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# The Long-Term Effects of Defined Benefit Pension Plan Freezes

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**Abstract**

In this paper I investigate the effects of defined benefit pension plan freezes on the companies' long-term stock performance, capital expenditures, R&D expenditures and acquisitions. I find that companies that freeze a DB pension plan invest less in R&D and have a relatively lower stock return compared to their peers in the three years prior to the freeze. In addition I find that these companies do not have a lower stock return in the three years after the freeze, while they invest less in capital expenditures, R&D and acquisitions than their peers in these years.

Keywords: defined benefit, stock return, capital, R&D, acquisitions, ratios
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# 1 Introduction

In the past two decades, a lot of companies in the U.S. have frozen a defined benefit (further referred to as DB) pension plan and have substituted new DB promises with contributions to defined contribution (further referred to as DC) pension plans[1] (Rauh et al., 2013).

Since the start of the shift from DB pension plans to DC pension plans, a lot of studies have been initiated to uncover the causes and the effects of this shift. Many papers like the papers of Rauh (2006) and Broadbent et al. (2006) indicate that the increase of underfunded DB pension plans (and as a result the increase of mandatory contributions for sponsors of DB pension plans) combined with the increased workforce mobility and increased transparency of pension plan accounting in this period caused the shift from DB pension plans to DC pension plans. The most frequently named reasons for the increase in underfunded plans are the decrease in the interest rates, shifts in the market values of the assets and changes in the amount of contributions of the sponsors in this period. The most important findings of the performed research on the effects of these shifts (or on the freezes of the DB pension plans) are:

1. Companies that have frozen a DB pension plan save a substantial amount on their pay roll in the years after the freeze (Rauh et al., 2013).
2. The leverage[2] and risk taking of these companies increase in the years following the freeze (Choy et al., 2014).
3. The positive short-term and (in a lesser degree) long-term effects on the stock performance of the companies that freeze a DB pension plan (Phan and Hegde (2013) and Milevsky and Song (2010)).

Although there are some papers that investigated the effects of DB pension plan freezes, there are still some effects that have not been fully analyzed.

In this paper, I investigate the long-term effects of DB pension plan freezes in the U.S. on the stock performance, the capital expenditures, R&D expenditures and acquisitions of the sponsor that freezes the plan. The data sample includes a total of 25,324 firm-year observations that range over a period from 1999 to 2015. The effects of a DB pension plan freeze on the long-term stock performance have not yet been thoroughly researched. Most papers analyze the short-term announcement effects

[1] Recently the Wall Street Journal announced that UPS, the world's largest package delivery company with a market capitalization of almost hundred billion dollars, is going to freeze a pension plan with a deficit of ten billion dollar for 70,000 nonunion employees.

[2] The leverage in which the pension assets and liabilities are not included. As Shivdasani and Stefanescu (2009) show the leverage of companies with DB pension plans rises by 35% when pension assets and liabilities are included in the companies' assets and liabilities.

on the stock return. The papers that investigate the effects of a DB pension plan freeze on the long-term stock performance like Phan and Hegde (2013) use smaller data samples[3] and other methods to examine the effects of DB pension plan freezes on these items. The effects of DB pension plan freezes on capital expenditures, R&D expenditures and acquisitions have not been investigated a lot by previous literature either. The paper of Phan and Hegde (2013) as well as the paper of Choy et al. (2014) investigate the effects of DB pension plan freezes on capital expenditures and Choy et al. (2014) investigates the effects on R&D expenditures as well. I use a substantially larger and more recent data sample than these two papers and I apply another methodology to determine these effects. To my knowledge, no research has been performed on the effects of DB pension plan freezes on acquisitions. For every item I investigate, I determine the cumulative abnormal return or ratio of the three years prior to the freeze and the three years following the freeze. I determine these cumulative abnormal returns and ratios relative to four different control groups. In addition I perform regressions for every item in which I include a dummy variable for the three years prior to a freeze and a dummy for the three years following the freeze. In these regressions I include a set of control variables that are partially based on the papers of Rauh (2006) and Fama and French (1993). The methods applied in this paper are partially based on the methods of Goyal and Wahal (2008) as well.

I find that the long-term stock performance of the three years prior to the freeze is significantly lower for firms that freeze a DB pension plan than for firms that do not freeze a DB pension plan. I find that the accumulated return of these companies over the three years prior to a freeze is on average 15,9% to 17,2% lower than the accumulated return of the companies' peers that do not freeze a DB pension plan. In addition I find that the long-term stock performance in the three years following the freeze of companies that freeze a DB pension plan does not significantly differ from firms that do not freeze a DB pension plan. The long-term stock performance of the three years following the freeze is even significantly higher for companies that freeze a DB pension plan than for companies that sponsor a DB pension plan, but do not freeze that pension plan. The accumulated return over the three years following a freeze is in this case 12,4% to 14,3% lower.

I do not find a difference in capital expenditures between companies that freeze a DB pension plan and companies that do not in the years prior to the DB pension plan freeze. I do find slightly lower capital expenditures for companies that freeze a DB pension plan compared to their peers that do not in the years following the freeze. An additional noteworthy finding is that the capital expenditures in the years prior to the freeze are lower for companies that freeze a DB pension plan than for companies that only sponsor a DB pension plan but do not freeze it. This difference

[3] E.g. Phan and Hegde (2013) use a data sample from 2001 to 2008 and only compare the long-term stock returns to companies that sponsor a DB pension plan as well.

is 3,7% of total assets and since the companies[4] have an average amount of 22 billion in total assets, this would mean that they spend an absolute amount of 814 million less than their peers that only sponsor DB pension plans, but do not freeze them.

In terms of R&D expenditures, I find that companies that freeze a DB pension plan under-invest relative to companies that do not freeze a DB pension plan in both the years prior to the freeze as the years following the freeze. The accumulated difference is 5,0% of total assets for the years prior to the freeze and 4,8% of total assets for the three years after the freeze, which comes down to an absolute difference of respectively 1,10 billion and 1,06 billion. However, these differences do not appear for both the years prior to the freeze as for the years following the freeze when I compare the companies that freeze a DB pension plan with either companies that solely sponsor DB pension plans or companies that sponsor a DB pension plan along with other pension plans.

For the level of acquisitions, I find that companies that freeze a DB pension plan do not invest less in acquisitions in the years prior to the freeze, but do invest less in acquisitions in the years following a freeze, when I compare those companies with companies that do not freeze a DB pension plan. The accumulated level of acquisitions to total assets is on average 2,3% to 2,4% lower for companies that freeze a DB pension plan over the three years after the freeze.

My findings in terms of the effect of a DB pension plan freeze on LT stock performance correspond with the findings of McFarland et al. (2009) for the years prior to freeze and partially correspond with the findings of Phan and Hegde (2013) for the years after the freeze. McFarland et al. (2009) find that firms underperform in the years prior to the freeze and Phan and Hegde (2013) find marginally positive abnormal returns for the first and second year after the freeze, but not for three years after the freeze, where I do not find any positive abnormal returns for all three years after the freeze[5].

My findings of the effect on capital expenditures and R&D expenditures partially correspond with the findings of Choy et al. (2014). They find that the capital expenditures are substantially lower in the years after a company freezes a DB pension plan, which I find as well. In contrast to Choy et al. (2014), I find that the R&D expenditures are significantly lower, where they find that companies that freeze a DB pension plan substitute capital expenditures with more risky R&D expenditures after the freeze.

This paper is structured as follows. In section 2, I discuss all the background information and related literature. Section 3 describes how I construct my final data sample, which data sources

[4] Companies that freeze a DB pension plan.

[5] In case of the control group that consists of companies with all different combinations of pension plans, but do not freeze a DB pension plan.

I use and which methods I apply to come to my empirical results that I discuss in section 4. Finally I summarize and conclude in section 5.

## 2 Theoretical Framework

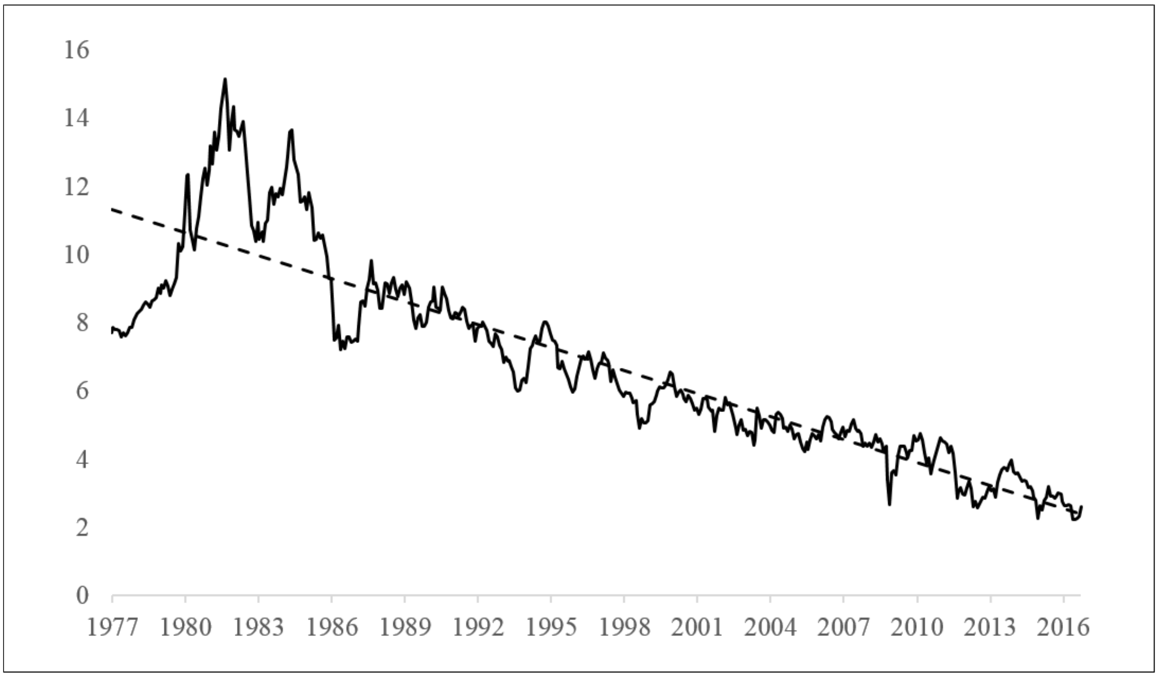
In this section, I give some background information about the different types of pension plans and I discuss pension plan related literature. There are two types of pension plans, i.e. DB pension plans and DC pension plans. The main difference between these two pension plans is that a DB pension plan guarantees an income at retirement, where a DC pension plan does not.

The way the monthly benefit at time of retirement is determined for a DB pension plan, differs per DB pension plan. Some DB pension plans promise an absolute amount like e.g. 2000 dollars per month at the age of retirement, but this is not very common. It is more common for DB pension plans to promise an amount that is determined on the basis of the amount of years the employee works at the sponsor of the plan and the average salary over these years of employment. There is one type of DB pension plan, called a cash balance (further referred to as CB) pension plan, that has the characteristics of a DB and DC pension plan. As in the case of a DB pension plan, the sponsor bears the investment risks and the income at time of retirement is predetermined and guaranteed. Unlike most of the DB pension plans, a CB pension plan is preserved on an individual basis which is quite similar to a DC pension plan. Because sponsors need to be able to pay out the benefits to the participants at the time of retirement, they need to make an estimate on the present value of the liabilities to determine what contributions they have to make.

To protect employees from scenarios in which the sponsor is unable to pay out the benefits because of e.g. bankruptcy, the benefits are in most cases protected by the Pension Benefit Guaranty Corporation. Where the risk of the investments lies totally with the sponsor in case of a DB pension plan, this is not the case for a DC pension plan. In a DC pension plan the employee bears the risk of the investments. Examples of DC plans are 401(k) plans and 403(b) plans[6]. The risks that sponsors of DB pension plans bear are on both the asset side as the liabilities side. To account for the liability risk, Black (1989) gives two types of recommendation for pension portfolio investments for the two types of measures for the market value of a pension fund: the Accumulated Benefit Obligation (ABO) and the Projected Benefit Obligation (PBO). The difference between these two measures is that the ABO just focuses on the years of employment and average salary as of now, where the PBO makes a projection for the average salary at the time of retirement. According to Pennacchi and Rastad (2011), who investigate portfolio allocation for public pension funds, this

[6] A lot of information regarding the pension plans is collected from the Department of Labor website

**Figure 1:** Development of 30 years U.S. treasury rate




This graph shows the development of the 30 years U.S. treasury rate over the last 40 years. The vertical axis shows the interest rate in percentages. The source that is used to collect 30 year U.S. treasury rates is the U.S. Department of Treasury website.

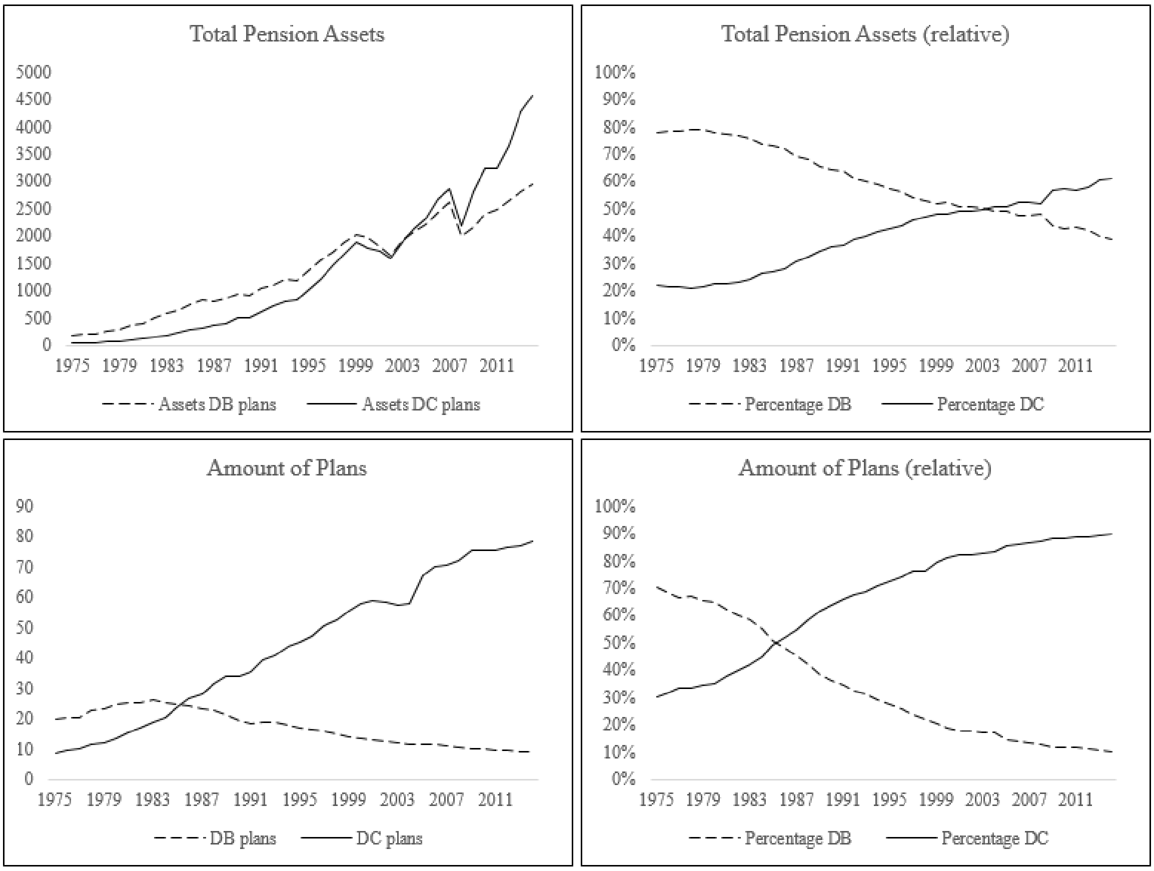
makes the PBO a better measure for liability risk if a public pension plan is a continuing concern. Black (1989) recommends to exclusively invest in bonds that match the duration of the liabilities if the ABO measure is applied and to invest a part of the portfolio in stocks if the PBO measure is used. The investment in stocks in case of the PBO measure is recommended to account for wage growth, which is positively correlated with stock returns (Black, 1989). The duration is a measure of the sensitivity to shocks in the interest rate and is given by the following formula:

$$Duration = \frac{\sum_{t=1}^{T} \frac{t*C_t}{(1+r)^t}}{\sum_{t=1}^{T} \frac{C_t}{(1+r)^t}} \tag{1}$$

The liabilities of DB pension plans are higher in times of low interest rates than in times of high interest rates, because the rate with which the liabilities are discounted is affected by the interest rate. As shown in *Figure 1*, the U.S. treasury rates have been declining for the past 35 years.

Comprix and Muller (2011) mention that these declining interest rates cause the obligations of the DB pension plans to become increasingly difficult to carry, because of the liabilities being discounted by rates that are based on the interest rates. According to Rauh et al. (2013), this

**Figure 2:** DB vs DC pension plans in number and assets




This figure contains four graphs. The top left graph shows the amount of total assets is contributed to DB- and DC pension plans. The vertical axis of the top left graph is given in billions of dollars. The top right graph gives the ratio of the DB pension assets and DC pension assets to total assets. The bottom left graph shows the amount of DC and DB pension plans in thousands. The bottom right graph shows the ratio of the number of DB- and DC pension plans to the total amount of pension plans. The data only contains U.S. corporate pension plans and the source from which the data is collected is the U.S. Department of Labor database.

decrease in interest rates is one heavily cited reason of companies shifting from DB pension plans to DC pension plans. The shift from DB- to DC pension plans in the U.S. is illustrated by the four graphs in *Figure 2*. Rauh et al. (2013) show that many companies in the U.S. froze DB plans and substituted the new DB promises with contributions to DC pension plans. There are two types of DB pension plan freezes, namely a "soft freeze" and a "hard freeze". When a company implements a soft freeze, the DB benefits still increase after the moment of the freeze for existing employees. However, employees that are hired after the soft freeze cannot participate in the DB pension plan. When a company undertakes a hard freeze, the accrued DB benefits that are earned by the existing employees till the time of the freeze will still be paid out at the time of retirement, but these employees are not able to grow their DB benefits in the future (Rauh et al., 2013).

Broadbent et al. (2006) investigate the shift from DB pension plans to DC pension plans in various countries. They offer a multiple explanations for the shift in their paper. They mention that (particularly for the U.S.) workforce mobility that is affiliated with demographic- and industrial change is an important driver of this shift. Broadbent et al. (2006) argue that DB pension plans penalize mobile workers, because in a lot of cases it is not possible to transfer all of the DB benefits from one employer to another. Another factor that plays an important role according to Broadbent et al. (2006) is the increased transparency of the financial risks created by regulatory- and accounting reform. In addition Shivdasani and Stefanescu (2009) show that the leverage ratios of the companies with a DB pension plan rise by 35% when the pension assets and liabilities are incorporated into the total assets and liabilities of the company. Together with the increased transparency, this could have forced sponsors to freeze their DB pension plans. Broadbent et al. (2006) also investigate the consequences of this shift for asset allocation and risk management. They state that the investment risk of the pension plan has shifted from the employer to the household. This is confirmed by the paper of Poterba et al. (2007) in which they show that average retirement wealth of DC pension plans exceed the average retirement wealth of DB pension plans, although there is a higher chance of very low retirement wealth under DC pension plans as well. There are no big differences in the asset allocation between the two types of plans, although participants of DC pension plans tend to invest a lot in the stock of their employer. This phenomenon is confirmed by many other papers (Liang and Weisbenner (2002), Huberman and Sengmueller (2004) and Benartzi et al. (2007)).

Another finding of Rauh et al. (2013) is that U.S. corporations that have frozen a DB pension plan, save 2,7% to 3,6% of pay roll per year and even save 3,1% of the company's total assets in the 10 years after a freeze, which indicates that employees are not fully compensated for the lost DB accruals. In earlier research, Rauh (2006) shows that mandatory contributions to DB pension plans have an effect on the investments of companies as well. He finds that there is a relation between the funding status of the company's pension plan and the level of capital expenditures of the company. When I interpret the results of these two papers, a logical thought would be that the capital expenditures will rise in the years after a DB pension plan freeze since Rauh et al. (2013) show that a company saves a lot of money by freezing its' DB pension plan and Rauh (2006) shows that the capital expenditures are negatively correlated with the mandatory contributions to these DB pension plans. However, the paper of Choy et al. (2014) shows that companies that freeze a DB pension plan shift their investments from capital expenditures to more risky R&D expenditures.

The main goal of the paper of Choy et al. (2014) was to determine if the freeze of a DB pension plan affects the firm risk. They specified three types of risk, namely the total risk, equity risk and credit risk. Apart from the finding of the shift to more risky R&D expenditures, they also find an increase in leverage, bond-yields and stock return volatility and a decrease in credit ratings after a DB pension plan freeze. Similar to Choy et al. (2014), Phan and Hegde (2013) also find that a freeze leads to an increase in leverage. Apart from that Phan and Hegde (2013) investigate if DB pension plan freezes create firm value in the short-term and long-term. They find that these freezes create value in the short-term and have marginally positive long-term abnormal returns in the first and second year after the freeze. Milevsky and Song (2010) and McFarland et al. (2009) investigate the effect of DB pension plan freezes on short-term stock performance as well. Milevsky and Song (2010) find positive risk-adjusted returns in the days after a freeze and they find that these positive risk-adjusted returns are higher for companies that are likely to face financial distress when they would not have frozen the DB pension plan. In contrast to Milevsky and Song (2010), McFarland et al. (2009) do not find much evidence to support that companies increase in market value in the days after a freeze. Instead, they predominantly find insignificant or even negative cumulative abnormal stock returns in the days after a freeze. Another finding of McFarland et al. (2009) is that companies that freeze a pension plan have underperformed in the years prior to the freeze when compared to industry peers that have DB pension plans as well and did not freeze those plans.

A lot of the papers that examine the effects of DB pension plan freezes, have a data sample that focuses on the years 2004 to 2007. The reason for this is that most of the DB pension plan freezes took place in that time period. As already mentioned, Broadbent et al. (2006) states that an important reason for the increase in pension plan freezes in these years, were the accounting reforms that took place in that time period. This raises the question if the risks of these DB pension plans were incorporated into the price before these accounting reforms. In the research of Jin et al. (2006), they examine if the risk of a company's pension plan is reflected in its' stock return. The empirical findings in this paper indicate that the risk of the firm's pension plan is incorporated into the equity risk of the sponsor. In their paper, they use a data sample with a time period from 1993 to 1998, which was far before the accounting reforms for the DB pension plans. Jin et al. (2006) also emphasize that the opaque set of accounting rules[7] for pension plans is one of the main reasons to examine if investors recognize the risk of the companies' pension plans, but as mentioned they do not find any evidence to believe that the market is informational inefficient. However, there are some papers that show that companies with DB pension plans are not correctly valued. E.g. Coronado et al. (2008) investigate the impact of pension accounting on the stock value of companies with DB pension plans. They argue that the increased attention created by the Financial Accounting Standard Board to start a project in restructuring the DB pension plan accounting, should alert investors for mispricing through informational problems. In contrast to Jin et al. (2006), they find that the mispricing is not eliminated by the increased attention to this lack of transparency, where Jin et al. (2006) not even find mispricing before this increased attention. The research of Coronado et al. (2008) elaborates on the paper of Coronado and Sharpe (2003) in which they find that one-

[7] In the same year as the paper of Jin et al. (2006) was published, some big changes to increase the transparency of DB pension plan accounting were made.

tenth of the firms with a DB pension plan were at least 20 percent overvalued. But apart from that paper, there are not a lot of papers that show the same results as Coronado et al. (2008). However, the findings of Jin et al. (2006) correspond to the results of a lot of other papers that investigate this topic at different points in time as they mention in their own paper as well (i.e. Oldfield (1977), Bulow et al. (1987) and Carroll and Niehaus (1998)). As Jin et al. (2006) also discuss in their paper, Carroll and Niehaus (1998) even show that the market incorporates an underfunded pension plan into the market value of the company by almost the total amount of underfunding, while the market does not fully incorporate the overfunding of the pension plan into the price. According to Carroll and Niehaus (1998) this is consistent with the fact that pension plan liabilities are an integral part of the company's liabilities while the excess assets can not be fully attributed to the company since these excess assets have to be shared. These findings strongly suggest that the market knows the risks of these pension plans and that the funding status of these pension plans is (correctly) incorporated into the market value of the company.

In my paper, I investigate the long-term effects of DB pension plan freezes on different variables. First, I investigate the effects of DB pension plan freezes on long-term stock price performance. There is a lot of research that is focused on the short-term abnormal stock returns (e.g. Milevsky and Song (2010) and McFarland et al. (2009)), where there are not a lot of papers that investigate the long-term stock performance. Although there are some papers that show that healthy employers are freezing their pension plans as well (Munnell et al., 2007), I expect the employers that freeze their pension plans to have lower stock returns than their peers in the years prior to the freeze, which is also shown by some papers (McFarland et al., 2009). In the years after the freeze I expect that the stock returns do not differ from the stock returns of their peers or that the stock returns are even higher due to e.g. the pay roll savings (Rauh et al., 2013), that can result a higher market value through an increase in free cash flows. This results in the following hypotheses regarding the effects of DB pension plan freezes on long-term stock performance:

**Hypothesis 1** *In the years prior to a DB pension plan freeze, the long-term stock performance of the companies that freeze a DB pension plan is relatively lower than the long-term stock performance of the companies' peers that do not freeze a DB pension plan.*

**Hypothesis 2** *In the years following a DB pension plan freeze, the long-term stock performance of the companies that freeze a DB pension plan is the same as, or relatively higher than the long-term stock performance of the companies' peers that do not freeze a DB pension plan.*

In the paper of McFarland et al. (2009), they compare the returns of the companies that freeze a DB pension plan with those companies that have a DB pension plans as well, but that do not freeze those plans. In contrast to McFarland et al. (2009), I compare the returns of companies that freeze a DB pension plan with other control groups as well like companies that only sponsor DC pension plans. Apart from the long-term stock return, I investigate the effect of DB pension plan freezes on capital expenditures as well for which I have the following hypotheses:

**Hypothesis 3** *In the years prior to a DB pension plan freeze, the capital expenditures of the companies that freeze a DB pension plan are relatively lower than the capital expenditures of the companies' peers that do not freeze a DB pension plan.*

**Hypothesis 4** *In the years after a DB pension plan freeze, the capital expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the capital expenditures of the companies' peers that do not freeze a DB pension plan.*

These hypotheses are based on the combination of the papers of Rauh (2006) and Rauh et al. (2013). As mentioned previously, the paper of Rauh (2006) shows that companies are constrained in their investment by mandatory contributions to DB pension plans. In addition, the paper of Rauh et al. (2013) shows that companies that freeze a DB pension plan, save a substantial amount of money on pay rolls, which enables that companies to spend more on capital expenditures. Combined, these findings suggest that companies that freeze a DB pension plan will invest more in capital expenditures as a result of higher cash flows through pay roll savings on mandatory contributions. In order to test these hypothesis, I make partially use of some of the methods applied in the paper of Rauh (2006). In addition, I use a bigger data sample over a longer time frame and I analyze the effects of a freeze instead of the effect of mandatory contributions on these expenditures. The fifth and sixth hypothesis concern the effect of DB pension plan freezes on the R&D expenditures of companies:

**Hypothesis 5** *In the years prior to a DB pension plan freeze, the R&D expenditures of the companies that freeze a DB pension plan are relatively lower than the R&D expenditures of the companies' peers that do not freeze a DB pension plan.*

**Hypothesis 6** *In the years after a DB pension plan freeze, the R&D expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the R&D expenditures of the companies' peers that do not freeze a DB pension plan.*

There are not a lot papers that investigated the effects of DB pension plan freezes on R&D expenditures. Choy et al. (2014) find that the R&D expenditures of companies go up after a DB pension plan freeze. In addition to the paper of Choy et al. (2014), I use a data sample that is larger and ranges over a larger time period and I apply other methods to test the effects on R&D expenditures. In order to test hypotheses 5 and 6, I use the same methods as I use to test hypotheses 3, 4, 7 and 8. Hypotheses 7 and 8 concern the effect of DB pension plan freezes on acquisitions and are formulated as follows:

**Hypothesis 7** *In the years prior to a DB pension plan freeze, the acquisition expenditures of the companies that freeze a DB pension plan are relatively lower than the acquisition expenditures of the companies' peers that do not freeze a DB pension plan.*

**Hypothesis 8** *In the years after a DB pension plan freeze, the acquisition expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the acquisition expenditures of the companies' peers that do not freeze a DB pension plan.*

To my knowledge, there is no research performed to the effects of DB pension plan freezes on acquisitions. Most research focuses on investments in terms of capital expenditures or in some papers also R&D expenditures, while in a lot of industries investments in the form of acquisitions can be substantial in maintaining growth and are sometimes even used as a substitute for R&D expenditures as shown by Blonigen and Taylor (2000), who find a negative relation between a firm's appetite to acquire and its' level of R&D expenditures.

# 3 Data and Methodology

In this section I discuss the data I use and the methods I apply in order to test my hypotheses. In the first part of this section I discuss the data sources that I use to get to my final data samples, the process of getting to the final data samples and the process of constructing the variables in these final data samples. In the second part of this section, I discuss the methods I apply to test my hypotheses.

## 3.1 Construction of Data Samples

In my research I use yearly panel data collected from different data sources. I use The Department of Labor (further referred to as DOL) database to collect all the pension plan data of each company. I collect two filings for each year between 1999 and 2015 from the DOL database: the Form 5500 filings and the Schedule H filings. The Form 5500 filings contain the general information for each pension- and welfare plan of all U.S. companies. The Schedule H filings contain all financial information of the large pension- and welfare plans such as the total assets, total contributions and total liabilities. A plan is scaled as large when it contains a hundred or more participants. In my research, I just take the large pension plans into account. After collecting all the Schedule H- and Form 5500 filings, I merge all the different filings. First I merge the Schedule H filings for every year and I remove the duplicate observations. Thereafter I do the same for the Form 5500 filings. Finally I merge these two data samples using the EIN-codes, PN-codes and the fiscal year-ends of the pension- and welfare plans. The EIN-codes are unique company identification numbers, where the PN-codes are unique plan identification numbers. After I merged all the data of the DOL filings, I drop a part of the observations based on the following arguments:

1. The observations that do not have a pension plan code[8], I exclude from the data sample. These codes are essential in recognizing if a pension plan is a DB- or DC pension plan and to see if a pension plan is frozen.

2. I drop all observations with a filled in welfare plan code[9], because I want to exclude the welfare plans from my final data sample. Apart from that, I exclude observations from which the plan name includes the phrases or words that are shown in *Table 36* as a second check. These phrases indicate that the plan is a welfare plan instead of a pension plan[10]. The plans that have both a welfare plan code and a pension plan code are dropped from the data sample as well.

3. Finally I exclude the observations for which companies have multiple pension plans with different fiscal year-ends. This is necessary because of the following reason: when a company freezes a pension plan before the fiscal year-end of that pension plan, but after the fiscal year-end of another pension plan, this freeze is appointed to a fiscal year that would not be the same as in the case of the other pension plan and that could eventually lead to distorted results in my analyses.

I collect the financial data of the companies from the CRSP- and Compustat databases. I use the CRSP database to collect all stock return related data as well as the market returns and the three month U.S. treasury bill rates which are used as a proxy for the risk free rate of return. I use the Compustat database to get all the companies' Balance Sheet-, Cash Flow Statement-, and Income Statement items. The CRSP- and Compustat data samples are merged using the CUSIP-codes and fiscal year-ends. Because the fiscal year-end of a company can range over the twelve months of the year, the CRSP data is taken monthly. In that case the company's stock price at the fiscal year-end of the company can be taken and the company's stock return can be determined over the same period as the fiscal year of the company. I do this for the market return and risk free rate of return as well. The CUSIP-codes are unique company identification numbers used by Compustat

[8]The pension plan code refers to the "Type Pension Benefit Code" that can be found in the Form 5500 filings for each plan.

[9]The welfare plan code refers to the "Type Welfare Benefit Code" that can be found (like the pension plan codes) in the Form 5500 filings.

[10]the phrases and words are based on a list the DOL made to identify the welfare plans. However, there is a substantial amount that is still identified as welfare plan after the first drop based on the welfare plan codes.

and CRSP. The reason the CUSIP-codes are used instead of the EIN-codes is that CRSP does not use EIN-codes. Compustat uses both the EIN-codes as the CUSIP-codes.

After producing two merged data samples, one merged CRSP-Compustat data sample and one merged DOL data sample, I merge these two data samples using the EIN-codes and the fiscal year-ends. This means I match the fiscal year-end of the company to that of its' pension plan(s). These fiscal years usually end in the same month. If the fiscal year of the company does not end in the same month as the fiscal year of its' pension plan, the observations are dropped from the sample. Finally all observations are collapsed by company and fiscal year. Before collapsing all the data, the pension plans get a tag based on the pension plan code of the plan. The pension plan code contains a sequence of numbers and characters based on the characteristics of the pension plan. This sequence indicates if a plan is e.g. a DB- or DC pension plan. Apart from indicating the type of plan, the sequence also indicates if the plan is frozen or not. In this research, three main tags[11] are created: a tag if the plan is a DB pension plan, a tag if the plan is a DC pension plan and a tag if the plan is a frozen DB pension plan. If the plan is a DB plan, the pension plan code contains the number 1. When a hard freeze of a DB pension plan has occured, the pension plan code contains the sequence "1I". If the plan is a DC plan, the pension plan code contains the number 2. To check if the freeze tags of different years are from the same pension plan of a company after collapsing the data, another variable is created by multiplying the PN-numbers of the plan with the freeze tags. If the values of this variable are not the same in the consecutive years of the freeze, the observations are dropped. I check these cases manually[12]. The observations are dropped from the data samples as well if the first year of a company in the data sample contains a frozen plan, because it is not possible to ensure that the company froze the pension plan in that particular year. Finally the observations with multiple pension plan freezes are dropped from the data sample[13]. This sample will be the base for the individual final samples of each test variable[14]. In *Table 1* there is an overview of the amount of observations per different point in time of the construction of the final data sample. The merged Form 5500 sample is taken as the starting point of the construction of the final data sample in *Table 1*. In *Table 2*, the descriptive statistics of the different test variables and a number of other variables are shown.

[11] A tag can either have a value of 1 or 0. If a plan is e.g. a DB pension plan it will get a DB tag of 1.

[12] It could be the case that a pension plan gets another PN-number in a consecutive year.

[13] When the company has multiple pension plan freezes, I will drop the observations from the year of the second freeze and the years thereafter.

[14] Because of differences in the amounts of reliable observations per final sample of each test variable, the final samples of each test variable differ in the amount of total observations.

**Table 1:** Construction of Data Sample

This table contains the number of observations per fiscal year at different points in time of the construction of the final data sample. Column *(1)* contains all pension plan observations from the Form 5500 from 1999 to 2015. Column *(2)* shows the number of observations after merging the Form 5500 data with the Schedule H data, which includes the financial data of all the big pension plans (with more than 100 participants). Column *(3)* shows the number of observations after merging the data with the merged CRSP-Compustat data set. After merging the data from the Department Of Labor with the CRSP-Compustat data, I collapse the data of every company per fiscal year which results in column *(4.1)*. Thus, in column *(4.1)* every observation is the observation of one company in the concerned fiscal year. Column *(4.1)* contains all the observations, where columns *(4.2)* and *(4.3)* contain the number of companies with respectively a DC pension plan and a DB pension plan. Column *(4.4)* contains the number of companies that freeze a pension plan per fiscal year. Finally, the data samples per test variable will be made out of *(4.1)*. These data samples differ to a small extent in number of observations per test variable due to false data like e.g. negative expenditures on acquisitions.

| Year | (1) | (2) | (3) | (4) | | | |
|---|---|---|---|---|---|---|---|
| | | | | (4.1) | (4.2) | (4.3) | (4.4) |
| *1999* | 573,773 | 62,059 | 2,363 | 1,378 | 1,313 | 367 | 0 |
| *2000* | 948,305 | 120,404 | 2,736 | 1,690 | 1,654 | 385 | 0 |
| *2001* | 1,016,494 | 128,791 | 2,774 | 1,657 | 1,626 | 388 | 0 |
| *2002* | 1,021,662 | 122,776 | 2,640 | 1,625 | 1,590 | 379 | 0 |
| *2003* | 952,156 | 120,113 | 2,634 | 1,603 | 1,577 | 400 | 27 |
| *2004* | 903,929 | 115,825 | 2,587 | 1,597 | 1,570 | 404 | 14 |
| *2005* | 913,013 | 116,823 | 2,545 | 1,594 | 1,566 | 401 | 14 |
| *2006* | 923,440 | 117,752 | 2,463 | 1,563 | 1,525 | 400 | 16 |
| *2007* | 931,737 | 115,948 | 2,489 | 1,544 | 1,514 | 396 | 19 |
| *2008* | 858,678 | 97,265 | 2,344 | 1,464 | 1,435 | 375 | 15 |
| *2009* | 412,195 | 90,805 | 2,342 | 1,438 | 1,411 | 374 | 19 |
| *2010* | 308,923 | 93,069 | 2,222 | 1,376 | 1,352 | 375 | 17 |
| *2011* | 286,019 | 92,011 | 2,237 | 1,371 | 1,349 | 374 | 15 |
| *2012* | 272,816 | 92,223 | 2,211 | 1,350 | 1,327 | 364 | 9 |
| *2013* | 264,837 | 92,220 | 2,139 | 1,353 | 1,328 | 351 | 20 |
| *2014* | 260,324 | 92,868 | 2,200 | 1,378 | 1,362 | 357 | 13 |
| *2015* | 251,797 | 91,957 | 2,115 | 1,343 | 1,330 | 331 | 7 |
| *Total* | 11,100,098 | 1,762,909 | 41,041 | 25,324 | 24,829 | 6,421 | 205 |

## 3.2 Construction of Variables

In this section, I discuss the construction of the different variables that I use in my analysis. First, I discuss the construction of the four test variables beginning with the yearly stock return. Thereafter I discuss the selection and construction of the explanatory variables I use in the performed regressions.

The construction of the yearly stock return is done before merging the CRSP-Compustat data sample with the DOL data sample, because the stock price of the year 1998 is dropped as a result of merging the data samples by fiscal year-end since the DOL data sample starts in 1999. However, this year is needed to determine the stock return of the first year. It is possible to directly collect the stock returns from CRSP data base, but there are a lot of missing stock returns in that case. This is to a smaller extent the case for the adjusted stock prices. For those reasons, I collect the raw stock prices of all U.S. companies covered by CRSP and all the corresponding cumulative adjustment factors. The unadjusted stock price is the stock price that is not adjusted for e.g. stock splits or stock dividends. The cumulative adjustment factor accounts for these events

**Table 2:** Descriptive Statistics of Final Data Sample

This table presents the descriptive statistics of 25,324 firm-year observations between 1999 and 2015 of a total of 3454 different companies in the US. The table contains the descriptive statistics of the test variables *yearly stock return*, *Capital Expenditures*$_t$ / *Total Assets*$_{t-1}$, *R&D* / *Total Assets*$_{t-1}$ and *Acquisitions*$_t$ / *Total Assets*$_{t-1}$, which are given by the first four rows in the table. Apart from that, I add descriptive statistics for the variables *Tobin's Q*, the two types of *Cash Flows*$_t$ / *Total Assets*$_{t-1}$ which differ in the subtraction or inclusion of total pension contributions, the *Total Assets* (in billions and as the logarithm of the total assets), the *Market Value* (in billions), *Pension Assets* (in billions) and the total pension assets of a company divided by its' total assets as shown by *PA / TA* in the table. For all these variables, I present the number of observations (all and nonzero (NZ Obs)), the mean, the standard deviations (SD) and the 10th-, 25th-, 50th- (median), 75th- and 90th percentiles of all nonzero observations.

| | | | | | Percentiles Of Nonzero Observations | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | Observations | Mean | SD | NZ Obs | p10 | p25 | p50 | p75 | p90 |
| | | | | Test variable Stock Return | | | | | |
| *Stock Return* | 24,348 | 0.087 | 0.638 | 24,317 | -0.545 | -0.237 | 0.035 | 0.311 | 0.716 |
| $CAPEX_t/TA_{t-1}$ | 25,324 | 0.048 | 0.066 | 23,418 | 0.003 | 0.012 | 0.030 | 0.063 | 0.121 |
| $R\&D_t/TA_{t-1}$ | 25,324 | 0.049 | 0.112 | 10,214 | 0.008 | 0.022 | 0.072 | 0.158 | 0.297 |
| $Acquisition_t/TA_{t-1}$ | 24,599 | 0.029 | 0.089 | 8,903 | 0.001 | 0.006 | 0.025 | 0.089 | 0.235 |
| *Tobin's Q* | 24,302 | 1.858 | 1.466 | 24,302 | 0.895 | 1.032 | 1.315 | 2.070 | 3.477 |
| $CF_t/TA_{t-1}$ | 25,139 | 0.038 | 0.184 | 25,139 | -0.136 | 0.010 | 0.063 | 0.124 | 0.195 |
| $NPCF_t/TA_{t-1}$ | 25,250 | 0.039 | 0.184 | 25,248 | -0.135 | 0.010 | 0.064 | 0.126 | 0.196 |
| *Total Assets* | 24,342 | 9.076 | 64.904 | 24,342 | 0.061 | 0.187 | 0.762 | 3.011 | 11.303 |
| *Log(Assets)* | 24,342 | 20.512 | 1.980 | 24,342 | 17.927 | 19.044 | 20.451 | 21.825 | 23.148 |
| *Market Value* | 24,348 | 4.646 | 20.269 | 24,348 | 0.038 | 0.138 | 0.545 | 2.100 | 7.710 |
| *Pension Assets* | 24,348 | 0.709 | 3.995 | 24,197 | 0.004 | 0.010 | 0.036 | 0.182 | 0.988 |
| *PA / TA* | 24,191 | 0.136 | 0.185 | 24,152 | 0.010 | 0.026 | 0.074 | 0.175 | 0.334 |

as demonstrated by the following equation:

$$R_{it} = \frac{(P_{it}/C_{it})}{(P_{i,t-1}/C_{i,t-1})} \tag{2}$$

In this equation, $R_{it}$ is the yearly stock return of company $i$ over the year $t$, $P_{it}$ is the raw stock price of company $i$ at time $t$ and $C_{it}$ the cumulative adjustment factor of company $i$ at time $t$. After calculating the yearly stock return, I subtract the risk free rates of return from the yearly stock returns. I use the three month U.S. treasury bill rates as a proxy for the risk free rate of return.

The other three test variables are divided by the total book assets at the beginning of the year, which is shown by the following equation:

$$RatioX_{it} = \frac{X_{it}}{TA_{i,t-1}} \tag{3}$$

In which $X_{it}$ can be the amount spent on capital expenditures, R&D or acquisitions of company $i$ over the year $t$ and $TA_{i,t-1}$ are the total book assets of company $i$ at the beginning of year $t$. The three types of expenditures are divided by the total assets to normalize for the size of the company. In case the capital expenditures, R&D expenditures or acquisition expenditures are missing for a company in a certain year, these observations are replaced with the value zero. I replace these values with zero, because the number of freeze observations will otherwise drop to a level for which the power will not be high enough to draw reliable conclusions. Finally the observations of the four test variables are winsorized at the 1$^{st}$ and the 99$^{th}$ percentile.

I use two sets of explanatory variables for the main analyses: one set of explanatory variables is used in the yearly stock return regressions and the other set of explanatory variables is used in the regressions of the capital expenditures, R&D expenditures and acquisition expenditures. The variables used to explain the yearly stock return are the market return, the logarithm of the total book assets at the beginning of the year, the Tobin's Q at the beginning of the year and a set of dummy variables based on the sector in which the company is active. The second set of explanatory variables includes the Tobin's Q at the beginning of the year, the cash flows of the company and a set of dummy variables based on the sector in which the company is active. I use three proxies for the market return, namely the Value-Weighted market return and Equally-Weighted market return of CRSP and the Standard & Poor's 500 return. I subtract the three-month U.S. treasury bill rate from these market returns as a proxy for the risk free rate. The dividend payments are included in the three different proxies of the market return. The Tobin's Q and the firms cash flows will be constructed the same way as in the paper of Rauh (2006). This results in the following equation for the Tobin's Q of a company:

$$TobinQ_{it} = \frac{EquityMV_{i,t-1} + TA_{i,t-1} - (EquityBV_{i,t-1} + DT_{i,t-1})}{TA_{i,t-1}} \tag{4}$$

Where $EquityM_{i,t-1}$, $EquityB_{i,t-1}$ and $DT_{i,t-1}$ are respectively the market value of equity, the book value of equity and the amount of deferred taxes of company $i$ at the beginning of year $t$. The market value of equity is calculated by multiplying the stock price with the amount of shares. The observations will be dropped if either the book value of equity or the market value of equity is negative or missing. When the amount of deferred taxes of a company is missing, the missing value will be replaced with the value zero. Rauh (2006) uses two types of cash flows in his paper: one without taking the company's pension expenditures into account and one with taking the company's pension expenditures into account. In my regressions, I will use both cash flow measures, which are constructed as shown in the following equations:

$$\frac{NPCF_{it}}{TA_{i,t-1}} = \frac{NI_{it} + DA_{it} + PE_{it}}{TA_{i,t-1}} \tag{5}$$

$$\frac{CF_t}{TA_{i,t-1}} = \frac{NI_{it} + DA_{it} + PE_{it} - TEC_{it}}{TA_{i,t-1}} \tag{6}$$

The first equation shows the cash flows without the subtraction of the pension expenditures and the second equation shows the cash flows with the subtraction of the pension expenditures. In both equations $NI_{it}$ is the net income of company $i$ over the year $t$, $DA_{it}$ is the Depreciation and Amortization of company $i$ over the year $t$, $PE_{it}$ are the pension expenditures of company $i$ over the year $t$ as stated in the income statement of the company and $TEC_{it}$ are the total employer contributions of company $i$ over the year $t$ as stated in the Schedule H filings of the DOL. The cash flows are divided by the total book assets of the beginning of the year to correct for firm size in the level of the cash flows of a company as has been done in the construction of the test variables as well. The sector dummies can either have a value of 1 if the company operates in the sector the dummy stands for and a value of 0 if the company does not operate in that sector. The sector dummies are based on the Standard Industrial Classification codes (further referred to as SIC-codes), which are collected from the CRSP database. There are 10 sector dummies in total. The dummies are differentiated according to the major SIC-sectors[15]. Finally the values of Tobin's Q, the total book assets and the cash flows are winsorized at the 1$^{st}$ and the 99$^{th}$ percentile. Apart from the variables for the main analyses, I also use four dummy variables in the additional analyses that I perform in this paper. The first dummy has the value 1 in the three years prior to a DB pension plan freeze and the value 0 otherwise. The second dummy has the value 1 in the three years after a DB pension plan

[15]The SIC-codes consist of a 4 digit sequence. The first two numbers of this sequence indicate the major sector group of a company.

freeze and the value 0 otherwise. The third dummy has the value 1 if the company only sponsors a DB pension plan and the value 0 otherwise, and the last dummy has the value 1 if the company has a DB pension plan and the value 0 otherwise[16].

## 3.3 Methodology

In this section, I discuss which methods I use to test my hypotheses. The section is split in two parts. In the first part, I discuss the methods used to test the effect of DB pension plan freezes on the long-term stock performance. In the second part I discuss the methods used to test the effect of DB pension plan freezes on the cash flow statement items[17] capital expenditures, R&D expenditures and acquisition expenditures.

### 3.3.1 Methodology of Testing Long-Term Stock Performance

In order to determine the effect of DB pension plan freezes on long-term stock price performance, I do two analyses. The first analysis is based on determining the cumulative abnormal stock returns in the three years before and after a DB pension plan freeze. This analysis is based on the methods that Goyal and Wahal (2008) use in their research. In their paper they investigate the effect of the selection or termination of an investment management firm on the returns of the plan sponsor[18]. The second analysis is based on regressing dummy variables for the three years before and after a DB pension plan freeze on the yearly stock return. To determine the cumulative abnormal returns, I first determine the abnormal returns. To determine the abnormal return per year, I subtract the expected return from the actual return. Thereafter, I sum the abnormal returns conditional on the time frame and as a last step I take the cross-sectional average of the cumulative abnormal returns of the different companies in the test sample. This results in the following equation for the cross-sectional average of the cumulative abnormal stock returns:

$$CAAR_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2}(R_{it} - E(R_{it})) \qquad (7)$$

As indicated in the equation, I first sum the abnormal returns conditional on the time frame $(t_1, t_2)$. Thereafter I sum the cumulative abnormal returns of the different companies in the test sample and I divide this summation by the number of companies ($N$) in the test sample. The expected return,

[16] A company can only have the value 1 for one of these four dummies. A company can have the value 0 for all of these dummies (in case the company only has a DC pension plan).

[17] Sometimes these expenditures can be shown by the income statement of the company instead of the cash flow statement.

[18] A big difference compared to my analysis is that Goyal and Wahal (2008) investigate the returns of the portfolio instead of the return on the stock of the sponsor.

as indicated by $E(R_{it})$ in the formula, is determined by regressions applied to four different control groups:

1. Control group one consists of the companies that only sponsor one or more DC pension plans.
2. The second control group consists of all companies that sponsor one or more pension plans. In this control group there are no restrictions in terms of the type of the pension plan(s). If the company freezes one or more of its' DB pension plans, it is removed from the control group.
3. The third control group consists of all companies that sponsor one or more DB pension plans. The companies in this group can sponsor other types of plans as well. If the company freezes one or more of its' DB pension plans, it is removed from the control group.
4. The last control group consists of the companies that only sponsor one or more DB pension plans. If the company freezes one or more of its' DB pension plans, it is removed from the control group.

The regressions I apply to these control groups are shown by the following two equations:

$$(R_{ct} - R_{ft}) = \alpha_c + \beta_c * (R_{Mt} - R_{ft}) + \epsilon_{ct} \tag{8}$$

$$(R_{ct} - R_{ft}) = \alpha_c + \beta_c * (R_{Mt} - R_{ft}) + \gamma_c * TA_{c,t-1} + \delta_c * Q_{ct} + \boldsymbol{\zeta_c} * \mathbf{x_{ct}} + \epsilon_{ct} \tag{9}$$

The first regression is the CAPM of Sharpe (1964) and the second regression is a multivariate regression that is based on the three-factor model of Fama and French (1993). In the second regression, $TA_{c,t-1}$ is the logarithm of the total book assets of a company in control sample $c$ at the beginning of year $t$, $Q_{ct}$ is the Tobin's Q of a company in control sample $c$ at the beginning of year $t$ and $\mathbf{x_{ct}}$ is a 10x1 vector of sector dummies of a company in control sample $c$, where $\boldsymbol{\zeta_c}$ is the corresponding 1x10 vector of the estimated coefficients of the sector dummies. Fama and French (1993) use the SMB-factor to correct for differences in return between small cap- and large cap stocks and the HML-factor to correct for the differences in return between value- and growth stocks. I substitute the SMB-factor with the logarithm of the total book assets of a company and I substitute the HML-factor with the Tobin's Q of a company. These substitutes are made because of the following arguments:

1. The SMB- and HML-factor are specified by taking the difference between two portfolios with different type of stocks, i.e. a small cap- and large cap stock portfolio (in case of the SMB-factor). When I regress this factor on a portfolio that consists of predominantly small cap stocks, the coefficient of the SMB-factor will likely be positive. So when one of the control

groups consists of predominantly small cap stocks while the test group consists of predominantly large cap stocks, this will lead to a distorted expected return. The logarithm of the total book assets and Tobin's Q are company specific and do therefore not carry this problem.

2. Most control groups consist of large panels with a lot of different types of stocks. This can give complications in case there are e.g. a lot of small cap- and large cap stocks in the panel. In that case the correlation between the SMB-factor and the small cap stock returns can be offset by the opposite correlation between the SMB-factor and the large cap stock returns (because they are both in the data sample). This also applies to the HML-factor.

The sector dummies are added, because companies of different sectors are exposed to different levels of risk that can result in differentiating stock returns. E.g. Kavussanos and Marcoulis (1997) show the differences in risk between the U.S. water transportation industry and other transport industries. Finally I use the intercept $\alpha_c$, the coefficients $\beta_c$, $\gamma_c$ and $\delta_c$ and the vector of coefficients $\zeta_c$ to estimate the expected stock returns of the test sample:

$$E(R_{it} - R_{ft}) = \alpha_c + \beta_c * (R_{Mt} - R_{ft}) + \epsilon_{ct} \tag{10}$$

$$E(R_{it} - R_{ft}) = \alpha_c + \beta_c * (R_{Mt} - R_{ft}) + \gamma_c * TA_{i,t-1} + \delta_c * Q_{it} + \boldsymbol{\zeta_c} * \mathbf{x_{it}} \tag{11}$$

In these equations I will replace the observations of the different control groups with the observations of the test group (as indicated by the subscripts $it$ instead of $ct$) in order to estimate the expected returns of the test group. The estimated coefficients and the intercept will differ per control group, which will lead to different expected returns per control group and therefore different abnormal returns.

The second analysis is based on the same regressions that are applied to estimate the expected returns in the first analysis. The difference with the first analysis is that I will define the differences in return in the three years prior to the freeze and the three years after the freeze with dummy variables in the regressions as shown by the following equations:

$$(R_{it} - R_{ft}) = \alpha + \rho * \mathbf{D_{test}} + \beta * (R_{Mt} - R_{ft}) + \epsilon_{it} \tag{12}$$

$$(R_{it} - R_{ft}) = \alpha + \rho * \mathbf{D_{test}} + \beta * (R_{Mt} - R_{ft}) + \gamma * TA_{i,t-1} + \delta * Q_{it} + \zeta * \mathbf{x_{it}} + \epsilon_{it} \tag{13}$$

In these regressions, $\mathbf{D_{test}}$ is a 3x1 vector of dummy variables and $\rho$ the corresponding 1x3 vector of the estimated coefficients. The first dummy variable of the vector $\mathbf{D_{test}}$ can be either a dummy variable that has the value 1 for the three years prior to a DB pension plan freeze (and the value 0 otherwise) or a dummy variable that has the value 1 for the three years after a DB pension plan freeze (and the value 0 otherwise). The other two dummy variables are a dummy variable that has the value 1 if a company only sponsors a DB pension plan and a dummy variable that has the value 1 if a company sponsors a DB pension plan along with other types of pension plans. A company can only have the value 1 for one of the three dummies in the vector. It is possible that the company has a value zero for all three dummy variables, this is the case when the company does not have a DB pension plan at all. Therefore the coefficients of these dummy variables indicate the difference in returns of these three groups relative to the group that consists of companies that only sponsor a DC pension plan(s). Consequently, this regression has only one estimate for the intercept $\alpha$, the coefficients $\beta$, $\gamma$ and $\delta$ and the two vectors of coefficients $\rho$ and $\zeta$.

For both analyses, I add a number of robustness checks. The standard regressions that I perform in both analyses are OLS-regressions in which I already control for heteroscedasticity and serial correlation. In addition I perform year fixed effects regressions and regressions in which I cluster by company. Furthermore, I determine the buy-and-hold abnormal return (further referred to as BHAR) as an extra robustness check on the first analysis in which I sum the abnormal returns. The BHAR is defined by the following formula:

$$\overline{BHAR}_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\left(\prod_{t=t_1}^{t_2}(1+R_{it}) - \prod_{t=t_1}^{t_2}(1+E(R_{it}))\right) \tag{14}$$

In the BHAR, I take buy-and-hold return of stock $i$ over the time frame $(t_1, t_2)$ and I subtract the expected buy-and-hold return of stock $i$ over the time frame $(t_1, t_2)$ instead of summing the yearly abnormal returns. Many researchers like Fama (1998) and Mitchell and Stafford (2000) argue that the buy-and-hold abnormal return method does not correct for potential cross-sectional correlation of event firm abnormal returns. They argue that the Calendar-time approach would be a better measure for abnormal returns since it does account for the cross-sectional correlation of event firm abnormal returns. One of the papers that I use as a guideline for this research (Goyal and Wahal, 2008) uses the calendar-time approach as well. Although some researchers like Loughran and Ritter (2000) also discuss the disadvantages of the calendar-time approach, this is not the reason I do not use the calendar-time approach in this paper. I do not use the calendar-time approach because of the following reason: the calendar-time approach requires monthly data. This will not create any problems in collecting stock price data. However, cash flow statement- and balance sheet items are reported annually or in some cases quarterly. It is possible to interpolate the data, but this makes the data sample less reliable.

### 3.3.2 Methodology of Testing Cash Flow Statement Items

In order to determine the abnormal ratios of the capital expenditures-, R&D expenditures- and acquisition expenditures to total assets, I will use roughly the same methods as those I apply to test the abnormal returns. Likewise, the cumulative abnormal ratios are defined by the summation of the abnormal ratios per year and company in the test group. In order to get the expected ratios of these three types of expenditures, I perform regressions that are based on the regressions Rauh (2006) performs in his paper to test the effect of mandatory contributions to DB pension plans on these ratios. I omit the variable mandatory contributions and I add the vector of sector dummies, which results in the following regression:

$$\frac{I_{ct}}{TA_{c,t-1}} = \alpha_c + \beta_c * Q_{ct} + \gamma_c * \frac{CF_{ct}}{TA_{ct-1}} + \delta_c * \mathbf{x_{ct}} + \epsilon_{ct} \tag{15}$$

In these regressions, the dependent variable $\frac{I_{ct}}{TA_{ct-1}}$ can be either the capital expenditures, R&D expenditures or acquisition expenditures of company $c$ over the year $t$ to the total book assets of company $c$ at the beginning of year $t$. The $\frac{CF_{ct}}{TA_{ct-1}}$ are the cash flows of company $c$ over year $t$ to the total book assets of company $c$ at the beginning of year $t$, which are determined in two different ways as discussed in the Data section. Rauh (2006) uses the cash flow to total assets ratio in his research, although he mentions that there is a lot of debate about the relation between cash flows and investments. E.g. Kaplan and Zingales (2000) show that firms that appear less financially constrained have much higher investment-cash flow sensitivities than firms that are more financially constrained. Apart from that, as indicated by Rauh et al. (2013), companies that freeze a DB pension plan save money on their pay rolls in the years after the freeze. This can result in higher cash flows in the years after the freeze, which causes the abnormal ratios to decrease through the increase of the expected ratios. This means that the effect of the freeze can already be caught by the cash flows and could thereby not be visible in cumulative abnormal ratios. Therefore I add a robustness check in which I omit the cash flow variable. Finally I add a vector of sector dummies to control for industry differences in the three expenditure ratios. After estimating the coefficients for the control group regressions, I compute the expected ratios of the test group with the estimated coefficients in the following way:

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}} \tag{16}$$

As in the case of the expected returns, I will replace the observations of the different control groups with the observations of the test group in these equations in order to estimate the expected ratios of the test group.

The methods of the second analysis of the three cash flow statement ratios is comparable to that of the stock performance regressions as well. Likewise, I add the same 3x1 vector of dummy variables to the regression that is applied to estimate the expected ratios in the first analysis, which results in the following formula:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it} \quad (17)$$

Where $\mathbf{D_{test}}$ is the 3x1 vector of the test dummy variables and $\rho$ the corresponding 1x3 vector of the estimated coefficients. As in the stock return regression, this regression has only one estimate for the intercept $\alpha$, the coefficients $\beta$, $\gamma$ and $\delta$ and the two vectors of coefficients $\rho$ and $\zeta$ since all the different groups are put in one sample.

For both types of regressions, I add a number of robustness checks. The standard regressions that I perform in both analyses are OLS-regressions in which I already control for heteroscedasticity and serial correlation. In addition I perform year fixed effects regressions and regressions in which I cluster by company.

# 4 Empirical Results

In this section I discuss the results of the analyses that I perform to test my hypotheses. This section consists of two parts. In the first part, I discuss the results of the analyses performed to test hypotheses 1 and 2 and in the second part I discuss the results of the analyses performed to test hypotheses 3 to 8.

## 4.1 Results Long-Term Stock Performance

In this section I discuss the results of the analyses I perform to test my first two hypotheses. The first hypothesis says that in the years prior to a DB pension plan freeze, the long-term stock performance of the companies that freeze a DB pension plan is relatively lower than the long-term stock performance of the companies' peers that do not freeze a DB pension plan. And the second hypothesis says that in the years after a DB pension plan freeze, the long-term stock performance of the companies that freeze a DB pension plan is the same as, or relatively higher than the long-term stock performance of the companies' peers that do not freeze a DB pension plan.

**Table 3:** Cumulative Abnormal Stock Returns

This table presents the cumulative abnormal returns in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal returns are determined by subtracting the expected returns from the actual returns. The expected returns are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E(R_{it} - R_{ft}) = \alpha + \beta_c * (R_{Mt} - R_{ft}) + \delta_c * Log(Assets_{i,t-1}) + \gamma_c * Q_{it} + \zeta_c * \mathbf{x_{it}}$$

I use the Equally-Weighted Market Return in these regressions. The cumulative abnormal returns are determined by the summation of the abnormal returns:

$$CAAR_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2}(R_{it} - E(R_{it}))$$

The concerned control sample is shown on the left side of the table. The figures within the parentheses are the standard errors of the cumulative abnormal returns.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.225*** | -0.159*** | -0.074** | 0.011 | 0.070 | 0.056 |
| | (0.059) | (0.057) | (0.034) | (0.030) | (0.046) | (0.067) |
| *All plans* | -0.172*** | -0.121** | -0.055 | 0.027 | 0.102** | 0.111 |
| | (0.059) | (0.057) | (0.034) | (0.030) | (0.046) | (0.068) |
| *With DB plans* | -0.148** | -0.098* | -0.044 | 0.028 | 0.108** | 0.143** |
| | (0.058) | (0.057) | (0.034) | (0.030) | (0.048) | (0.069) |
| *Only DB plans* | -0.020 | -0.010 | -0.003 | 0.067** | 0.182*** | 0.268*** |
| | (0.059) | (0.058) | (0.035) | (0.030) | (0.049) | (0.071) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.202*** | -0.144** | -0.065* | 0.021 | 0.088* | 0.081 |
| | (0.060) | (0.057) | (0.034) | (0.030) | (0.046) | (0.068) |
| *All plans* | -0.159*** | -0.112** | -0.050 | 0.032 | 0.112** | 0.124* |
| | (0.059) | (0.057) | (0.034) | (0.030) | (0.046) | (0.068) |
| *With DB plans* | -0.149** | -0.097* | -0.044 | 0.027 | 0.105** | 0.141** |
| | (0.058) | (0.058) | (0.035) | (0.030) | (0.048) | (0.070) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

*Table 3* contains the cumulative abnormal stock returns of the three years prior to a DB pension plan freeze and the three years after a DB pension plan freeze. In both time frames, I include cumulative abnormal returns of 2 years and 1 year before and after the DB pension plan freeze. The coefficients I use to determine the expected returns of the test group are given by the *tables 12, 13, 14* and *15* in the appendix. For the first part of *table 3*, I estimate the coefficients of the first three control groups using the OLS regression with the clustered companies, sector dummies and the Equally-Weighted market return. In case of the control group that consists of companies that only sponsor DB pension plans, I use the regression without the sector dummies and clustered companies, because of the low number of observations. The coefficients of the second part of the table are estimated with the year fixed effects regression. The corresponding abnormal returns per year are given in *table 11* in the appendix. The left column shows the control group that is used to determine the expected return. For the three years prior to the DB pension plan freeze, the cumulative abnormal stock return is negative and significant at a 5% level for all three years prior to the freeze in case of the control group that consists of companies that only have a DC pension plan. The cumulative abnormal stock return of the three years prior to a DB pension plan freeze is on average -22,5% (as indicated by the coefficient -0,225) and is significant at a 1% level for this control group. When I control for year fixed effects in the regressions, the cumulative abnormal return is -20,2%, which is significant at a 1%-level as well. For the control group that consist of companies with all types of pension plans, the cumulative abnormal stock return of the three years prior to a freeze is -17,2% for the normal regression and -15,9% for the year fixed effects regression. Both are significant at a 1%-level. In case I apply the control group that contains the companies with at least one DB pension plan the cumulative abnormal stock return is -14,8% for the normal regression and -14,9% in case of the year fixed effect regression that are significant at a 5%- and 10%-level respectively. These negative cumulative abnormal returns are in line with previous papers regarding this topic like the paper of McFarland et al. (2009). I do not find significant negative cumulative abnormal returns when I use the control group that consists of companies that only have a DB pension plan. However, I do find a cumulative abnormal return of 26,8% for the three years after a DB pension plan freeze for this control group that is significant at a 1%-level. I find a cumulative abnormal return of 14,3% which is significant at a 5% level for the control group of the companies with a DB pension plan. The cumulative abnormal return is 14,1% when I apply a year fixed effects regression to this group, which is significant at a 5% level as well. In case of the other two control groups (that consist of either companies with solely DC pension plans or companies with all type of pension plans), I do not find significant cumulative abnormal returns for the three years after a freeze. Only in case of the year fixed effects regression I find a cumulative abnormal return of 12,4% that is significant at a 10%-level for the control group that consists of companies with all types of pension plans.

I perform three robustness checks to verify the results of the first analysis. The first robustness check is given by *table 17* in which I use the Value-Weighted market return instead of the Equally-Weighted market return to determine the expected returns. The results are similar in direction to the results of *table 3* although the cumulative abnormal returns are less negative and some of these cumulative abnormal returns are significant at a lower level. In the second robustness check, I apply the CAPM to determine the expected returns as presented in *table 16*. The results of the second robustness check are similar in direction to the results shown in *table 3*, although there are some differences. The cumulative abnormal returns of the 3 years after the freeze are positive and significant at a 10%-level for the two control groups that consist of companies with solely DC pension plans and of companies with all types of pension plans as well. The last robustness check I perform, contains the results of the cumulative abnormal returns of the BHAR-model. The cumulative abnormal returns are similar in direction, but even more negative in the years prior to the freeze and more positive in the years after the freeze. Apart from that, some of these cumulative abnormal returns are significant at a higher level as well.

**Table 4:** Regression Results of LT Stock Performance

This table shows the results of the regressions with the companies' *yearly stock return* - $R_f$ as the dependent variable. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$(R_{it} - R_{ft}) = \alpha + \rho * \mathbf{D_{test}} + \beta * (R_{Mt} - R_{ft}) + \gamma * TA_{i,t-1} + \delta * Q_{it} + \zeta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I use the Equally-Weighted market returns and I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Column *(1)* shows the results of the CAPM. Columns *(2)* to *(4)* show the results of different variants of the Multi-factor Model. The three variants differ in the inclusion of the sector dummies, the clustering of the companies in the data sample and in controlling for year fixed effects. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | CAPM | Multi-factor Models | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **TEST DUMMY PRIOR** | | | | |
| *Dummy Prior* | -0.059*** | -0.063*** | -0.073*** | -0.065*** |
| | (0.022) | (0.022) | (0.022) | (0.025) |
| *Dummy DB* | -0.067** | -0.073** | -0.069** | -0.042 |
| | (0.028) | (0.029) | (0.030) | (0.039) |
| *Dummy Both* | -0.016 | -0.018* | -0.038*** | -0.031*** |
| | (0.010) | (0.011) | (0.011) | (0.012) |
| *Market Return -* $R_f$ | 0.831*** | 0.824*** | 0.823*** | 0.822*** |
| | (0.018) | (0.018) | (0.018) | (0.083) |
| *Log(Assets)* | | -0.001 | 0.010*** | 0.005** |
| | | (0.003) | (0.003) | (0.002) |
| *Tobin's Q* | | -0.012*** | -0.019*** | -0.019*** |
| | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24313 | 24268 | 24268 | 24268 |
| *Adjusted R-Squared* | 0.130 | 0.131 | 0.137 | 0.012 |
| **TEST DUMMY AFTER** | | | | |
| *Dummy After* | 0.029 | 0.027 | 0.017 | 0.010 |
| | (0.021) | (0.021) | (0.021) | (0.027) |
| *Dummy DB* | -0.064** | -0.069** | -0.065** | -0.039 |
| | (0.028) | (0.029) | (0.030) | (0.039) |
| *Dummy Both* | -0.013 | -0.014 | -0.033*** | -0.026** |
| | (0.010) | (0.011) | (0.011) | (0.012) |
| *Market Return -* $R_f$ | 0.831*** | 0.825*** | 0.823*** | 0.824*** |
| | (0.018) | (0.018) | (0.018) | (0.083) |
| *Log(Assets)* | | -0.002 | 0.008*** | 0.004* |
| | | (0.003) | (0.003) | (0.002) |
| *Tobin's Q* | | -0.012*** | -0.019*** | -0.019*** |
| | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24313 | 24268 | 24268 | 24268 |
| *Adjusted R-Squared* | 0.130 | 0.131 | 0.137 | 0.011 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

In the second analysis I perform, I apply roughly the same regression that I use in the first analysis to determine the expected returns. The difference lies in the addition of a vector that contains three dummy variables. The first dummy variable in this vector is the test variable and can either be a dummy for the three years prior to a freeze or a dummy for the three years following a freeze. The other two dummies are a dummy for companies that only sponsor DB pension plans and a dummy for companies that sponsor a DB pension plan along with other types of pension plans. The vector can not contain more than one value of 1. The results of the performed regressions are shown in *table 4*. The table consists of two parts presenting the results of the two test variables.

The first part presents the results of the regressions with the dummy variable for the three years prior to a freeze. The first column shows the results of the CAPM with the three dummy variables and the other three columns show different versions of the multi-factor model that differ in the addition of sector dummies, clustering of the companies and controlling for year fixed effects. In all the regressions the dummy that has the value 1 for the three years prior to a freeze has a negative coefficient that is significant at a 1%-level. The least negative coefficient is -0,059 (in case of the CAPM) and the most negative coefficients is -0,073 (in case of the multi-factor model with sector dummies and clustered companies). These coefficients imply a return that is 5,9% or 7,3% lower in the three years before a freeze compared to companies that only have DC pension plans. Another interesting finding is that in most of the models the coefficients of the two other dummies (*Dummy DB and Dummy Both*) are negative as well. This implies that companies that have a DB pension plan have on average a lower stock return than the companies that only have DC pension plans. A surprising coefficient is the coefficient of the variable *Log(Assets)*, which is positive and significant for two of the three versions of the multi-factor model. This is surprising since a lot of papers show that small cap stocks tend to have higher returns than large cap stocks. E.g. Keim (1983) investigates the relation between abnormal stock returns and the market value of NYSE and AMEX common stocks and he finds that this relation is always negative indicating that small stocks always tend to have positive abnormal returns. Other papers like the paper of Wong (1989) show that this appears on other stock exchanges (like on the stock exchange of Singapore) as well. However, Banz (1981) finds that the differences in return between firms of different sizes especially appears in case the companies are very small and that there is just a little difference in return between average-sized companies and large companies. The second part of *table 4* shows the results of the regressions with the dummy for the three years after a freeze as the test variable. As shown by the table, all the coefficients are positive but not significant, which means that the returns after the freeze of a DB pension plan do not differ from the returns of companies that only sponsor DC pension plans. The coefficients for the control variable are almost similar to the coefficients in the regressions of the first part of the table. In the tables *table 19* and *table 20* in the appendix I show the regressions in which I add the different control variables individually and I perform the regressions of the first three columns without clustering the companies.

In summary, the results of the two different analyses give strong evidence to accept the first and second hypothesis. Like McFarland et al. (2009), I find that companies that freeze a DB pension plan underperform in the years prior to a freeze compared to all control groups except from the group that consists of companies that only sponsor DB pension plans[19]. In addition, I find that the cumulative abnormal returns do not significantly differ from zero or are even positive.

[19] McFarland et al. (2009) compares the companies that freeze a DB pension plan with companies that sponsor a DB pension plan. This corresponds to the third control group in the first analysis

My findings correspond to the findings of Phan and Hegde (2013), who find marginally positive long-term abnormal returns for the first and second year after the freeze, which I find as well.

## 4.2 Results Cash Flow Statement Ratios

In this section, I discuss the results of the performed analyses to test the hypotheses of the effects of a DB pension plan freeze on the different cash flow statement ratios. This section is divided in the three cash flow statement items I analyze: the capital expenditures, R&D expenditures and acquisition expenditures.

### 4.2.1 Results Capital Expenditures Ratio

In this section I discuss the results of the analyses I perform to test the third and fourth hypotheses. The third hypothesis says that in the years prior to a DB pension plan freeze, the capital expenditures of the companies that freeze a DB pension plan are relatively lower than the capital expenditures of the companies' peers that do not freeze a DB pension plan. The fourth hypothesis says that in the years following a DB pension plan freeze, the capital expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the capital expenditures of the companies' peers that do not freeze a DB pension plan. The results of the first analysis I perform to test this hypothesis are presented in *table 5*. This table contains the cumulative abnormal capital expenditures ratios of the three years prior to a DB pension plan freeze and the three years after a DB pension plan freeze. The table is presented in the same format as the cumulative abnormal stock returns in *table 3*. The coefficients of the regressions that I estimate to determine the expected ratios are given in *table 22* and *table 23* in the appendix. For the cumulative abnormal ratios of the first part of the table, I use the OLS regression with the clustered companies and sector dummies to estimate the coefficients for the first three control groups. In case of the control group that consists of companies that only sponsor DB pension plans, I use the regression without the sector dummies and clustered companies, because of the low number of observations. The coefficients of the second part of the table are estimated with the year fixed effects regression. The corresponding abnormal ratios per year are given in table *table 21*. As shown in *table 5*, I do not find negative cumulative abnormal ratios for the three years prior to the freeze when I apply the control groups that consist of either companies that only sponsor DC pension plans, companies that sponsor all kind of plans or companies that sponsor a DB pension plan along with other types of pension plans. Only when I apply the control group that consists of companies that only sponsor DB pension plans, I find negative cumulative abnormal ratios of 3,7% to total assets. The mean of the total assets at the beginning of the year of the companies that freeze a DB pension plan in my data sample

**Table 5:** Cumulative Abnormal Capital Expenditures Ratios

This table presents the cumulative abnormal ratios of $Capital\ Expenditures_{it}$ / $Total\ Assets_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The cumulative abnormal ratios are determined by the summation of the abnormal ratios:

$$CAAR_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2}(R_{it} - E(R_{it}))$$

The concerned control sample is shown on the left side of the table. The figures within the parentheses are the standard errors of the cumulative abnormal ratios.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.004 | -0.003 | -0.000 | -0.007** | -0.012* | -0.016 |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.006) | (0.011) |
| *All plans* | -0.003 | -0.002 | -0.000 | -0.007** | -0.012* | -0.015 |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.006) | (0.010) |
| *With DB plans* | -0.001 | -0.001 | 0.000 | -0.007** | -0.012* | -0.012 |
| | (0.009) | (0.006) | (0.004) | (0.003) | (0.006) | (0.010) |
| *Only DB plans* | -0.037*** | -0.025*** | -0.011*** | -0.021*** | -0.038*** | -0.046*** |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.007) | (0.012) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.005 | -0.003 | -0.001 | -0.008** | -0.013** | -0.017 |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.006) | (0.011) |
| *All plans* | -0.004 | -0.003 | -0.000 | -0.007** | -0.012* | -0.016 |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.006) | (0.010) |
| *With DB plans* | -0.001 | -0.001 | 0.000 | -0.007** | -0.012* | -0.013 |
| | (0.009) | (0.006) | (0.004) | (0.003) | (0.006) | (0.010) |
| *Observations* | 150 | 166 | 173 | 173 | 141 | 113 |
| **Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level* | | | | | | |

is around 22 billion in the three years prior to the freeze. This means that these companies spend on average 814 million less on capital expenditures over these three years than their peers[20], which comes down to around 271 million per year less. The cumulative abnormal ratios of the three years after a freeze are again only significant when I apply the control group that consists of companies that only sponsor DB pension plans. Surprisingly, this cumulative abnormal ratio is negative with 4,6% to total assets. When I look at the results of the cumulative abnormal ratios of one year or two years after the freeze, I find negative cumulative abnormal ratios for the other control groups as well for both the cumulative abnormal ratios that are not adjusted for year fixed effects and that are adjusted for year fixed effects.

I perform one extra robustness check for the first analysis in which I omit the cash flow variable in the regressions applied to determine the expected ratios. The results are given by *table 24*. When I omit this variable, the cumulative abnormal ratios of the three years prior to the freeze and the three years after the freeze become even more negative.

[20] This is only the case for the peer group that consists of companies that only sponsor DB pension plans.

**Table 6:** Regression Results of Capital Expenditures Ratio

This table shows the results of the regressions with the companies' *Capital Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ as the dependent variable. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* to *(4)* differ in the inclusion of the sector dummies, the clustering of the companies in the data sample and in controlling for year fixed effects. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **TEST DUMMY PRIOR** | | | | |
| *Dummy Prior* | -0.004 | -0.006* | -0.001 | -0.001 |
| | (0.003) | (0.003) | (0.003) | (0.002) |
| *Dummy DB* | 0.007 | 0.005 | 0.001 | -0.002 |
| | (0.008) | (0.008) | (0.004) | (0.003) |
| *Dummy Both* | 0.005* | 0.001 | -0.004 | -0.004*** |
| | (0.003) | (0.003) | (0.002) | (0.001) |
| *Tobin's Q* | 0.008*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | 0.080*** | 0.060*** | 0.061*** |
| | | (0.006) | (0.004) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24366 | 24246 | 24246 | 24246 |
| *Adjusted R-Squared* | 0.031 | 0.077 | 0.341 | 0.344 |
| **TEST DUMMY AFTER** | | | | |
| *Dummy After* | -0.009*** | -0.012*** | -0.007*** | -0.005* |
| | (0.003) | (0.003) | (0.003) | (0.002) |
| *Dummy DB* | 0.007 | 0.005 | 0.001 | -0.002 |
| | (0.008) | (0.008) | (0.004) | (0.003) |
| *Dummy Both* | 0.005 | 0.000 | -0.004 | -0.004*** |
| | (0.003) | (0.003) | (0.002) | (0.001) |
| *Tobin's Q* | 0.008*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | 0.080*** | 0.060*** | 0.061*** |
| | | (0.006) | (0.004) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24366 | 24246 | 24246 | 24246 |
| *Adjusted R-Squared* | 0.031 | 0.077 | 0.341 | 0.344 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

The results of the second analysis are presented in *table 6.* I apply roughly the same regression that I use in the first analysis to determine the expected ratios. The difference lies in the addition of a vector that contains the same dummy variables as the dummy vector I add in the stock return regressions. The first part of the table presents the results of the first test variable: the dummy variable for the three years prior to a freeze. The coefficient of this dummy variable is only significant (at a 10%-level) in the second regression. In this regression the coefficient has a value of -0,006 which means that the ratio of the capital expenditures to total assets is 0,6 percentage point lower in the three years prior to a freeze compared to their peers that only sponsor DC pension plans. The variables Tobin's Q and cash flows to total assets have a positive and significant effect on the capital expenditures ratio. The lowest coefficient for the Tobin's Q is 0,007 which indicates that the capital expenditures ratio increases on average with 0,7 percentage point if the Tobin's Q increases with 1. The lowest coefficients for the cash flows to total assets is 0,06 which implies that the capital expenditures of a company increase on average with 6 dollars if the the cash flows of the company increase with 100 dollars. The second part of *table 6* shows the results of the second test variable, which is the dummy variable for the three years after a DB pension plan freeze. The coefficients for this dummy variable are all negative and significant at a 1%-level except from the year fixed effect regression where the coefficient is significant at a 10%-level. The highest coefficient is -0,012 and the lowest is -0,005. A coefficient of -0,012 indicates that the capital expenditures ratio is on average 1,2 percentage point lower for the three years after a freeze compared to companies that only have a DC pension plan. A noteworthy finding in both parts of the table is the effect of the inclusion of sector dummies on the adjusted R-squared of the regression. In both case the R-squared increases from 7,7% to 34,1%. This indicates that the sector in which a company is active explains a big part of the amount of capital expenditures a company spends.

In summary, the results of both analyses do not give any reason to accept the two hypotheses regarding the effects of DB pension plan freezes on capital expenditures. On the contrary, the cumulative abnormal ratios of the capital expenditures of the three years after the freeze of a DB pension plan are rather negative than positive. This is in line with the paper of Choy et al. (2014), who find that capital expenditures reduce in the years following a freeze. However, in their paper they state that this decrease in capital expenditures is substituted by an increase in R&D expenditures, which is analyzed in the next section.

#### 4.2.2 Results R&D Expenditures ratio

In this section I discuss the results of the analyses I perform to test the fifth and sixth hypotheses. The fifth hypothesis says that in the years prior to a DB pension plan freeze, the R&D expenditures of the companies that freeze a DB pension plan are relatively lower than the R&D expenditures of the companies' peers that do not freeze a DB pension plan. The sixth hypothesis says that in the years after a DB pension plan freeze, the R&D expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the R&D expenditures of the companies' peers that do not freeze a DB pension plan. The results of the first analysis I perform to test this hypothesis are presented in *table 7*. The cumulative abnormal ratios as well as the expected ratios used to determine the cumulative abnormal ratios are constructed the same way as in the first analysis of the capital expenditures ratio. The coefficients applied to determine the expected ratios are presented in *table 27* and *table 28* in the appendix and the corresponding abnormal ratios per

**Table 7:** Cumulative Abnormal R&D Ratios

This table presents the abnormal ratios and cumulative abnormal ratios of *R&D Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The cumulative abnormal ratios are determined by the summation of the abnormal ratios:

$$CAAR_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2}(R_{it} - E(R_{it}))$$

The concerned control sample is shown on the left side of the table. The figures within the parentheses are the standard errors of the cumulative abnormal ratios.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.067*** | -0.048*** | -0.023*** | -0.022*** | -0.040*** | -0.064*** |
| | (0.008) | (0.005) | (0.003) | (0.002) | (0.005) | (0.008) |
| *All plans* | -0.050*** | -0.036*** | -0.018*** | -0.017*** | -0.029*** | -0.048*** |
| | (0.007) | (0.005) | (0.003) | (0.002) | (0.004) | (0.007) |
| *DB plans* | -0.003 | -0.003 | -0.002 | -0.002 | -0.003 | -0.004 |
| | (0.005) | (0.003) | (0.001) | (0.001) | (0.002) | (0.004) |
| *Only DB plans* | 0.009* | 0.006* | 0.003* | 0.002 | 0.003 | 0.007 |
| | (0.005) | (0.003) | (0.002) | (0.002) | (0.003) | (0.005) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.065*** | -0.046*** | -0.023*** | -0.022*** | -0.038*** | -0.062*** |
| | (0.008) | (0.005) | (0.003) | (0.002) | (0.005) | (0.008) |
| *All plans* | -0.049*** | -0.035*** | -0.017*** | -0.016*** | -0.028*** | -0.046*** |
| | (0.007) | (0.005) | (0.003) | (0.002) | (0.004) | (0.007) |
| *DB plans* | -0.003 | -0.003 | -0.002 | -0.002 | -0.003 | -0.004 |
| | (0.005) | (0.003) | (0.001) | (0.001) | (0.002) | (0.004) |
| *Observations* | 150 | 166 | 173 | 173 | 141 | 113 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

year are given in *table 26* in the appendix. As shown in *table 7*, the cumulative abnormal ratios for the three years prior to the freeze are negative and significant at a 1%-level for the first two control groups in both parts of the table. For the control group that consists of companies with solely DC pension plans, the cumulative abnormal ratio is -6,7% to total assets at the beginning of the years. When the control group that consists of companies with all types of pension plans is applied, the cumulative abnormal ratio is -5,0%. As mentioned in the section of the capital expenditures ratio, the average total assets at the beginning of the year is around 22 billion for the test group. This implies that the average company that freezes a DB pension plan, spends 1,5 billion less on R&D over the three years prior to a freeze than its' peers in the first control group and almost 1,1 billion less than its' peers in the second control group. This comes down to respectively 500 million and 367 million per year. The R&D expenditures ratio does not significantly differ from the other two control groups in the three years prior to a freeze. For the three years after the freeze, I find the same results regarding the cumulative abnormal ratios as for the three years prior to freeze. Again, the cumulative abnormal ratios are negative for the first two control groups.

**Table 8:** Regression Results of R&D Expenditures Ratio

This table shows the results of the regressions with the companies' *R&D Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ as the dependent variable. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* to *(4)* differ in the inclusion of the sector dummies, the clustering of the companies in the data sample and in controlling for year fixed effects. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **TEST DUMMY PRIOR** | | | | |
| *Dummy Prior* | -0.027*** | -0.018*** | -0.021*** | -0.021*** |
| | (0.002) | (0.002) | (0.002) | (0.003) |
| *Dummy DB* | -0.027*** | -0.019*** | -0.016*** | -0.015*** |
| | (0.002) | (0.003) | (0.004) | (0.005) |
| *Dummy Both* | -0.030*** | -0.015*** | -0.019*** | -0.019*** |
| | (0.002) | (0.002) | (0.002) | (0.001) |
| *Tobin's Q* | 0.032*** | 0.031*** | 0.028*** | 0.028*** |
| | (0.002) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.280*** | -0.272*** | -0.276*** |
| | | (0.013) | (0.013) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24366 | 24246 | 24246 | 24246 |
| *Adjusted R-Squared* | 0.226 | 0.439 | 0.487 | 0.492 |
| **TEST DUMMY AFTER** | | | | |
| *Dummy After* | -0.029*** | -0.017*** | -0.020*** | -0.022*** |
| | (0.002) | (0.002) | (0.002) | (0.004) |
| *Dummy DB* | -0.027*** | -0.019*** | -0.016*** | -0.015*** |
| | (0.002) | (0.003) | (0.004) | (0.005) |
| *Dummy Both* | -0.030*** | -0.015*** | -0.019*** | -0.019*** |
| | (0.002) | (0.002) | (0.002) | (0.001) |
| *Tobin's Q* | 0.032*** | 0.031*** | 0.028*** | 0.028*** |
| | (0.002) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.280*** | -0.272*** | -0.276*** |
| | | (0.013) | (0.013) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 24366 | 24246 | 24246 | 24246 |
| *Adjusted R-Squared* | 0.226 | 0.439 | 0.487 | 0.492 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

As for the capital expenditures ratio, I perform one robustness check for the first analysis. In this robustness check, I omit the cash flow variable in the regressions applied to determine the expected ratios. The results are shown in *table 29*. The results of this check are roughly the same as the results in *table 7* except from two differences. The first difference is that although the directions are the same, the cumulative abnormal ratios are less negative. E.g. the cumulative abnormal ratio of the three years prior to the freeze of the first control group is -6,7% in *table 7* and -3,7% in *table 29*. The second difference is that cumulative abnormal ratio of the three years after the freeze of the third group is negative and significant at a 5%-level in *table 29*.

The results of the second analysis to test the fifth and sixth hypotheses are given in *table 8*.

This analysis is performed in the same way as the second analysis of the capital expenditures ratio. The first part of the table shows the results of the dummy variable of the three years prior to the freeze. All four regressions give a negative and significant coefficient for this dummy variable that varies between -0,018 and -0,027. This implies that the R&D expenditures ratio of the companies that freeze a DB pension plan is on average 1,8 percentage point to 2,7 percentage point lower than the same ratio of their peers that only sponsor DC pension plans. The companies that only sponsor DB pension plans or that sponsor DB pension plans as well as other kind of plans spend less on R&D as well. All the coefficients for these two dummies are negative and significant at a 1%-level as well. A surprising result is that the variable cash flow to total assets has a negative effect on the R&D expenditures that is significant at a 1%-level as well. The coefficient for this variable varies between -0,272 and -0,280 implying the R&D expenditures of a company to drop with 27,2 dollars to 28 dollars when the cash flows of the company increase with 100 dollars. Another noteworthy finding for this variable is that it has a lot of explanatory value based on the increase of the R-squared from 22,6% to 43,9%. The R&D expenditures of the three years after the freeze do not differ much from the R&D expenditures in the three years prior to the freeze according to the results in the second part of *table 8*.

In summary, the results of both analyses indicate that the cumulative abnormal R&D expenditures ratios are negative in the three years prior to the freeze compared to their peers in most of the control groups, but not all of the control groups. Where the results of the capital expenditures correspond with the results of Choy et al. (2014), I do not find any positive cumulative abnormal R&D ratios for the years following the freeze. In contrary, the cumulative abnormal R&D expenditures ratios stay negative in the three years after the freeze of a DB pension plan compared to their peers in most of the control groups.

### 4.2.3 Empirical Results Acquisition ratio

In this section I discuss the results of the analyses I perform to test the seventh and eighth hypotheses. The seventh hypothesis says that in the years prior to a DB pension plan freeze, the acquisition expenditures of the companies that freeze a DB pension plan are relatively lower than the acquisition expenditures of the companies' peers that do not freeze a DB pension plan. The eighth hypothesis says that in the years after a DB pension plan freeze, the acquisition expenditures of the companies that freeze a DB pension plan are the same as, or relatively higher than the acquisition expenditures of the companies' peers that do not freeze a DB pension plan. The results of the first analysis I perform to test this hypothesis are presented in *table 9*. The cumulative abnormal ratios as well as the expected ratios used to determine the cumulative abnormal ratios are constructed the same

**Table 9:** Cumulative Abnormal Acquisition Ratios

This table presents the abnormal ratios and cumulative abnormal ratios of $Acquisitions_{it}$ / $Total\ Assets_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The cumulative abnormal ratios are determined by the summation of the abnormal ratios:

$$CAAR_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=t_1}^{t_2}(R_{it} - E(R_{it}))$$

The concerned control sample is shown on the left side of the table. The figures within the parentheses are the standard errors of the cumulative abnormal ratios.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.016 | -0.010 | -0.001 | -0.007 | -0.016* | -0.027** |
| | (0.011) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *All plans* | -0.013 | -0.008 | -0.000 | -0.006 | -0.014 | -0.023** |
| | (0.011) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *DB plans* | 0.000 | 0.001 | 0.005 | -0.001 | -0.005 | -0.009 |
| | (0.010) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *Only DB plans* | -0.022** | -0.013 | -0.003 | -0.009 | -0.023** | -0.032*** |
| | (0.010) | (0.008) | (0.005) | (0.006) | (0.009) | (0.012) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.016 | -0.010 | -0.001 | -0.007 | -0.016* | -0.027** |
| | (0.011) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *All plans* | -0.014 | -0.009 | -0.000 | -0.006 | -0.014 | -0.024** |
| | (0.011) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *DB plans* | 0.000 | 0.001 | 0.005 | -0.001 | -0.005 | -0.009 |
| | (0.010) | (0.008) | (0.006) | (0.006) | (0.009) | (0.012) |
| *Observations* | 150 | 166 | 173 | 173 | 141 | 113 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

way as in the case of the other two cash flow statement ratios. The coefficients applied to determine the expected ratios are presented in *table 32* and *table 33* in the appendix and the corresponding abnormal ratios per year are given in *table 31* in the appendix. As shown in *table 9*, I do not find any significant cumulative abnormal ratios for the three years prior to the DB pension plan freeze for every control group except from the last control group that consists of companies that only sponsor DB pension plans. The cumulative abnormal ratio is -2,2% in this case and is significant at a 5%-level. For the three years after a freeze, I find negative cumulative abnormal ratios for three of the four control groups. The cumulative abnormal ratios are significant at a 5%-level. For the control group that consists of companies that only sponsor DB pension plans, the cumulative abnormal ratio is even significant at a 1%-level. Only for the control group that consists of companies that sponsor DB pension plans along with other types of pension plans, the cumulative abnormal ratio is not significant.

As in the case of the other two cash flow statement ratios, I perform one robustness check in which I omit the cash flow to total assets variable from the expected ratio regressions. The results of this robustness check are shown in *table 34*. The results of this check do not differ much from the results in *table 9*, except from the changes in the level of significance of the cumulative abnormal ratios of the three years after a DB pension plan freeze. The significance level of the cumulative abnormal ratio of the second control group drops from a significance level of 5% to a significance level of 10%.

The results of the second analysis to test the third hypothesis is given in *table 10*. This analysis is performed in the same way as the second analysis of the other two cash flow statement ratios. The first part of the table shows the results of the dummy variable of the three years prior to the freeze. I do not find any significant relation between the three years prior to a freeze

**Table 10:** Regression Results of Acquisition Ratio

This table shows the results of the regressions with the companies' $Acquisitions_{it}$ / $Total\ Assets_{i,t-1}$ as the dependent variable. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* to *(4)* differ in the inclusion of the sector dummies, the clustering of the companies in the data sample and in controlling for year fixed effects. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **TEST DUMMY PRIOR** | | | | |
| *Dummy Prior* | -0.005 | -0.006 | -0.004 | -0.003 |
| | (0.003) | (0.004) | (0.004) | (0.004) |
| *Dummy DB* | 0.002 | 0.000 | 0.005 | 0.003 |
| | (0.007) | (0.007) | (0.007) | (0.006) |
| *Dummy Both* | -0.004** | -0.007*** | -0.006*** | -0.006*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** | 0.003*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | 0.054*** | 0.055*** | 0.053*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 23666 | 23550 | 23550 | 23550 |
| *Adjusted R-Squared* | 0.007 | 0.018 | 0.033 | 0.032 |
| **TEST DUMMY AFTER** | | | | |
| *Dummy After* | -0.009*** | -0.012*** | -0.010*** | -0.011*** |
| | (0.003) | (0.003) | (0.003) | (0.004) |
| *Dummy DB* | 0.002 | -0.000 | 0.005 | 0.003 |
| | (0.007) | (0.007) | (0.007) | (0.006) |
| *Dummy Both* | -0.004** | -0.007*** | -0.006*** | -0.006*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** | 0.003*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | 0.054*** | 0.055*** | 0.054*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Fixed Effects* | N | N | N | Y |
| *Clustered by Company* | Y | Y | Y | N |
| *Observations* | 23666 | 23550 | 23550 | 23550 |
| *Adjusted R-Squared* | 0.007 | 0.019 | 0.034 | 0.032 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

and the acquisitions ratio. The dummy variable for companies that sponsor both DB- and DC pension plans has a negative coefficient that is significant at a 5%-level in the first regression and a negative coefficient that is significant at a 1%-level in the other three regressions. This indicates that companies that sponsor both DB- and DC pension plans spend less on acquisitions than their peers that only sponsor DC pension plans. Other results of this regression show that the Tobin's Q has a positive effect on the amount spent on acquisitions relative to total assets. This finding is in line with the papers of Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004), who show that acquirers usually are overvalued. The second part of the table shows the results of the dummy variable of the three years after the freeze. For all different regressions I perform, the relation between the amount spent on acquisitions and the three years following a freeze is negative and significant at 1%-level. The coefficient varies from -0,009 to -0,012 over the different regressions. The other results in the second part of the table are almost similar to the results of the first part of the table. Another noteworthy finding is that the adjusted R-squared is very low compared to the adjusted R-squared of the regressions of the other two cash flow statement items, while the set of explanatory variables is the same. The highest adjusted R-squared in *table 10* is 3,4%, where the highest adjusted R-squared for the regressions of the capital expenditures ratio and R&D expenditures ratio is respectively 34,4% and 49,2%.

In summary, the results of both analyses indicate that companies do not spend less on acquisitions compared to their peers that do not freeze a DB pension plan in the three years prior to the freeze. However, the results of both analyses do imply that companies spend significantly less on acquisitions compared to their peers that do not freeze a DB pension plan in the three years following the freeze.

# 5 Conclusion

In this paper, I investigate the effect of defined benefit pension plan freezes on the long-term stock performance, capital expenditures, R&D expenditures and acquisitions of the company. To determine the effects of a DB pension plan freeze on these four items, I determine the cumulative abnormal returns and ratios of these items and I regress (among a set of control variables) dummy variables for the three years prior to a freeze and the three years following a freeze on these four different items. I determine the abnormal returns and ratios with the help of regressions that are based on the papers of Rauh (2006) and Fama and French (1993).

In line with the research of McFarland et al. (2009), I find that the long-term stock performance of companies that freeze a DB pension plan is significantly lower than the stock performance of these companies' peers that only sponsor DC pension plans or sponsor a DB pension plan along with other types of plans in the three years prior to the freeze. I do not find lower stock returns for companies that freeze a DB pension plan than for companies that only sponsor DB pension plans in the three years prior to a freeze. Apart from that I find that companies that freeze a DB pension plan have the same or a higher long-term stock returns than their peers that do not freeze a DB pension plan in the years following the freeze.

In line with the paper of Choy et al. (2014), I find that the capital expenditures of companies that freeze a DB pension plan are lower than the capital expenditures of their peers that do not freeze a DB pension plan in the years after a freeze. A noteworthy finding is that the capital expenditures of the companies that freeze a DB pension plan are only lower than the capital expenditures of the companies that only sponsor DB pension plans in the years prior to the freeze. The capital expenditures of the companies that freeze a DB pension plan do not significantly differ from the capital expenditures from the rest of the groups in the years prior to the freeze.

For the three years prior to the freeze, I find lower R&D expenditures for companies that freeze a DB pension plan than for these companies' peers that do not freeze a DB pension plan. In contrast to the findings of Choy et al. (2014), I do not find that the R&D expenditures become higher in the years following the freeze. The R&D expenditures of companies that freeze a DB pension plan stay lower than the R&D expenditures of companies that do not freeze a DB pension plan[21], although the R&D expenditures do not significantly differ from the control group that consists of companies that sponsor a DB pension plan and do not freeze this pension plan.

In case of the acquisitions, I only find significant differences between companies that freeze a DB pension plan and companies that only sponsor DB pension plans in the years prior to the freeze. In the years after the freeze the amount spent on acquisitions of companies that freeze a DB pension plan are in most cases significantly lower than the amount spent on acquisitions of the peers of these companies that do not freeze a DB pension plan.

[21] This is in comparison with the control group that consists of all companies with a pension plan

# 6 Appendix

## 6.1 Additional Tables Long-Term Stock Return

**Table 11:** Abnormal Stock Returns

This table presents in addition to *Table 3* the abnormal returns in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal returns are determined by subtracting the expected returns from the actual returns. The expected returns are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E(R_{it} - R_{ft}) = \alpha + \beta_c * (R_{Mt} - R_{ft}) + \delta_c * Log(Assets_{i,t-1}) + \gamma_c * Q_{it} + \zeta_c * \mathbf{x_{it}}$$

I use the Equally-Weighted Market Return in these regressions. The figures within the parentheses are the standard errors of the abnormal returns.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.068** | -0.086** | -0.074** | 0.011 | 0.040 | -0.025 |
| | (0.030) | (0.038) | (0.034) | (0.030) | (0.035) | (0.038) |
| *All plans* | -0.051* | -0.066* | -0.055 | 0.027 | 0.056 | -0.006 |
| | (0.029) | (0.038) | (0.034) | (0.030) | (0.034) | (0.038) |
| *With DB plans* | -0.047* | -0.052 | -0.044 | 0.028 | 0.058* | 0.008 |
| | (0.028) | (0.039) | (0.034) | (0.030) | (0.034) | (0.038) |
| *Only DB plans* | -0.005 | -0.010 | -0.003 | 0.067** | 0.095*** | 0.050 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.035) | (0.038) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.059** | -0.077** | -0.065* | 0.021 | 0.049 | -0.016 |
| | (0.030) | (0.038) | (0.034) | (0.030) | (0.035) | (0.038) |
| *All plans* | -0.047 | -0.062 | -0.050 | 0.032 | 0.060* | -0.001 |
| | (0.029) | (0.038) | (0.034) | (0.030) | (0.035) | (0.038) |
| *With DB plans* | -0.049* | -0.052 | -0.044 | 0.027 | 0.057 | 0.008 |
| | (0.028) | (0.039) | (0.035) | (0.030) | (0.035) | (0.038) |
| *Observations* | 190 | 197 | 200 | 192 | 170 | 144 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 12:** Expected Stock Return Regressions Part I

This table presents the results of the regression where the companies' *yearly stock return* (- $R_f$) is the dependent variable. The control sample that is used in this table is the sample that consists of companies with solely DC pension plans. The table is divided in three parts with different proxies for the market return as indicated by the captions in between the parts of the table. Only in the Market Model (column *(1)*) the return is determined without subtracting the risk free rate of return. In the other regressions (columns *(2)* to *(6)*) the risk free rate of return is subtracted from the stock return of the company (as of for the Market Return). The standard errors of the coefficients are shown between the parentheses. In column *(6)*, I control for year fixed effects.

| Variables | Market Model | CAPM | Multifactor Model | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | | | Value-weighted CRSP Market Return | | | |
| *Intercept* | 0.009* | 0.009 | 0.222*** | 0.357*** | -0.211 | -0.361** |
| | (0.005) | (0.005) | (0.059) | (0.066) | (0.151) | (0.139) |
| *Market Return* | 1.232*** | | | | | |
| | (0.026) | | | | | |
| *Market Return - $R_f$* | | 1.232*** | 1.238*** | 1.224*** | 1.220*** | 1.257*** |
| | | (0.026) | (0.026) | (0.026) | (0.026) | (0.149) |
| *Log(Assets)* | | | -0.011*** | -0.015*** | -0.001 | 0.006 |
| | | | (0.003) | (0.003) | (0.003) | (0.003) |
| *Tobin's Q* | | | | -0.022*** | -0.028*** | -0.020*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 17916 | 17887 | 17852 | 17852 | 17852 | 17852 |
| *Adj. R-Squared* | 0.117 | 0.117 | 0.118 | 0.121 | 0.127 | 0.012 |
| | | | Equal-weighted CRSP Market Return | | | |
| *Intercept* | -0.034*** | -0.034*** | -0.011 | 0.070 | -0.495** | -0.399** |
| | (0.005) | (0.005) | (0.058) | (0.064) | (0.152) | (0.139) |
| *Market Return* | 0.931*** | | | | | |
| | (0.020) | | | | | |
| *Market Return - $R_f$* | | 0.931*** | 0.931*** | 0.921*** | 0.921*** | 0.920*** |
| | | (0.020) | (0.020) | (0.019) | (0.019) | (0.100) |
| *Log(Assets)* | | | -0.001 | -0.004 | 0.011*** | 0.006 |
| | | | (0.003) | (0.003) | (0.003) | (0.003) |
| *Tobin's Q* | | | | -0.013*** | -0.019*** | -0.020*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 17916 | 17887 | 17852 | 17852 | 17852 | 17852 |
| *Adj. R-Squared* | 0.140 | 0.140 | 0.140 | 0.141 | 0.148 | 0.013 |
| | | | Standard & Poor's 500 Market Return | | | |
| *Intercept* | 0.039*** | 0.038*** | 0.289*** | 0.436*** | -0.137 | -0.336* |
| | (0.005) | (0.005) | (0.060) | (0.066) | (0.152) | (0.139) |
| *Market Return* | 1.303*** | | | | | |
| | (0.027) | | | | | |
| *Market Return - $R_f$* | | 1.303*** | 1.312*** | 1.298*** | 1.295*** | 1.479*** |
| | | (0.027) | (0.028) | (0.028) | (0.028) | (0.172) |
| *Log(Assets)* | | | -0.013*** | -0.018*** | -0.003 | 0.006 |
| | | | (0.003) | (0.003) | (0.003) | (0.003) |
| *Tobin's Q* | | | | -0.024*** | -0.030*** | -0.020*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 17916 | 17887 | 17852 | 17852 | 17852 | 17852 |
| *Adj. R-Squared* | 0.111 | 0.111 | 0.113 | 0.116 | 0.122 | 0.012 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

## **Table 13:** Expected Stock Return Regressions Part II

This table presents the results of the regression where the companies' *yearly stock return* (- $R_f$) is the dependent variable. The control sample that is used in this table is the sample that consists of all companies with pension plans: only DC, only DB or both DC- and DB pension plans. The table is divided in three parts with different proxies for the market return as indicated by the captions in between the parts of the table. Only in the Market Model (column *(1)*) the return is determined without subtracting the risk free rate of return. In the other regressions (columns *(2)* to *(6)*) the risk free rate of return is subtracted from the stock return of the company (as of for the Market Return). The standard errors of the coefficients are shown between the parentheses. In column *(6)*, I control for year fixed effects.

| Variables | Market Model | CAPM | Multifactor Model | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | | | Value-weighted CRSP Market Return | | | |
| *Intercept* | 0.013** | 0.013** | 0.188*** | 0.298*** | -0.183 | -0.280* |
| | (0.004) | (0.004) | (0.046) | (0.052) | (0.144) | (0.125) |
| *Market Return* | 1.116*** | | | | | |
| | (0.022) | | | | | |
| *Market Return - $R_f$* | | 1.115*** | 1.121*** | 1.111*** | 1.106*** | 1.151*** |
| | | (0.022) | (0.022) | (0.022) | (0.022) | (0.129) |
| *Log(Assets)* | | | -0.009*** | -0.012*** | -0.002 | 0.002 |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | | | | -0.020*** | -0.026*** | -0.019*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 22604 | 22570 | 22526 | 22526 | 22526 | 22526 |
| *Adj. R-Squared* | 0.108 | 0.108 | 0.110 | 0.112 | 0.118 | 0.011 |
| | | | Equal-weighted CRSP Market Return | | | |
| *Intercept* | -0.026*** | -0.027*** | 0.015 | 0.082 | -0.387** | -0.311* |
| | (0.004) | (0.004) | (0.045) | (0.050) | (0.145) | (0.125) |
| *Market Return* | 0.836*** | | | | | |
| | (0.017) | | | | | |
| *Market Return - $R_f$* | | 0.836*** | 0.836*** | 0.828*** | 0.827*** | 0.824*** |
| | | (0.017) | (0.016) | (0.016) | (0.016) | (0.086) |
| *Log(Assets)* | | | -0.002 | -0.004 | 0.006* | 0.002 |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | | | | -0.012*** | -0.018*** | -0.019*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 22604 | 22570 | 22526 | 22526 | 22526 | 22526 |
| *Adj. R-Squared* | 0.127 | 0.127 | 0.128 | 0.128 | 0.135 | 0.011 |
| | | | Standard & Poor's 500 Market Return | | | |
| *Intercept* | 0.039*** | 0.039*** | 0.240*** | 0.360*** | -0.128 | -0.257* |
| | (0.004) | (0.004) | (0.047) | (0.052) | (0.144) | (0.125) |
| *Market Return* | 1.185*** | | | | | |
| | (0.023) | | | | | |
| *Market Return - $R_f$* | | 1.185*** | 1.193*** | 1.183*** | 1.179*** | 1.366*** |
| | | (0.023) | (0.023) | (0.023) | (0.023) | (0.149) |
| *Log(Assets)* | | | -0.010*** | -0.014*** | -0.004 | 0.002 |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | | | | -0.022*** | -0.028*** | -0.019*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 22604 | 22570 | 22526 | 22526 | 22526 | 22526 |
| *Adj. R-Squared* | 0.104 | 0.104 | 0.105 | 0.108 | 0.114 | 0.011 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 14:** Expected Stock Return Regressions Part III

This table presents the results of the regression where the companies' *yearly stock return* (- $R_f$) is the dependent variable. The control sample that is used in this table is the sample that consists of all companies with DB pension plans. The table is divided in three parts with different proxies for the market return as indicated by the captions in between the parts of the table. Only in the Market Model (column *(1)*) the return is determined without subtracting the risk free rate of return. In the other regressions (columns *(2)* to *(6)*) the risk free rate of return is subtracted from the stock return of the company (as of for the Market Return). The standard errors of the coefficients are shown between the parentheses. In column *(6)*, I control for year fixed effects.

| Variables | Market Model | CAPM | Multifactor Model | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Value-weighted CRSP Market Return** | | | | | | |
| *Intercept* | 0.022** | 0.022** | 0.002 | 0.004 | 0.466 | -0.177 |
| | (0.007) | (0.007) | (0.106) | (0.110) | (0.352) | (0.262) |
| *Market Return* | 0.744*** | | | | | |
| | (0.038) | | | | | |
| *Market Return -* $R_f$ | | 0.744*** | 0.746*** | 0.745*** | 0.740*** | 0.747** |
| | | (0.038) | (0.038) | (0.039) | (0.039) | (0.230) |
| *Log(Assets)* | | | 0.001 | 0.001 | 0.009 | 0.009* |
| | | | (0.005) | (0.005) | (0.005) | (0.004) |
| *Tobin's Q* | | | | -0.001 | -0.016* | -0.009 |
| | | | | (0.006) | (0.007) | (0.007) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 3998 | 3994 | 3988 | 3988 | 3988 | 3988 |
| *Adj. R-Squared* | 0.094 | 0.094 | 0.094 | 0.094 | 0.102 | 0.006 |
| **Equal-weighted CRSP Market Return** | | | | | | |
| *Intercept* | 0.005 | 0.005 | -0.145 | -0.151 | 0.334 | -0.185 |
| | (0.007) | (0.007) | (0.105) | (0.109) | (0.347) | (0.262) |
| *Market Return* | 0.513*** | | | | | |
| | (0.028) | | | | | |
| *Market Return -* $R_f$ | | 0.513*** | 0.515*** | 0.516*** | 0.513*** | 0.461** |
| | | (0.028) | (0.028) | (0.028) | (0.028) | (0.154) |
| *Log(Assets)* | | | 0.007 | 0.007 | 0.015** | 0.009* |
| | | | (0.005) | (0.005) | (0.005) | (0.004) |
| *Tobin's Q* | | | | 0.003 | -0.012 | -0.009 |
| | | | | (0.006) | (0.007) | (0.007) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 3998 | 3994 | 3988 | 3988 | 3988 | 3988 |
| *Adj. R-Squared* | 0.093 | 0.093 | 0.094 | 0.094 | 0.102 | 0.006 |
| **Standard & Poor's 500 Market Return** | | | | | | |
| *Intercept* | 0.039*** | 0.039*** | 0.044 | 0.048 | 0.508 | -0.165 |
| | (0.007) | (0.007) | (0.106) | (0.110) | (0.357) | (0.261) |
| *Market Return* | 0.805*** | | | | | |
| | (0.040) | | | | | |
| *Market Return -* $R_f$ | | 0.805*** | 0.807*** | 0.807*** | 0.800*** | 0.918*** |
| | | (0.040) | (0.041) | (0.041) | (0.041) | (0.264) |
| *Log(Assets)* | | | -0.000 | -0.000 | 0.007 | 0.009* |
| | | | (0.005) | (0.005) | (0.005) | (0.004) |
| *Tobin's Q* | | | | -0.002 | -0.017* | -0.009 |
| | | | | (0.006) | (0.007) | (0.007) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Observations* | 3998 | 3994 | 3988 | 3988 | 3988 | 3988 |
| *Adj. R-Squared* | 0.093 | 0.093 | 0.093 | 0.093 | 0.100 | 0.007 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 15:** Expected Stock Return Regressions Part IV

This table presents the results of the regression where the companies' *yearly stock return* (- $R_f$) is the dependent variable. The control sample that is used in this case is the sample that consists of companies with solely DB pension plans. The table is divided in three parts with different proxies for the market return as indicated by the captions in between the parts of the table. Only in the Market Model (column *(1)*) the return is determined without subtracting the risk free rate of return. In the other regressions (columns *(2)* to *(4)*) the risk free rate of return is subtracted from the stock return of the company (as of for the Market Return). Because of the low amount of observations for this control sample, there are no regressions in which I add the sector dummies or in which I control for year fixed effects. The standard errors of the coefficients are shown between the parentheses.

| Variables | Market Model | CAPM | Multifactor Model | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Value-weighted CRSP Market Return | | | |
| *Intercept* | 0.011 | 0.010 | -0.149 | -0.099 |
| | (0.030) | (0.031) | (0.330) | (0.347) |
| *Market Return* | 0.433** | | | |
| | (0.150) | | | |
| *Market Return -* $R_f$ | | 0.433** | 0.455** | 0.460** |
| | | (0.150) | (0.156) | (0.156) |
| *Log(Assets)* | | | 0.007 | 0.007 |
| | | | (0.015) | (0.015) |
| *Tobin's Q* | | | | -0.038 |
| | | | | (0.025) |
| *Sector dummies* | N | N | N | N |
| *Observations* | 242 | 240 | 236 | 236 |
| *Adj. R-Squared* | 0.031 | 0.031 | 0.032 | 0.033 |
| | Equal-weighted CRSP Market Return | | | |
| *Intercept* | -0.030 | -0.031 | -0.263 | -0.222 |
| | (0.030) | (0.030) | (0.323) | (0.339) |
| *Market Return* | 0.479*** | | | |
| | (0.115) | | | |
| *Market Return -* $R_f$ | | 0.480*** | 0.495*** | 0.493*** |
| | | (0.115) | (0.118) | (0.117) |
| *Log(Assets)* | | | 0.011 | 0.011 |
| | | | (0.015) | (0.015) |
| *Tobin's Q* | | | | -0.031 |
| | | | | (0.025) |
| *Sector dummies* | N | N | N | N |
| *Observations* | 242 | 240 | 236 | 236 |
| *Adj. R-Squared* | 0.077 | 0.077 | 0.080 | 0.079 |
| | Standard & Poor's 500 Market Return | | | |
| *Intercept* | 0.022 | 0.021 | -0.121 | -0.073 |
| | (0.029) | (0.029) | (0.330) | (0.347) |
| *Market Return* | 0.486** | | | |
| | (0.160) | | | |
| *Market Return -* $R_f$ | | 0.485** | 0.505** | 0.508** |
| | | (0.160) | (0.166) | (0.166) |
| *Log(Assets)* | | | 0.007 | 0.007 |
| | | | (0.015) | (0.015) |
| *Tobin's Q* | | | | -0.037 |
| | | | | (0.025) |
| *Sector dummies* | N | N | N | N |
| *Observations* | 242 | 240 | 236 | 236 |
| *Adj. R-Squared* | 0.033 | 0.033 | 0.033 | 0.033 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

## **Table 16:** Robustness Check I on Abnormal Returns

This table is added as a robustness check on *Table 3.* In this table I use Value-weighted market returns instead of Equally-weighted market returns to determine the expected returns in the following regression:

$$E(R_{it} - R_{ft}) = \alpha + \beta_c * (R_{Mt} - R_{ft}) + \delta_c * Log(Assets_{i,t-1}) + \gamma_c * Q_{it} + \zeta_c * \mathbf{x_{it}}$$

Apart from that, the figures in the table are constructed the same way as in *Table 3.*

**ABNORMAL RETURNS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.038 | -0.038 | -0.062* | -0.021 | 0.004 | -0.061 |
| | (0.029) | (0.039) | (0.035) | (0.030) | (0.035) | (0.037) |
| *All plans* | -0.034 | -0.033 | -0.054 | -0.011 | 0.014 | -0.048 |
| | (0.028) | (0.039) | (0.035) | (0.030) | (0.034) | (0.037) |
| *With DB plans* | -0.038 | -0.033 | -0.047 | 0.001 | 0.028 | -0.024 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.034) | (0.038) |
| *Only DB plans* | -0.007 | -0.003 | -0.010 | 0.039 | 0.066* | 0.026 |
| | (0.027) | (0.040) | (0.036) | (0.031) | (0.035) | (0.038) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.046 | -0.047 | -0.072** | -0.032 | -0.007 | -0.073* |
| | (0.029) | (0.039) | (0.035) | (0.030) | (0.034) | (0.037) |
| *All plans* | -0.036 | -0.036 | -0.058* | -0.017 | 0.008 | -0.054 |
| | (0.029) | (0.039) | (0.035) | (0.030) | (0.034) | (0.037) |
| *With DB plans* | -0.037 | -0.032 | -0.045 | 0.002 | 0.029 | -0.023 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.034) | (0.038) |
| *Observations* | 190 | 197 | 200 | 192 | 170 | 144 |

**CUMULATIVE ABNORMAL RETURNS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.136** | -0.100* | -0.062* | -0.021 | 0.003 | -0.033 |
| | (0.066) | (0.059) | (0.035) | (0.030) | (0.046) | (0.066) |
| *All plans* | -0.118* | -0.086 | -0.054 | -0.011 | 0.023 | 0.002 |
| | (0.065) | (0.059) | (0.035) | (0.030) | (0.046) | (0.067) |
| *With DB plans* | -0.120* | -0.081 | -0.047 | 0.001 | 0.052 | 0.062 |
| | (0.062) | (0.059) | (0.035) | (0.030) | (0.047) | (0.068) |
| *Only DB plans* | -0.026 | -0.013 | -0.010 | 0.039 | 0.127** | 0.197*** |
| | (0.061) | (0.059) | (0.036) | (0.031) | (0.050) | (0.071) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.163** | -0.119** | -0.072** | -0.032 | -0.019 | -0.066 |
| | (0.065) | (0.059) | (0.035) | (0.030) | (0.046) | (0.066) |
| *All plans* | -0.130** | -0.094 | -0.058* | -0.017 | 0.013 | -0.014 |
| | (0.064) | (0.058) | (0.035) | (0.030) | (0.046) | (0.066) |
| *With DB plans* | -0.112* | -0.074 | -0.045 | 0.002 | 0.053 | 0.065 |
| | (0.062) | (0.058) | (0.035) | (0.030) | (0.047) | (0.068) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 17:** Robustness Check II on Abnormal Returns

This table is added as a robustness check on *Table 3*. In this table I use the CAPM instead of the Multi-factor model to determine the expected returns as shown by the equation below:

$$E(R_{it} - R_{ft}) = \alpha + \beta_c * (R_{Mt} - R_{ft})$$

Apart from that, the figures in the table are constructed the same way as in *Table 3*.

**ABNORMAL RETURNS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.055* | -0.067* | -0.053 | 0.030 | 0.058* | -0.003 |
| | (0.030) | (0.038) | (0.034) | (0.031) | (0.035) | (0.039) |
| *All plans* | -0.052* | -0.061 | -0.048 | 0.031 | 0.059* | 0.001 |
| | (0.029) | (0.038) | (0.034) | (0.030) | (0.035) | (0.038) |
| *With DB plans* | -0.049* | -0.048 | -0.039 | 0.030 | 0.059* | 0.011 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.035) | (0.038) |
| *Only DB plans* | -0.005 | -0.010 | -0.003 | 0.067** | 0.095*** | 0.050 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.035) | (0.038) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.054* | -0.067* | -0.053 | 0.030 | 0.058* | -0.003 |
| | (0.030) | (0.038) | (0.034) | (0.031) | (0.035) | (0.039) |
| *All plans* | -0.052* | -0.061 | -0.048 | 0.031 | 0.060* | 0.001 |
| | (0.029) | (0.038) | (0.034) | (0.030) | (0.035) | (0.038) |
| *With DB plans* | -0.051* | -0.048 | -0.040 | 0.027 | 0.056 | 0.010 |
| | (0.027) | (0.039) | (0.035) | (0.030) | (0.035) | (0.038) |
| *Observations* | 191 | 197 | 200 | 192 | 170 | 144 |

**CUMULATIVE ABNORMAL RETURNS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.183*** | -0.123** | -0.053 | 0.030 | 0.106** | 0.121* |
| | (0.059) | (0.057) | (0.034) | (0.031) | (0.047) | (0.070) |
| *All plans* | -0.169*** | -0.110* | -0.048 | 0.031 | 0.109** | 0.133* |
| | (0.059) | (0.057) | (0.034) | (0.030) | (0.047) | (0.070) |
| *With DB plans* | -0.141** | -0.084 | -0.039 | 0.030 | 0.109** | 0.152** |
| | (0.059) | (0.058) | (0.035) | (0.030) | (0.048) | (0.071) |
| *Only DB plans* | -0.024 | -0.015 | -0.003 | 0.067** | 0.183*** | 0.268*** |
| | (0.058) | (0.058) | (0.035) | (0.030) | (0.049) | (0.071) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | -0.180*** | -0.120** | -0.053 | 0.030 | 0.107** | 0.122* |
| | (0.059) | (0.057) | (0.034) | (0.031) | (0.047) | (0.070) |
| *All plans* | -0.165*** | -0.107* | -0.048 | 0.031 | 0.110** | 0.133* |
| | (0.059) | (0.057) | (0.034) | (0.030) | (0.047) | (0.070) |
| *With DB plans* | -0.150** | -0.090 | -0.040 | 0.027 | 0.105** | 0.149** |
| | (0.058) | (0.058) | (0.035) | (0.030) | (0.049) | (0.071) |
| *Observations* | 191 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 18:** Robustness Check III, Buy-and-Hold Abnormal Returns

This table presents the Buy-and-Hold abnormal returns in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal returns are determined by subtracting the expected returns from the actual returns. The expected returns are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E(R_{it} - R_{ft}) = \alpha + \beta_c * (R_{Mt} - R_{ft}) + \delta_c * Log(Assets_{i,t-1}) + \gamma_c * Q_{it} + \zeta_c * \mathbf{x_{it}}$$

I use the Equally-Weighted Market Return in these regressions. The Buy-and-Hold abnormal returns illustrated by the following equation:

$$\overline{BHAR}_{(t_1,t_2)} = \frac{1}{N}\sum_{i=1}^{N}\left(\prod_{t=t_1}^{t_2}(1+R_{it}) - \prod_{t=t_1}^{t_2}(1+E(R_{it}))\right)$$

The figures between the parentheses are the standard errors of the Buy-and-Hold abnormal returns.

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.348*** | -0.193*** | -0.109*** | -0.025 | 0.012 | -0.014 |
| | (0.051) | (0.047) | (0.034) | (0.030) | (0.053) | (0.071) |
| *All plans* | -0.204*** | -0.107** | -0.072** | 0.010 | 0.088 | 0.120* |
| | (0.051) | (0.046) | (0.034) | (0.030) | (0.054) | (0.072) |
| *With DB plans* | -0.143*** | -0.049 | -0.042 | 0.033 | 0.131** | 0.195** |
| | (0.054) | (0.048) | (0.034) | (0.030) | (0.056) | (0.077) |
| *Only DB plans* | 0.020 | 0.052 | 0.004 | 0.077** | 0.220*** | 0.352*** |
| | (0.050) | (0.048) | (0.035) | (0.030) | (0.057) | (0.078) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.312*** | -0.175*** | -0.102*** | -0.018 | 0.025 | 0.008 |
| | (0.053) | (0.047) | (0.034) | (0.030) | (0.053) | (0.071) |
| *All plans* | -0.207*** | -0.102** | -0.067** | 0.014 | 0.095* | 0.130* |
| | (0.047) | (0.046) | (0.034) | (0.030) | (0.054) | (0.072) |
| *With DB plans* | -0.147*** | -0.048 | -0.042 | 0.031 | 0.126** | 0.187** |
| | (0.053) | (0.049) | (0.035) | (0.030) | (0.057) | (0.077) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 19:** Additional Long-Term Stock Return Regressions Part I

This table shows in addition to *Table 4* the results of the regressions with the companies' *yearly stock return* (- $R_f$) as the dependent variable. The test variable is the dummy variable *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise). I perform 6 different regressions. In all these regressions I use the Equally-Weighted market returns and I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* show the outcomes of the Market Model and the CAPM. Columns *(3)* to *(6)* show the outcomes of different variants of the Multi-factor Model. In columns *(3)* and *(4)* I add the control variables *log(Assets)* and *Tobin's Q*. Columns *(4)* to *(6)* differ in the inclusion of the sector dummies and in controlling for year fixed effects. In all regressions I control for heteroskedasticity and in the second part of the table, I perform the first 5 regressions in which I cluster by company. Some of these regressions are already performed in *Table 4*. Regression *(6)* is not performed with the clustered companies because the clusters are not nested within the year panels. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Market Model | CAPM | Multifactor Models | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **COMPANIES NOT CLUSTERED** | | | | | | |
| *Dummy Prior* | -0.059*** | -0.059*** | -0.060*** | -0.063*** | -0.073*** | -0.065*** |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.025) |
| *Dummy DB* | -0.066** | -0.067** | -0.068** | -0.073** | -0.069** | -0.042 |
| | (0.028) | (0.028) | (0.029) | (0.029) | (0.029) | (0.039) |
| *Dummy Both* | -0.016* | -0.016* | -0.017* | -0.018** | -0.038*** | -0.031*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.010) | (0.012) |
| *Market Return* | 0.831*** | | | | | |
| | (0.016) | | | | | |
| *Market Return - $R_f$* | | 0.831*** | 0.831*** | 0.824*** | 0.823*** | 0.822*** |
| | | (0.016) | (0.016) | (0.016) | (0.016) | (0.083) |
| *Log(Assets)* | | | 0.001 | -0.001 | 0.010*** | 0.005** |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | | | | -0.012*** | -0.019*** | -0.019*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Fixed Effects* | N | N | N | N | N | Y |
| *Observations* | 24348 | 24313 | 24268 | 24268 | 24268 | 24268 |
| *Adj. R-Squared* | 0.130 | 0.130 | 0.130 | 0.131 | 0.137 | 0.012 |
| **COMPANIES CLUSTERED** | | | | | | |
| *Dummy Prior* | -0.059*** | -0.059*** | -0.060*** | -0.063*** | -0.073*** | - |
| | (0.022) | (0.022) | (0.022) | (0.022) | (0.022) | - |
| *Dummy DB* | -0.066** | -0.067** | -0.068** | -0.073** | -0.069** | - |
| | (0.028) | (0.028) | (0.029) | (0.029) | (0.030) | - |
| *Dummy Both* | -0.016* | -0.016 | -0.017* | -0.018* | -0.038*** | - |
| | (0.010) | (0.010) | (0.011) | (0.011) | (0.011) | - |
| *Market Return* | 0.831*** | | | | | - |
| | (0.018) | | | | | - |
| *Market Return - $R_f$* | | 0.831*** | 0.831*** | 0.824*** | 0.823*** | - |
| | | (0.018) | (0.018) | (0.018) | (0.018) | - |
| *Log(Assets)* | | | 0.001 | -0.001 | 0.010*** | - |
| | | | (0.002) | (0.003) | (0.003) | - |
| *Tobin's Q* | | | | -0.012*** | -0.019*** | - |
| | | | | (0.003) | (0.003) | - |
| *Sector dummies* | N | N | N | N | Y | - |
| *Fixed Effects* | N | N | N | N | N | - |
| *Observations* | 24348 | 24313 | 24268 | 24268 | 24268 | - |
| *Adj. R-Squared* | 0.130 | 0.130 | 0.130 | 0.131 | 0.137 | - |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 20:** Additional Long-Term Stock Return Regressions Part II

This table shows in addition to *Table 4* the results of the regressions with the companies' *yearly stock return* (- $R_f$) as the dependent variable. The test variable is the dummy variable *Dummy After* (which is 1 for the three years after the freeze and 0 otherwise). I perform 6 different regressions. In all these regressions I use the Equally-Weighted market returns and I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* show the outcomes of the Market Model and the CAPM. Columns *(3)* to *(6)* show the outcomes of different variants of the Multi-factor Model. In columns *(3)* and *(4)* I add the control variables *log(Assets)* and *Tobin's Q*. Columns *(4)* to *(6)* differ in the inclusion of the sector dummies and in controlling for year fixed effects. In all regressions I control for heteroskedasticity and in the second part of the table, I perform the first 5 regressions in which I cluster by company from which some regressions are already performed in *Table 4*. Regression *(6)* is not performed with the clustered companies because the clusters are not nested within the year panels. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Market Model | CAPM | Multifactor Models | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **COMPANIES NOT CLUSTERED** | | | | | | |
| *Dummy After* | 0.029 | 0.029 | 0.030 | 0.027 | 0.017 | 0.010 |
| | (0.020) | (0.020) | (0.020) | (0.020) | (0.020) | (0.027) |
| *Dummy DB* | -0.064** | -0.064** | -0.064** | -0.069** | -0.065** | -0.039 |
| | (0.028) | (0.028) | (0.029) | (0.029) | (0.029) | (0.039) |
| *Dummy Both* | -0.014 | -0.013 | -0.013 | -0.014 | -0.033*** | -0.026** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.010) | (0.012) |
| *Market Return* | 0.832*** | | | | | |
| | (0.016) | | | | | |
| *Market Return - $R_f$* | | 0.831*** | 0.832*** | 0.825*** | 0.823*** | 0.824*** |
| | | (0.016) | (0.016) | (0.016) | (0.016) | (0.083) |
| *Log(Assets)* | | | -0.000 | -0.002 | 0.008*** | 0.004* |
| | | | (0.002) | (0.002) | (0.002) | (0.002) |
| *Tobin's Q* | | | | -0.012*** | -0.019*** | -0.019*** |
| | | | | (0.003) | (0.003) | (0.003) |
| *Sector dummies* | N | N | N | N | Y | Y |
| *Fixed Effects* | N | N | N | N | N | Y |
| *Observations* | 24348 | 24313 | 24268 | 24268 | 24268 | 24268 |
| *Adj. R-Squared* | 0.130 | 0.130 | 0.130 | 0.131 | 0.137 | 0.011 |
| **COMPANIES CLUSTERED** | | | | | | |
| *Dummy After* | 0.029 | 0.029 | 0.030 | 0.027 | 0.017 | - |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | - |
| *Dummy DB* | -0.064** | -0.064** | -0.064** | -0.069** | -0.065** | - |
| | (0.028) | (0.028) | (0.029) | (0.029) | (0.030) | - |
| *Dummy Both* | -0.014 | -0.013 | -0.013 | -0.014 | -0.033*** | - |
| | (0.010) | (0.010) | (0.011) | (0.011) | (0.011) | - |
| *Market Return* | 0.832*** | | | | | - |
| | (0.018) | | | | | - |
| *Market Return - $R_f$* | | 0.831*** | 0.832*** | 0.825*** | 0.823*** | - |
| | | (0.018) | (0.018) | (0.018) | (0.018) | - |
| *Log(Assets)* | | | -0.000 | -0.002 | 0.008*** | - |
| | | | (0.002) | (0.003) | (0.003) | - |
| *Tobin's Q* | | | | -0.012*** | -0.019*** | - |
| | | | | (0.003) | (0.003) | - |
| *Sector dummies* | N | N | N | N | Y | - |
| *Fixed Effects* | N | N | N | N | N | - |
| *Observations* | 24348 | 24313 | 24268 | 24268 | 24268 | - |
| *Adj. R-Squared* | 0.130 | 0.130 | 0.130 | 0.131 | 0.137 | - |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## 6.2 Additional Tables Capital Expenditures

**Table 21:** Abnormal Ratios Capital Expenditures to Total Assets

This table presents in addition to *Table 5* the abnormal ratios of $Capital\ Expenditures_{it}$ / $Total\ Assets_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The figures within the parentheses are the standard errors of the abnormal ratios.

| ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| Not adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | 0.002 | -0.003 | -0.000 | -0.007** | -0.007** | -0.006* |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.004) |
| *All plans* | 0.002 | -0.003 | -0.000 | -0.007** | -0.007** | -0.006* |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| *Wiht DB plans* | 0.003 | -0.002 | 0.000 | -0.007** | -0.006** | -0.005 |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| *Only DB plans* | -0.010** | -0.014*** | -0.011*** | -0.021*** | -0.020*** | -0.017*** |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.004) |
| Adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | 0.001 | -0.003 | -0.001 | -0.008** | -0.007** | -0.007* |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.004) |
| *All plans* | 0.002 | -0.003 | -0.000 | -0.007** | -0.007** | -0.006* |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| *With DB plans* | 0.003 | -0.002 | 0.000 | -0.007** | -0.006** | -0.005 |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| *Observations* | 171 | 182 | 173 | 173 | 150 | 135 |
| **Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level* | | | | | | |

**Table 22:** Expected Capital Expenditures Regressions Part I

This table presents the results of the regressions where *Capital Expenditures / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with solely DC pension plans and companies with all different combinations of pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Only DC Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | 0.033*** | 0.030*** | 0.024*** | 0.025* |
| | (0.001) | (0.001) | (0.007) | (0.010) |
| *Tobin's Q* | 0.007*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.072*** | 0.055*** | 0.056*** |
| | | (0.003) | (0.003) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.029 | 0.071 | 0.343 | 0.346 |
| Only DC Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | 0.033*** | 0.030*** | 0.024*** | 0.025* |
| | (0.001) | (0.001) | (0.007) | (0.010) |
| *Tobin's Q* | 0.007*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.072*** | 0.055*** | 0.056*** |
| | | (0.003) | (0.003) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.029 | 0.071 | 0.343 | 0.346 |
| All plans Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | 0.034*** | 0.030*** | 0.025*** | 0.026** |
| | (0.001) | (0.001) | (0.007) | (0.010) |
| *Tobin's Q* | 0.007*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.078*** | 0.059*** | 0.060*** |
| | | (0.003) | (0.003) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.028 | 0.075 | 0.340 | 0.344 |
| All plans Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | 0.034*** | 0.030*** | 0.025*** | 0.026** |
| | (0.001) | (0.001) | (0.007) | (0.010) |
| *Tobin's Q* | 0.007*** | 0.008*** | 0.007*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.078*** | 0.059*** | 0.060*** |
| | | (0.003) | (0.003) | (0.002) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.028 | 0.074 | 0.340 | 0.344 |
| **Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level* | | | | |

**Table 23:** Expected Capital Expenditures Regressions Part II

This table presents the results of the regression where *Capital Expenditures / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with with DB pension plans and companies with solely DB pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*. Because of the low amount of observations for the control sample with solely DB pension plans, there are no regressions in which I add the sector dummies or in which I control for year fixed effects.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **DB plan Control Sample, non-pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.035*** | 0.033*** | 0.042 | 0.045 |
| | (0.002) | (0.001) | (0.026) | (0.025) |
| *Tobin's Q* | 0.009*** | -0.005** | -0.002 | -0.002* |
| | (0.001) | (0.002) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | 0.252*** | 0.171*** | 0.176*** |
| | | (0.023) | (0.017) | (0.010) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.024 | 0.142 | 0.393 | 0.394 |
| **DB plan Control Sample, pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.035*** | 0.034*** | 0.042 | 0.046 |
| | (0.002) | (0.001) | (0.026) | (0.025) |
| *Tobin's Q* | 0.009*** | -0.005** | -0.002 | -0.002* |
| | (0.001) | (0.002) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | 0.254*** | 0.173*** | 0.177*** |
| | | (0.023) | (0.017) | (0.010) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.024 | 0.143 | 0.394 | 0.395 |
| **Only DB plans Control Sample, non-pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.011 | 0.010 | - | - |
| | (0.017) | (0.015) | - | - |
| *Tobin's Q* | 0.030* | 0.016 | - | - |
| | (0.015) | (0.015) | - | - |
| *Cash Flows / Total Assets* | | 0.272*** | - | - |
| | | (0.074) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.103 | 0.198 | - | - |
| **Only DB plans Control Sample, pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.011 | 0.011 | - | - |
| | (0.017) | (0.015) | - | - |
| *Tobin's Q* | 0.030* | 0.017 | - | - |
| | (0.015) | (0.015) | - | - |
| *Cash Flows / Total Assets* | | 0.264*** | - | - |
| | | (0.073) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.103 | 0.195 | - | - |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 24:** Robustness Check on Abnormal Capital Expenditures Ratios

This table is added as a robustness check on *Table 5*. In this table I omit the variable $\frac{CF_{it}}{TA_{i,t-1}}$, which results in the following regression that is used to determine the expected ratios:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha_c + \beta_c * Q_{it} + \gamma_c * \mathbf{x_{it}}$$

Apart from that, the figures in the table are constructed the same way as in *Table 5*.

**ABNORMAL RATIOS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | 0.003 | -0.001 | 0.001 | -0.005* | -0.004 | -0.003 |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *All plans* | 0.003 | -0.001 | 0.000 | -0.006** | -0.004 | -0.004 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *DB plans* | 0.001 | -0.004 | -0.003 | -0.008*** | -0.006** | -0.005* |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *Only DB plans* | -0.014*** | -0.016*** | -0.014*** | -0.022*** | -0.019*** | -0.018*** |
| | (0.004) | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | 0.003 | -0.001 | 0.000 | -0.005** | -0.004 | -0.004 |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *All plans* | 0.003 | -0.001 | 0.000 | -0.006** | -0.004 | -0.004 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *DB plans* | 0.000 | -0.004 | -0.003 | -0.008*** | -0.006** | -0.005* |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| *Observations* | 192 | 197 | 200 | 192 | 170 | 144 |

**CUMULATIVE ABNORMAL RATIOS**

| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
|---|---|---|---|---|---|---|
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | Not adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | 0.003 | 0.000 | 0.001 | -0.005* | -0.008 | -0.011 |
| | (0.009) | (0.006) | (0.003) | (0.003) | (0.006) | (0.009) |
| *All plans* | 0.002 | -0.001 | 0.000 | -0.006** | -0.009 | -0.011 |
| | (0.008) | (0.006) | (0.003) | (0.003) | (0.006) | (0.009) |
| *DB plans* | -0.006 | -0.006 | -0.003 | -0.008*** | -0.013** | -0.017** |
| | (0.008) | (0.006) | (0.003) | (0.003) | (0.005) | (0.009) |
| *Only DB plans* | -0.045*** | -0.030*** | -0.014*** | -0.022*** | -0.039*** | -0.052*** |
| | (0.010) | (0.007) | (0.004) | (0.003) | (0.006) | (0.011) |
| | Adjusted for Year Fixed Effects | | | | | |
| *Only DC plans* | 0.002 | -0.000 | 0.000 | -0.005** | -0.009 | -0.012 |
| | (0.009) | (0.006) | (0.003) | (0.003) | (0.006) | (0.009) |
| *All plans* | 0.001 | -0.001 | 0.000 | -0.006** | -0.009* | -0.012 |
| | (0.008) | (0.006) | (0.003) | (0.003) | (0.006) | (0.009) |
| *DB plans* | -0.006 | -0.006 | -0.003 | -0.008*** | -0.013** | -0.017** |
| | (0.008) | (0.006) | (0.003) | (0.003) | (0.005) | (0.009) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## **Table 25:** Additional Capital Expenditures Regressions

This table shows in addition to *Table 6* the results of the regressions with with the companies' *Capital Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ as the dependent variable. The difference between this table and *Table 6* is that I do not cluster the companies in these regressions. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* to *(3)* differ in the inclusion of the sector dummies. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | **TEST DUMMY PRIOR** | | |
| *Dummy Prior* | -0.004** | -0.006*** | -0.001 |
| | (0.002) | (0.002) | (0.002) |
| *Dummy DB* | 0.007 | 0.005 | 0.001 |
| | (0.005) | (0.004) | (0.003) |
| *Dummy Both* | 0.005*** | 0.001 | -0.004*** |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.008*** | 0.008*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.080*** | 0.060*** |
| | | (0.003) | (0.003) |
| *Sector dummies* | N | N | Y |
| *Observations* | 24366 | 24246 | 24246 |
| *Adj. R-Squared* | 0.031 | 0.077 | 0.341 |
| | **TEST DUMMY AFTER** | | |
| *Dummy After* | -0.009*** | -0.012*** | -0.007*** |
| | (0.002) | (0.002) | (0.002) |
| *Dummy DB* | 0.007 | 0.005 | 0.001 |
| | (0.005) | (0.004) | (0.003) |
| *Dummy Both* | 0.005*** | 0.000 | -0.004*** |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.008*** | 0.008*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.080*** | 0.060*** |
| | | (0.003) | (0.003) |
| *Sector dummies* | N | N | Y |
| *Observations* | 24366 | 24246 | 24246 |
| *Adj. R-Squared* | 0.031 | 0.077 | 0.341 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## 6.3 Additional Tables R&D Expenditures

**Table 26:** Abnormal Ratios R&D Expenditures to Total Assets

This table presents in addition to *Table 7* the abnormal ratios of *R&D Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The figures within the parentheses are the standard errors of the abnormal ratios.

| ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| Not adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.024*** | -0.024*** | -0.023*** | -0.022*** | -0.020*** | -0.025*** |
| | (0.003) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) |
| *All plans* | -0.019*** | -0.018*** | -0.018*** | -0.017*** | -0.015*** | -0.019*** |
| | (0.003) | (0.002) | (0.003) | (0.002) | (0.002) | (0.002) |
| *DB plans* | -0.001 | -0.001 | -0.002 | -0.002 | -0.002* | -0.003** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| *Only DB plans* | 0.003 | 0.004** | 0.003* | 0.002 | 0.001 | 0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) | (0.001) |
| Adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.024*** | -0.024*** | -0.023*** | -0.022*** | -0.019*** | -0.025*** |
| | (0.003) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) |
| *All plans* | -0.018*** | -0.018*** | -0.017*** | -0.016*** | -0.014*** | -0.019*** |
| | (0.003) | (0.002) | (0.003) | (0.002) | (0.002) | (0.002) |
| *DB plans* | -0.001 | -0.001 | -0.002 | -0.002 | -0.002* | -0.003** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| *Observations* | 171 | 182 | 173 | 173 | 150 | 135 |
| **Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level* | | | | | | |

**Table 27:** Expected R&D Expenditures Regressions Part I

This table presents the results of the regression where *R&D Expenditures / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with solely DC pension plans and companies with all different combinations of pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Only DC Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | -0.009*** | 0.004** | -0.010 | -0.010 |
| | (0.002) | (0.001) | (0.012) | (0.016) |
| *Tobin's Q* | 0.034*** | 0.032*** | 0.027*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.288*** | -0.272*** | -0.276*** |
| | | (0.007) | (0.007) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.212 | 0.433 | 0.491 | 0.496 |
| Only DC Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | -0.009*** | 0.004** | -0.010 | -0.010 |
| | (0.002) | (0.001) | (0.012) | (0.016) |
| *Tobin's Q* | 0.034*** | 0.032*** | 0.027*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.289*** | -0.272*** | -0.276*** |
| | | (0.007) | (0.007) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.212 | 0.433 | 0.491 | 0.496 |
| All plans Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | -0.014*** | 0.000 | -0.011 | -0.010 |
| | (0.001) | (0.001) | (0.012) | (0.015) |
| *Tobin's Q* | 0.033*** | 0.032*** | 0.028*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.285*** | -0.277*** | -0.281*** |
| | | (0.007) | (0.007) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.213 | 0.435 | 0.484 | 0.489 |
| All plans Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | -0.014*** | 0.000 | -0.011 | -0.010 |
| | (0.001) | (0.001) | (0.012) | (0.015) |
| *Tobin's Q* | 0.033*** | 0.032*** | 0.028*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) | (0.000) |
| *Cash Flows / Total Assets* | | -0.285*** | -0.277*** | -0.281*** |
| | | (0.007) | (0.007) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.213 | 0.435 | 0.484 | 0.489 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

## **Table 28:** Expected R&D Expenditures Regressions Part II

This table presents the results of the regression where *R&D Expenditures / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with with DB pension plans and companies with solely DB pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*. Because of the low amount of observations for the control sample with solely DB pension plans, there are no regressions in which I add the sector dummies or in which I control for year fixed effects.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DB plan Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | -0.005*** | -0.005*** | -0.010*** | -0.009 |
| | (0.001) | (0.001) | (0.002) | (0.015) |
| *Tobin's Q* | 0.011*** | 0.011*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | -0.007 | -0.022 | -0.024*** |
| | | (0.015) | (0.016) | (0.006) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.134 | 0.134 | 0.212 | 0.211 |
| DB plan Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | -0.005*** | -0.005*** | -0.010*** | -0.009 |
| | (0.001) | (0.001) | (0.002) | (0.015) |
| *Tobin's Q* | 0.011*** | 0.011*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | -0.010 | -0.023 | -0.025*** |
| | | (0.015) | (0.016) | (0.006) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.134 | 0.134 | 0.213 | 0.212 |
| Only DB plans Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | -0.012*** | -0.012*** | - | - |
| | (0.003) | (0.003) | - | - |
| *Tobin's Q* | 0.014*** | 0.014*** | - | - |
| | (0.003) | (0.003) | - | - |
| *Cash Flows / Total Assets* | | -0.006 | - | - |
| | | (0.013) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.358 | 0.356 | - | - |
| Only DB plans Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | -0.012*** | -0.012*** | - | - |
| | (0.003) | (0.003) | - | - |
| *Tobin's Q* | 0.014*** | 0.014*** | - | - |
| | (0.003) | (0.003) | - | - |
| *Cash Flows / Total Assets* | | -0.006 | - | - |
| | | (0.013) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.358 | 0.356 | - | - |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 29:** Robustness Check on Abnormal R&D Expenditures Ratios

This table is added as a robustness check on *Table 7*. In this table I omit the variable $\frac{CF_{it}}{TA_{i,t-1}}$, which results in the following regression that is used to determine the expected ratios:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha_c + \beta_c * Q_{it} + \gamma_c * \mathbf{x_{it}}$$

Apart from that, the figures in the table are constructed the same way as in *Table 7*.

| ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| Not adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.037*** | -0.036*** | -0.036*** | -0.037*** | -0.035*** | -0.038*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) |
| *All plans* | -0.028*** | -0.027*** | -0.026*** | -0.028*** | -0.027*** | -0.029*** |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.003) | (0.003) |
| *DB plans* | -0.001 | -0.001 | -0.001 | -0.002 | -0.002** | -0.002** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| *Only DB plans* | 0.002 | 0.003** | 0.003** | 0.002 | 0.001 | 0.001 |
| | (0.002) | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) |
| Adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.037*** | -0.035*** | -0.035*** | -0.036*** | -0.035*** | -0.038*** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.004) |
| *All plans* | -0.028*** | -0.026*** | -0.026*** | -0.028*** | -0.027*** | -0.029*** |
| | (0.003) | (0.002) | (0.002) | (0.003) | (0.003) | (0.003) |
| *DB plans* | -0.001 | -0.001 | -0.001 | -0.002 | -0.002** | -0.002** |
| | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| *Observations* | 192 | 197 | 200 | 192 | 170 | 144 |

| CUMULATIVE ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| Not adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.108*** | -0.071*** | -0.036*** | -0.037*** | -0.071*** | -0.112*** |
| | (0.009) | (0.006) | (0.003) | (0.003) | (0.006) | (0.010) |
| *All plans* | -0.080*** | -0.053*** | -0.026*** | -0.028*** | -0.054*** | -0.085*** |
| | (0.007) | (0.005) | (0.002) | (0.003) | (0.005) | (0.009) |
| *DB plans* | -0.003 | -0.002 | -0.001 | -0.002 | -0.005** | -0.007* |
| | (0.005) | (0.003) | (0.001) | (0.001) | (0.002) | (0.004) |
| *Only DB plans* | 0.010** | 0.007** | 0.003** | 0.002 | 0.003 | 0.005 |
| | (0.005) | (0.003) | (0.002) | (0.001) | (0.003) | (0.004) |
| Adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.107*** | -0.070*** | -0.035*** | -0.036*** | -0.070*** | -0.111*** |
| | (0.009) | (0.006) | (0.003) | (0.003) | (0.006) | (0.010) |
| *All plans* | -0.079*** | -0.052*** | -0.026*** | -0.028*** | -0.053*** | -0.084*** |
| | (0.007) | (0.005) | (0.002) | (0.003) | (0.005) | (0.009) |
| *DB plans* | -0.003 | -0.002 | -0.001 | -0.002 | -0.005** | -0.007* |
| | (0.005) | (0.003) | (0.001) | (0.001) | (0.002) | (0.004) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

**Table 30:** Additional R&D Expenditures Regressions

This table shows in addition to *Table 8* the results of the regressions with with the companies' *R&D Expenditures*$_{it}$ / *Total Assets*$_{i,t-1}$ as the dependent variable. The difference between this table and *Table 8* is that I do not cluster the companies in these regressions. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* and *(3)* differ in the inclusion of the sector dummies. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| **TEST DUMMY PRIOR** | | | |
| *Dummy Prior* | -0.027*** | -0.018*** | -0.021*** |
| | (0.001) | (0.001) | (0.002) |
| *Dummy DB* | -0.027*** | -0.019*** | -0.016*** |
| | (0.001) | (0.002) | (0.002) |
| *Dummy Both* | -0.030*** | -0.015*** | -0.019*** |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.032*** | 0.031*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | -0.280*** | -0.272*** |
| | | (0.007) | (0.007) |
| *Sector dummies* | N | N | Y |
| *Observations* | 24366 | 24246 | 24246 |
| *Adj. R-Squared* | 0.226 | 0.439 | 0.487 |
| **TEST DUMMY AFTER** | | | |
| *Dummy After* | -0.029*** | -0.017*** | -0.020*** |
| | (0.001) | (0.001) | (0.001) |
| *Dummy DB* | -0.027*** | -0.019*** | -0.016*** |
| | (0.001) | (0.002) | (0.002) |
| *Dummy Both* | -0.030*** | -0.015*** | -0.019*** |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.032*** | 0.031*** | 0.028*** |
| | (0.001) | (0.001) | (0.001) |
| *Cash Flows / Total Assets* | | -0.280*** | -0.272*** |
| | | (0.007) | (0.007) |
| *Sector dummies* | N | N | Y |
| *Observations* | 24366 | 24246 | 24246 |
| *Adj. R-Squared* | 0.226 | 0.439 | 0.487 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## 6.4 Additional Tables Acquisitions

**Table 31:** Abnormal Acquisition Ratios

This table presents in addition to *Table 9* the abnormal ratios of $Acquisition_{it}$ / $Total\ Assets_{i,t-1}$ in the 3 years before and 3 years after a company freezes a DB pension plan. The abnormal ratios are determined by subtracting the expected ratios from the actual ratios. The expected ratios are determined by two types of the following regression (one where I control for year fixed effects and one where I do not) over four different control samples (three for the FE-regressions):

$$E\left(\frac{I_{it}}{TA_{i,t-1}}\right) = \alpha_c + \beta_c * Q_{it} + \gamma_c * \frac{CF_{it}}{TA_{i,t-1}} + \delta_c * \mathbf{x_{it}}$$

The figures within the parentheses are the standard errors of the abnormal ratios.

| **ABNORMAL RATIOS** | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| Not adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.004 | -0.006 | -0.001 | -0.007 | -0.013*** | -0.010** |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.005) |
| *All plans* | -0.003 | -0.005 | -0.000 | -0.006 | -0.012*** | -0.009* |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.004) |
| *DB plans* | 0.001 | -0.001 | 0.005 | -0.001 | -0.008* | -0.004 |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.004) |
| *Only DB plans* | -0.006 | -0.007 | -0.003 | -0.009 | -0.017*** | -0.011** |
| | (0.006) | (0.006) | (0.005) | (0.006) | (0.005) | (0.005) |
| Adjusted for Year Fixed Effects | | | | | | |
| *Only DC plans* | -0.004 | -0.006 | -0.001 | -0.007 | -0.014*** | -0.010** |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.005) |
| *All plans* | -0.003 | -0.005 | -0.000 | -0.006 | -0.013*** | -0.009* |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.004) |
| *DB plans* | 0.001 | -0.001 | 0.005 | -0.001 | -0.008* | -0.004 |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.004) |
| *Observations* | 171 | 182 | 173 | 173 | 150 | 135 |
| **Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level* | | | | | | |

**Table 32:** Expected Acquisition Regressions Part I

This table presents the results of the regression where *Acquisitions / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with solely DC pension plans and companies with all different combinations of pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Only DC Control Sample, non-pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.021*** | 0.019*** | 0.066** | 0.066*** |
| | (0.001) | (0.001) | (0.022) | (0.017) |
| *Tobin's Q* | 0.004*** | 0.005*** | 0.003*** | 0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.050*** | 0.052*** | 0.050*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.005 | 0.017 | 0.033 | 0.031 |
| **Only DC Control Sample, pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.021*** | 0.019*** | 0.066** | 0.066*** |
| | (0.001) | (0.001) | (0.022) | (0.017) |
| *Tobin's Q* | 0.004*** | 0.005*** | 0.003*** | 0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.050*** | 0.052*** | 0.050*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 17936 | 17927 | 17927 | 17927 |
| *Adj. R-Squared* | 0.005 | 0.017 | 0.033 | 0.031 |
| **All plans Control Sample, non-pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.019*** | 0.017*** | 0.065** | 0.065*** |
| | (0.001) | (0.001) | (0.022) | (0.016) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** | 0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.053*** | 0.054*** | 0.052*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.006 | 0.018 | 0.035 | 0.033 |
| **All plans Control Sample, pension adjusted Cash Flows** | | | | |
| *Intercept* | 0.019*** | 0.017*** | 0.065** | 0.065*** |
| | (0.001) | (0.001) | (0.022) | (0.016) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** | 0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.053*** | 0.054*** | 0.053*** |
| | | (0.004) | (0.004) | (0.003) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 22620 | 22611 | 22611 | 22611 |
| *Adj. R-Squared* | 0.006 | 0.018 | 0.035 | 0.033 |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 33:** Expected Acquisition Regressions Part II

This table presents the results of the regression where *Acquisitions / Total Assets*$_{t-1}$ is the dependent variable. The table is divided in four parts parts by the type of control sample and the type of cash flows used in the regressions as shown by the captions in between. The two types of control samples are companies with with DB pension plans and companies with solely DB pension plans. The difference in the regressions of columns *(3)* and *(4)* is that I control for year fixed effects in column *(4)*. Because of the low amount of observations for the control sample with solely DB pension plans, there are no regressions in which I add the sector dummies or in which I control for year fixed effects.

| Variables | Models | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| DB plan Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | 0.009*** | 0.008** | -0.013*** | -0.016 |
| | (0.003) | (0.003) | (0.003) | (0.042) |
| *Tobin's Q* | 0.009*** | 0.001 | -0.000 | -0.001 |
| | (0.002) | (0.002) | (0.002) | (0.001) |
| *Cash Flows / Total Assets* | | 0.149*** | 0.121*** | 0.130*** |
| | | (0.023) | (0.023) | (0.016) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.015 | 0.037 | 0.051 | 0.049 |
| DB plan Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | 0.009*** | 0.008** | -0.012*** | -0.016 |
| | (0.003) | (0.003) | (0.003) | (0.042) |
| *Tobin's Q* | 0.009*** | 0.002 | -0.000 | -0.001 |
| | (0.002) | (0.002) | (0.002) | (0.001) |
| *Cash Flows / Total Assets* | | 0.147*** | 0.121*** | 0.130*** |
| | | (0.023) | (0.023) | (0.016) |
| *Sector dummies* | N | N | Y | Y |
| *Observations* | 3997 | 3997 | 3997 | 3997 |
| *Adj. R-Squared* | 0.015 | 0.036 | 0.051 | 0.049 |
| Only DB plans Control Sample, non-pension adjusted Cash Flows | | | | |
| *Intercept* | 0.015 | 0.014 | - | - |
| | (0.010) | (0.009) | - | - |
| *Tobin's Q* | 0.010 | -0.001 | - | - |
| | (0.007) | (0.007) | - | - |
| *Cash Flows / Total Assets* | | 0.224* | - | - |
| | | (0.108) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.004 | 0.042 | - | - |
| Only DB plans Control Sample, pension adjusted Cash Flows | | | | |
| *Intercept* | 0.015 | 0.014 | - | - |
| | (0.010) | (0.009) | - | - |
| *Tobin's Q* | 0.010 | -0.001 | - | - |
| | (0.007) | (0.007) | - | - |
| *Cash Flows / Total Assets* | | 0.220* | - | - |
| | | (0.107) | - | - |
| *Sector dummies* | N | N | - | - |
| *Observations* | 238 | 238 | - | - |
| *Adj. R-Squared* | 0.004 | 0.042 | - | - |

**Significant at 5%-level, **Significant at 1%-level, ***Significant at 0.1%-level*

**Table 34:** Robustness Check on Abnormal Acquisition Ratios

This table is added as a robustness check on *Table 9*. In this table I omit the variable $\frac{CF_{it}}{TA_{i,t-1}}$, which results in the following regression that is used to determine the expected ratios:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha_c + \beta_c * Q_{it} + \gamma_c * \mathbf{x_{it}}$$

Apart from that, the figures in the table are constructed the same way as in *Table 9*.

| ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to -2 | -2 to -1 | -1 to 0 | 0 to 1 | 1 to 2 | 2 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.004 | -0.003 | -0.002 | -0.005 | -0.008 | -0.008* |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *All plans* | -0.003 | -0.003 | -0.002 | -0.005 | -0.007 | -0.007* |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *DB plans* | -0.002 | -0.001 | 0.000 | -0.003 | -0.005 | -0.005 |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *Only DB plans* | -0.010* | -0.008 | -0.006 | -0.011** | -0.013** | -0.013*** |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.004 | -0.004 | -0.002 | -0.006 | -0.008 | -0.008* |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *All plans* | -0.004 | -0.003 | -0.002 | -0.005 | -0.007 | -0.007* |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *DB plans* | -0.002 | -0.001 | 0.000 | -0.003 | -0.005 | -0.005 |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.004) |
| *Observations* | 192 | 197 | 200 | 192 | 170 | 144 |

| CUMULATIVE ABNORMAL RATIOS | | | | | | |
|---|---|---|---|---|---|---|
| Control Sample | Pre-freezing Period (Years) | | | Post-freezing Period (Years) | | |
| | -3 to 0 | -2 to 0 | -1 to 0 | 0 to 1 | 0 to 2 | 0 to 3 |
| | | | Not adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.008 | -0.005 | -0.002 | -0.005 | -0.010 | -0.020** |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *All plans* | -0.007 | -0.005 | -0.002 | -0.005 | -0.010 | -0.019* |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *DB plans* | -0.003 | -0.001 | 0.000 | -0.003 | -0.005 | -0.013 |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *Only DB plans* | -0.024** | -0.014* | -0.006 | -0.011** | -0.021** | -0.034*** |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| | | | Adjusted for Year Fixed Effects | | | |
| *Only DC plans* | -0.008 | -0.005 | -0.002 | -0.006 | -0.011 | -0.021** |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *All plans* | -0.008 | -0.005 | -0.002 | -0.005 | -0.010 | -0.019* |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *DB plans* | -0.003 | -0.001 | 0.000 | -0.003 | -0.005 | -0.013 |
| | (0.010) | (0.008) | (0.005) | (0.005) | (0.008) | (0.010) |
| *Observations* | 190 | 197 | 200 | 192 | 169 | 143 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## **Table 35:** Additional Acquisition Regressions

This table shows in addition to *Table 10* the results of the regressions with with the companies' $Acquisitions_{it}$ / $Total\ Assets_{i,t-1}$ as the dependent variable. The difference between this table and *Table 10* is that I do not cluster the companies in these regressions. The table is split in two parts, which present the results of the two test variables. The test variables are the dummy variables *Dummy Prior* (which is 1 for the three years prior to a freeze and 0 otherwise) and *Dummy After* (which is 1 for the three years after a freeze and 0 otherwise). I perform four different variants of the following regression:

$$\frac{I_{it}}{TA_{i,t-1}} = \alpha + \rho * \mathbf{D_{test}} + \beta * Q_{it} + \gamma * \frac{CF_{it}}{TA_{it-1}} + \delta * \mathbf{x_{it}} + \epsilon_{it}$$

In all these regressions I add dummy variables for companies with only a DB pension plan and with both a DB- and DC pension plan. Columns *(1)* and *(2)* differ in the addition of the variable $\frac{CF_{it}}{TA_{i,t-1}}$. Columns *(2)* and *(3)* differ in the inclusion of the sector dummies. In all regressions I control for heteroskedasticity. The figures within the parentheses are the standard errors of the coefficients.

| Variables | Models | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| **TEST DUMMY PRIOR** | | | |
| *Dummy Prior* | -0.005* | -0.006 | -0.004 |
| | (0.003) | (0.004) | (0.004) |
| *Dummy DB* | 0.002 | 0.000 | 0.005 |
| | (0.006) | (0.006) | (0.006) |
| *Dummy Both* | -0.004*** | -0.007*** | -0.006*** |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.054*** | 0.055*** |
| | | (0.004) | (0.004) |
| *Sector dummies* | N | N | Y |
| *Observations* | 23666 | 23550 | 23550 |
| *Adj. R-Squared* | 0.007 | 0.018 | 0.033 |
| **TEST DUMMY AFTER** | | | |
| *Dummy After* | -0.009*** | -0.012*** | -0.010*** |
| | (0.003) | (0.003) | (0.003) |
| *Dummy DB* | 0.002 | -0.000 | 0.005 |
| | (0.006) | (0.006) | (0.006) |
| *Dummy Both* | -0.004*** | -0.007*** | |
| | (0.001) | (0.001) | (0.001) |
| *Tobin's Q* | 0.005*** | 0.005*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) |
| *Cash Flows / Total Assets* | | 0.054*** | 0.055*** |
| | | (0.004) | (0.004) |
| *Sector dummies* | N | N | Y |
| *Observations* | 23666 | 23550 | 23550 |
| *Adj. R-Squared* | 0.007 | 0.019 | 0.034 |

**Significant at 10%-level, **Significant at 5%-level, ***Significant at 1%-level*

## 6.5 Other Additional Tables

**Table 36:** List of phrases and words that indicate welfare plan

| | | |
|---|---|---|
| Dental & Vision | Group Vision | Medical Plan |
| Dental Plan | Term Disability | Group Medical |
| Dental Program | Disability Plan | Group Accident |
| Death Plan | Mortuary Fund | Accidental Death |
| AD&D | Welfare Benefit | Severance Plan |
| Dismemberment | Welfare Plan | Cafeteria Plan |
| Injury Benefits | LTD Plan | Supplemental Unemployment |
| Life Plan | STD Plan | Employee Assistance |
| Group Health | 125 Plan | Retiree Health Fund |
| Health Plan | Section 125 | Flexible Benefit |
| Health Care Plan | Severance Pay | Fringe Benefit |
| Health Benefit Plan | Vacation Plan | Premium Only |

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