify in search of better opportunities and ultimately increases value. We provide additional evidence on this relationship by investigating the endogeneity of the diversification decision relying on a market largely ignored in the previous literature.

The scarce empirical evidence for the UK suggests that diversified companies are traded with a discount of about 15% (Lins and Servaes, 1999). However, Goergen and Renneboog (2004) find that the large European mergers and acquisitions (M&A) bids in the 1990s are motivated by synergies and about 60% of M&A have positive total wealth gains. Hence, there is also evidence that European companies intend to maximize shareholders' value through M&A, which is one of the ways to diversify. We provide new evidence on the UK conglomerates by investigating two research questions. First, we examine whether the valuation discount of UK conglomerates is attributed to the diversification or it is caused by other characteristics. By controlling for endogeneity, we evaluate the impact of diversification on firm value. Second, we look at the reasons to diversify in the UK with respect to the findings for the US.

Previous literature on UK conglomerates considers diversification status as an exogenous variable without taking into consideration the influence of other variables on the diversification decision. We measure the effect of diversification on firm value by taking into account the possibility of endogeneity. Following Campa and Kedia's (2002) methodology, we assume that the decision to operate as a diversified firm is a function of industry-, firm-specific characteristics and macroeconomic effects. The choice of the organizational structure is considered as the endogenous outcome influenced by these variables. In addition, we rely on an extended sample period relative to previous studies for the UK. The benchmark stand-alone firms to which the segments of diversified firms are compared include also de-listed firms as a

result of M&A or bankruptcy. These dead companies are on average discounted and some of the companies become the new unit of the diversified firm through M&A. Hence, the ignorance of dead companies in the calculations could influence the calculated discount. By incorporating dead firms in the calculations of excess value we correct for a possible upward bias of the diversification discount (Campa and Kedia, 2002; Graham, Lemmon and Wolf, 2002).

We also analyse the determinants of diversification simultaneously with the possible causes of lower market value of conglomerates. The crucial difference between the two branches of the literature, with the value-decreasing versus value-increasing diversification findings, lies in the explanation of the negative excess value. Campa and Kedia (2002) argue that the characteristics of firms that diversify may cause firms to be discounted. Thus, firm characteristics that may determine the lower market value are investigated in more detail. In particular, we identify the variables that determine firms to operate as a diversified firm and they could also decrease the excess value.

The rest of the paper is organized as follows. Section 2 comprises the literature overview. Section 3 describes the data sample, excess value calculations and summary statistics. Section 4 presents the estimation methodology together with the empirical findings. Section 5 concludes the paper/is the conclusion.

4.2 Literature Overview

Over the past decade, an extensive finance literature has emerged focusing on the relationship between corporate diversification and market valuation of firms. Theoretical arguments suggest that diversification may have both value-enhancing and value-reducing effects. One potential benefit of corporate diversification can be a more efficient resource allocation through an internal capital market, especially when the external capital market is relatively less developed (Stein, 1997; Hubbard and Palia, 1999; Matsusaka and Nanda, 2002). Other arguments are a greater debt capacity as a result of the coinsurance effect; lower taxes arising from the tax code's asymmetric treatment of gains and losses; managerial economies of scale; and increased market power, as a result of cross-subsidized predatory pricing (Matsusaka, 2001; Maksimovic and Philips, 2002; Burch, Nanda and Narayananuse, 2002).

The potential costs of diversification are value-decreasing investments and inefficient allocation of capital among divisions of diversified firms (Lamont (1997), Scharfstein (1998), Rajan, Servaes and Zingales, 2000). Berger and Ofek (1995) show that the value loss can be

explained by over-investment and cross-subsidization of diversified firms. Other studies emphasize the agency costs of diversified firms (Denis, Denis and Sarin, 1997; Hyland and Diltz, 2002; Aggarwal and Samwick, 2003). Another destroying effect of diversification may be information asymmetries, which can appear between central and divisional managers and between inside managers and outside investors (Meyer, Milgrom and Roberts, 1992; Scharfstein and Stein, 2000; Holmstrom and Kaplan, 2001).

Since diversification could have both value destroying and value enhancing effects, there is the need of empirical investigations analyzing the effect of corporate diversification. However, previous empirical research on the diversification consequences shows contradicting results. A great amount of studies provide empirical evidence on the value-destroying effect of corporate diversification. These studies compare the market value of firms operating in multiple lines of business to the value of a portfolio of stand-alone firms operating in the same industries as the conglomerate. From the methodological point of view mostly the simple pooled OLS estimation technique is used. Lang and Stulz (1994) argue that the diversification discount is consistent with the view that diversification hurts performance. Berger and Ofek (1995) find an average value loss from diversification of about 15% and the results obtained by Servaes (1996) also exhibit a large diversification discount in the period of the conglomerate merger wave. Based on the estimated discount, a significant number of studies suggest that diversification has not been beneficial for US corporations, and the firms have not been able to exploit the potential benefits (Morck, Shleifer and Vishny, 1990; Shleifer and Vishny, 1988).

Our paper is in line with the more recent literature that emphasise the value-increasing effect of diversification. Following Campa and Kedia (2002), the characteristics of diversified firms, which make the benefits of diversification greater than the costs, may also cause firms to be discounted. The discount is attributable to other factors than diversification and these factors influence both the firm value and the decision to diversify. After controlling for firm-specific characteristics in the decision to diversify a diversification premium is obtained.

Supporting evidence for this hypothesis is presented by studies which analyse firms prior to diversification. Graham, Lemmon and Wolf (2002) find that much of the value reduction occurs because the firm acquires already discounted business units, and not because diversification destroys value. Villalonga (2004) and Hyland (2002) find supporting evidence for the presence of a discount before diversification takes place, which is consistent with Maksimovic and Philips' (2002) value-maximizing theory. Whited (2001) finds also no evidence for inefficient allocation of investments of conglomerates. She argues that the

estimated discount should be attributed to the measurement errors in Tobins' Q. In addition, Gomes and Livdan (2004) provide a theoretical model to illustrate the optimality of diversification for large mature firms, since in this way they can overcome the decreasing returns nature of the single-sector technology. Their theoretical model and its application to an artificial panel predict for diversified firms in general lower market to book values relative to focused firms despite the result that diversification is optimal.

4.3 Sample, Excess Value and Summary Statistics

The sample consists of the constituent companies of the FTSE all-share index listed on the London Stock Exchange over the 1998 – 2003 period and de-listed companies (both diversified and specific firms) which provide balance-sheet, profit and loss statements for the selected period. Firms are considered as diversified when they report sales or profits in two or more segments as defined by the two-digit SIC code level. Single-segment firms are those with only one reported segment or those with more than one reported segment but the main segment accounts for more than 90% of total sales and total profits. Our calculations rely on the sample of diversified firms, regardless of the time of diversification. In line with the previous literature on UK diversification, we analyze only unrelated diversification.[23]

We start with the entire list of 697 firms included in the FTSE all-share index and the list of 3,261 dead firms collected from Thomson Financial Datastream. From the list of dead firms those that were active and provide data for the period between 1998 and 2003 (526 firms) are selected. We exclude years when firms report segments in the financial sector and years in which the sum of segment sales deviated from total sales by more than 1%. Firm-years with one of the firms' segments in a miscellaneous product area are also excluded whenever this segment's sales account for more than 10% of total sales or total profit. If this unidentified segment accounts for less than 10% of both total sales and total profits, the firm's segment sales reported in the miscellaneous product area we include into the firm's major segment.

In addition, we apply the criteria introduced by Berger and Ofek (1995) and widely used in the previous literature. This criteria is based on the exclusion of observations for which total

[23] Related diversification means that firms operate in industry segments with similar two-digit SIC codes but different three- or four-digit SIC codes. In case of unrelated diversification firms operate in different industry segments based on two-digit SIC codes. Evidence on the US suggests that there is no discount for related diversification (Meyer, Milgrom and Roberts, 1992; Morck, Shleifer and Vishny, 1990; Graham, Lemmon and Wolf, 2002).

sales are less than £11 million as well as extreme excess values greater than 1.386 or smaller than – 1.386. The final sample consists of 796 current and dead firms with 2,252 firm-years. Current firms are those that are listed in 2003 on the London Stock Exchange. Dead companies are those de-listed firms that were removed from the market during the period between 1998 and 2003 due to M&A, bankruptcy or other reasons. The selected final sample facilitates a comparison with the existing literature (Berger and Ofek, 1995; Lins and Servaes, 1999; Campa and Kedia, 2002). Table 4.1 reports the sample selection details.

Table 4.1: Sample Selection Procedure

Current firms	Number of firms	Number of firm-years	Dead firms	Number of firms	Number of firm-years
1. Non-financial firms in FTSE all share index constituent list	480	1,848	1. Non-financial dead firms that report accounting items in the period 1998 – 2003	526	1,176
2. Firms with total sales deviated from sum of segments sales less than 1% or one of the segment with less than 10% is in unidentified segment	475	1,834	2. Firms with total sales deviated from sum of segments sales less than 1% or one of the segment with less than 10% is in unidentified segment	462	1,044
3. Firms with total sales more than £11 million	459	1,747	3. Firms with total sales more than £11 million	399	883
4. Firms with excess value smaller than 1.386 or greater than -1.386	433	1,496	4. Firms with excess value smaller than 1.386 or greater than -1.386	363	756
Final sample: current and dead firms	Number of firms: 796 Number of firm-years: 2,252				

Note: The constituent list of FTSE all share index is based on the list drawn on September 30, 2003. Current firms are those that are listed in 2003 on the London Stock exchange and observations are collected for the period between 1998 and 2003. Dead companies are firms removed from the market during the period between 1998 and 2003 due to merger, acquisition, bankruptcy or other reasons.

The market value of conglomerates relative to the single-segment firms is analyzed by Berger and Ofek's (1995) excess value measure where the imputed value is calculated as:

$$IV = \sum_{j=1}^{n} \left(\frac{MV_s}{S_s} \right)_j S_j \,. \tag{1}$$

The term $(MV_s / S_s)_j$ represents the market-to-sales ratio for the median single-segment firms belonging to the industry sector that corresponds to the segment j of the diversified firm.[24] S_s and MV_s are total sales and market value of the median single segment firm, respectively. S_j denotes the sales of segment j of the diversified company. n is the number of segments in diversified firms. Relying on the imputed value (1), the excess value can be calculated as:

$$EV = \ln \frac{MV}{IV}, \tag{2}$$

where MV is the end of the year market value of common equity plus the book value of debt and preference capital of a given company.

The excess value (2) measures the actual value of firms relative to the median single-segment firm operating in the same industries in that year. This makes the excess value measure industry- and time-neutral.[25] When the market value of conglomerates is less than the weighted sum of imputed divisional values we get a negative excess value. A negative excess value indicates a valuation discount, whereas positive excess values are indicative of a premium. For the firm's imputed value calculation in the sample of benchmark single-segment firms we include those firms that were de-listed from the market. Our sample includes also diversified firms that operate in industries without single-segment firm counterparts. In such cases, the imputed value is calculated based on the median capital to sales ratio of the closest industry group.

The characteristics of single-segment and diversified firms are examined with the average value of firm size (total assets and total capital), the leverage ratio, profitability (the ratio of

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[24] Within the Berger-Ofek methodology assets or earnings can be used instead of sales. Since we can get consistent segment data only for sales, we avoid using the other two variables.

[25] However, time patterns in the excess value measure can arise due to changes in the distribution of single-segment firms as well as the entry and exit of the firms in the sample (Campa and Kedia, 2002).

operating income to sales and the ratio of EBIT to sales), firm's growth (the first difference of total assets to sales ratio) as well as the excess value. The summary statistics of current and dead firms in Table 4.2 show that dead companies are approximately five times smaller (based on total assets and total capital), have lower profitability (based on median values of operating income to sales and EBIT to sales) and lower excess values (both single- and multi-segment) compared to current firms. This suggests that the absence of dead companies from the sample may lead to an upward bias in the diversification discount.

Diversified firm-years account for 36% of the sample. Based on total assets and total capital, diversified firms are twice as big as single-segment companies. Since an average single-segment company possesses total assets of £1,121 million, diversified companies' assets are valued at £2,210 million. The differences in total assets and total capital between single- and multi-segment firms are even bigger when we look at the median values. Hence, a proper evaluation of the effect of diversification on firm value should take into account firms' size.

Theoretically, one of the benefits of diversified firms is the greater debt capacity as a result of the coinsurance effect. From the sample statistics in Table 4.2 we see that leverage is higher for diversified firms than for single-segment companies. This confirms the theoretical expectation that diversified firms take advantage of the coinsurance opportunity. Looking at the profitability measures (EBIT/sales and operating income/sales), we find no evidence for worse performance of diversified companies. However, the average growth of diversified firms is lower compared to focused firms, which could affect negatively their market value.

Table 4.2: Summary Statistics

	Total assets		Total capital		Leverage ratio		Operating income/sales		EBIT/sales		Firms growth/ sales		Excess value	
	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.	Mean	Med.
Current firms	2069.57	243.05	2846.08	301.453	0.221	0.200	0.032	0.080	0.039	0.090	0.130	0.056	0.010	0.000
Single-segment f. (897 firm-years)	1647.29	169.31	2257.01	232.642	0.197	0.170	0.007	0.080	0.014	0.090	0.160	0.055	0.033	0.010
Multi-segment f. (599 firm-years)	2701.93	624.80	3728.20	649.453	0.258	0.240	0.068	0.090	0.076	0.090	0.078	0.057	-0.023	-0.020
Dead firms	413.277	76.551	614.102	77.671	0.222	0.200	0.012	0.060	0.021	0.070	0.139	0.046	-0.120	-0.090
Single-segment f. (544 firm-years)	253.403	76.073	359.271	78.553	0.226	0.210	-0.006	0.060	0.003	0.060	0.148	0.050	-0.107	-0.070
Multi-segment f. (212 firm-years)	823.522	76.786	1268.00	75.140	0.211	0.170	0.058	0.080	0.070	0.090	0.108	0.036	-0.153	-0.115
Final sample-all firms	1513.55	169.01	2096.80	208.821	0.221	0.201	0.025	0.077	0.033	0.083	0.132	0.054	-0.033	0.000
Single-segment f. (1441 firm-years)	1121.07	130.86	1540.58	164.342	0.208	0.183	0.002	0.072	0.010	0.077	0.156	0.054	-0.020	0.000
Multi-segment f. (811 firm-years)	2210.90	354.60	3085.09	365.822	0.245	0.226	0.065	0.086	0.074	0.091	0.083	0.055	-0.057	-0.051

Note: Total assets and total capital are expressed in £ million. Total capital is defined as the market value of equity plus the book value of total debt and preferred capital. Leverage ratio is calculated as the ratio of total debt to total assets. Firms' growth is calculated as the first difference of total assets divided by sales. Excess value is the ratio of firm value to its imputed value and it measures the actual value of firms relative to the median single-segment firms operating in the same industries in the given year. Current firms are those that are listed in 2003 on the London Stock Exchange. Dead firms are removed from the market during the 1998 – 2003 period due to merger, acquisition, bankruptcy or other reasons.

4.4 Methodology and Empirical Results

In this section, we address the following issues. First, we present empirical findings using the pooled OLS method to provide a comparison with the previous literature on UK data (subsection 4.1). Second, the determinants of diversification are analysed. Based on macroeconomic effects, industry- and firm-specific characteristics the diversification probability is estimated (subsection 4.2). Third, we allow the diversification dummy to be endogenously determined and estimate the effect of diversification on firms' market value. Following Campa and Kedia (2002) the estimated probability is used as an instrument in the general two-stage least squares model. In this way, endogeneity is taken into consideration and the effect of diversification on firms' value can be obtained (section 4.3). Fourth, we investigate the firms' growth correlation with the macroeconomic environment and its influence on the firms' decision to diversify and the excess value (section 4.4).

4.4.1 Pooled OLS Estimation

The regression specification is as follows:

$$EV_{it} = \alpha + \delta D_{it} + \beta' X_{it} + e_{it}\,. \tag{3}$$

EV_{it} denotes the firms' excess value as defined above, α is a constant, and D_{it} the diversification dummy, which takes the value 1 if the firm operates in more than one industry and 0 otherwise. X_{it} represents the set of firm characteristics that could influence the excess value. The control variables approximate firm size (natural logarithm of total assets) TA_{it}, profitability (ratio of operating income to sales) PR_{it} and leverage (ratio of total debts to total assets) LEV_{it}.[1] e_{it} represents the error term.

Estimation results are reported in Table 4.3. There are differences in the estimated coefficient of the discount dummy across years, which suggest that year-specific characteristics should be taken into consideration in a pooled estimation. Furthermore, for the year 2003 only a few observations are available and as a result the yearly estimates for 2003 should be interpreted with caution. Since the pooled regression excluding the year 2003

[1] Part of the previous literature also uses capital expenditure as a control variable to approximate investment. Such data are not available to us.

(results not reported but available upon request) do not change significantly the pooled results, the sample 1998 – 2003 is used through the rest of the calculations.

When looking at the whole period, we find a positive and significant size effect on the excess value. The effect of profitability on the firms' excess value is positive but not significant, while the coefficient of leverage is positive and significant. More importantly, the diversification discount is about 9% and it is significant. The estimated smaller diversification discount compared to previous evidence (Lins and Servaes, 1999) could be attributed to the survivor bias corrected in our investigation. Another possible explanation could be the different analyzed time period, which may suggest that the valuation discount of diversified firms decreased over time from 15% (1994) obtained by Lins and Sevaes (1999) to 9% estimated in the current paper. The rest of the estimated coefficients correspond to the previous findings.

Table 4.3: Estimation of the Diversification Discount over Time

	α	D_{it}	TA_{it}	PR_{it}	LEV_{it}	$\overline{R}^2$	N
1998	-0.44	-0.13	0.04	-0.06	0.06	0.01	463
	(-2.08)**	(-2.12)**	(1.92)*	(-1.25)	(0.35)		
1999	-0.38	-0.08	0.02	0.68	0.26	0.03	494
	(-1.79)*	(-1.31)	(1.29)	(3.45)***	(1.74)*		
2000	-0.37	-0.11	0.03	0.27	0.05	0.01	425
	(-1.70)*	(-1.63)*	(1.51)	(1.97)**	(0.32)		
2001	-0.91	-0.08	0.07	0.03	0.01	0.03	406
	(-3.97)***	(-1.24)	(3.75)***	(0.69)	(0.03)		
2002	-0.27	-0.08	0.02	0.22	0.18	0.04	376
	(-1.15)	(-1.21)	(0.97)	(3.58)***	(1.06)		
2003	-0.64	0.14	0.04	0.15	0.43	0.01	88
	(-1.30)	(.68)	(0.85)	(0.59)	(1.13)		
1998-2003	-0.50	-0.09	0.04	0.06	0.15	0.02	2252
	(-4.96)***	(-3.07)***	(4.51)***	(1.16)	(2.21)**		

Note: The estimated regression equation is $EV_{it} = \alpha + \delta D_{it} + \beta' X_{it} + e_{it}$, where α is a constant, EV_{it} denotes the excess value and D_{it} is the diversification dummy, which takes the value 1 if the firm operates in more than one industry and 0 otherwise. X_{it} contains control variables as the firm size TA_{it}, profitability PR_{it} and leverage ratio LEV_{it}. *t*-statistics are reported in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively. $\overline{R}^2$ is the adjusted coefficient of determination and N the number of observations.

4.4.2 Probit Estimation

To investigate the determinants of diversification the diversification probability is estimated using three types of variables which could influence the firms' decision to function as a single- or multi-segment firm. These variables measure industry-, macroeconomic- and firm-specific characteristics. The firms' decision to operate as a multi-segment firm is determined by:

$$P_{it} = \gamma' Y_{it} + \mu_{it}, \tag{4}$$

where Y_{it} is the set of exogenous variables and μ_{it} denotes an error term. The latent variable P_{it} is not observable. D_{it} takes on values of 0 or 1 according to the following rule:

$$D_{it} = \begin{cases} 1, \text{ if } P_{it} > 0 \\ 0, \ otherwise \end{cases}. \tag{5}$$

The estimated probability of a positive outcome of equation (4) is:

$$\hat{P}_{it} = Prob\left(D_{it} = 1 \middle| Y_{it}\right) = \phi\left(\gamma' Y_{it}\right), \tag{6}$$

where $\phi(.)$ denotes the standard normal distribution. $\hat{P}_{it}$ is used in the next subsection as an instrument in the general two-stage least squares model. For a theoretical discussion of the probit model see Maddala (1983).

Y_{it} is the set of observable variables including firm-specific variables, macroeconomic and business trend variables as well as industry dummies. The firm characteristics are operating income to sales (PR_{it}), leverage (LEV_{it}), the square value of both variables $(PR_{it}^2,\ LEV_{it}^2)$, dividends (DIV_{it}) and size dummies. The size dummy variables are defined based on four size-groups: firms with total capital less than £50 million $(S1_{it})$, firms with total capital between £50 and £150 million $(S2_{it})$, firms with total capital between £150 and £500 million $(S3_{it})$ and firms with total capital more than £500 million $(S4_{it})$.

Based on the theoretical argument that diversified firms take advantage of greater debt capacity by a coinsurance effect, we expect a positive correlation between leverage and the diversification probability. Operating income to sales ratio and dividends can be considered as variables capturing firms' performance. Following the hypothesis of value-decreasing investments and inefficient allocation of capital among divisions of diversified firms (Lamont,

1997; Scharfstein, 1998; Rajan, Servaes and Zingales, 2000) we can expect a negative impact of performance on the diversification probability. However, if we accept the hypothesis of a more efficient resource allocation through an internal capital market (Stein, 1997; Hubbard and Palia, 1999; Matsusaka and Nanda, 2002), positive coefficients of profitability and dividends are expected. Hence, the effect of profitability and dividends can be either positive or negative, confirming one of these two hypotheses. As the firm grows in size, marginal productivity falls and becomes unprofitable for the firm to invest additional resources in ongoing activities (Gomes and Livdan, 2004). Hence, large firms have higher benefits from diversification and based on this we expect a positive size effect.

The business trend and macroeconomic variables are the yearly real growth of gross domestic product (GDP_{it}), the number of announced domestic M&A in a year expressed in thousand of firms (NMA_{it}), the value of M&A expressed in £ hundred billions (VMA_{it}) as well as two year dummies $(Y1999_{it}$ and $Y2001_{it})$.[27] We expect a negative GDP effect, since under deteriorating economic conditions firms are facing higher economic and financial risks and diversification could be a solution to decrease it. We include M&A activities because this is one of the ways in which a firm changes its diversification status besides internal growth and restructuring the existing operations. Hence, we expect a positive coefficient for both variables. Other year-specific effects not captured by the GDP and M&A activities are controlled by the year-dummies. Year-specific variables are important in the model, since they capture the decision to diversify without influencing directly the excess value of the firm.

Industry-specific effects are controlled through industry dummies. Each dummy variable represents one of the industry divisions defined by the one-digit SIC codes. These are the following industry divisions:

- extraction of minerals and ores other than fuels, manufacture of metals, mineral products and chemicals $(IND2_{it})$,
- metal goods, engineering and vehicles $(IND3_{it})$,
- other manufacturing $(IND4_{it})$,
- construction $(IND5_{it})$,
- distribution, hotels and catering, repairs $(IND6_{it})$,
- transport and communication $(IND7_{it})$,

[27] Other year-dummies are dropped from the model due to multi-collinearity.

- business services ($IND8_{it}$) and
- other services ($IND9_{it}$).

In the case of single-segment firms the industry dummy takes the value 1 if the firm operates in the given industry and 0 otherwise. The industry dummy variables for diversified firms take a value between 0 and 1 based on the share of segment sales in total sales. The sum of all industry variables for a given diversified firm takes the value 1.

The maximum likelihood estimates of the probit model are reported in Table 4.4. Column 2 and 3 represents the estimates of the model including all variables mentioned above. The null hypothesis that the model does not have greater explanatory power than an intercept only model is rejected at the 1% significance level according to the likelihood ratio test. For the interpretation of the results we present also the marginal effects of the explanatory variables calculated at its sample mean.[28]

When looking at the set of firm characteristics, the influence of profitability on diversification probability is positive but not statistically significant. The effect of leverage is nonlinear and significant. Leverage is positively related to the diversification probability. However, based on the coefficient of the square value of leverage, it can be argued that firms with leverage above a given rate exhibit a lower probability to diversify. We find a significant positive dividend coefficient, which confirms the value-increasing effect of diversification. This result is in line with the findings of Schoar (2002) that conglomerates are more productive than stand alone firms. With respect to size, we observe a monotonic increase in coefficients of different size dummies ($S1_{it}$, $S2_{it}$ and $S4_{it}$), which can be interpreted as evidence of a positive size effect of diversification probability.[29] The probability to act as a diversified firm is significantly higher for firms with total capital higher than £500 million ($S4_{it}$) than for small firms with total capital less than £50 million ($S1_{it}$). This can be explained by the higher possible benefits and higher capacities of large relative to small firms to diversify.

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[28] The marginal effect presents the change in the probability caused by an infinitesimal change in each independent variable. In the case of the dummy variables the marginal effect shows the change in probability for a discrete change from 0 to 1.

[29] One of the size groups need to be excluded because of perfect multi-collinearity resulting in a singular matrix. We choose to exclude the $S3_{it}$ size group, in order to observe the coefficients of very large and very small firms ($S1_{it}$, $S4_{it}$).

Table 4.4: Probit Model Estimation of Diversification Status

Variable	Coefficient (*t*-statistic)	Marginal Effect	Coefficient (*t*-statistic)	Marginal Effect
α	-1.75 (7.00)***		-1.74 (9.20)***	
PR_{it}	0.03 (0.23)	0.011		
PR_{it}^2	0.01 (0.34)	0.002		
LEV_{it}	1.84 (4.39)***	0.673	1.81 (4.43)***	0.667
LEV_{it}^2	-2.38 (3.74)***	-0.874	-2.25 (3.60)***	-0.826
DIV_{it}	0.02 (5.84)***	0.008	0.02 (6.05)***	0.008
$S1_{it}$	0.03 (0.37)	0.013		
$S2_{it}$	0.16 (1.98)**	0.061	0.14 (1.86)*	0.051
$S4_{it}$	0.63 (8.27)***	0.236	0.59 (8.70)***	0.224
GDP_{it}	-0.35 (2.98)***	-0.129	-0.20 (3.30)***	-0.072
NMA_{it}	3.01 (4.89)***	1.104	2.65 (5.68)***	0.975
VMA_{it}	0.29 (1.54)	0.105		
$Y1999_{it}$	0.20 (2.16)**	0.076	0.13 (1.86)*	0.050
$Y2001_{it}$	-0.08 (0.89)	-0.028		
$IND2_{it}$	0.07 (0.36)	0.024		
$IND3_{it}$	0.25 (1.65)	0.093		
$IND4_{it}$	0.15 (1.00)	0.057		
$IND5_{it}$	0.19 (1.06)	0.070		
$IND6_{it}$	-0.06 (0.41)	-0.022		
$IND7_{it}$	0.01 (0.08)	0.005		

Table 4.4: Probit Model Estimation of Diversification Status (Continued)

Variable	Coefficient (*t*-statistic)	Marginal Effect	Coefficient (*t*-statistic)	Marginal Effect
$IND8_{it}$	-0.60 (3.81)***	-0.220	-0.70 (8.20)***	-0.256
$IND9_{it}$	0.32 (1.83)*	0.116		
N	2252		2252	
$L(\gamma)$	-1298.47		-1308.26	
$LR \sim \chi^2(21)$	346.38***		296.79***	
$P > \chi^2$	0.00		0.00	
Pseudo R^2	0.12		0.11	

Note: The estimated equation is $P_{it} = \gamma' Y_{it} + \mu_{it}$, where P_{it} is the unobservable diversification probability. Y_{it} is the set of observable variables including a constant α, industry dummies, firm-specific variables and macroeconomic and business trend variables. The firm characteristics are profitability measured with operating income to sales PR_{it}, leverage ratio LEV_{it}, the square value of both variables PR_{it}^2 and LEV_{it}^2 as well as dividends DIV_{it}. From the four size dummies three are included $(S1_{it}, S2_{it}$ and $S4_{it})$. Business trend and macroeconomic variables are the yearly GDP growth GDP_{it}, the number of announced domestic M&A expressed in thousands of firms NMA_{it}, the value of M&A expressed in £ hundred billions VMA_{it} as well as year dummies $Y1999_{it}$ and $Y2001_{it}$. The variables from $IND2_{it}$ to $IND9_{it}$ are the industry dummies based on the one-digit SIC codes. N is the number of observations, $L(\gamma)$ denotes the maximised value of the log-likelihood, LR is the likelihood ratio test distributed as $\chi^2(21)$ and $P > \chi^2$ is the probability of test statistic that the slope coefficients are all equal to zero. The marginal effect is defined as the change in probability for an infinitesimal change in each independent continuous variable and, by default, the discrete change in the probability for dummy variables. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

The estimated coefficient of GDP growth is negative and significant at 1% level. This confirms the hypothesis that firms are more likely to operate as diversified firms in a recession. During economic downturns firms search for new productive opportunities and they diversify. The coefficients on the M&A variables are positive and significant at the 1% level only in the case of NMA_{it}. This shows that in a more active market for corporate control there is a higher probability to diversify through M&A.

The year-dummy 1999 has a significant positive influence on the probability to operate as a diversified firm. One of the explanations could be that in 1999 the European M&A market

was almost as large as in the US and the number of hostile acquisitions jumped from 10 bids yearly to 369 bids (Goergen and Renneboog, 2004). The year-dummy 2001 has an insignificant and negative influence on the probability to diversify. In line with this result, the year 2001 is characterized by an abrupt decline in M&A activities. The estimates of yearly dummies reinforce our previous conclusion that changes in M&A activities significantly affect the diversification probability.

The decision to operate as a diversified firm is not significantly influenced by industry characteristics with the exception of the business services industry division. This industry division includes the business, the renting of movables, the owning and the dealing real estates sub-sector with a high percentage (more than 80%) of the complete industry division. The coefficient is negative, which shows that firms operating in these industries are more likely to operate as single firms or as a diversified firm in related segments.[30] Moreover, we re-estimate the probit model excluding the insignificant variables. The results are provided in the fourth and fifth column of Table 4.4. There is no significant difference between coefficients and estimated probability of the two models with and without insignificant variables.

4.4.3 Instrumental Variables Estimation Model

In this subsection, we recalculate the valuation effect of diversification, relying on Campa and Kedia's (2002) instrumental variables estimation methodology. Since Campa and Kedia (2002) analyze separately the "diversifying" and "refocusing" firms, our sample include diversified as well as focused firms, regardless of the time of diversification. We include all listed and de-listed (death) companies even if they do not change their organizational structure in a given period. We consider "not changing" their status also a decision in the sense that they decide to remain focused or to remain diversified as a result of the changes in the firm's environment.

The simultaneous equation framework consists in the first stage of the estimation of equation:

$$D_{it} = \theta \hat{P}_{it} + \beta' X_{it} + r_{it}\,, \tag{7}$$

[30] Related diversification in this case means that firms operate in industry segments with a similar two-digit SIC code and different three-digit SIC codes.

where D_{it} denotes the diversification dummy defined above and X_{it} is the set of exogenous explanatory variables also used in equation (3). $\hat{P}_{it}$ is the estimated probability from equation (4) and r_{it} represents the error term. In the second stage, the fitted values of the diversification dummy $\hat{D}_{it}$ are used as an independent variable in the estimation of excess value:

$$EV_{it} = \alpha + \delta \hat{D}_{it} + \beta' X_{it} + e_{it}\,. \tag{8}$$

Firm-characteristics influence both the decision to operate as a diversified firm and the value of the firm. Hence, firm-specific variables contained in X_{it} are included in both stages of the instrumental variables estimation. The set of exogenous explanatory variables includes size, profitability and leverage. Using squared values of the profitability measure, we capture its non-linear effect on diversification discount and firm value. The squared values of other control variables did not significantly influence the firms' excess value and therefore are excluded from the final regression model.

It is possible to investigate the validity of the selected instruments. We need variables that influence the diversification status while being uncorrelated with the excess value of the firm. Since the measure of excess value is by construction independent of any industry and time effect we can easily select the proper variables. All industry- and year-specific characteristics satisfy this condition. Another necessary condition of a good instrument in terms of the rank condition requires that the coefficient θ in equation (7) is significantly different from zero, which implies that the selected instruments are highly correlated with the diversification dummy. Such a condition can be tested explicitly and the resulting tests are presented in the first stage regression of the general two-stage least squares model.[31]

The results of the instrumental variables estimation are presented in Table 4.5. In the first stage regression the coefficient of the probability variable is highly significant. This shows that the rank condition is satisfied. In the second-stage regression all explanatory variables are already exogenous and the estimated coefficients are consistent. t-statistics are calculated based on the heteroskedasticity-robust standard errors. The diversification discount turns to a

[31] Additional tests, like the Durbin-Wu-Hausman endogeneity test and the test of excluded instruments based on the Hansen-Sargan statistic also support the validity of the selected instrument. Empirical findings are not reported but available upon request.

premium of 30%.[32] In order to check the validity of the implemented model, we test for endogeneity using the Hausman (1978) test, which is based on the difference between the OLS estimator and the instrumental variables estimator. The null hypothesis can be rejected at the 5% significance level, which suggests that endogeneity is present and should be controlled.

The estimated premium is similar to those obtained for US firms and in contradiction to the existing evidence for the UK market. Campa and Kedia (2002) find a 30% premium. Villalonga (2000) shows that after controlling for diversification motives a mean discount of 8% turns into a statistically significant premium of 34%. Our result is in line with the profit-maximizing neoclassical model developed by Maksimovic and Philips (2002), where firms optimally choose the number of segments depending on their comparative advantage. They show that the negative excess value of conglomerates is consistent with profit maximization. We can conclude that firms are likely to diversify or to remain diversified, driven by value-increasing motivation, when there are net gains to diversification and remain focused in case of net costs to diversifying. The refocusing event is explained by the same logical argumentation.

Table 4.5: Instrumental Variables Estimation Results of Excess Value on Endogenous Diversification Dummy

	First Stage Regression Coefficient (*t*-statistic)	Second Stage Regression Coefficient (*t*-statistic)
α	-0.02 (0.28)	-0.22 (1.81)*
$\hat{D}_{it}$		0.30 (2.50)**
TA_{it}	0.04 (5.90)***	0.01 (0.29)
PR_{it}	0.01 (0.12)	0.24 (4.63)***
LEV_{it}	-0.01 (0.15)	0.12 (1.59)
PR_{it}^2	-0.00 (0.03)	0.03 (4.60)***
$\hat{P}_{it}$	0.22 (11.67)***	

[32] As a robustness check, we re-estimated the regression equations with a GMM model. For an exactly identified model, the efficient GMM and the instrument variable estimators should coincide and this was confirmed by our estimations. Results are available upon request.

Table 4.5: Instrumental Variables Estimation Results of Excess Value on Endogenous Diversification Dummy (Continued)

	First Stage Regression Coefficient (*t*-statistic)	Second Stage Regression Coefficient (*t*-statistic)
$\overline{R}^2$	0.14	
N	2252	2252
Hausman test		14.73
$P > \chi^2$		0.01

Note: The first stage equation is $D_{it} = \theta \hat{P}_{it} + \beta X_{it} + r_{it}$, where D_{it} is the diversification dummy, $\hat{P}_{it}$ the estimated probability and X_{it} includes a constant α, the logarithm of total assets TA_{it}, profitability PR_{it}, leverage ratio LEV_{it} and the square of the profitability PR_{it}^2. The second stage equation is $EV_{it} = \alpha + \delta \hat{D}_{it} + \beta' X_{it} + e_{it}$. EV_{it} denotes the excess value, α a constant and $\hat{D}_{it}$ the instrumented diversification dummy. X_{it} is defined as in the first stage. $\overline{R}^2$ is the adjusted coefficient of determination and N the number of observations. The Hausman (1978) test of no endogeneity is rejected at 5% level. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

4.4.4 Macroeconomic Effects and Firms' Growth

In this subsection, we investigate in more detail the determinants of the lower market value of conglomerates relative to focused firms. We look for possible characteristics that make the benefits of diversification greater than the costs of diversification, and also cause firms to be discounted. First, we look at the estimation results of the probit model in Table 4.4, which shows the effect of different variables on the decision to diversify. Second, we analyse from the list of these variables the ones that may cause firms to be discounted.

When looking at the OLS findings in Table 4.3 and the simultaneous equations estimates in Table 4.5, size has a positive effect on the diversification decision and the market value. Large firms have a higher market value and a higher probability to diversify. As a result, size characteristics are important for the diversification decision but they do not cause a negative excess value. As expected, more profitable firms have a higher market value, but profitability does not significantly influence the decision to diversify. Leverage plays a significant role in the probit model and in the excess value equation. Diversified firms have in general a higher leverage but again leverage does not decrease the excess value. Based on size, profitability and leverage, we do not find any explanation of the lower market valuation of conglomerates.

Campa and Kedia (2002) find that the US firms with lower profitability and lower level of investment in current operations are more likely to diversify. However, the coefficients are not significant.

Whereas for US firms the macroeconomic conditions do not significantly influence the probability to diversify, we find a significant negative effect. In periods of high GDP growth firms tend to focus and in periods of economic downturns more firms diversify or they remain diversified. Some firms' growth opportunities could be more affected by unfavorable economic environment and they react to it by diversifying. In this case, diversification is a strategy to avoid less favorable market valuation.

Next, firms' growth correlation with the macroeconomic environment is investigated by re-estimating the major regressions of our analysis including the firms' growth as a control variable.[33] The findings on the effect of firms' growth on diversification decision and excess value are reported in Table 4.6. The previously estimated diversification premium does not change significantly. More importantly, firms' growth explains a significant part of the excess value evolution based on both OLS and instrumental variables estimations. Including firms' growth in the initial equation, the diversification discount obtained from the OLS model is decreasing significantly.

Based on the first and second stage regressions, firms' growth contributes to excess value and diversification. There is a positive and significant effect on the excess value of the firm and a negative and significant effect on the decision to diversify or to remain diversified. Firms with lower growth have lower excess value and face a higher probability to diversify. We can conclude that there is a positive relationship between macroeconomic growth, firms' growth and excess value on the one hand and a negative relationship of firms' growth and diversification on the other hand.

[33] Firms' growth is calculated as the first difference of total assets divided by total sales. We omit the information on the first year of each firm and any firm-year when the previous firm-year is missing.

Table 4.6: Estimating the Diversification Discount/Premium with Firms' Growth

	OLS Estimation	Instrumental Variables Regression	
		First Stage Regression	Second Stage Regression
	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)
α	-0.50 (4.28)***	0.01 (0.07)	-0.28 (1.67)*
D_{it}	-0.06 (1.70)*		0.28 (1.93)**
G_{it}	0.07 (3.46)***	-0.05 (2.98)***	0.09 (2.93)***
TA_{it}	0.03 (3.10)***	0.04 (3.99)***	0.01 (0.28)
PR_{it}	0.67 (6.97)***	-0.03 (0.40)	0.64 (5.33)***
LEV_{it}	0.19 (2.22)**	0.00 (0.01)	0.17 (2.04)**
PR_{it}^2	0.24 (5.53)***	-0.01 (0.32)	0.23 (3.97)***
$\hat{P}_{it}$		0.24 (9.45)***	
R^2	0.07	0.14	
N	1374	1374	1374

Note: The OLS estimation is based on the equation $EV_{it} = \alpha + \delta D_{it} + \beta' X_{it} + e_{it}$, where EV_{it} denotes the excess value, α a constant and D_{it} the diversification dummy. X_{it} contains firms' growth G_{it}, the natural logarithm of total assets TA_{it}, profitability PR_{it}, leverage ratio LEV_{it} and square value of profitability PR_{it}^2. The first stage equation of instrumental variables estimation is $D_{it} = \theta \hat{P}_{it} + \beta X_{it} + r_{it}$, where D_{it} is the diversification dummy and $\hat{P}_{it}$ the estimated probability. X_{it} includes a constant α and the set of variables defined in the OLS equation. The second stage equation is $EV_{it} = \alpha + \delta \hat{D}_{it} + \beta' X_{it} + e_{it}$. EV_{it} denotes the excess value and $\hat{D}_{it}$ the instrumented diversification dummy. X_{it} is defined as in the OLS equation. $\overline{R}^2$ is the adjusted coefficient of determination and N the number of observations. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

4.5 Conclusion

There is a great amount of literature which provides evidence that corporate diversification destroys shareholders' value. These findings are mainly based on simple OLS estimations, assuming that the diversification status is an independent variable. In this study, we provide additional evidence that the diversification is endogenous, i.e., firms choose to

follow a diversification strategy determined by firm characteristics, macroeconomic conditions and M&A activities. The investigation of UK companies is instructive, because no other major European country has more in common with the US from the corporate governance perspective.

We can draw three major conclusions based on our empirical results. First, UK firms' decision to operate as a diversified company is determined by firm characteristics, macroeconomic conditions regardless of the industry in which they operate. The only exception is the business services industry sector, where firms are more likely to remain focused or to diversify only in related industries.

Second, after controlling for endogeneity, the diversification discount of UK firms of about 9% turns to a significant premium of 30%. The evidence of a premium is consistent with the value-maximization theory of diversification, which considers firm diversification as efficient capital allocation. Our estimated premium corresponds to recent results for the US. This paper brings contradictory evidence to previous findings on the UK market, which supports the agency theory of diversification arguing that managers pursue their own interests at the expense of shareholders' value.

Third, by explaining the lower market valuation of diversified firms relative to focused firms, we find evidence of significant macroeconomic effects, which explain both a negative excess value and diversification. Firms' growth is correlated with macroeconomic developments and it explains a significant part of the market value evolution of firms. Moreover, the group of firms with lower growth affected by macroeconomic environment diversify with a higher probability. These findings are in line with argumentation by Burch, Nanda and Narayanan (2002) that firms with lower growth and insufficient value-creation opportunities have incentives to operate as diversified firms and, in turn, increase their market power.

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5 INSTITUTIONAL INVESTORS AND STOCK MARKET EFFICIENCY: THE CASE OF THE JANUARY ANOMALY

5.1 Motivation and literature overview on market anomalies

Since the late 1970s, researchers have discovered several seasonal patterns in stock returns that constitute a challenge to the efficient markets hypothesis. Regularities in stock returns or stock market anomalies comprise, among many others, the January effect (abnormally high returns in January), the Monday seasonal (significantly lower Monday returns), and the size effect (higher average risk-adjusted returns for small stocks). In this paper, we focus on the following aspect of stock market anomalies: if stock returns exhibit exploitable regularities, then smart traders are expected to take advantage of these patterns, thereby earning abnormal profits. Consequently, on stock markets with a sufficiently large number of smart traders, anomalies are supposed to disappear as the trading of this investor group arbitrages away seasonal patterns in stock returns.

Recent empirical findings suggest that institutional investors play the role of smart traders on stock markets and, therefore, may have an impact on stock market anomalies. Institutional investors can be characterized as informed traders who speed up the adjustment of stock prices to new information, thereby rendering the stock market more efficient. Institutions can obtain an informational advantage by exploiting economies of scale in information acquisition and processing. The marginal costs of gathering and processing information are lower for institutional than for individual traders. In addition, institutional investors may be better trained and have superior resources than individual investors. Moreover, for many years it has been common practice of companies to inform securities analysts in advance about company-specific news, and only recently have regulatory measures been launched (namely the SEC's Regulation FD) to prevent this habit. Hence, institutional investors' trading decisions may be stronger information-driven than those of individual investors.

Dennis and Weston (2001) support this view by providing evidence for U.S. stock exchanges that institutions are better informed than individual investors. Cohen, Gompers, and Vuolteenaho (2002) show that institutional investors push stock prices towards their fundamental values by exploiting individual traders' sentiment. Following Barber and Odean (2005), individual investors display attention-based buying behavior, whereas institutions do not exhibit this kind of non-fundamental trading pattern. The impact of institutional trading on

stock market anomalies has recently been covered by two papers. Kamara (1997) and Chan, Leung, and Wang (2004) highlight the role of institutional investors on the Monday seasonal. They present evidence for U.S. stock markets that an increase in institutional ownership decreases the magnitude of the Monday effect. Gompers and Metrick (2001) show that an increase in institutional trading is partly responsible for the disappearance of Banz' (1981) small stock premium.[34]

In this study, we focus on the impact of institutional trading on a third major anomaly, namely the January effect.[35] Two of the most prominent explanations for the January effect refer to the specific trading behaviors of individual and institutional investors. First, the tax-loss-selling hypothesis explains the January anomaly with tax-motivated trading of individual investors. As the end of the year approaches, individual investors sell stocks that declined in value in order to realize tax losses. After the turn of the year they re-invest in these securities, which pushes stock prices up (Ritter, 1988). Second, the window-dressing hypothesis suggests that institutional investors' portfolio rebalancing activities are responsible for the January anomaly. Institutions are evaluated relative to their peers and, therefore, buy winners and sell losers in order to present respectable year-end portfolio holdings (Lakonishok et al., 1991). The findings in Sias and Starks (1997) are favorable for the tax-loss-selling hypothesis and show that individual traders are primarily responsible for the January anomaly.

This study highlights the impact of institutional traders on the January effect in Poland and Hungary. The history of both emerging stock markets provides a unique institutional environment to investigate the influence of individual and institutional investors on the January anomaly. In Poland, the pension system reform on May 19, 1999, separates the history of the stock market into a period of predominantly individual trading and a period dominated by institutional trading. Similarly, in Hungary, private pension funds were founded in 1997 and started their financial activities in 1998. Before 1998, primarily small individual investors populated the Hungarian stock market.

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[34] Another strand of the finance literature views institutions as investors which induce non-fundamental dynamics in stock returns due to their specific trading behavior. The main arguments in this context are investment activities relying on herding, positive feedback trading, and window-dressing strategies (Lakonishok, Shleifer, and Vishny, 1992; Grinblatt, Titman, and Wermers, 1995; Nofsinger and Sias, 1999; Badrinath and Wahal, 2002; Griffin, Harris, and Topaloglu, 2003).

[35] Empirical evidence on the January effect can be found in, for example, Reinganum (1983), Gultekin and Gultekin (1983), and Ritter (1988).

The pension system reform in both countries changed the investor structure drastically due to the enrichment of the old pay-as-you-go system with a privately managed pension funds pillar. Since 1999, these pension funds are the most important group of institutional investors on the Polish and Hungarian stock markets. In addition to the change of the investor structure, in both countries capital gains taxes do not exist, which rules out the tax-loss-selling hypothesis as a rationale for the January effect. Consequently, if a January effect can be detected in the data during the period before the entrance of pension fund investors in both stock markets, then it must be driven by an anomalous trading behavior of Polish and Hungarian individual investors. We exploit the shift in the institutional environment in both emerging capital markets to provide evidence on the impact of individual and institutional investors' trading decisions on the January anomaly.

Relying on the institutional background of the Polish and the Hungarian stock markets, we contribute to the literature answering the following two questions. First, is there evidence in favor of a January effect during the period of individual trading? If this is the case, we can conclude that individual investors' non-fundamentally driven trading decisions led to the January anomaly. Second, in which way did Polish and Hungarian pension fund investors contribute to the January anomaly after 1999 and 1998, respectively? In case pension funds exhibit window-dressing behavior, we expect a strengthening effect on the January anomaly. In contrast, if pension funds' trading decisions are more influenced by fundamental information, a dampening effect on unusually high stock returns in January can be expected.[36]

The remainder of the paper proceeds as follows. Section 2 outlines the institutional background for Poland and Hungary. Section 3 characterizes the data set, while the econometric methodology is described in section 4. Section 5 contains the empirical findings, and section 6 summarizes and concludes the paper.

[36] It is obvious that the date of entrance of pension funds into the stock market plays an important role in the following investigation. Similarly, one branch of the literature studies the impact of the introduction of futures markets on stock return anomalies of the underlying spot market (Kamara, 1997; Szakmary and Kiefer, 2004). In our investigation, we can exclude an influence from the introduction of futures markets because these markets were established earlier (January 16, 1998, in Poland and March 31, 1995, in Hungary) than when the appearance of pension fund investors on the stock markets took place.

5.2 Institutional Background

5.2.1 Poland

Re-established in 1991, the Polish stock market has grown rapidly during the last decade in terms of both the number of companies listed and market capitalization. In comparison to the two other European Union accession countries in the region, namely the Czech Republic and Hungary, the capitalization of the Polish stock market is significantly higher. It is comparable to that of the smaller mature European stock markets like Austria and was about 70 billion U.S. dollars at the end of 2004 (Warsaw Stock Exchange, 2005).

The major change in the investor structure on the Polish stock market has its origin in the pension system reform. In 1999, the public system was enriched by a private component, represented by open-end pension funds. Participation in this component, often called the "second pillar", is mandatory for employees below certain age. They are obliged to transfer 7.3% of their gross salary to the government-run social insurance institute called Zakład Ubezpieczeń Społecznych (ZUS), which in turn transfers the collected contributions to the pension funds. The first transfer of money from the ZUS to the pension funds took place on May 19, 1999. This date marks a significant change of the investor structure on the Polish stock market. In 1999, about 20% domestic institutional investors and 45% domestic individual investors traded at the Warsaw Stock Exchange. Over time the proportion of domestic institutional traders has increased, whereas the relative importance of individual investors has decreased. In 2004, approximately one-third of the investors were domestic individuals, and about one-third were national institutions. Constantly about one-third of the investors on the Polish stock market adhere to the group of foreign investors.

While before May 19, 1999, the majority of traders were small, private investors, after that date pension funds became important players on the stock market in Poland. There were also some mutual funds active in the market, but they had relatively small amounts of capital under management. Moreover, the role of corporate investors, i.e., companies investing their capital surpluses, was very small. This unique institutional characteristic allows us to compare the period before May 19, 1999 – characterized by predominantly non-institutional trading – with the period after that date, when pension funds as institutional investors started to act on the stock market.

The number of pension funds in the 1999–2003 period varied between 15 and 21. The change in their number occurred mainly due to some acquisitions of smaller funds by larger

ones. It is important to note, however, that their structure as well as the structure of the assets under their management remained invariant. By the end of 2003, 17 pension funds operated in the Polish stock market with about 8 billion U.S. dollars under management. In comparison, Polish insurance companies and mutual funds had only 3 and 1 billion U.S. dollarsof assets, respectively. In 2003, pension funds invested about 3 billion U.S. dollars in stocks listed on the Warsaw Stock Exchange. Their stock holdings predominantly consist of large-capitalization stocks that are listed in the blue-chip index WIG20 and usually belong to the Top 5 in their industries. Therefore, pension funds have become important players on the Polish stock market with the potential to affect stock prices.

Concerning capital gains taxation, until the end of 2003 capital gains made by domestic individual investors were tax-exempt and dividends were subject to a 15% withholding tax. Since January 1, 2004, capital gains have been taxed at a uniform 19% rate. The tax rate for dividends was raised from 15% to 19%. However, the number of firms paying dividends is low.

5.2.2 Hungary

The Budapest Stock Exchange, re-established in 1990, experienced a significant increase in its capitalization, attaining about 6 billion U.S. dollars in 1996, mainly due to the privatization of Hungary's bigger state-owned companies such as Mol, OTP, Gedeon Richter, and Matav. In the following years, the stock market went through a phase of continuous growth, reaching a capitalization of 30 billion U.S. dollars at the end of 2004.

The introduction of a three-pillar pension system on January 1, 1998, had an important influence on the Hungarian stock market because a growing share of households' savings was channeled to stock market investments through pension funds. Since 1998, individuals can choose between the mandatory public system – the first pillar – and the mandatory private system. Open-end private mandatory pension funds represent the second pillar of the Hungarian pension system. The first 38 mandatory private funds started their activities in 1998 with 134 million U.S. dollars of assets under management and about 1.3 million members. The third pillar consists of voluntary pension funds, which can be both open-end and closed-end funds and also play an important role with a comparable amount of assets.[37]

[37] The first voluntary pension funds started their activity already in 1994. However, the assets under their management were marginal at that time.

The establishment of the private mandatory pension funds in 1998 was beneficial and stimulating for voluntary pension funds. The year 1998 can therefore be considered as the year when pension funds appeared as institutional investors on the Hungarian stock market. However, compared to the institutional framework in Poland, the exact date of entrance of pension funds into the Hungarian stock market is less clear-cut and hardly traceable. Whereas for Poland, May 1999 is known as the start date of pension funds' investment activities and is well-documented as such, the investment activities of Hungarian pension funds seemed to develop gradually over the year 1998. Detailed information on this issue is practically not available. Consequently, we choose January 1, 1999, as the start date of increased institutional ownership on the Hungarian stock market to ensure that the entire post-event period is characterized by intensive institutional trading. The pension funds' capital was growing during the following years and, by the end of 2004, amounted to 4 and 2.5 billion U.S. dollars for the mandatory and voluntary pension funds, respectively.

The number of pension funds decreased over time, mainly due to acquisitions, and by the end of 2004, 18 private and 75 voluntary pension funds remained in the market. Contrary to other countries, where pension funds participate directly in the stock market, in Hungary an increasing number of pension funds entrusted their assets to investment fund managers. Consequently, the impact of pension funds on stock market prices should be evaluated by means of portfolio managers' investment activities. At the end of 2004, 23 investment fund managers had under their management 4.9 billion U.S. dollars of pension fund assets, 5.2 billion U.S. dollarsof investment fund assets, and 3.7 billion U.S. dollars of contributions from other sources. Notwithstanding the assignment of pension funds' assets to portfolio managers, their investment activities have to adhere to the pension funds' investment regulations specified by law. In addition, the accumulated accounts can be invested in the longer term since contributions are not accessible before retirement.

In Hungary, no capital gains tax applies if gains are achieved on the Budapest Stock Exchange or any other stock exchange in the European Union.[38] While dividends received by a Hungarian company from another Hungarian company are tax-exempt, for individuals the dividend withholding tax is 20%. Pension funds are not subject to tax on the proceeds of the

[38] Within the personal income tax system, capital gains from stock market transactions are considered as interest-type income and are not taxed. For capital gains on transactions not qualified as a stock exchange deal, the tax rate was 20% before and 25% after 2005. For a short period of time in 2001–2002, stock market gains were also taxed with a 20% rate.

funds. Proceeds are taxed only when they are paid out to the contributors, at rates depending on whether the proceeds are qualified as interest, dividends, or capital gains.

5.3 Data

The data for Poland contain daily closing prices for all stocks listed on the Warsaw Stock Exchange in the period from October 3, 1994, to March 31, 2004.[39] These time series were directly provided by the Warsaw Stock Exchange. Altogether, the sample comprises 278 firms over the indicated sample period. The time series are stock-split adjusted and corrected for outliers to assure that our results are not driven or distorted by a few extreme values. For this purpose, the 0.5% of highest and lowest returns observed in the data set are excluded from the investigation and, therefore, deleted from all sub-samples.

To investigate the impact of the pension funds' investment activities, we construct two sub-samples of actively institutionally traded stocks as follows. We calculate a measure of each stock's institutional coverage by dividing the aggregate pension fund holdings of that stock by the overall aggregate pension fund holdings in a particular year. This measure can be interpreted as the percentage share of a particular stock in the aggregate pension fund holdings. A stock is defined as actively institutionally traded in a given year if the measure of relative institutional holdings exceeds 1%.[40]

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[39] The selection of the start date is due to the following reasoning. Shortly after its re-opening, the Polish stock market experienced a stock price increase of 924% from May 6, 1993, to March 8, 1994, and a subsequent crash. Furthermore, it was not until October 3, 1994, that trading on the Warsaw Stock Exchange was extended from four days to five days a week. Starting our inquiry at the beginning of October 1994 ensures that the empirical findings are neither distorted by the bubble and crash periods nor affected by the change in trading frequency.

[40] We drop stocks with only marginal institutional coverage as for these stocks institutional trading behaviour may not have a large impact on stock returns. The 1% cut-off point is arbitrarily chosen but proved to be an acceptable compromise for the purpose of our study. On the one hand, it allows us to eliminate those stocks which are not at all or only marginally covered by institutional investors and to come up with a limited number of stocks that are actively traded by institutions. On the other hand, the size of the resulting sub-samples is still sufficient for econometric testing.

We calculate this measure for all stocks and all years separately during the 1999–2003 period and end up with five yearly measures of relative pension fund holdings for each individual stock. A stock is included in the first sample of actively institutionally traded stocks if the pension fund holding measure of this stock exceeds the 1% level in at least three out of the five years. This amounts to 60% of the post-event period. In an alternative, less strict definition a stock has to exceed the 1% cut-off point in at least two of the five years, i.e. during 40% of the post-event period. These criteria result in the identification of 20 stocks for the stricter definition and 28 stocks for the less strict definition of institutionally traded shares. Columns 1 and 2 of Table 5.1 provide additional information about these stocks. Whereas Polish pension fund investors do not have a preference for stocks of a specific sector, they concentrate their investments on large firms' stocks.

For Hungary, the data consist of daily closing prices for the stocks listed on the Budapest Stock Exchange in the period from January 3, 1994, to December 31, 2004. The time series were obtained from Thomson Financial Datastream. Altogether, the cross-section of the sample comprises 84 firms. The same trimming procedure was applied to the data set as described above for the Polish case. In contrast to Poland, we do not have reliable information regarding stock splits, dividends, and other impact factors on stock returns. This provides an additional reason for the exclusion of 0.5% of the extreme stock return observations in both tails of the distribution.

Table 5.1: Stocks Actively Traded by Institutional Investors

Poland		Hungary	
Company	Sector	Company	Sector
Institutionally traded stocks (strict definition)			
Agora	Media	Antenna	Broadcasting
BPH	Banking	Borsodchem	Chemicals
BRE	Banking	Danubius	Hotels
BSK	Banking	Demasz	Electricity Supply
Budimex	Construction	Egis	Pharmaceuticals
Computerland	IT	Fotex	Retail trade
Dębica	Chemicals	Magyar Telekom	Telecommunications
Echo	Construction	MOL	Oil/Natural Gas
Kęty	Metals	NABI	Engineering/Machinery
KGHM	Metals	OTP	Banking
Orbis	Hotels	Pannonplast	Plastics industry
PBK	Banking	Pick Szeged	Food products
Pekao	Banking	Rába	Machinery
PGF	Wholesale & Retails	Richter	Pharmaceuticals
PKN	Chemicals	Synergon	IT
Prokom	IT	TVK	Chemicals
Stomil	Chemicals	Zalakerámia	Construction
Świecie	Wood and paper		
TPSA	Telecommunications		
WBK	Banking		
Additional institutionally traded stocks (less strict definition)			
BIG	Banking	Graboplast	Textile
ComArch	IT	Prímagáz	Gas services
Elektrim	Telecommunications		
Kredyt Bank	Banking		
Netia	Telecommunications		
Optimus	IT		
Softbank	IT		
Żywiec	Food		

Note: The table presents the stocks identified as actively traded by institutional investors and the corresponding sectors. The selection criteria are described in the text. When applying the stricter (less strict) definition, 20 (28) Polish and 17 (19) Hungarian companies are included in the sub-samples of institutionally traded stocks.

To determine a sub-sample of institutionally traded stocks for the Hungarian stock market, we requested the portfolio holdings of all Hungarian pension funds. The pension funds' replies show that their stock market investment decisions closely mirror the composition of the main stock index BUX. In the sample of Hungarian stocks actively traded by institutional investors, we therefore focus on the stocks included in the BUX. Information on the BUX composition was provided by the Budapest Stock Exchange for the 1996–2004 period. Contrary to Poland, we do not use a 1% cut-off criterion because the BUX is dominated by very few stocks with high weights. Hence, a cut-off point as the one mentioned above would considerably reduce our sample in size. The number of stocks included in the institutional sample would be too small to conduct a cross-sectional investigation.

For a strict definition of institutionally traded stocks that is roughly in line with the selection criterion for Poland, we use all stocks that are included in the BUX for at least 60% of the time in the post-reform sample period from 1998 to 2004. This definition results in the identification of 17 institutionally traded stocks. For a less strict definition, we require inclusion in the BUX for at least 40% of the same time period. The less strict definition increases the sample of institutionally traded stocks to 19. We use these two sub-samples of 17 and 19 stocks to investigate the effect of institutional trading on the Hungarian stock market. Columns 3 and 4 of Table 5.1 list the Hungarian companies selected together with their sector affiliation.

5.4 Methodology

In the empirical investigation we distinguish between the impacts of predominantly individual versus institutional investor groups on stock returns in January. First, the hypothesis is investigated that individual investors exhibit anomalous trading behavior and cause abnormally high stock returns in January. Second, we analyze the hypothesis that institutions are informed traders relying on fundamental information and, consequently, that the entrance of pension funds on the stock market dampens the anomalous January effect. If the contrary holds, the trading behavior of pension funds can be ascribed a positive contribution to higher stock returns in January relative to other months of the year, which would be in line with the window-dressing hypothesis.

The hypotheses are investigated within a panel framework and separately tested for different sub-samples of stocks from Poland and Hungary. The advantages of a panel data model over a purely time-series investigation of index data or individual shares are manifold (see, e.g., Baltagi, 2001). Most importantly, unobserved individual heterogeneity can be

controlled for that would otherwise have to go undetected and could generate biased results. Specifically, the following one-way error component regression model is run:

$$r_{i,t} = \beta_0 + \beta_1 JAN_t + \beta_2 JAN_t^{Inst} + \beta_3 r_{i,t-1} + u_i + e_{i,t}\,, \qquad (1)$$

where the subscript i denotes the cross-sectional and t the time-series dimension of the data set. The dependent variable is the daily stock return $r_{i,t}$, calculated as the logarithmic difference in prices $r_{i,t} = 100\ln(P_{i,t} / P_{i,t-1})$. $P_{i,t}$ denotes the individual stock price at the close of every trading day. JAN_t is a dummy variable which takes on the value of 1 in January throughout the whole sample period. The dummy variable JAN_t^{Inst} is 1 only for those January observations that fall into the period of increased institutional trading at the Warsaw and Budapest Stock Exchanges, i.e. beginning with January 2000 for Poland and January 1999 for Hungary. In addition, we allow for stock returns autocorrelation in the time-series dimension by including the lagged dependent variable $r_{i,t-1}$ as an additional explanatory variable.[41] u_i denotes an unobservable firm-specific random effect, and $e_{i,t}$ is the remainder disturbance.

In the above specification, a positive and significant parameter β_1 provides evidence in favor of a January effect in stock returns. For the interpretation of the parameter β_2, three cases have to be distinguished. First, a negative and significant coefficient β_2 indicates a reduction of positive January stock returns (estimated by $\hat{\beta}_1$) due to the entrance of pension funds as institutional investors into the market. Second, if β_2 is positive and significant, then institutional investors' trading behavior is in line with the window-dressing hypothesis because a strengthening of the January anomaly can be observed. Third, if β_2 is statistically insignificant, institutions do not have an influence on the January anomaly. The sum $(\beta_1 + \beta_2)$ provides a measure of the magnitude of the January effect in the period of increased institutional trading.

In addition to testing the hypotheses separately for the different sub-samples described in the text, we estimate the following joint model with several dummy and interaction variables:

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[41] A potential bias in the parameter estimates is not an issue in this setting due to the large time-series dimension of the data. We can, therefore, rely on asymptotic properties and obtain consistent parameter estimates (Baltagi, 2001).

$$r_{i,t} = \beta_0 + \beta_1(JAN_t \cdot INST_i) + \beta_2(JAN_t^{Inst} \cdot INST_i) + \beta_3 INST_i + \beta_4 POST_t + u_i + e_{i,t}, \quad (2)$$

where all previously introduced variables are defined as in equation (1).[42] In addition, the indicator variable $INST_i$ equals 1 for those companies included in the sample of institutionally traded stocks and is 0 otherwise. $POST_t$ is a dummy variable with value 1 for the period of increased institutional trading and 0 otherwise. The interaction variables $(JAN_t \cdot INST_i)$ and $(JAN_t^{Inst} \cdot INST_i)$ correspond to JAN_t and JAN_t^{Inst}, respectively, in regression equation (1) when the latter is run for the institutional sub-samples.

The model specified above is estimated for both sub-samples of institutionally traded stocks. We henceforth refer to the version estimated with the more strictly defined institutional dummy $INST_i$ as equation (2a) and to the less strictly defined one as equation (2b). The coefficients β_1 and β_2 can be interpreted as described for equation (1). In addition, β_3 captures possible systematic differences between average stock returns of the institutional and the control sample, and β_4 displays aggregate factors that affected average stock returns over time in the same way for institutionally traded and non-traded shares.

Finally, we investigate whether the decrease in the magnitude of the January anomaly takes place gradually over a longer period or within a relatively short period of time. This question is relevant because it helps us to assess whether the observed results are really due to the appearance of institutional investors on the stock market. To accomplish this task, we use a rolling estimation window technique and run the regression:

$$r_{i,t} = \alpha + \beta JAN_t + u_i + e_{i,t}, \quad (3)$$

where all variables are defined as in equation (1). Starting in October 1994 for Poland and in January 1994 for Hungary, we estimate this regression for a three-year time period and obtain a parameter estimate of β. This parameter is an estimate of the average January effect during the estimation period. Then we move the estimation window by one month toward the end of the sample and estimate regression (3) again. We end up with a time series of β

[42] The lagged dependent variable is dropped from the regressor list for the sake of brevity since its inclusion did not alter our empirical findings.

estimates which can be plotted and subjected to a visual investigation afterwards.

5.5 Empirical Results

First, summary statistics and regression results are presented separately for the two sub-samples of stocks actively traded by institutional investors, a control sample of all stocks excluding the stocks identified as institutionally traded as well as the whole sample reflecting the entire Polish and Hungarian stock markets. Hence, we are able to analyze the impact of the Polish and Hungarian pension system reform on stock returns not only through time – before and after the pension funds' appearance as institutional traders on the stock market – but also in a cross-sectional dimension, i.e. among stocks more actively traded and those nearly non-traded by institutional investors.

To gain some first insight into the seasonal patterns inherent in our data, daily average stock returns for January and for February to December are reported in Table 5.2. Daily mean stock returns in January are positive and higher than average stock returns between February and December for all samples. Furthermore, for both institutional sub-samples (Panels A1, B1, A2, B2) we observe higher average January stock returns during the 1994–1999 (1994–1998) period relative to the years 2000–2004 (1999–2004) for Poland (Hungary). This also refers to the whole samples (Panels D1, D2) which include all stocks listed on the respective stock exchange. Interestingly, for the Polish control sample (Panel C1) we observe an increase of average stock returns over time, whereas Hungarian stock returns (Panel C2) are slightly lower in the 1999–2004 period compared to the 1994–1998 sub-sample.

Table 5.2: Average Daily Stock Returns

Poland			Hungary		
Sample Period	January	February – December	Sample Period	January	February – December
Panel A1: Institutional Sample I ($N = 20$)			Panel A2: Institutional Sample I ($N = 17$)		
1994 – 1999	0.3964	0.0624	1994 – 1998	0.4471	0.0368
2000 – 2004	0.1618	0.0186	1999 – 2004	0.0849	-0.0166
1994 – 2004	0.2452	0.0382	1994 – 2004	0.1993	0.0010
Panel B1: Institutional Sample II ($N = 28$)			Panel B2: Institutional Sample II ($N = 19$)		
1994 – 1999	0.3902	0.0642	1994 – 1998	0.4523	0.0369
2000 – 2004	0.1758	-0.0331	1999 – 2004	0.0662	-0.0176
1994 – 2004	0.2546	0.0110	1994 – 2004	0.1973	0.0018
Panel C1: Control Sample ($N = 250$)			Panel C2: Control Sample ($N = 65$)		
1994 – 1999	0.0004	-0.0582	1994 – 1998	0.1841	-0.0556
2000 – 2004	0.0190	-0.0361	1999 – 2004	0.1134	0.0568
1994 – 2004	0.0131	-0.0452	1994 – 2004	0.1410	0.0115
Panel D1: Whole Sample ($N = 278$)			Panel D2: Whole Sample ($N = 84$)		
1994 – 1999	0.0586	-0.0406	1994 – 1998	0.2611	-0.0287
2000 – 2004	0.0385	-0.0357	1999 – 2004	0.0976	0.0319
1994 – 2004	0.0450	-0.0378	1994 – 2004	0.1588	0.0084

Note: Mean stock returns are calculated as simple arithmetic averages of daily stock returns. The overall sample period is from October 3, 1994 to March 31, 2004, for Poland and from January 3, 1994, to December 31, 2004, for Hungary. The years 1999 and 1998 mark the dates of the Polish and the Hungarian pension system reforms, respectively. N denotes the number of stocks.

Table 5.3 displays the empirical findings for Poland. When looking at the results for the two sub-samples of actively institutionally traded stocks (Panels A and B), we find evidence in favor of a pronounced January effect in the period when the Polish stock market was dominated by individual investors. The estimated coefficients of the January effect are about 0.36. All coefficient estimates of the dummy variable JAN_t are statistically significant at the 1% level. The empirical findings in favor of a January effect are insofar interesting as during the period

of predominately individual trading capital gains taxes did not exist in Poland. Hence, the tax-loss-selling hypothesis can be ruled out as a rationale for higher stock returns in January. We can therefore conclude that Polish stock returns dynamics exhibit an anomalous January effect during the period prior to the entrance of institutional investors, which may be explained by individual investors' sentiment.[43]

Moreover, for both institutional samples the magnitude of the January effect decreases in the period after the pension fund investors' entrance into the stock market, measured by the coefficients of the institutional investors dummy JAN_t^{Inst}. The estimated parameter values are statistically significant and about –0.22. Thus, the significant negative parameter estimates of the institutional investors dummy reject the window-dressing hypothesis. The anomalous January effect in stock returns does not entirely disappear after the entrance of pension funds as institutional investors into the Polish stock market. However, its magnitude becomes substantially lower.

The results are robust towards the inclusion of the lagged dependent variable $r_{i,t-1}$. For both institutional samples, the coefficient of $r_{i,t-1}$ is positive and significant, which can be explained by the implications of strategic trading models (Kyle, 1985; Barclay and Warner, 1993). Rational informed investors spread their trades over time to conceal information. By breaking up a large order into several smaller trades, institutional investors reduce the overall price impact. Moreover, price impacts may be inversely related to market liquidity (Madhavan and Smidt; 1993). This suggests that the benefits of trading over a longer horizon are greater in thin relative to liquid stock markets, which, in turn, implies an increase in trade duration and a decrease in order size.

[43] The existence of a January effect in stock returns without capital gains taxes is not new. Tinic, Baroni-Adesi, and West (1987) provide evidence for Canada and Jones, Pierce, and Wilson (1987) for the U.S. before capital gains were taxed in these countries.

Table 5.3: Empirical Results for Poland

Equation	*Const*	JAN_t	JAN_t^{Inst}	$r_{i,t-1}$	
	Panel A: Institutional Sample I ($N = 20$)				
(1)	0.0399***	0.3512***	-0.2306**	0.0148***	
	(0.0151)	(0.0829)	(0.1015)	(0.0053)	
(1)	0.0382**	0.3582***	-0.2347**		
	(0.0152)	(0.0830)	(0.1017)		
	Panel B: Institutional Sample II ($N = 28$)				
(1)	0.0114	0.3730***	-0.2089**	0.0225***	
	(0.0133)	(0.0714)	(0.0882)	(0.0044)	
(1)	0.0104	0.3787***	-0.2134**		
	(0.0144)	(0.0717)	(0.0886)		
	Panel C: Control Sample ($N = 250$)				
(1)	-0.0535***	0.0559*	0.0065	-0.0336***	
	(0.0059)	(0.0341)	(0.0408)	(0.0017)	
(1)	-0.0452***	0.0456$^{\clubsuit}$	0.0186		
	(0.0060)	(0.0344)	(0.0411)		
	Panel D: Whole Sample ($N = 278$)				
(1)	-0.0445***	0.1069***	-0.0317	-0.0277***	
	(0.0055)	(0.0310)	(0.0372)	(0.0016)	
(1)	-0.0378***	0.0963***	-0.0200		
	(0.0055)	(0.0313)	(0.0375)		
Equation	*Const*	$(JAN_t \cdot INST_i)$	$(JAN_t^{Inst} \cdot INST_i)$	$INST_i$	$POST_t$
(2a)	-0.0700***	0.3872***	-0.2796**	0.0791***	0.0450***
	(0.0094)	(0.0991)	(0.1215)	(0.0189)	(0.0112)
(2b)	-0.0718***	0.4086***	-0.2608**	0.0534***	0.0464***
	(0.0095)	(0.0814)	(0.1008)	(0.0161)	(0.0113)

Note: The estimated models are (1) $r_{i,t} = \beta_0 + \beta_1 JAN_t + \beta_2 JAN_t^{Inst} + \beta_3 r_{i,t-1} + u_i + e_{i,t}$ and (2) $r_{i,t} = \beta_0 + \beta_1 (JAN_t \cdot INST_i) + \beta_2 (JAN_t^{Inst} \cdot INST_i) + \beta_3 INST_i + \beta_4 POST_t + u_i + e_{i,t}$, where stock returns are calculated as $r_{i,t} = 100 \ln(P_{i,t} / P_{i,t-1})$. JAN_t (JAN_t^{Inst}) denotes a dummy variable which takes on the value 1 in January throughout the whole sample period (during the period of increased institutional trading at the Warsaw Stock Exchange). $INST_i$ is a dummy variable indicating a stock's affiliation to the stricter (less strict) sub-sample of institutionally traded shares for equation 2a (2b). $POST_t$ is a dummy with value 1 for the period of increased institutional trading. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, and $^{\clubsuit}$ at the 19% level.

The estimated results for the control sample (Panel C) consisting of all stocks except for the 28 institutionally traded ones reinforce the above findings. The coefficients of the dummy variable JAN_t are positive and significant at the 10% and 19% levels. Hence, we find at least weak evidence indicating that a January effect exists in returns of non-institutionally traded stocks. In contrast to the results for the two institutional samples, the parameters for JAN_t^{Inst} are statistically insignificant. For stocks not actively traded by Polish pension fund investors, the magnitude of the January effect does not decrease during the period after May 19, 1999.[44] The statistically insignificant parameters for JAN_t^{Inst} in the control sample emphasize that the estimated decrease in the two institutional samples is caused by the institutions' trading behavior and not by other factors.[45] In addition, the estimated coefficient of the variable JAN_t^{Inst} for the whole market is not significant either, which suggests that the January effect for the market as a whole continues to be driven by individual investors.

The empirical findings on the joint model (2) are reported at the bottom of Table 5.3 for the more strictly defined dummy $INST_i$ (equation 2a) and for the less strictly defined version (equation 2b). The empirical results confirm the findings on a pronounced January effect for actively institutionally traded Polish stocks and the substantial decrease in the anomaly's magnitude after the entrance of pension funds into the stock market. In addition, actively institutionally traded stocks earn significantly higher returns relative to the rest of the stocks. The period of increased institutional trading is accompanied by higher average stock returns compared to the period before the pension system reform.

The findings for Hungary in Table 5.4 are consistent with the ones for the Polish stock market and support the pension funds' impact on the January anomaly. The estimation results

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[44] Given the marginal level of significance of the JAN_t coefficients, we run separate regressions investigating whether a January effect exists in the post-event period. The values of the coefficients of the January dummy variables are slightly higher relative to the ones reported in Table 3 and are significant at the 1% level. Hence, a January effect exists in the period after May 19, 1999, in non-institutionally traded Polish stocks.

[45] The January effect in the pre-event period is substantially higher for institutionally traded stocks compared to the stocks in the control sample. A reason for this finding may be the extreme illiquidity of a subset of stocks in the control sample. As our study focuses on the evolution of January stock returns over time instead of the level of the January effect for particular stocks, we do not further explore this issue.

for the two sub-samples of actively institutionally traded stocks (Panels A and B) show a pronounced January effect in the period before the investment activities of Hungarian pension funds. The estimated parameters of the dummy variable JAN_t are about 0.44 and are statistically significant. In line with the results for Poland, the tax-loss-selling hypothesis as a rationale for higher January stock returns can be ruled out because capital gains are not taxed in Hungary. Moreover, the anomalous January effect decreases drastically after the entrance of pension funds into the stock market with statistically significant coefficients for JAN_t^{Inst} of about –0.36. The findings are robust concerning the inclusion of the lagged dependent variable. The estimated parameters are positive and significant, supporting the implications of strategic trading models and market liquidity outlined above.

Table 5.4: Empirical Results for Hungary

Equation	*Const*	JAN_t	JAN_t^{Inst}	$r_{i,t-1}$	
	Panel A: Institutional Sample I ($N = 17$)				
(1)	0.0003	0.4357***	-0.3541***	0.0331***	
	(0.0138)	(0.0832)	(0.0991)	(0.0051)	
(1)	-0.0021	0.4405***	-0.3544***		
	(0.0201)	(0.0837)	(0.0998)		
	Panel B: Institutional Sample II ($N = 19$)				
(1)	0.0012	0.4449***	-0.3822***	0.0309***	
	(0.0132)	(0.0770)	(0.0932)	(0.0048)	
(1)	-0.0006	0.4468***	-0.3807***		
	(0.0181)	(0.0774)	(0.0939)		
	Panel C: Control Sample ($N = 65$)				
(1)	0.0094	0.1701***	-0.0575	-0.0500***	
	(0.0111)	(0.0605)	(0.0760)	(0.0033)	
(1)	0.0115	0.1726***	-0.0707		
	(0.0112)	(0.0608)	(0.0765)		
	Panel D: Whole Sample ($N = 84$)				
(1)	0.0067	0.2555***	-0.1598***	-0.0309***	
	(0.0087)	(0.0481)	(0.0598)	(0.0027)	
(1)	0.0062	0.2518***	-0.1622***		
	(0.0098)	(0.0484)	(0.0603)		
Equation	*Const*	$(JAN_t \cdot INST_i)$	$(JAN_t^{Inst} \cdot INST_i)$	$INST_i$	$POST_t$
(2a)	-0.0139	0.4801***	-0.4135***	-0.0246	0.0563***
	(0.0155)	(0.0994)	(0.1190)	(0.0223)	(0.0179)
(2b)	-0.0156	0.4849***	-0.4397***	-0.0218	0.0581***
	(0.0158)	(0.0909)	(0.1108)	(0.0216)	(0.0179)

Note: The estimated models are (1) $r_{i,t} = \beta_0 + \beta_1 JAN_t + \beta_2 JAN_t^{Inst} + \beta_3 r_{i,t-1} + u_i + e_{i,t}$ and (2) $r_{i,t} = \beta_0 + \beta_1 (JAN_t \cdot INST_i) + \beta_2 (JAN_t^{Inst} \cdot INST_i) + \beta_3 INST_i + \beta_4 POST_t + u_i + e_{i,t}$, where stock returns are calculated as $r_{i,t} = 100 \ln(P_{i,t} / P_{i,t-1})$. JAN_t (JAN_t^{Inst}) denotes a dummy variable which takes on the value 1 in January throughout the whole sample period (during the period of increased institutional trading at the Warsaw Stock Exchange). $INST_i$ is a dummy variable indicating a stock's affiliation to the stricter (less strict) sub-sample of institutionally traded shares for equation 2a (2b). $POST_t$ is a dummy with value 1 during the period of increased institutional trading. *** denotes statistical significance at the 1% level.

The empirical results of the control sample (Panel C) also indicate that a January effect exists in the period before Hungarian pension funds invested on the stock market. The estimated parameters of JAN_t are positive and significant at the 1% level. In line with the findings for Poland, the magnitude of the January effect is smaller for non-institutionally traded shares relative to stocks actively institutionally traded. More importantly, the estimated coefficients of the dummy variable JAN_t^{Inst} are not statistically significant. This finding supports the hypothesis that the estimated decrease in the two institutional samples is caused by institutions' trading behavior and not by other factors. The decrease in the magnitude of the January effect is also observed for the whole market. In addition, the findings for the joint model support the empirical results discussed above.

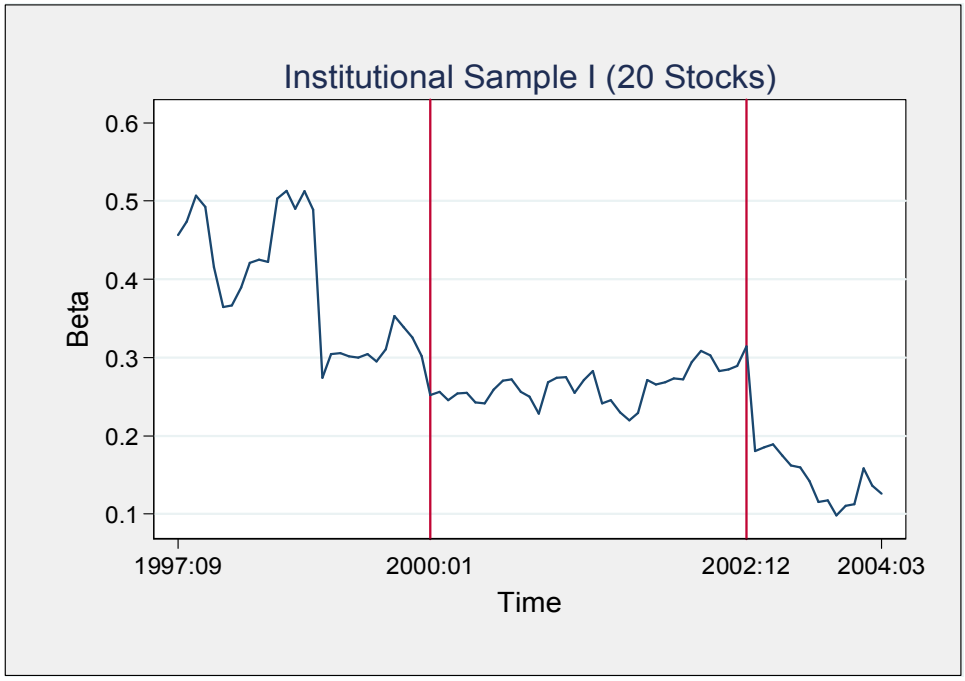
All results presented are calculated for a sample where 0.5% of extreme stock returns in both tails of the distribution were dropped. As a check of robustness, we repeated the above analysis using the sample without excluding the outliers. The results for Poland are qualitatively identical. The same holds for Hungary except for the findings of the control sample. For this sub-sample, very few large return outliers seem to impact the findings and justify our outlier correction. Moreover, we re-run all regressions including lagged returns of the S&P 500 index. The findings are qualitatively the same and do not change our main conclusions.[46]

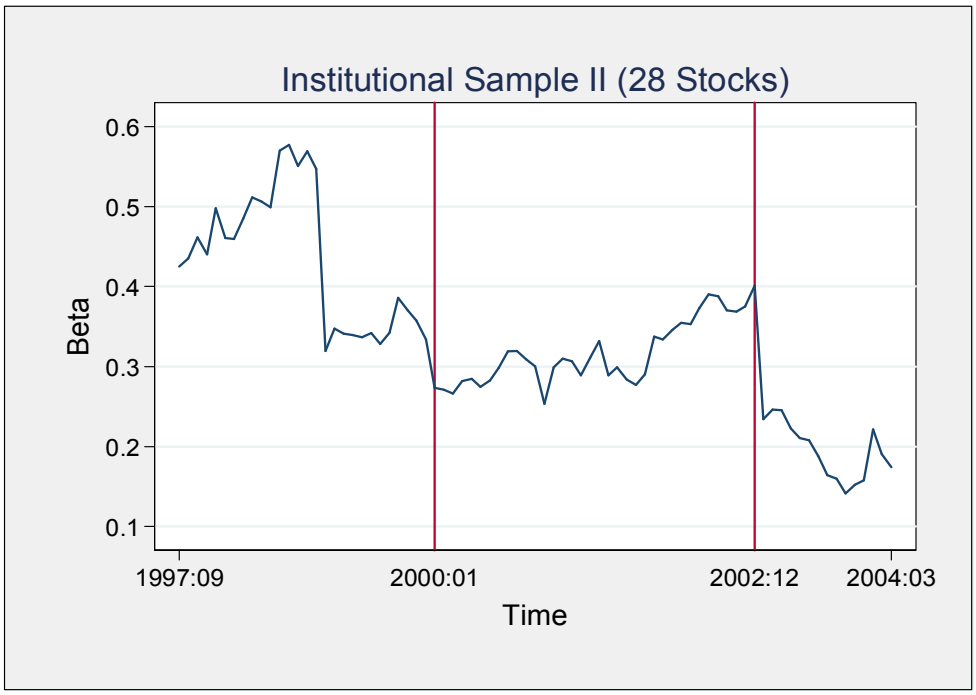
Last, we present the findings of the rolling estimation of equation (3). For Poland, the estimated β coefficients are displayed in Figure 5.1. The upper graph is the estimate for the institutionally traded sample including 20 stocks, the lower graph for the institutional sample with 28 stocks. All data points left of the first vertical marker contain January data from only the pre-event period, all points right of the second vertical marker only include January stock returns from the post-event period. The coefficients in between the two vertical lines were obtained from samples covering January stock returns from both the post- and the pre-event periods. In consistence with our theoretical proposition, we observe a drastic decline of the β parameter over time. For the pre-event period, β estimates are large. The inclusion of post-event data leads to a decrease in the estimated β coefficients. Once there are only data from post-event January stock returns included in the sample (the data to the right of the second vertical marker), β estimates sharply decline and stabilize on a considerably lower level. Thus, we observe a decreasing January effect exactly at the time when Polish pension fund managers

[46] The results of both robustness checks are not reported but available on request.

entered the market.[47]

Figure 5.1: Rolling Estimation Results for Poland





Note: Regression results of equation (3) for 20 (upper graph) and 28 (lower graph) institutionally traded stocks. The figures display the evolution of the β coefficient over time.

[47] These results are robust to the length of the estimation window and the size of the shift. We used estimation windows of 18, 24, and 30 months and obtained comparable results. Similarly, when moving forward the window by one week instead of one month, the results are almost identical.

Figure 5.2 shows the estimated β coefficients for the two Hungarian institutional sub-samples. The βs are calculated in the same manner as for Poland. During the period before the first marker, the estimated β coefficients are about 0.50. They decline drastically to values around 0.10 after the first January stock returns from the post-event periods are included in the regressions. After the second vertical marker, the estimated β parameters increase slightly and then fall to zero. Given the fact that, contrary to the Polish market, we do not have a certain well-known starting point for institutional trading on the Hungarian stock market, the evidence is naturally not as clear-cut as the evidence for the Polish market. The tendency of falling β coefficients, however, is nevertheless strong.

Figure 5.2: Rolling Estimation Results for Hungary

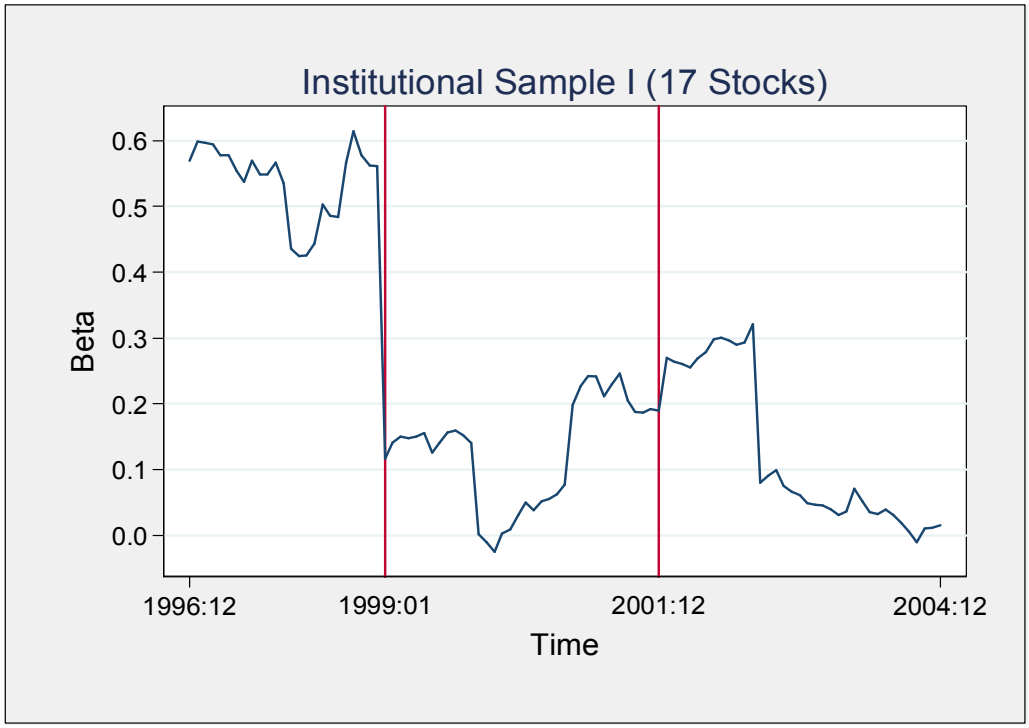
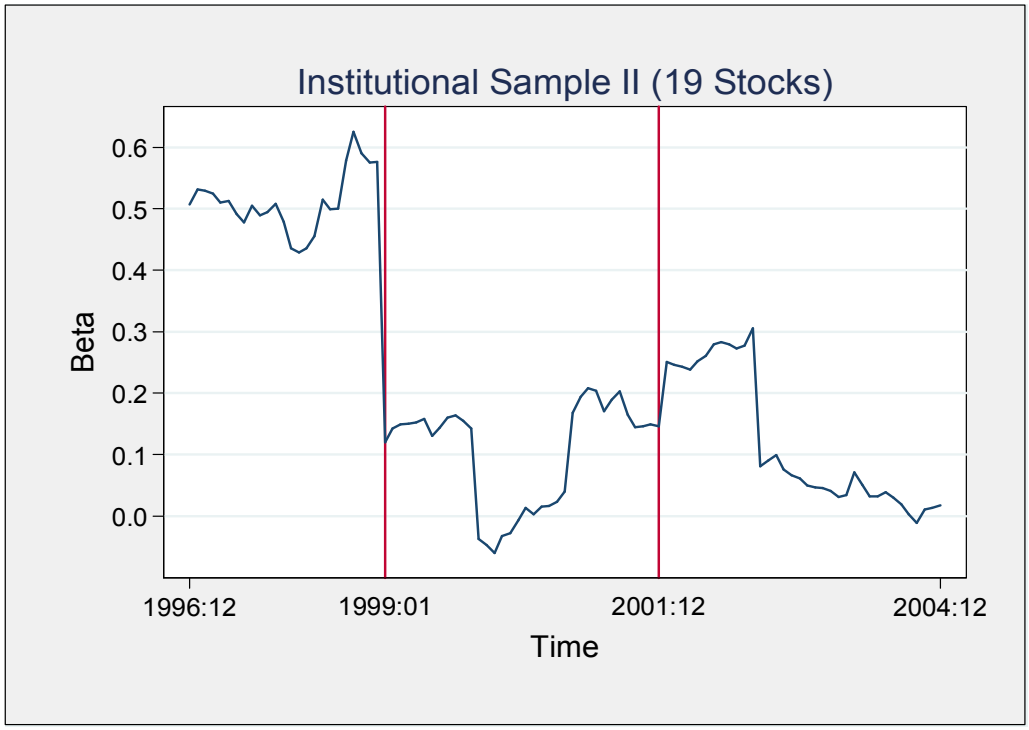


Figure 5.2: Rolling Estimation Results for Hungary (Continued)



Note: Regression results of equation (3) for 17 (upper graph) and 19 (lower graph) institutionally traded stocks. The figures display the evolution of the β coefficient over time.

5.6 Summary and Conclusions

The increase in the number of institutional investors trading on stock markets world-wide since the end of the 1980s has been associated with a rising interest on the part of financial economists in institutions' impact on stock prices. One branch of literature investigates the effect of an increase in institutional ownership on the magnitude of stock market anomalies. This paper adds to the evidence available on the Monday effect (Kamara, 1997; Chan, Leung, and Wang, 2004) and the size effect (Gompers and Metrick, 2001) by providing empirical results on the impact of institutional trading on the January effect.

Our results shed light on the causes for the anomaly and enhance the understanding of the relationship between asset prices and the investor structure of stock markets. The major difference between previous studies and ours is the unique institutional framework we exploit to investigate the role of institutional investors for the January anomaly. After the pension

system reforms in Poland on May 19, 1999, and in Hungary in 1998, pension fund investors became a large fraction of traders on the stock market. In contrast, before these dates the majority of traders were small, private investors. Moreover, capital gains taxes did not exist in Poland and Hungary during the period of predominantly individual trading.

The institutional features of the Polish and the Hungarian stock markets enable us to investigate the role of individual and institutional investors on the magnitude of the January effect. Our empirical findings are twofold. First, we can empirically confirm that there is a significant January effect in Polish and Hungarian stock returns driven by the trading behavior of individuals. Due to the lack of capital gains taxes we cannot rely on the tax-loss-selling hypothesis as a rational explanation for the January effect. Instead, our findings suggest that higher stock returns in January during the period before the pension system reforms in both countries are the result of possibly sentiment-driven investment decisions by individual investors.

Second and more importantly, our empirical results show that the increase in institutional trading on the Polish and the Hungarian stock markets had a significant dampening effect on the magnitude of the January anomaly. Our evidence is comparable to the results found in Kamara (1997) and Chan, Leung, and Wang (2004) for the Monday effect as well as Gompers and Metrick (2001) for the size effect in the U.S. The window-dressing hypothesis is not supported. The empirical evidence indicates that trading by Polish and Hungarian pension funds to a certain extent arbitrages away seasonal patterns in stock returns and, therefore, increases the efficiency of both stock markets. The price effect of irrational trading patterns seems to be partly eliminated by rational investors.

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6 CONCLUSIONS

The aim of this thesis was to provide new empirical evidence in some highly relevant fields of European corporate finance and capital markets. The traditional research approaches and methodologies developed in studies focusing on the US market are checked and, whenever it is needed, alternative approaches pertinent for the European case are proposed. The investigation concentrates on topics of financing constraints, corporate diversification and the institutional investors' influence on the stock market anomalies.

The first article has developed a new classification scheme that can be used to detect the presence of financing constraints in the euro area. Based on this new classification, the findings show that financially constrained firms that are unable to obtain external financing or face higher costs of borrowing invest at a lower rate and grow more slowly. They also hold relatively higher cash positions that grow substantially under depressed economic conditions, confirming the precautionary cost hypotheses of holding cash. The results also suggest that all firms save cash out of their cash flow in a systematic way, since they operate under market imperfections where liquidity is relevant for the intertemporal allocation of capital. This is in line with the transaction cost motive of holding cash. The fixed costs of borrowing induce firms to raise external funds infrequently and to use cash holdings as a buffer. Hence, regardless of the degree of financing constraints, each firm has its optimal amount of cash holdings. The liquidity irrelevance hypothesis holds only for firms operating under perfect market conditions where internal and external financing sources are interchangeable. Consequently, we can conclude that the cash flow sensitivity of cash holdings cannot be used for testing financing constraints of euro-area firms.

In the second article an alternative method of investigation of the euro-area financing conditions is proposed. The focus is oriented towards the firms' ability to take advantage of their sector-specific growth opportunities and whether they can get the external sources induced by their technological demand for external financing. It is tested whether firm size matters for an efficient reallocation of financial resources following a sector-specific growth shock. Such a response can only be efficient if firms' financial sources are elastic enough for the required investment, i.e. if firms are able to get additional external financing to fulfil their improved growth opportunities. For large and medium firms it is found that industries with higher growth opportunities are able to grow relatively faster compared with firms in other sectors, indicating an environment of favourable financing conditions. These firms are able to adapt to the time-varying industrial growth opportunity shocks in the short run and to specialise in industries

with a high natural reliance on external financing on the long run.

The third article provides evidence that corporate diversification is endogenous. In the special case of UK conglomerates it is found that firms choose to follow a diversification strategy determined by firm characteristics, macroeconomic conditions and M&A activities. After controlling for endogeneity, the diversification discount of UK firms of about 9% turns to a significant premium of 30%. The evidence of a premium is consistent with the value-maximization theory of diversification, which considers firm diversification as efficient capital allocation. The premium estimated by this study corresponds to the results of recent studies conducted on US firms. At the same time, it brings contradictory evidence to previous findings for the UK market that supported the agency theory of diversification arguing that managers pursue their own interests at the expense of shareholders' value.

In the last article of this thesis the effect of institutional investors on the January stock market anomaly is investigated. The Polish and Hungarian pension system reforms and the associated increase in investment activities of pension funds are used as a unique institutional characteristic to provide evidence on the impact of individual versus institutional investors on the January effect. The robust empirical results provided by this study suggest that the increase in institutional ownership has reduced the magnitude of an anomalous January effect induced by individual investors' trading behaviour.

V E R S I C H E R U N G

Ich versichere an Eides statt, dass ich die eingereichte Dissertation „Financing Constraints, Corporate Diversification, and Stock Market Anomalies: The European Case" selbständig verfasst habe. Anderer als der von mir angegebenen Quellen und Hilfsmittel habe ich mich nicht bedient. Alle wörtlich oder sinngemäß den Schriften anderer Autoren entnommenen Stellen habe ich kenntlich gemacht.

Curriculum Vitae
Rozália PÁL

Personal data

Citizenship: Romanian

Phone: ++40 748 156 024
++40 21 200 1057

Email: pal@euv-frankfurt-o.de
rozaliapal@yahoo.com

Education

2002 - 2006	Postgraduate Research Programme "Capital Markets and Finance in the Enlarged Europe", European University Viadrina, Frankfurt (Oder), Ph.D. Thesis defence date: 31.01.2007, Westfälishe Wilhelms-Universität Münster, Faculty of Economics Ph.D. Thesis: "Financing Constraints, Corporate Diversification, and Stock Market Anomalies: The European Case"
2000 - 2002	Professional Programme in Applied Economics, prepared in co-operation with the University of Pittsburgh, the Institute for Advanced Studies in Vienna and the University of Technology in Vienna-Academia Istropolitana Nova, Svaty Jur, Slovakia MA Thesis: "Tests of International Asset Pricing Models –a mean-variance framework" Case Study for European Countries
1996 - 2000	BA in Economics, West University of Timisoara, Romania

Field of Expertise

Corporate finance:	Corporate diversification and firm value
	Financing constraints and capital structure
Macroeconomics:	Emerging markets development

Professional Experience

Since 2006	UniCredit Romania, a Bank of UniCredit Group, Bucharest, senior economist- economic research
Dec. 2005 - Apr. 2006	European Central Bank, Frankfurt Main, internship at the Directorate Monetary Policy, Capital Market and Financial Structure Division Conducted research project: Financing conditions of Euro Area SMEs
Apr. – Jul. 2005	European University Viadrina, Frankfurt (Oder), teaching the exercise classes for course on Asset Pricing, summer semester
Oct. 2004 - Jan. 2005	European Central Bank, Frankfurt Main, internship at the Directorate Monetary Policy, Capital Market and Financial Structure Division Conducted research project: Financial Constraints of the Euro Area Non-Financial Corporations
1998 - 2000	Center for Social Science Research (CSSR), West University of Timisoara, research assistant and program coordinator

Languages

Hungarian – native language
Romanian – fluent
English – fluent
German – advanced

Software and computer skills

Visual Basic;
STATA, Eviews, SPSS, SAS;
Microsoft Office: Word, LateX, Excel, Access, PowerPoint.