



VALUE-REDISTRIBUTION BY PRIVATE EQUITY: BREACHING IMPLICIT PENSION CONTRACTS?

Abstract

This research aims to examine the effects of private equity on human capital as measured by the deferred income of workers and pensioners covered by a defined benefit pension arrangement. Research is performed by analyzing private equity portfolio companies in the US and testing five previously identified value-redistributing strategies possibly applied by private equity firms to increase operational performance. Portfolio companies are compared to listed peers. Additionally, case studies are presented to illustrate value-redistribution practices and to complement the empirical research with a socio-economic point of view. Results indicate private equity uses defined benefit pension plans for value-redistribution to a limited extent as measured by the proposed strategies. Recommendations for future research include a plan-level analysis, while practitioners and regulators are advised to increase transparency to improve the negative image painted by critics of the private equity sector.

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Preface

During the process of performing research and writing my thesis on private equity and its effects on human capital, I have learned a great deal of the private equity sector and was able to broaden my academic scope. Although I have struggled from time to time, I would like to thank my supervisors Onno Steenbeek and Aleksandar Andonov for providing me with valuable feedback. Onno, as my main supervisor, made it very clear from the start that a master thesis was going to be a chance for me to present myself and show my capabilities as a researcher. Your feedback and support has helped me a lot. Furthermore, I would also like to thank you for introducing me to your colleague, John Renkema, who has also assisted me in writing this thesis by providing valuable tips and feedback from a private equity perspective. Finally, I want to thank Dick van der Sluijs for brainstorming with me about the econometrical component of empirical research and sharing your knowledge on time-series analysis.

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Table of Contents

1. Introduction.....	3
1.1 Private equity – a controversial business model.....	3
1.2 Human capital effects of private equity	5
1.3 Research set-up and research summary	6
2. Literature Review	8
2.1 Chapter Overview.....	8
2.2 Private Equity	8
2.3 Pension Economics	12
2.4 Redistribution strategies for pension arrangements	21
3. Methodology	28
3.1 Chapter Overview.....	28
3.2 Data and descriptive statistics.....	28
3.3 General Methodology	32
3.3 Methodology of the pension redistribution strategies	34
3.4 Summary statistics on the included variables.....	40
4. Results	45
4.1 Results for Strategy I: Retrenching pension arrangements.....	45
4.2 Results for Strategy II: Decrease pension funding.....	46
4.3 Results for Strategy III: Increase pension allocation risk-taking.....	47
4.4 Results for Strategy IV: Expected return on pension assets.....	48
4.5 Results for Strategy V: Increase pension discount rate.....	49
5. Conclusion and discussion.....	50
5.1 Chapter Overview.....	50
5.2 Concluding remarks on Strategies I – V.....	50
5.3 Discussion	54
5.4 Research recommendations for a plan-level analysis.....	56
5.5 Policy implications for practitioners and regulators	57
Literature.....	59

1. Introduction

1.1 Private equity – a controversial business model

The private equity business model has been an interesting subject for academics since its inception in the 1980s and its resurrection in the early 2000s. A reason for repeated research in this area of corporate finance might lie in the perceived financial outperformance of public equity markets on a consistent basis (Harris, Jenkinson and Kaplan, 2014). Using the Public Market Equivalent method of Kaplan and Schoar (2005), Harris, Jenkinson and Kaplan (2014) find that their data set containing data from nearly 1,400 private equity funds outperforms the S&P 500 by roughly 3% per annum and also outperforms small-cap indices, be it very slightly. Critics of private equity however, point to the financial mechanisms employed to achieve this perceived outperformance and wonder whether society at large benefits from financial intermediaries such as private equity firms and their funds. More precisely, a great body of research deals with the effects of private equity on employee relations and employment growth. The following case of Delphi Automotive illustrates this critique.

Case: Delphi Automotive

Delphi Automotive is a former subsidiary of General Motors and a supplier of auto parts used in the production of GM. It was spun off from GM in 1999 but had to declare bankruptcy in 2005. Private equity investors started acquiring Delphi's debt while it was in bankruptcy for 20 cents on the dollar of their face value. While the bankruptcy court was deciding on the fate of the company, the distressed debt investors used their controlling interest in Delphi to force the judge to auction the shares of Delphi. The investors bought the company for 67 cents per share. Due to the bankruptcy of Delphi, the pensions of 25,200 workers were transferred to the Pension Benefit Guaranty Corporation (PBGC) at a cost of \$5.6 billion for the U.S. taxpayer. In addition to this, the health insurance payments for a share of Delphi's engineers were unilaterally cancelled, saving the company \$70 million per year. Pension arrangements for employees and retirees were reduced between 30% and 70%, since the PBGC is only allowed to cover a certain fraction of pensions by insurance. Released from its pension obligations and other debt burdens, the company made a fresh start. In November 2011, the company was taken public by the private equity investors at \$22 a share, who gained \$904 million in the process (Greg Palast, 2012).

A second reason for academic interest in the private equity sector lies in the increased flow of capital committed to private equity and the number of transactions that took place since 2000. In their search for yield and diversification, institutional investors and investment banks committed increasing amounts of capital and debt financing, making the topic relevant for researchers. Especially in the years prior to the financial crisis, deal volume spiked as well as the number of deals. This can be gleaned from Figure 1.

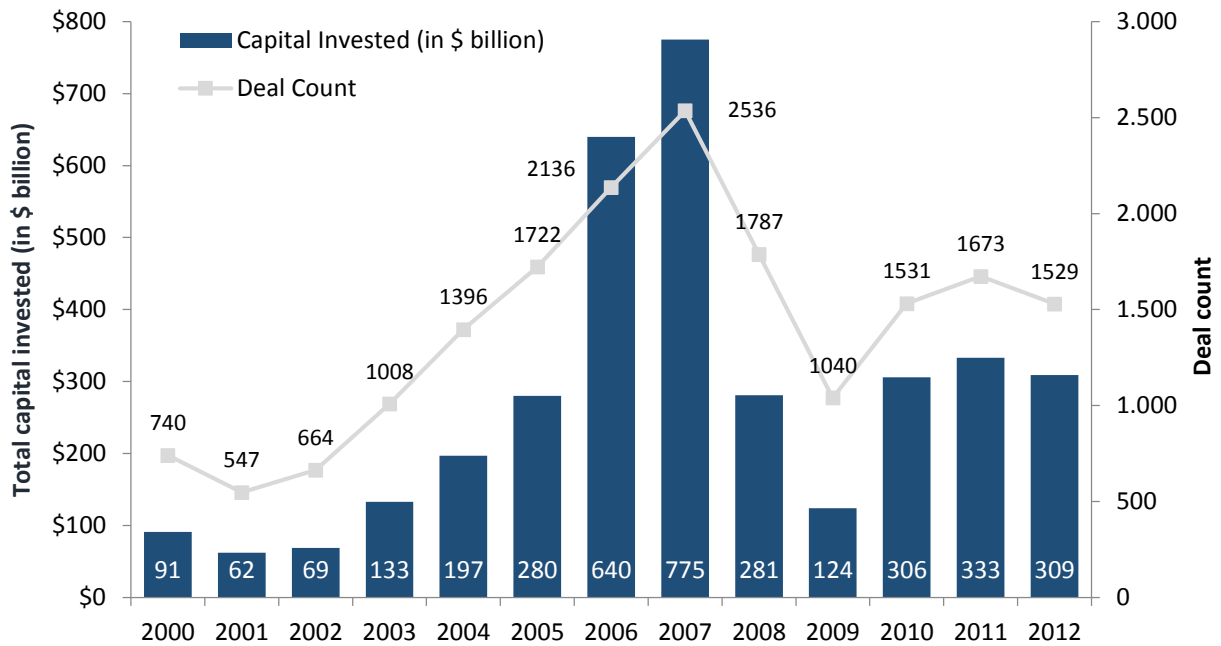


Figure 1: Total capital invested in leveraged buy-outs and deal count, 2000-2012 (source: PitchBook, taken from Appelbaum and Batt, 2014)

A critique on private equity for its negative impact on human capital is formulated by Elizabeth Lewis (2015) in a working paper. She refers to private equity firms as the Holmesian bad man¹, the unusual one who tries to exploit the system: in this case the financial system. In the paper by Lewis (2015), the Chapter 11 bankruptcy laws are being examined, as this legal structure seems to make dumping pensions onto the Pension Benefit Guaranty Corporation (PBGC) straightforward and particularly suitable for private equity firms. The three cases highlighted in her working paper show the image of private equity firms redistributing wealth from employees, in this case their deferred income, to shareholders by means of a Chapter 11 bankruptcy filing. The moral judgment of private equity being a destructive business model for the economy as a whole is not self-contained. Froud and Williams (2007a) identify financial engineering by private equity, for example by shielding the company's profits from tax payments by saddling up the company with high amounts of debt, as the main source of its value creation and state the purpose of value created merely enriches the managerial elite.

A different view on LBOs and the private equity business model arose from the papers by Jensen and Meckling (1976) and Jensen (1986, 1988) on the agency theory in the corporate world.

¹ The Holmesian Bad Man is a common part of law studies, to learn students that a legal system cannot be based on the fact that most people do the right thing. A legal system must account for the bad man, who will try to exploit the system.

According to their view, a manager's most important task is to maximize shareholder value. The board of directors, representing the shareholders, is the principal while managers take the role of agent in this theory. Several instruments were introduced to align incentives of the manager with the owners of the company, such as linking pay to performance by rewarding managers with shares and stock options. In addition, the instrument of debt as a disciplining force of the market was introduced (Jensen, 1986). This view sparked a wave of hostile takeovers in the 1980s using debt as its main financing method. Along with several legislative changes around this time, including the Employment Retirement Income Security Act (ERISA), which made it possible for pension funds and insurance companies to hold stock, the academic view on corporations became the origin for the business model of private equity. A business model that was able to minimize principal-agent related issues present in listed equity with its dispersed ownership structure.

1.2 Human capital effects of private equity

Having discussed theoretical considerations on the human capital effects of private equity and the institutional advantages, it is now time to consider empirical findings. Davis et al. (2014) find employment shrinks by some 1% at target companies relative to the control group in the first two years following a buyout by private equity. This number included acquisitions and divestitures however, leading Appelbaum and Batt (2014) to believe the actual employment reduction figure is higher than 1%. Regarding the wage effects of private equity, results show that on average the decline in earnings per worker (EPW) was 4 log points or 2.4% following a buyout (Davis et al., 2014). In sectors employing mostly unskilled workers, EPW decline was highest and amounted to 6 to 8 log points compared to controls. Other scholars find different results, although studies are not easily comparable because of the level of examination (firm-, establishment- or employee-level) and because of the different institutional environments present. Antoni, Maug and Obernberger (2015) examine the impact of LBOs at the individual employee level in Germany in a working paper and find the overall wage effect is positive, although it differs among employees with respect to job-related skills, tenure and age. Boucly et al. (2011) study LBOs in France and find a positive impact on employment and wages, effects which they attribute to relieved financial constraints following a buyout.

In addition to potential employment decreases in private equity owned companies and negative wage effects compared to listed companies, decreases in other employee benefits such as pension plan contributions for defined benefit plans might also be a way of redistributing value from workers and retirees to shareholders. Rauh (2006) finds that pension contributions can amount to 10%

of capital expenditures in a given firm-year and comprise 6% of operational cash flow for S&P 500 companies on average, making a pension plan an interesting vehicle for wealth redistribution.

Although there has been a trend away from defined benefit pensions over the past decades, approximately one fifth of all Fortune 500 companies still offer defined benefit pensions (Towers Watson, 2016). Shleifer and Summers (1988) call it a 'breach of trust' when workers' implicit contracts are reneged on by new owners of the company, while those workers might have exhibited extra effort for the company in order to receive deferred compensation. Pension benefits are often part of such an implicit contract between the employer and the employee. This leads to believe employee pension benefits are not only affected through bankruptcies and the consequent dumping of pension liabilities onto the PBGC, as portrayed by Lewis (2015), but possibly also in subtler ways.

1.3 Research set-up and research summary

Value-redistribution via defined benefit pension arrangements might occur through the following strategies: (I) *Retrenching pension arrangements, resulting in a lower pension cost per employee*, (II) *decreasing pension funding*, (III) *increasing pension asset allocation risk*, (IV) *by increasing the estimated return on pension assets* and (V) *increasing the discount rate for accounting purposes* (Rens van Rijn, 2014). It is worth noting that the U.S. regulatory climate suits these redistributions well, being the main reason for studying the U.S. corporate universe. By assessing to what extent private equity owned companies might employ these five strategies, the main question this study tries to answer is: *Are defined benefit pension plans used for value-redistribution from workers and pensioners to shareholders by private equity investors?* By using a benchmark of listed peers, a comparison can be made. The research is done empirically, using statistical analysis by means of an OLS regression. Case studies are presented on three strategies to amplify the motivation for these strategies from a financialization perspective. By combining empirical results analysed from a mainstream corporate finance perspective with a socio-economic viewpoint, informative conclusions and policy implications are presented. Due to data limitations, it was not possible to study to what extent private equity investors soft- or hard-freeze defined benefit pension plans following a transaction.

This study examines a subset of the U.S. corporate universe, which, according to the Private Equity Growth Capital Council (PEGCC) headquartered 2,797 private equity firms with investments in 17,774 U.S. companies in 2013. Since the year 2000 about 7.5 million people in the U.S. have been working for companies that were private equity owned at some point. It should be noted that this study refers to later-stage financing by private equity and excludes venture capital transactions. The time period under investigation runs from 2001-2015 and includes 43 private equity invested

companies with pre- and post-investment data for a total period of seven years. In order to ensure comparability, a listed equity control group was composed including 142 listed companies.

For Strategy I and II the hypothesized signs were found to be true, while the results for Strategy III, IV and V did not agree with the hypothesized signs. The results for Strategy I should be interpreted with caution due to the scaling factor, which is the number of employees. Based on the empirical results found, this study argues private equity firms use the defined benefit plan of its portfolio companies for value-redistribution to a limited extent when compared to listed companies. It seems more likely the pension plan is regarded as an integrated part of the capital structure, influencing the costs of financial distress. It must furthermore be noted that the landscape of private equity investments is diverse in terms of transaction types, transaction sizes and includes divisional buyouts and complex building strategies. Therefore, employing Form 5500 data to conduct a plan-level empirical analysis is expected to yield a better insight in the application of value-redistributing strategies of private equity than the firm-level analysis employed in this study. Finally, this paper argues that the US private equity sector can improve its image by increasing transparency at the portfolio company level. This can be done by following the example of the UK Private Equity Reporting Group (PERG) and publishing an annual report on a list of portfolio companies that satisfy certain predetermined criteria, for example. Regulators should aggravate reporting standards for private equity owned companies so academics can provide more insight in the ways of value-creation and value-redistribution from company stakeholders to shareholders.

The remainder of this thesis is organized as follows. In Chapter 2, literature on private equity, its business model and the generation of returns is discussed. Additionally, a framework in which transfers of pension benefits in U.S. companies are possible will be drawn up, based on the U.S. regulatory pension landscape. In Chapter 3, the data and the variables under examination will be presented and regression equations will be formulated. The results will be presented and discussed in Chapter 4 and finally, concluding remarks and a discussion will be stated in Chapter 5.

2. Literature Review

2.1 Chapter Overview

In this chapter, related literature on private equity firms and their business model will be discussed, as well as regulation concerning pension accounting and finance in the United States. By reviewing evidence of private equity's effects on the real economy as measured by employment growth and the level of wages and subsequently combining this evidence with theoretical considerations for pension plan management in the US, expectations on pension plan management by private equity firms are shaped within the regulatory boundaries present. Finally, the theoretical motivation underlying the hypotheses concerning the five value-redistribution strategies will be discussed.

2.2 Private Equity

2.2.1 Private Equity's business model

Private equity is a business model that stems from the 1980s, when a large wave of leveraged buyouts occurred in response to shareholder maximization views of influential economists such as William Meckling, Michael Jensen and Milton Friedman. The business model of private equity is to create value by leveraging returns, increasing operational efficiency and making use of market-timing in achieving a controlling interest in a company (Kaplan and Strömberg, 2009). Private equity firms are financial intermediaries that primarily act on the behalf of institutional investors by setting up funds for which they collect investments. The investors are called the Limited Partners (LPs) (Walz and Cumming, 2010). The funds are managed by a General Partner (GP) who decides on which companies to invest in, how to manage them and which exit strategy to pursue (Appelbaum and Batt, 2014).

Advocates of private equity view its business model as a superior organizational form, supported by Jensen and Meckling's agency theory: the company is in the hands of a few large shareholders that are able to closely monitor the managers. In addition, the general partners bring in their large network and financial know-how, which leads to outperformance of public equity indices and creates economic value (Appelbaum and Batt, 2014). On the other hand, critics point to the moral hazard that arises due to the capital structure of LBOs. LBOs tend to be financed with debt levels of 60-90% (Kaplan and Strömberg, 2009) while the stake of the GP is only 1-2% of the 10-40% equity investment, the rest is financed by the LPs. GPs capture upside potential in earnings by collecting a 2% management fee and 20% of all realized profits (the 2 and 20 model), while their losses are capped to 0.5% of the total initial investment (2% x 25%, taking the average between 10%-40% equity). This

encourages them to take risk. The outcome of moral hazard associated with the payoff structure combined with high leverage is a higher default rate of portfolio companies compared to listed equity. Hotchkiss, Smith and Strömberg (2012) studied a sample of highly levered firms and found that a quarter of the companies in their sample (1997-2010) ended in a default, although not all companies were private equity owned. Strömberg (2008) reports a 1.2% annual default rate for private equity owned companies, two times as high as quoted peers in his sample. Another important property of the private equity business model is the alignment of management with shareholders by financial incentives and generous performance-based pay. If managers do not fulfil the expectations of their new owners, they are easily replaced. It was found 69% of the CEOs was replaced at some point during private equity ownership of a company (Acharya, Hahn and Kehoe, 2009). This evidence supports the premise of the private equity business model decreasing agency costs by increased monitoring of managers. The structure of the private equity business model is depicted in figure 2.

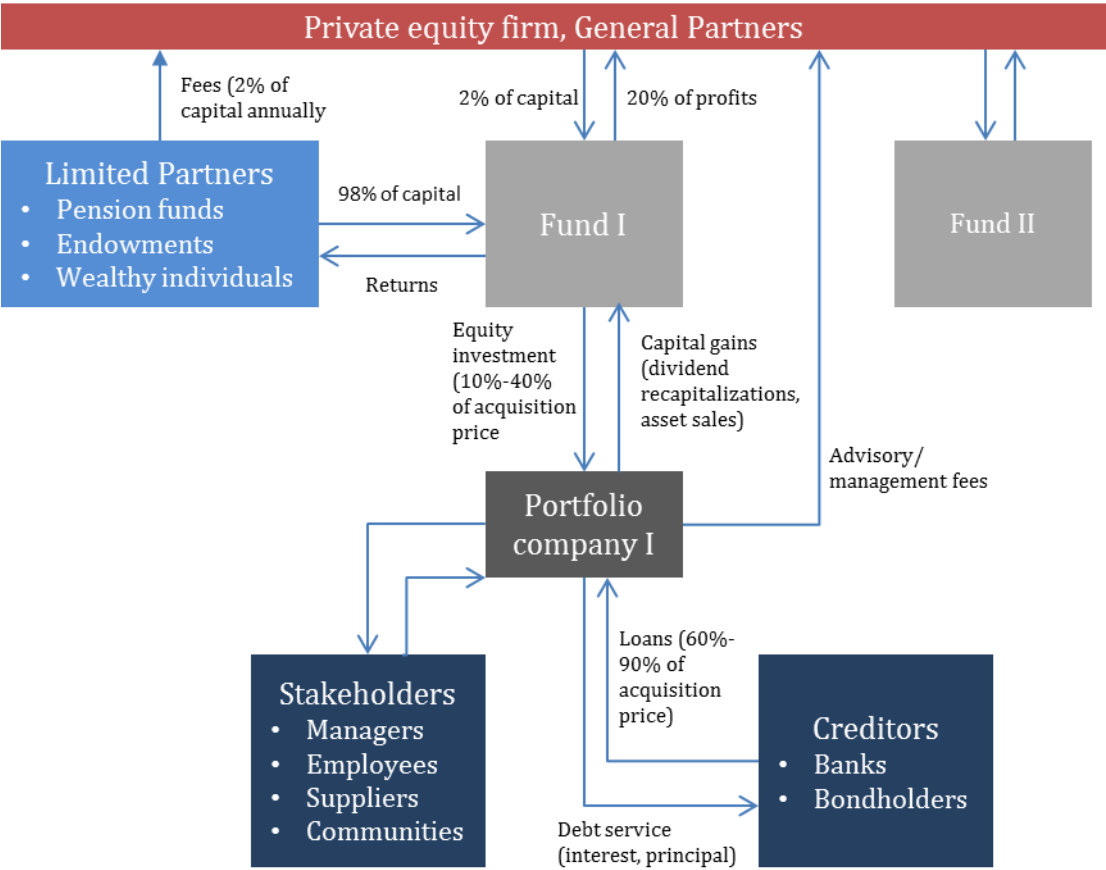


Figure 2: The business model structure of private equity investments in portfolio companies (source: Watt, 2008)

Finally, a very important aspect of private equity is the exiting of investments through a sale or an IPO (Metrick and Yasuda, 2010). Funds are set up by the firm and typically last ten years. In this ten-year time frame prudent investment opportunities must be identified, operations must be streamlined and an exit opportunity has to be found, since private equity firms remain to be financial intermediaries who must return the committed capital including returns to their limited partners (Metrick and Yasuda, 2010). This is different from corporate mergers and acquisitions that often strive for synergies and long-term value and do not need an exit strategy.

2.2.2 Creating value – or redistributing it?

Academics identified the three most important ways in which it is possible for private equity firms to make profits in the funds they operate and these are: (1) the use of leverage in acquiring portfolio companies, (2) market timing efforts and (3) operational improvements (Guo et al., 2011, Kaplan and Strömberg, 2009). The first strategy relies on the use of debt financing for doing acquisitions and subsequently using the interest payments on the newly-issued debt as a tax shield, thereby decreasing the weighted average cost of capital for a company (Guo et al., 2011). Secondly, market timing efforts pertain to the ability of private equity fund managers to identify industries that are undervalued and buying companies in such an industry. Over the course of the investment economic circumstances might improve, leading to higher industry valuations and transaction multiples than at the time of acquisition. The third and final way of creating shareholder value is by making operational improvements to the portfolio company. The third way of generating returns is of particular relevance for this investigation, given that improving operations in a portfolio company can be achieved by cutting back labour-related costs. Guo et al. (2011) estimate operational improvements to explain 23% of the pre-buyout return of a portfolio company compared to an estimate of its profitability if the buyout had not taken place and the company would have grown on the same foot as its pre-buyout industry peers and comparable companies. This number emphasizes the importance of analysing how this value is precisely created and more importantly, whether or not it is to some extent redistributed from (former) workers' pension claims.

2.2.3 Wealth transfers from workers to shareholders

A great deal of research has been aimed at investigating the effects on employment growth and wage levels following private equity involvement in a company. Amess and Wright (2007, 2009, and 2012) have focused on UK post-buyout employment and wages evidence, while Davis et al. (2009, 2011, and 2014) have studied these matters for the US. Davis et al. (2014) use a sample of 3200 US firms and

150.000 establishments (actual shops, plants, sites) and find employment on average lags about 1% compared to comparable listed companies while earnings per worker (EPW) declined, although this differs across industries. They also find differences between transaction types since the decline in EPW is larger (4 to 7 log points compared to controls) for public-to-private transactions than for private to private transactions (Davis et al., 2014). Amess and Wright (2007) report lower employment growth for MBI (Management Buy-Ins) and higher employment growth for MBO transactions (Management Buy-Out), relative to comparable listed companies. A more extensive review of studies on employment growth effects, wages and employee relations of private equity can be found in Wood and Wright (2009), table 2. Wright, Amess and Bacon (2009) also review empirical evidence on the effects on the real economy due to private equity involvement and also include human resource management (HRM) practices. Both review articles do not find the evidence to point to an overall negative or positive effect on the real economy, since the aggregated outcome of the cited empirical work seems to be ambiguous. Reasons mentioned for the ambiguity are the heterogeneity in remuneration structures across firms and industries, the different transaction types private equity firms engage in and the per-firm difference in relationships between managers and unions (Wood and Wright, 2009, Wright, Amess and Bacon, 2009).

Interestingly, scholars that have studied private equity's effect on employment and wages seem to be somewhat prejudiced in reviewing earlier evidence. Kaplan and Strömberg (2009) and Appelbaum and Batt (2014) for example, both cite evidence from Davis et al. (2009) that employment growth in private equity owned companies lags behind comparable listed companies by 1%, although their interpretation of this result is different. Kaplan and Strömberg (2009) conclude the empirical results to be inconclusive regarding net job creation effects of LBOs compared to peers, while Appelbaum and Batt (2014) conclude that the methodology used by Davis et al. (2014) understates the negative employment effects of private equity. Employment growth is estimated to lag behind controls by more than the reported 1%, providing evidence for negative effects on the real economy (Appelbaum and Batt, 2014). This adds to the ambiguity of the effects of private equity on value-redistribution from a mainstream corporate finance perspective.

2.2.4 The financialization approach

Since the empirical evidence on wealth transfers from workers to shareholders due to private equity does not seem to provide satisfying answers and authors sometimes seem prejudiced in their investigation, an alternative view of private equity might prove to be helpful. Wood and Wright (2009) put forward that practically all empirical work on private equity is based on assumptions of mainstream

finance and the agency theory of the firm developed by Michael Jensen in the 1970s, which they label rational-incentive approaches. Instead, it is also possible to regard private equity from a socio-economic point of view. The financialization approach constitutes an alternative theoretical socio-economic viewpoint and includes the idea that institutional investors are becoming increasingly proactive, in addition to a stronger emphasis on shareholder value in general and an increasing influence of the financial sector on the real economy (Wood and Wright, 2009). Private equity seems to be the embodiment of this view, in which value is actively reallocated from other stakeholders to shareholders to generate returns (Froud et al., 2004). Froud and Williams (2007a) formalize the financialization approach for private equity by drawing on two case studies from the UK in which debt was loaded on to portfolio companies with the goal of extracting special one-time dividends for the managers and limited partners, which they refer to as the managerial elite. They explain how private equity shifts ownership claims by use of leverage and posit that financial gains from operational improvements are inferior to the financial engineering strategies employed by private equity firms (Froud and Williams, 2007a). Appelbaum, Batt and Clark (2013) study four cases of wealth distribution from employees to shareholders by private equity firms and argue that these transfers are not welfare-neutral. A critique on the socio-economic view of private equity is that it draws upon a small number of cases to prove its point, making it hard to generalize the evidence found and applying it to the entire private equity industry (Wood and Wright, 2009).

The mixed evidence on real economic outcomes following private equity involvement in combination with the drawbacks of the rational-incentive and financialization approaches to studying private equity call for an integrated approach when studying the effects on (former) worker's pension claims. In summary, although there are individual cases of companies in which value has actively been reallocated from employees to shareholders, it remains difficult to assess whether value-redistribution is an integral part of the private equity business model.

2.3 Pension Economics

2.3.1 The United States pension system

In the US, employees can benefit from a public pension system and from a voluntary occupational pension in the form of defined benefit, defined contribution or a hybrid variant. The decision on what type of pension plan is to be established is made by the sponsor company. The most common defined contribution plan is known as a 401(k) plan, in which employees make pre-tax contributions that are matched by an employer contribution of 50% up to a maximum of 6%. An employee could choose to

contribute 12% of his or her pay, to which the employer adds 6% of pay, for example (Munnell, 2006). Participation is not compulsory (OECD, 2008). Multiple defined benefit pension plans exist, such as federal government retirement plans, private pension plans and multi-employer sponsored pension plans. This study considers private defined benefit pension plans. The benefit is stated as a percentage of final or average pay and is based on the years of service an employee has fulfilled (Munnell, 2006). If the annual build-up in benefits is between 1% and 1.5%, 30 years of service would amount to 30-45% of average pay over the last 20 years of service, for example (OECD, 2008). Participation is compulsory for employees. The annual contributions the sponsor makes are tax-exempt to a certain degree of funding (Rauh, 2006).

In case of a (bankruptcy and a subsequent) termination of a pension plan, the pension liabilities are assumed by the Pension Benefit Guaranty Corporation (PBGC). This social protection is funded by insurance premiums defined benefit sponsors have to make to the PBGC: an amount per participant and an amount per \$1000 of underfunding². In addition, the pension assets of a terminated company are also transferred to the PBGC and it becomes a creditor to the bankrupt company (GAO, 2015). The Pension Protection Act of 2006 governed alterations to the PBGC safety net.

Since 1980, a shift has occurred from defined benefit to defined contribution plans. In 1981, around 60% of the US workforce with pension coverage was covered in a defined benefit plan, which decreased to around 40% in 2001 (Munnell, 2006). By 2008, this figure had decreased to around 20% (OECD, 2008). This shift is explained by employer preferences as well as employee preferences. For employees, it is easier to take their 401(k) balances with them to a new employer by taking the money out as a lump-sum, while it increases self-control over their pension assets since employees can decide on the asset allocation. Employers favour defined contribution plans because they do not bear the investment risk of the assets and the interest rate risk of the pension liability (Munnell, 2006). These uncertainties are especially relevant for private equity owned sponsor companies, as shown by Rauh (2006). Companies face financing and investment constraints due to mandatory pension plan contributions. For every dollar of mandatory contributions, capital expenditures decrease by approximately \$0.60 to \$0.70 and the investment constraints seem to be stronger for companies with small cash balances (Rauh, 2006). As private equity investors employ cash flows of a sponsor company to service debt, mandatory contributions affect private equity owned companies substantially.

² See the PBGC website for current premium levels: <http://www.pbgc.gov/prac/prem/premium-rates.html#scheduled>. Linking the insurance premium to the degree of underfunding did not coincide with the erection of the PBGC, but was a regulatory alteration. As a result, empirical evidence of the pension put theory found has weakened, see Amir and Benartzi (1999) and Rauh (2006). Furthermore, the insurance premium paid for every \$1000 of unfunded vested benefits has increased from \$9 in 2003 to \$30 in 2016 and is scheduled to increase to \$41 in 2019. This further diminishes the value of the pension put option.

In the following paragraphs the regulatory and financial reporting developments and their interplay with managerial decision-making regarding defined benefit pension plans will be discussed in more detail.

2.3.2 Historical overview of academic literature concerning pensions

Since the introduction of ERISA – the Employee Retirement Income Security Act – in 1974 and the concurrent establishment of the PBGC, a great body of research has been conducted on corporate pensions throughout the decades. The research can be grouped broadly into one of the following three categories, based on profession: financial economics, accounting and actuarial. One must note however, that overlap often exists in studies because of the interlinkage between these three professions.

For pension economics, the academic corporate pension paradigm starts with Sharpe (1976) and Sharpe and Treynor (1977), who discuss optimal funding policy for corporate defined benefit pension plans, also in a response to ERISA legislation. The main focus of this paradigm is whether or not wealth is transferred from plan members to shareholders, which determinants influence these transfers and to what extent they (are legally allowed to) take place. The erection of the PBGC effectively created a put option for corporate sponsors by securing the pension liabilities when a company is in distress. The PBGC then assumes the pension plan assets and 30% of corporate assets in return before other creditors come in (Bodie et al., 1987). Because insurance payments to the PBGC were not dependent on the riskiness of a company's assets, risk-taking was induced when a plan was heavily underfunded and the put option became more valuable. On the other hand, pension fund contributions are and have been tax-deductible under ERISA law, which would induce profitable companies to maximize contributions, resulting in increased funding ratios (Black, 1980, Tepper, 1981). Another aspect of pension finance has investigated determinants and motivations for the asset allocation strategies of pension funds. Bodie et al. (1987) view this matter in two contrasting perspectives, the traditional view and the corporate financial view. From the perspective of the corporate financial view, the liabilities of the corporate pension plan are equal to other financial liabilities the company has and plan assets are seen as financial assets of the company. Decision-making happens without taking into account the interests of plan members. In the traditional view, the fiduciary cause of the plan is highlighted and all decisions tend to be made in the best interest of plan members, both active participants and retirees. The corporate financial perspective was empirically found to be most consistent in their research (Bodie et al., 1987). As with funding decisions, tax-deductibility also plays a role in asset allocation. Bonds are treated favourably over equity

investments in terms of taxability (Black, 1980). The favourable tax treatment of bonds discourages risk-taking associated with investing an increasingly large fraction of plan assets in equities.

Although most of the later financial economic pension research is based on the corporate pension paradigm of the 1970s and 1980s, there have been quite some changes in labour relations over time. Ippolito (1985) uses an implicit contract model to show employees are financially motivated to remain with the firm as a result of their deferred compensation in the form of pensions. Over time however, employee loyalty to a single firm has decreased and labour has become increasingly flexible. In addition, accounting and actuarial standards have changed, beginning with the introduction of SFAS 87 in 1986 and the Tax Reform Act of 1986. These sociological and regulatory developments have had their impact on theoretical considerations for academics and financial analysts. The Tax Reform Act (TFA) showed for example, how unintended effects can materialize as a result of changes in legislation. The TFA, which imposed a tax penalty on overfunded defined benefit plans that were reversed to cash-balance plans³ or were terminated and succeeded by defined contribution plans, completely changed the ownership rights to excess pension assets, while it was designed to secure pension benefits in defined benefit plans. By 1995, new contribution behaviour had resulted in a 60% reduction of excess pension assets in defined benefit plans (Ippolito, 2001). This is relevant because studies concerning funding levels in the 1980s often talk about overfunded pension plans and overfunding being the reason for plan reversions (Bodie, 1991), while overfunding had disappeared almost completely by 1995 due to the TFA. Therefore, the regulatory environment for pension economics present in a study is important to consider.

2.3.3 Modern pension finance: risk-shifting vs. risk-management

The trade-off between tax advantages and moral hazard created by the PBGC put option as discussed earlier and the suggested implications this has for asset allocation and underfunding can be classified as risk-shifting hypotheses. As the funding ratio of a plan shifts from an overfunded status to an underfunded status, the tax benefits of pension contributions and bond-holdings gradually decrease while the pension put option value and equity-holdings gradually increase (Campbell and Viceira, 2006). Rauh (2009), has proposed a different view on defined benefit pension plan asset allocation in the form of risk-management, which dominates the risk-shifting hypothesis in his study. The reason for doubting the risk-shifting hypothesis is that allocation to equities tends to increase when firms are

³ From the U.S. DOL website (https://www.dol.gov/sites/default/files/ebsa/about-ebsa/our-activities/resource-center/faqs/faq_consumer_cashbalanceplans.pdf): A cash balance plan is a defined benefit plan that defines the benefit in terms that are more characteristic of a defined contribution plan. In other words, a cash balance plan defines the promised benefit in terms of a stated account balance.

financially healthier, while it is expected to decrease in order to capture the tax benefits on investments in bonds (Rauh, 2009). In addition, Amir and Benartzi (1999) find weak evidence for the pension put option theory as a consequence of funding regulation and legislation changes, while Petersen (1996) also finds a positive correlation between the funding ratio and the allocation to riskier assets. The risk-management hypothesis suggests firms and pension plans will want to avoid costs of financial distress, which increase when a company is closer to bankruptcy, and therefore manages risk-taking in its asset allocation (Rauh, 2009). Furthermore, allocation to equities is also found to be determined by the maturity of the pension fund, measured by the share of active participants. This is evidence in favour of the fiduciary duty of pension plans, as managers seem to consider the duration of the liabilities in deciding on their asset mix (Rauh, 2009).

The evidence for risk-management in corporate pension plans also points to a different view on contribution, funding and asset allocation policy in which managerial influence is central and where corporate governance is an important determinant of pension plan management. Cocco and Volpin (2007) study pension fund risk-taking in terms of asset allocation and pension plan contributions in UK defined benefit plans and find that a higher number of insider pension plan trustees⁴ contributes to the agency view that insiders act on the behalf of shareholders instead of plan participants by lowering contributions and increasing the allocation to risky assets (equities). The conflicting hypotheses of risk-shifting and risk-management are brought together by Anantharaman and Lee (2014), who propose yet a different solution to this puzzle: managerial risk-aversion. The theoretical fundament for their view relies on the fact that decision-making in corporations is done by managers and although managers should act in the interest of shareholders, they tend to be more risk-averse than shareholders. Managerial risk-aversion can be altered by means of compensation contracting, in which the level of pay is linked to firm equity in the form of equity-based compensation in order to align the incentives of managers with the shareholders of the company. Anantharaman and Lee (2014) refer to equity-based compensation as having a higher delta (higher stock price means increasing wealth) and refer to options as adding vega. Options tend to link managerial performance to firm-risk. Options are also valuable in overcoming risk-avoiding behaviour introduced by delta, possibly occurring when a manager is underdiversified in firm-specific wealth, and/or experiences reputational issues (Anantharaman and Lee, 2014). A link is found between the degree of vega a manager is exposed to and the degree of underfunding and riskiness of the plan asset allocation. The evidence is strongest for the CFO of a company, indicating that the responsibility of the pension fund is his domain

⁴ Insider trustees are defined as executive directors of the pension plan sponsor company

(Anantharaman and Lee, 2014). Risk-shifting and risk-management properties present in a firm thus seem to be connected to board-level compensation schemes and managerial risk-aversion.

2.3.4 Pension fund contributions and the effects on the sponsor

The link between investment decisions and mandatory funding contributions made by corporate sponsors is investigated by Rauh (2006). His study provided empirical evidence for the dependence of companies on internal funds for doing investments and the negative relationship this has with contributions made to pension plans. Increasingly strict legislation on the minimum pension funding requirements requires firms to increase contributions when the company's pension plan is underfunded, resulting in declining capital expenditures. Rauh (2006) states pension funds have to contribute the maximum of two funding requirements, the Deficit Reduction Contribution (DFC) and the Minimum Funding Contribution (MFC). When a pension fund is underfunded 25% or more, the DFC becomes the required contribution the sponsor must make (Rauh, 2006). In the next paragraph, regulation concerning mandatory pension funding will be discussed in more detail. It is shown that firms limit their pension fund contributions to the bare legal minimum in order to maintain enough free capital to invest in positive-NPV investments (Rauh, 2006). This is reflected in figures also, as 25% of the firms investigated by Rauh (2006) had a firm-year in which the mandatory contribution made up more than 10% of total capital expenditures. The consequences of the capital restraints pension fund contributions can have on the sponsoring firm are evaluated by Franzoni and Marín (2006), who investigate the performance of companies with underfunded pension plans. They find that the market overvalues companies with underfunded plans since the underperformance of these companies can be as high as 10.6% for the most underfunded decile portfolio in their analysis. Following up on the study by Rauh from 2006, it was found that the internal financing constraints imposed by pension fund contributions are also affected by the external constraints companies have in terms of their access to the capital markets (Campbell et al., 2012).

2.3.5 Accounting and actuarial regulatory framework

After considering the theoretical foundation for certain financial decision-making behaviour and the effects on pension funding, risk-taking and asset allocation, it is important to examine the regulatory framework that enhances it. A few examples of pension accounting under US GAAP and actuarial guidelines will be used to draw up the regulatory framework in which corporate managers make optimal financial decisions under a certain degree of discretion. It is this degree of managerial

discretion that allows for earnings management and cash flow management techniques by managers to maximize the returns to shareholders by redistributing value from pensioners.

In general, defined benefit pension plan sponsors are concerned with two primary financial issues:

1. Pension funding – or the cash contributions made to the pension plan. Pension plan funding is governed by laws described in the Internal Revenue Code (IRC), in which the minimum funding requirement and the maximum tax-deductible contributions are specified.
2. Pension accounting – the annual pension expense and the accounting of assets and liabilities present in the financial statement of the sponsor, under actuarial assumptions regarding the company's salary structure (economic) and longevity (demographic) of employees. The Financial Accounting Standards Board (FASB) governs pension accounting by defining the generally accepted accounting principles (GAAP) in the United States (Pension Committee of the AAA⁵, 2004).

Employees defer a certain part of their salary to save money to use in retirement. Even though employees do not receive this deferred compensation today, it must be recognized as an expense in terms of accounting. The annual pension cost of a company is determined by: the normal cost, which is also referred to as the service cost, the interest cost and the funding status of the plan. The service cost concerns the benefits earned by active participants (current employees) in the current book year (Pension Committee of the AAA, 2004). The interest cost arises because the time value of money has brought the earnings of prior years one year closer to maturity. Finally, the regulator requires the sponsor to make additional contributions when the plan is underfunded. It should be noted that the annual figures of pension funding and pension expenses differ from each other.

Actuaries set assumptions to measure these costs, based on guidelines drawn up by the FASB and the Internal Revenue Service (Pension Committee of the AAA, 2004). A distinction between economic and demographic assumptions is made. Economic assumptions concern projected salary increases due to increased productivity, inflation adjustments and seniority for example, while demographic assumptions involve mortality and retirement assumptions. The salary scale assumptions are reflected in the calculation of the service cost. In addition, the discount rate with which plan liabilities are discounted and the expected long-term return on plan assets are economic assumptions as well (Towers Watson, 2012). The expected rate of return is relevant for calculating the pension cost and is a credit component, meaning this expectation of annual earnings is deducted from the service

⁵ AAA is the American Academy of Actuaries, the report is an analysis by their Pension Committee: Fundamentals of Current Pension Funding and Accounting of Private Sector Pension Plans (July 2004), p. 6.

and interest cost. The discount rate is used for discounting the liabilities of the pension plan, the projected benefit obligation (PBO). It is used when calculating the service cost and the interest cost component of the pension cost (Towers Watson, 2012). An example of the reported pension cost is shown below.

	Pension Benefits		
	U.S.		
	2015	2014	2013
Weighted-average assumptions used to determine net periodic benefit cost for years ended December 31			
Discount rate	4.00	5.00	4.00
Long-term rate of return on funded assets	7.00	7.25	7.25
Long-term rate of compensation increase	5.75	5.75	5.75
Components of net periodic benefit cost			
Service cost	864	677	801
Interest cost	785	807	749
Expected return on plan assets	(830)	(799)	(835)
Amortization of actuarial loss/(gain)	544	409	646
Amortization of prior service cost	6	8	7
Net pension enhancement and curtailment/settlement cost	499	276	723
Net periodic benefit cost	1,868	1,378	2,091

Figure 3: Example of pension cost accounting, from the 2015 annual report of ExxonMobil

As can be gleaned from figure 3, taken from the notes to the ExxonMobil 2015 financial statements, the discount rate assumptions and the different cost components for each book year are reported. In addition, a few amortization line items are reported. *Amortization of prior service cost* arises when a plan amendment is issued and this influences benefits based on services rendered in earlier times, a cost that is allowed to be amortized over different periods. *Actuarial loss (gain)* is a cost that arises because of a change in assumptions underlying the PBO, a change in the valuing of plan assets and the difference between the expected return on plan assets and the actual return. *The pension enhancement and curtailment/settlement cost* is the unfunded actuarial liability, a result of the plan being underfunded and this cost may be amortized over several years (Pension Committee of the AAA, 2004). The item on the bottom line, the *Net periodic benefit cost* is the pension cost for its US pensions for ExxonMobil. Note however, that the numbers in figure 3 pertain to the income statement of a company and are different from the actual cash contributions made to the fund. The company

contributions are based on the minimum funding requirements under ERISA law and amounted to \$1,478 bln in 2014 and \$0 in 2015 for ExxonMobil⁶.

When turning to the assets and liabilities of the pension fund it is possible to link the mandatory pension fund contributions to the funding status. A defined benefit pension plan consists of assets and liabilities. The assets are calculated by taking their market value and are therefore termed the fair value of plan assets, they increase by cash contributions and the return on the invested assets and decrease by the benefits paid. The calculation of liabilities is subject to actuarial assumptions concerning the discount rate and future salary increases and is the current value of prior years’ pension cost. This is summarized in table 1.

Fair Value of Plan Assets (FVPA)	Projected Benefit Obligation (PBO)
Fair value at the start of the year	PBO at the start of the year
(+) Actual return on plan assets	(+) This year’s pension cost
(+) Employer contributions	(-) Benefits paid
(-) Benefits paid	
= Fair value at the end of the year	= PBO at the end of the year

Table 1: Assets and liabilities of a defined benefit pension plan

2.3.6 Takeover consequences for a corporate pension plan

After examining the determinants of managerial behaviour in managing defined benefit pension plans and drawing up the regulatory framework in which they are allowed to do so, this paragraph looks at empirical evidence of the consequences of a takeover on pension arrangements. Shleifer and Summers (1988), as mentioned earlier, posited the implicit contracts theory in which going-private transactions are a way to effect wealth transfers from firm stakeholders to shareholders. Research in the early 1990s mostly studied the breach of implicit contracts in light of plan reversions⁷ (Ippolito and James, 1992 and Pontiff et al., 1990). Pontiff et al. (1990) find that plan reversions occur twice as often in the two years following a hostile takeover than in the two years preceding it and report the economic gains can explain 11% of the takeover premium in cases where a reversion actually occurs. Ippolito and James (1992) study LBOs in the 1980s and conclude there is not enough evidence to select either theory as empirically superior over the other, although they also find the number of reversions doubles

⁶ Taken from the financial statements of the 2015 annual report of ExxonMobil

⁷ A plan reversion constitutes the change from a defined benefit plan into a defined contribution or similar type of plan

following an LBO. In addition, Bergstresser, Desai and Rauh (2006) have studied the use of the assumed long-term rate of return on pension assets as an earnings management practice, employed by companies facing critical earnings thresholds. Results in their paper show managers have a tendency to raise the long-term rate of return in anticipation of an acquisition. The effect is stronger when the sensitivity of a company’s earnings with respect to the assumed rate of return is higher. The difference is approximately 30 basis points compared to other firms in the same firm-year and industry (Bergstresser, Desai and Rauh, 2006). Not much is known on the effects of mergers and acquisitions on funding ratios or asset allocation risk-taking by managers.

This paragraph has focused on the pension system in the United States and academic theory that tries to explain managerial decision-making in the financial management of a corporate pension plan. In addition, the regulatory framework concerning defined benefit pensions has been elucidated in order to define the boundaries within which value-redistribution is possible.

2.4 Redistribution strategies for pension arrangements

Following up on the theoretical value-redistribution framework of Rens van Rijn (2014), five possible strategies have been identified for the US pension system. These five value-redistributing strategies rely on the managerial discretion present in setting actuarial assumptions underlying the US pension accounting principles and in taking financing or funding decisions allowed under the Internal Revenue Code, subject to minimum funding requirements. The five strategies are shown in table 2.

Strategy	Type of decision	Primarily affects
1: Retrench pension arrangements	Actuarial/Accounting or Plan Reversion	Cash flows/ Reported Earnings
2: Decrease pension funding	Financing	Cash flows
3: Increase risk in asset allocation	Financing	Reported earnings
4: Increase estimated return on plan assets	Actuarial/Accounting	Reported earnings
5: Increase discount rate	Actuarial/Accounting	Cash flows/ Reported earnings

Table 2: Value-redistribution strategies for pension arrangements

A short explanation of the five strategies will be given to provide guidance on how they could be employed in practice. Short case studies will be introduced to illustrate how each strategy can be exploited in practice and to enrich the empirical investigation with a financialization approach to value-redistribution. Finally, the specific properties of the institutional set-up of private equity investments will be used to explain why these strategies might benefit private equity in particular.

2.4.1 Strategy I: Retrenching pension agreements

Retrenching pension agreements can be done in several ways for the financial sponsor of a defined benefit pension plan. Management might renege on the agreements by altering the actuarial assumptions underlying the calculation of the service cost or it might choose to revert the plan to a defined contribution scheme. As explained in paragraph 2.3.5 on actuarial and accounting regulation for US defined benefit pension schemes, the normal cost or service cost plus, if necessary, a certain fraction of underfunding is contributed to the pension scheme annually. Since the service cost is based on assumptions regarding future salary increases and inflation adjustments, the normal cost could be reduced by retrenching these assumptions. Another option for management is to do a reversion of the pension plan or convert to a cash-balance plan. A reversion or freeze of a defined benefit plan is discouraged by law, through the instalment of an excise tax on overfunded plans. Still, the advantages of a defined contribution scheme are clear: the corporate sponsor is no longer exposed to investment risk and interest rate risk, because these risks are borne by the employees (Munnell, 2006). From 1981 to 2001, the percentage of US workers covered in a defined contribution plan increased from 19% to 56% (Munnell, 2006). More recently, Rauh, Stefanescu and Zeldes (2015) have found that a reduction between 2.7% and 3.6% of total annual payroll can be achieved by freezing defined benefit pension plans.

Case: The Dade Behring pension plan freeze by Bain Capital

In 1994, Bain Capital acquired Baxter International in a leveraged buyout and later on bought a medical division of DuPont in an add-on acquisition to form the largest diagnostics company in the world named Dade Behring, with sales totalling over \$600 million in 1995. Sales rose to \$1.3 billion by 1998, but long-term debt closely followed: it rose from \$298 mln to \$816 mln over the same period (Michael Barbaro, 2011). Cost-cutting by laying off employees became a common practice. Finally, in 1999, Bain froze the defined benefit pension scheme and converted it into a defined contribution plan. Prior to the conversion, employees were entitled to receive 75% of the average of their last three years' salaries. In return, they got a cash-balance plan in which they would get a lump sum equal to what they were owed in 1999. This saved the company between \$10 mln and \$40 mln annually, according to Norman Stein, a University of Alabama professor specialized in pensions. The savings projections were used to borrow an additional \$421 mln dollars, which was used to pay out dividends to Bain Capital and Goldman Sachs (Michael Barbaro, 2011).

Private equity hypothesis

Retrenching pension agreements relies on the breach of implicit contracts theory formulated by Shleifer and Summers (1988). Actuarial assumptions underlying the calculation of benefits for employees can be altered and agreements in place can be reneged to accomplish lower pension costs per worker. An example of an assumption that can be changed by management is the long-term rate of compensation increase, which was also reported by ExxonMobil in the accounting example. Another way of achieving lower costs is by reverting the defined benefit plan into a defined contribution plan, as described in the case. The retrenchments lead to higher pre-tax profits, which is interesting for an investor when considering the search for an exit opportunity as the value of a company is often based on a multiple of pre-tax profits. It is therefore expected that private equity owners are likely to retrench pension agreements in portfolio companies more often than listed companies do.

2.4.2 Strategy II: Decreasing pension funding

Contributions made by a company are subject to minimum funding requirements for plan sponsors. However, in the case of underfunding these mandatory contributions can be spread out over a period of ten years⁸. An example provided by Munnell and Soto (2007) shows that when a pension plan is underfunded for \$5 million, it may spread this out and pay \$0,5 million annually in addition to the regular annual pension cost. A way to decrease funding is by only contributing the legal minimum, as to not waste any cash flow. Underfunding seems to be partially adjusted for, since for financially constrained companies every extra dollar in mandatory contributions reduces the value of the company by \$1.30 (Franzoni, 2009). Furthermore, in a 2005 report by the Government Accountability Office (GAO) it was found that many sponsors skip cash contributions by using the Funding Standard Account (FSA) (GAO, 2005). If a firm has an existing credit balance or has large amortizations, it may use these to shield from making a cash contribution. This happened frequently in the late 1990s and early 2000s, when 62% of the 100 largest DB pension plans skipped cash contributions most years. For underfunded plans, this ratio was as high as 41% (GAO, 2005).

Another way of decreasing funding is by taking a company through a Chapter 11 bankruptcy, which presents the opportunity of transferring the pension obligations onto the PBGC. Chapter 11 bankruptcy filings have been used by companies, both publicly listed and private equity owned companies, as an efficient financial engineering tool when approaching distress (Akerlof and Romer, 1993). Using bankruptcy to get rid of pension obligations is a risk only present in firms with a defined

⁸ Recently, this has been reduced to seven years. This has not affected the sample.

benefit pension plan as defined contribution schemes such as 401(k) plans are not insured by the PBGC. Strömberg et al. (2011) find only a small fraction of pre-default private equity owners retains control of the company following its bankruptcy. This should be taken in mind when reading the case.

Case: Friendly's bankruptcy

In 2007 a Sun Capital fund acquired Friendly's, an ice cream producer and restaurant owner, for \$337 million dollars in an LBO. Near the end of 2011 Friendly's restaurant chain had to file for bankruptcy. As a result, 65 unprofitable stores were closed and 1200 employees were laid off. Consequently, a different Sun Capital fund announced its intention to buy the company out of bankruptcy. Through a section 363 bankruptcy sale process, the new Sun Capital fund was able to acquire Friendly's by assuming only the debt that was served to allow Friendly's to continue business as a going concern during its time in bankruptcy, a loan of \$75 million, and no cash. Since it was a third Sun Capital fund that provided this loan, Sun Capital was now the owner and the biggest lender of the company at the same time. This led to the special scenario in which the equity investor remained the owner of Friendly's by forgiving or assuming the loan it had provided itself (Spector, 2012). As a result, the pension liabilities of the pension fund were shifted to the PBGC and the \$100 million defined benefit pension plan was no longer the responsibility of Sun Capital (Appelbaum and Batt, 2014).

Private equity hypothesis

There are two main motivations for private equity owners to underfund the pension plan. When having acquired a company partly by issuing debt and thereby increasing the leverage ratio of a portfolio company, cash flows become more important for in order to service its debt and pay its interest. This can be done by foregoing contributions to the pension plan through the use of amortization costs in the FSA. In addition, the underfunded status of a pension plan is hard to disentangle financially due to the complex accounting rules that surround them. Private equity investors are therefore hypothesized to decrease pension funding by minimizing or foregoing contributions, effectively leading to lower funding ratios compared to listed companies.

2.4.3 Strategy III: Increase risk in pension asset allocation

By shifting the allocation from bonds to equities, it is possible for managers to increase risk-taking in a pension plan. Referring back to earlier paragraphs on risk-shifting and risk-management, there are several motivations for managers to engage in a certain degree of risk-taking. Since empirical studies have found evidence (for example Amir and Benartzi, 1999) for the pension put theory and tax-shelter of bonds to be rather weak due to changes in regulation, the explanation for a riskier asset allocation

is more likely to be found in the risk-management paradigm of Rauh (2009) or corporate governance related theories (Cocco and Volpin, 2007, Anantharaman and Lee, 2014). According to the risk-management theory, companies and their owners tend to minimize the costs of financial distress, which would induce them to take less risk in the asset allocation of the pension fund as funding and the financial condition of the company deteriorate. On the other hand, private equity ownership structures often include managers to gain large stakes in the company that is acquired and tie them to firm-risk to minimize agency costs. Finally, it was also found that asset allocation varies with the maturity of the pension fund, implicating investing prudence by keeping in mind the fiduciary obligation to plan members (Rauh, 2009). Unfortunately, no case was found to illustrate this value-redistributing strategy.

Private equity hypothesis

Given the high debt levels private equity investors tend to use to discipline management and leverage their returns, combined with the anecdotal evidence of Friendly's bankruptcy, would point to the use of risk-shifting strategies by management in terms of asset allocation by magnifying the value of the pension put option. When taking the risk-management approach of Rauh (2009), it would be expected the manager balances the costs of financial distress associated with a higher debt level and the risk taken in its pension asset portfolio. Finally, the high equity ownership stakes and more importantly the incentive payment schemes of management provide an explanation for increased allocation to equities, thereby increasing risk (Anantharaman and Lee, 2014). It is therefore hypothesized that private equity firms are likely to increase risk in the asset allocation of a portfolio company by shifting from bonds to equities.

2.4.4 Strategy IV: Increase the expected return on plan assets

Since the expected or estimated return on plan assets is a credit item in the pension cost of a company, increasing this item decreases the pension cost, thereby increasing accounting profits. The expected rate of return is the long-term expectation of the fund's annual return on its assets. In a report by Towers Watson on private pensions in the US from 2012, the expected rate of return varied from 3.10% to 10% across a sample of 500 plans. The median expected rate of return was 7.80%. This shows that there is a certain degree of managerial discretion involved in determining this rate in addition to the consideration of the prevailing market circumstances and the investment policy of the pension plan (Pension Committee of the AAA, 2004).

Case: Pension accounting by IBM

During the 1990s analysts following IBM knew that most of its increases in earnings per share were inflated because of large share buybacks and income on its pension assets. This was found to be in order by most analysts because they would correct for the inflation to consider operational profitability of IBM. In addition, the expected rate of return did not contribute a great deal to pre-tax earnings up until 1997 because of higher actual returns during the mid to late 1990s (they averaged 15% annually from 1995-1999). This increased however, during the years that followed. By 2000, some 10% (\$1.2 bln) of the \$11.5 bln earnings of IBM was earned by the pension plan. Moreover, IBM had gradually increased its expected return on plan assets from 9.25% in 1997 to 10.00% in 2000, while actual returns started to fall due to the bursting dotcom bubble in the early 2000s. The contribution of this increased expected return on plan assets therefore amounted to nearly 5% of IBM's pre-tax income for the year 2000 and 2001 (Bergstresser, Mihai and Rauh, 2006). Since executive compensation at IBM in the form of options was linked to profits that included pension plan earnings, its executives started to benefit from the increased expected return on plan assets as well (McLean, 2002).

Private equity hypothesis

Increasing the expected return on plan assets gives a private equity investor the opportunity to decrease the pension expense, thereby increasing pre-tax profits. Bergstresser, Mihai and Rauh (2006) report large incentive compensation contracts and merger activity as significant determinants of earnings manipulation by opportunistically employing pension assets. Combined with the difficulty market participants seem to have in valuing pension deficits correctly (Coronado et al., 2008 and Franzoni and Marín 2006), this value-redistribution strategy is hypothesized to suit private equity investors particularly well. This is because the managers of a private equity owned firm are disciplined by having to service high levels of debt and are motivated with large equity stakes and option bonus schemes. Furthermore, increasing the expected return is an easy way to increase pre-tax profits when searching for exit opportunities.

2.4.5 Strategy V: Increasing the discount rate

The discount rate is used to calculate the present value of pension obligations on a company's balance sheet and at the same time for calculating the normal cost components of the annual pension expense, the service cost and interest cost. Discount rates have converged significantly following regulatory pressure resulting in the link to AA bond indices (Bergstresser, Desai and Rauh, 2006). Bergstresser, Desai and Rauh (2006) add that setting the discount rate is done by the company actuary and not by management, overall resulting in less managerial discretion in setting the discount rate compared to

the expected return on plan assets. The effect of the obligatory link of the pension discount rate to the yield on long-term investment grade corporate bonds is illustrated by comparing the private pension schemes to public defined benefit schemes in the U.S., who face different regulation. Andonov, Bauer and Cremers (2015) compared private and public pension funds in the U.S. and found that because U.S. public pension funds link their discount rate to expectations on the long-term return on plan assets due to regulatory incentives, these public pension funds tend to increase their asset allocation risk in order to justify a higher pension discount rate. Consequently, this leads to inflated funding ratios for U.S. public pension funds. Unfortunately, no case study was found to illustrate this strategy in a U.S. corporation. The economic relevance of this strategy is reflected in the large impact changes in the discount rate have on pension liabilities: a 1% change in the discount rate will increase or decrease the pension liability by 15% on average (May et al., 2005).

Private equity hypothesis

Private equity investors want to increase operational efficiency of the companies they acquire in order to maximize profits. Even though the discount rate is not set by management directly, it might still try to induce the company actuary to set it at the optimal level. By setting the discount rate optimally with respect to the regulatory boundaries the pension expense for a company is reduced and simultaneously the pension liability has become smaller in case of an underfunded pension plan. The discount rate therefore has a direct and an indirect effect on pre-tax profits. A lower pension expense affects the pre-tax profits directly, while the effect on the funded status leads to lower minimum funding requirements which consequently further lower the pension expense. Ultimately, this contributes to higher valuations of the company when preparing for an exit and financial relief for servicing debt. Therefore, it is hypothesized that private equity investors will employ the value-redistributing strategy of maximizing the discount rate for its pension obligations in portfolio companies relatively more often than their quoted peers.

3. Methodology

3.1 Chapter Overview

This chapter will begin by introducing the data set. Next, the general methodology of this study, which is twofold, will be discussed. Thereafter, the five value-redistribution strategies for pensions will be addressed and their regression equations will be formalized. Finally, summary statistics on the most important sample variables will be discussed.

3.2 Data and descriptive statistics

This paragraph will present the data set under examination in this study. Origin of the data and demarcations used to arrive at the final data set will be discussed. Descriptive statistics of the data set will be presented to provide a clear picture of the data set at hand and to note important caveats that must be considered when interpreting the results.

The data set for this study was retrieved from different databases focused on private equity investments. The starting point for this study was the private equity investments database from Thomson One. Between 2001 and 2015, 5374 U.S. companies received their first investment from a private equity sponsor by means of an LBO or public-to-private transaction, or received funding through a PIPE transaction⁹ or via a Bridge loan in the buyout deals phase of investing. Only transactions in the buyout phase were considered to ensure all-equity venture capital transactions were excluded. Consequently, only transactions involving mature firms were present in the initial data set. By doing this, the data set contains transactions in which value-redistribution opportunities and the leveraged investment strategies that are typical for private equity firms in the buyout stage are present. Of the 5374 companies, 194 companies were excluded because no identifier was available. The time period for the analysis was chosen because of data limitations with respect to annual report data, which was not present in Worldscope and Compustat North-America prior to 2001. Table 3 displays the distribution of transactions over time for the sample as compared to the full Thomson One and Preqin data sets.

Table 3 reveals private equity activity is spread fairly even over the analysed time period, although there seems to have been a spike in investments in the years preceding the global financial crisis of 2008. As mentioned above, four different transaction classifications were considered.

⁹ A PIPE transaction is a private investment in public equity

Year	Sample		Thomson One		Preqin	
	N	%	N	%	N	%
2001	1	2,33%	210	4,05%	46	3,35%
2002	0	0,00%	212	4,09%	76	5,54%
2003	1	2,33%	279	5,39%	105	7,65%
2004	5	11,63%	304	5,87%	130	9,47%
2005	2	4,65%	422	8,15%	151	11,00%
2006	2	4,65%	497	9,59%	190	13,84%
2007	6	13,95%	682	13,17%	209	15,22%
2008	3	6,98%	469	9,05%	95	6,92%
2009	6	13,95%	267	5,15%	85	6,19%
2010	5	11,63%	305	5,89%	107	7,79%
2011	4	9,30%	308	5,95%	75	5,46%
2012	6	13,95%	368	7,10%	58	4,22%
2013	2	4,65%	267	5,15%	30	2,18%
2014	0	0,00%	297	5,73%	14	1,02%
2015	0	0,00%	293	5,66%	2	0,15%
Total	43	100,00%	5180	100,00%	1373	100,00%

Table 3: Sample transactions per year compared to full Thomson One and Preqin data sets.

Table 4 reports the distribution among the different classes. Notable is the relatively large presence of PIPE transactions when compared to the Preqin data set. Given the nature of this transaction type, this is not surprising. PIPE transactions usually result in one or several board seats for the private equity investor, while the original share capital is still publicly traded and consequently reporting standards are higher than for portfolio companies that are taken private. The Preqin data set does not contain data on bridge loans. Unfortunately, the Thomson One Private Equity investments database does not include the transaction type variable in its output.

Transaction type	Sample		Preqin data set	
	N	%	N	%
LBOs/buyouts	22	51,16%	1147	83,54%
PIPE	16	37,21%	60	4,37%
Public to Private	2	4,65%	166	12,09%
Bridge Loan	3	6,98%	-	-
Total	43	100,00%	1373	100,00%

Table 4: Transaction distribution by type of transaction

The next step encompassed determining the availability of annual report data for private equity invested companies. Using the excel add-in from Thomson One Banker and matching companies from Thomson One Banker to Worldscope using the CompanyID identifier, balance sheet and income statement data on pensions was retrieved. Companies were included when pension information was available for at least the period from three years before the buyout year (year t) until three years after ($t+3$)¹⁰, leading to seven observations per company. For 43 companies, Worldscope provided this data. Transactions completed in 2014 or later were excluded due to a lack of post-transaction data. In many cases, portfolio companies were private when they received their first investment, which could explain the low level of companies reporting financials. In addition, a number of companies ceased to report their financials after they were taken private or after receiving an LBO. Furthermore, divisional buyouts were excluded since the company divesting this business unit did not come under control of a PE firm, even though the parent company was included in the database.

Since the Thomson One database provides data on entrance and exits by PE sponsors in separate databases, a Preqin data set was used to hand-match exit dates to investments based on company name. In addition, news stories were used to complete the hand-matching process regarding exit dates. As a result, time under investment by a private equity sponsor is known for 95.4% (n=41) of the companies in the data set. The last date in the Preqin data set was considered to be the exit date when the private equity firm made partial exits from its portfolio company.

Including current investments	Excluding current investments
4.30 years	3.97 years

Table 5: Average sample duration of private equity investments

The same methodology has been applied to news stories data. Nine companies (20.90%) in the sample were still under private equity investment at the end of the time period in 2015. Table 5 provides general information on the average time of investment. As shown in table 5, the average time of investment was only 4 years (4.3 years when including companies currently in a private equity portfolio) for the sample. Kaplan and Strömberg (2009) report that 50% of all investments are exited within six years and 76% is exited within ten years. Other studies report median investment times of

¹⁰ Transactions completed on or after October 1st of a calendar year were assigned to year $t+1$ following Davis et al. (2014)

three to five years on average (Froud and Williams, 2007a, Guo et al., 2011, Lopez de Silanes et al., 2015).

To ensure the pension data on private equity invested companies is compared to a publicly listed benchmark, a control group was composed using the comparable company function in the Thomson One database. Only U.S. companies have been selected for the control group and the controls were matched to the private equity sponsored companies based on industry (SIC code) and size as measured by latest financial year revenues reported. The ten closest matches were employed, resulting in a control group of 348 companies since Worldscope provided ten matches for nearly but not every company and due to overlap in comparable companies. Of the initial group of 348 companies, 142 companies reported their pension financials over the period 2001-2015 (or at least the majority of those years, selection criterion was ten years or more). The matching process is not flawless however, given the fact that private equity firms are renowned for rapid expansion and divestment in portfolio companies. Davis et al. (2014) state buyouts catalyse the creative destruction process, which they measure by the number of new jobs created and jobs lost and the transfer of production units (i.e. stores, plants) between companies. This property raises suspicion on whether 2015 revenues really provide a close match for comparable companies when the buyout was completed in 2004 for example. Not to mention the fact that companies can undergo tremendous change in a decade in terms of size even without private equity investments. Such changes might influence company dynamics and consequently affect the pension agreements as well. Unfortunately, Thomson One did not provide alternative options in the selection of comparables.

Sample	Size			Leverage	
	Total Assets	EV	Employees	Debt/Assets	Debt/EV
Average	14,534	13,352	14,055	0.38	2.05
Median	3,371	4,461	6,282	0.37	1.03
n = 43					
Control group					
Average	13,787	12,712	18,412	0.29	1.03
Median	4,605	6,010	7,082	0.28	0.77
n=142					

Table 6: Descriptive statistics for private equity sample and control group, all values are from 2015. EV stands for Enterprise Value. Total assets and EV are in U.S. dollars. Employees as measured by full-time equivalent.

Table 6 presents data about the private equity sample relative to the control group in terms of size measured by total assets, enterprise value and employees, profitability as measured by the price-to-book ratio and return on assets, leverage ratios and the industry sector. In terms of size, the private

equity sample and the control group are rather similar, as can be gleaned from the table. The (ex-) portfolio companies do seem to have a more leveraged capital structure, both in terms of debt over assets and debt over total shareholder's equity (0.38 and 2.05 vs. 0.29 and 1.04 respectively). This is in line with the commonly employed strategy of private equity firms to finance a buyout/transaction with substantial amounts of debt (Kaplan and Strömberg, 2009).

3.3 General Methodology

When taking an analytical view of the data at hand, it can be divided into three groups: based on time the private equity data set (the treatment group) consists of two periods, one before the transaction *year t* and one after. The third group consists of the data on comparable companies (the control group). To statistically test whether a difference exists between private equity invested companies and their listed peers, one would ideally compare the control group to the treatment group in a balanced manner. This means that the number of firm years is equal for the periods before and after the investment in *year t* for the entire treatment group. This allows the researcher to compare the control group to the treatment group in the period before investment and the period after and subsequently report possible differences¹¹. Coefficients can be estimated with an ordinary least squares (OLS) regression. To prevent correlation of the error term with the regressors due to the heteroskedastic panel structure of the data, generalized least squares (GLS) or first-differencing can be used to overcome this problem. This study employs the GLS method to prevent the loss of data points associated with first-differencing. Due to data limitations, the sample of private equity invested companies is limited to 43. Possible redistribution effects concerning pension arrangements are examined during three firm-years on either side of the transaction. Since the common holding period of a portfolio company is between three and five years for private equity investors (Froud and Williams, 2007a, Guo et al., 2011, Lopez-de-Silanes, 2015) and due to data limitations, it was decided to examine three firm-years on either side of the transaction year.

Comparing these three groups is done in two different ways. Firstly, for all five previously identified value-redistributing strategies in pension quality of employees, the data on private equity invested companies will be split up into a period before (period one) and after (period two) the transaction year. Initially, the two periods will be compared to the full sample of controls, employing the available data on these companies from 2001-2015. The first regression will include the control group sample and the firm-years of the private equity sample prior to the investments. The second

¹¹ Studies that follow this methodology are Pontiff, Shleifer and Weisbach (1990) and Davis et al. (2014)

regression will include the control group sample and the firm-years of the private equity sample post-investment. The regressions will be presented as follows:

$$Y_{it} = \beta_0 + \beta_1 * PE_{it} + \beta_j * X_{jit} \quad (1)$$

Where Y_{it} is the value of the dependent variable of a value-redistributing pension strategy for company i at time t (for example the funding ratio: $\frac{FVPA}{PBO}$) and PE_{it} is a dummy variable indicating whether the company is a private equity target that has received a buyout or an investment at some point, in which case it takes a value of “1”. Control variables will be added to capture non-private equity influences in changes of the dependent variable and differ per strategy. Control variables are identified by studying earlier empirical work on the financial management of defined benefit pensions. If the private equity dummy is significantly different from zero in the post-buyout sample and has the predicted sign, this points to private equity firms employing a particular value-redistributing strategy. Using GLS ensures the error terms are clustered group wise (at the company level) and are constant through time, controlling for unobservable effects through time due to economic circumstances (Stata website, 2016).

A second way of looking at the hypothesized retrenchment of pension agreements by private equity firms is by investigating the subsample of private equity owned companies (treatment group) and examine whether a change in the dependent variable occurred following the investment by private equity and the consequent managerial involvement. These regressions will be set up in the same manner as regression equation (1) presented above. The private equity dummy variable will be assigned the value of “1” for every post-investment firm-year and a “0” for firm-years prior to the investment year. This methodology does not allow for benchmarking.

Since both methodologies have their drawbacks given the available data, combining the comparison of private equity invested companies with their listed peers and testing for changes in the dependent variable following the transaction year is expected to ensure the most solid economic results.

3.3 Methodology of the pension redistribution strategies

Strategy I: Retrench Pension Agreements

$$\frac{PSC}{E}_{it} = \beta_0 + \beta_1 * PE_{it} + \beta_2 * Profitability_{it} + \beta_3 * PDR_{it} + \beta_4 * Funding\ Ratio_{it}$$

This regression tries to estimate the relation between pension fund contributions and private equity involvement in a company. Pension service cost per employee (PSC/E) is the dependent variable in this regression, measuring the first of five strategies that might be used by private equity investors for value-redistribution from pension plan members to shareholders. Based on the hypothesis developed in the previous chapter, we expect the coefficient of Private Equity to have a negative influence on PSC/E, resulting in a negative sign for β_1 . Control variables include profitability, which is expected to have a positive sign and the pension discount rate (positive sign).

In Worldscope, the Pension service costs data item is described as the expense of pension benefits payable accrued during the year by companies' employees. Specifically for defined-benefit pension plans, the annual service costs represent the present value of increased future pension obligations due to an added year of service. This liability adds to the projected benefit obligation (total pension liabilities) in terms of its accounting treatment (SFAS no. 87, 1985). It must be noted that this data item does not include contributions to the pension plan made by the employee. The calculation of this liability, which is referred to by actuaries as the Normal Cost (NC), can be done under different methods. The two most common methods are the Projected Unit Credit cost (PUC) and the (Traditional) Unit Credit cost (UC) (Pension Committee of the AAA, 2004). The difference between the PUC and UC lies in whether or not the actuary considers future expected increases in pay or not, which is done under the PUC method, but not under the UC method (Pension Committee of the AAA, 2004).

Profitability is included in the regression as an auxiliary variable since Bodie et al. (1987) introduced the financial slack hypothesis, stating companies might store excess financial assets in their pension fund as to reduce taxes. Shivdasani and Stefanescu (2009) looked at pension assets and liabilities as determinants for corporate capital structure and report on a partial tax shield that pension funding provides. The value of a tax shield increases with profitability, resulting in an expected positive sign. Profitability is calculated by dividing the earnings before interest and taxes by total assets. Furthermore, in pension accounting and the calculation of pension obligations the pension discount rate is used to discount the pension service cost (SFAS no. 87, 1985). The level of the service cost liability thus also depends on the level of the pension discount rate, making it necessary to include this

variable in the regression. The funding ratio is included in a separate regression to check whether retrenchment is dependent on the funding level of a pension plan.

Often, when years of service accrue and employees get older, contributions are increased by means of an actuarial calculation. The average age of employees or the maturity of the pension plan might therefore also influence the level of pension service costs, but unfortunately no data is available on this variable. Finally, it can be gleaned from the accounting example (Chapter 2.3.5) of ExxonMobil's annual report that companies include an assumption on the rate of future wage increases when they calculate the pension cost per employee. For this reason, it was deemed unnecessary to include a variable controlling for employee wages.

Strategy II: Decrease pension funding

$$\frac{FVPA}{PBO}_{it} = \beta_0 + \beta_1 * PE_{it} + \beta_2 * WeightedEquityPerf_{it} + \beta_3 * WeightedBondPerf_{it} + \beta_4 * PDR_{it}$$

In this regression, the effect of private equity involvement on the funding ratio is examined. The hypothesis for the pension funding strategy states private equity involvement is expected to have a negative effect on the funding ratio, resulting in a negative value for β_1 . The funding ratio $\frac{FVPA}{PBO}$ is therefore the dependent variable, while the explanatory variable is the private equity indicator variable. The funding ratio is calculated by dividing the fair value of plan assets (FVPA) by the projected benefit obligation (PBO). Control variables are the performances of the equity markets as measured by the annual Russell 3000 index return and the bond markets as measured by the annual Barclays U.S. Aggregate Bond index return and the pension discount rate (PDR). The effect of the pension discount rate is ambiguous, while the financial performances of the pension fund's assets are expected to have a positive effect on the funding ratio.

Every year since the signing of the Pension Protection Act in 2006, corporate sponsors are obliged to inform all defined benefit plan participants with an annual funding notice in order to inform participants on the financial health of the plan. An important number in the annual notice is the funding level, according to the U.S. Department of Labor (DOL website, 2016). In academic literature, the funding level – or funding ratio – has also been used to assess the funding policy of a corporate sponsor. The funding ratio of a defined benefit plan has different definitions and corresponding calculations. Francis and Reiter (1987) and Bodie et al. (1987)¹² define the funding ratio as the ratio of

¹² Bodie et al. (1987) use two measures of pension liabilities: total benefits accrued and vested benefits accrued

plan assets to benefits accrued (1), while Rauh (2006) defines the funding ratio as pension assets minus pension liabilities (2). The PBGC does not state a clear definition of the funding ratio on its website, but defines an underfunded defined benefit plan as unable to pay all benefits earned by participants¹³, while the DOL uses the first definition¹⁴. This study employs the definition of the U.S. DOL by dividing plan assets by liabilities.

Rauh (2006) states that four factors determine the annual change in the funding ratio for a pension plan. The first factor is the yearly return on the financial assets the plan invests in different security types as decided by the management of the sponsor company. Since the actual return on assets is no longer reported since the introduction of SFAS 132 in 1998, the U.S. returns on equities and bonds scaled by their allocation percentage are included to proxy for this factor. The Russell 3000 index covers 98% of U.S. public equity, while the Barclays U.S. Aggregate bond index covers a large basket of U.S. bonds with a long-term duration (5.55 years)¹⁵.

The second factor is the rate used for discounting the pension liabilities, the PDR. Until April 2004 firms were required to use the 30-year treasury rate, but legislation was implemented that changed this (Rauh, 2006). In 2009, legislation was implemented that divides pension liabilities in three maturities: short-term, medium-term and long-term rates. The discount rate for liabilities in each of these maturities is based on investment grade corporate bonds rated AA and is set by the company actuary (Bergstresser, Desai and Rauh, 2006). Changes in this rate due to actuarial reasons or changes in the term-structure of interest rates affect the PDR (Rauh, 2006). The effect of this independent variable on the funding ratio is ambiguous since it depends on the duration of assets and liabilities.

The third factor mentioned by Rauh (2006) pertains to the funding decisions the sponsor company makes and is consequently captured in the private equity indicator variable. The fourth and final factor encompasses changes in the level and structure of benefits, but since these costs may be amortized over several years the effect is marginal. Therefore, no variable was included to measure the changes in pension benefits.

¹³ PBGC online glossary: <http://www.pbgc.gov/about/pg/header/glossary.html#U>

¹⁴ DOL funding notice appendix: <https://www.dol.gov/ebsa/regs/fundingnoticeappa.doc>

¹⁵ https://index.barcap.com/Benchmark_Indices/Aggregate/Bond_Indices

Strategy III: Increase risk in pension asset allocation

$$EquityAlloc_{it} = \beta_0 + \beta_1 * PE_{it} + \beta_2 * \frac{FVPA}{PBO}_{it} + \beta_3 * WeightedEquityPerf_{it-1} + \beta_4 * WeightedBondPerf_{it-1}$$

The third regression equation relates pension asset allocation risk as measured by the percentage of pension assets invested in equities to the involvement of private equity. Based on the developed hypothesis in Chapter 2, private equity involvement is expected to have a positive relation with pension asset allocation risk as measured by the percentage of assets invested in equities and a positive value for β_1 . Control variables include the funding ratio of the plan and the one-year lagged investment returns of bonds and equities.

Pension asset allocation risk is often measured by the percentage of assets invested in equities¹⁶. As discussed in paragraph 2.3.3, different theories have been put forward to explain risk-taking behaviour in the corporate pension plan. The risk-shifting theory from Bodie et al. (1987) opposes the risk-management theory from Rauh (2009) and these theories look at risk-taking from a funding ratio perspective. Cocco and Volpin (2007) take a different perspective by looking at the number of insiders on the board of trustees in the UK, while Anantharaman and Lee (2014) use managerial payment incentives as explanatory variable for risk-taking. Cocco and Volpin (2007) integrate the risk-shifting hypothesis in their predictions by assuming a stronger effect for companies with higher leverage. This leverage effect is captured by the private equity indicator, as well as the alignment of management with the private equity owners through increased risk-taking incentives provided by stock options.

The opposing asset allocation risk theories by Bodie et al. (1987) and Rauh (2009) include the funding ratio as their explanatory variable, while Anantharaman and Lee (2014) include the funding ratio as a control variable. Following earlier academic work, the funding ratio is therefore included as a control variable. A negative coefficient of β_2 would point to the risk-shifting hypothesis, while a positive coefficient would provide evidence for the risk-management theory. The lagged investment returns are included to control for behavioural inertia in investing and possible costs associated with rebalancing the portfolio. High equity returns (10%) have been found to lead to a 2.9% higher equity allocation (Rauh, 2009).

Finally, it was found that the percentage of active employees is also significant in explaining the variation of pension asset allocation risk (Rauh, 2009). This evidence shows that managers act on

¹⁶ Benartzi and Amir (1999), Cocco and Volpin (2007), Rauh (2009), Anantharaman and Lee (2014)

their fiduciary duty by taking the duration of pension liabilities into consideration when altering the asset allocation. Unfortunately, no measure was found to control for the share of active employees.

Strategy IV: Increase the expected return on plan assets

$$\begin{aligned} \text{ExpectedROA}_{it} = & \beta_0 + \beta_1 * PE_{it} + \beta_2 * \text{EquityAlloc}_{it} + \beta_3 * \text{BondAlloc}_{it} + \\ & \beta_4 * \text{WeightedEquityPerf}_{it-1} + \beta_5 * \text{WeightedBondPerf}_{it-1} \\ & + \beta_6 * \text{Actual Return (estimated)}_{it-1} \end{aligned}$$

The above regression estimates the effect of private equity involvement on the expected return on pension plan assets. The expected return is a credit component of the calculation of the annual pension cost based on an expected return percentage multiplied by the financial assets of the pension plan. Increasing the expected return thus leads to a lower pension expense on the income statement. Private equity involvement is expected to have a positive effect on the expected return, leading to a positive value for β_1 . The control variables added are the allocation to bonds and equities and the returns of the U.S. equity and bonds indices (Russell 3000 and Barclays U.S. Aggregate) scaled by their allocation percentages.

The IBM case presented in 2.4.5 and earlier evidence on earnings manipulation by use of the expected rate of return on plan assets has identified this value-redistribution strategy. Bergstresser, Desai and Rauh (2006) examine the expected return and find it is increased by management when companies prepare for a takeover, near critical earnings announcements and find a relation with the exercise timing of managerial stock options. Taking the search for exit opportunities into account, private equity firms could profit from increasing the expected rate of return and the possible presence of this effect is captured by the private equity indicator variable. This study follows the methodology employed in earlier empirical work by Bergstresser, Desai and Rauh (2006) and by Amir and Benartzi (1999), who include the asset allocation to equities and the (lagged) performance of pension assets to reject certain hypotheses that managers base the expected rate of return on current or past performance. For robustness, the lagged estimated actual return was used instead of the weighted performances of equities and bonds.

Strategy V: Increasing the pension discount rate

$$PDR_{it} = \beta_0 + \beta_1 * PE_{it} + \beta_2 * LTInterestRate_{it} + \beta_3 * Profitability_{it}$$

The fifth and final regression estimates the effect of private equity involvement on setting the level of the pension discount rate. The coefficient of private equity is expected to be positive as a higher discount rate decreases the value of the pension benefit obligation ceteris paribus (PBO), thereby improving the funding ratio. This leads to an expectation of a positive value for β_1 . Consequently, optimizing the PDR provides a way of redistributing value from pensioners to shareholders since the pension expense is lowered and the minimum funding requirement (MFC) is reduced. Reducing the MFC lowers cash contributions to the pension plan. The control variables added in this regression are the long-term interest rate on corporate bonds rated AA and a profitability measure.

The pension discount rate is reported annually by companies and is an item present in the Worldscope database. Since the pension discount rate is set by the company actuary and has to be based on a basket of investment grade corporate bonds due to regulation, less managerial discretion is involved. Taking this into account, the effect of private equity is expected to be smaller than for the assumed return on assets. By adding the long-term interest rate on investment grade corporate bonds as a control variable, any possible effect of private equity is ensured to be captured. The long-term interest rate (LTIR) variable is expected to have a positive sign. Profitability is added to control for the effect of earnings management. Bodie et al. (1987) includes a profitability measure for this reason, while the reasoning of Bergstresser, Desai and Rauh (2006) concerning the expected return on plan assets can be extended to the pension discount rate as well since the effects are similar from an accounting perspective.

Summary of the expected signs for each value-redistributing pension strategy	
I Pension arrangements	-
II Pension funding	-
III Risk-taking in pension asset allocation	+
IV Expected return on plan assets	+
V Effect on pension discount rate	+/=

Table 7: Summary of hypothesized signs for the private equity indicator variable

3.4 Summary statistics on the included variables

Table 8 shows descriptive statistics for the variables included in the regressions. The pension service cost per employee variable has a large standard deviation and is widely dispersed. From theory it is known that the service cost includes the benefits earned by the active employees arising from an extra year of service to the company. Although changes to actuarial assumptions underlying the calculation of the service cost could change, the variation is expected to be limited. The PSC was then scaled to the number of employees to make the numbers comparable. However, large companies often have multiple pension plans, both DB and DC, resulting in a distortion of the scaling factor. This could explain the large variation in the level of service costs per employee. Furthermore, it can be seen that the service costs per employee were lower for the private equity sample both pre- and post-investment, compared to the control group. This is also the case for the funding ratio since the medians were 0.744 and 0.724 for the PE sample vs. 0.795 for the control group.

This leads to think there might be some form of selection bias present in the companies that received a buyout or a different form of private equity funding. Since market timing was identified to be an important source of returns for private equity investors in the previous chapter, the lower funding ratio and pension service cost per employee of target companies might have been lower due to the fact that these companies were on average performing worse than their listed peers. This is also reflected by a lower profitability (0.052 vs. 0.081). A form of sample selection bias could affect the results of the regression.

Summary statistics						
Pre-investment						
Variable	Obs.	Mean	Std. Dev.	Min.	Median	Max.
PSC/E	98	1529.418	2063.665	18.385	797.867	9103.115
Funding Ratio	111	0.712	0.260	0.150	0.744	1.230
Equity Allocation	105	0.581	0.187	0.047	0.630	0.880
Expected ROA	115	0.073	0.015	0.016	0.079	0.090
PDR	113	0.056	0.009	0.033	0.058	0.078
Profitability	111	0.052	0.105	-0.238	0.048	0.325
Equity Return	105	0.020	0.120	-0.310	0.032	0.218
Bond Return	105	0.021	0.014	0.003	0.018	0.069
Annual Return (estim.)	105	0.041	0.117	-0.301	0.066	0.228
Post-investment						
Variable	Obs.	Mean	Std. Dev.	Min.	Median	Max.
PSC/E	142	1381.647	1604.421	18.385	983.405	9103.115
Funding Ratio	166	0.680	0.208	0.220	0.724	1.014
Equity Allocation	160	0.514	0.208	0.000	0.545	0.860
Expected ROA	166	0.070	0.019	0.006	0.075	0.166
PDR	170	0.051	0.012	0.020	0.053	0.088
Profitability	160	0.067	0.155	-0.289	0.060	0.679
Equity Return	160	0.041	0.100	-0.329	0.043	0.251
Bond Return	160	0.019	0.016	-0.018	0.018	0.078
Annual Return (estim.)	158	0.060	0.098	-0.324	0.072	0.249
Control group						
Variable	Obs.	Mean	Std. Dev.	Min.	Median	Max.
PSC/E	1,571	1732.719	1947.856	1.603	1034.694	16468.790
Funding Ratio	1,659	0.799	0.205	0.205	0.795	1.824
Equity Allocation	1,526	0.545	0.168	0.000	0.590	0.930
Expected ROA	1,640	0.075	0.014	0.750	0.075	0.164
PDR	1,715	0.053	0.011	0.010	0.055	0.111
Profitability	1,949	0.081	0.077	-0.238	0.077	0.325
Equity Return	1,521	0.043	0.100	-0.313	0.052	0.288
Bond Return	1,511	0.016	0.013	-0.020	0.015	0.078
Annual Return (estim.)	1,536	0.058	0.097	-0.313	0.074	0.282

Table 8: This table depicts summary statistics for the most important variables employed in the regressions. The statistics are calculated separately for each subsample and the data is winsorized at the 1% and 99% level.

Below, the dependent variables of all five strategies are displayed graphically for the private equity invested sample over time from $t-3$ to $t+3$, to get a glimpse of certain trends. Figures 3-7 show these dependent variables. Figure 3 displays the development of pension service costs per employee over time. As can be gleaned from the figure, the average cost has gone down after the buyout year.

Due to the low number of observations, the median and average of the sample do not show the exact same trend.

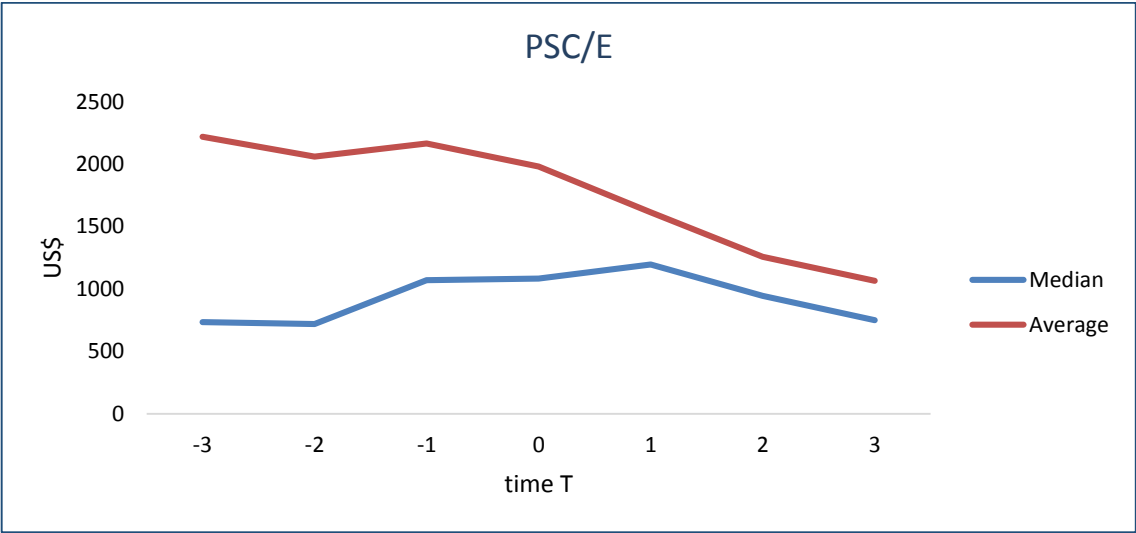


Figure 3: Pension Service Cost per Employee from t-3 to t+3

Figure 4 shows a graph in which the funding ratio of the private equity sample companies is included as a trend line. The funding ratio seems to have gone down following private equity involvement in a company.

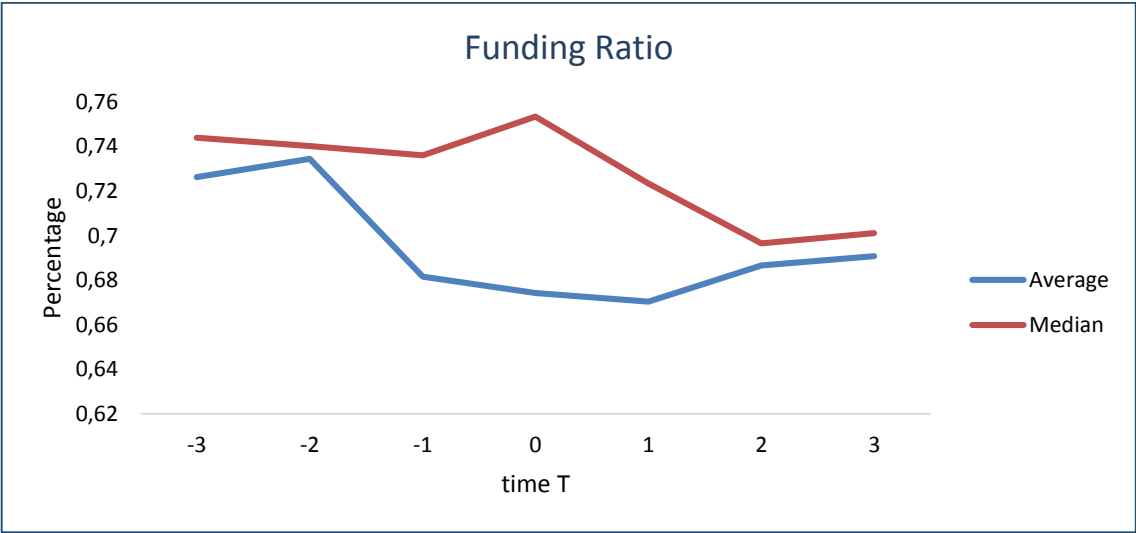


Figure 4: Funding Ratio from t-3 to t+3

The following figure, figure 5, depicts the pre- to post-investment trend for the percentage of pension plan assets allocated to equities, the dependent variable in the regression for Strategy III.

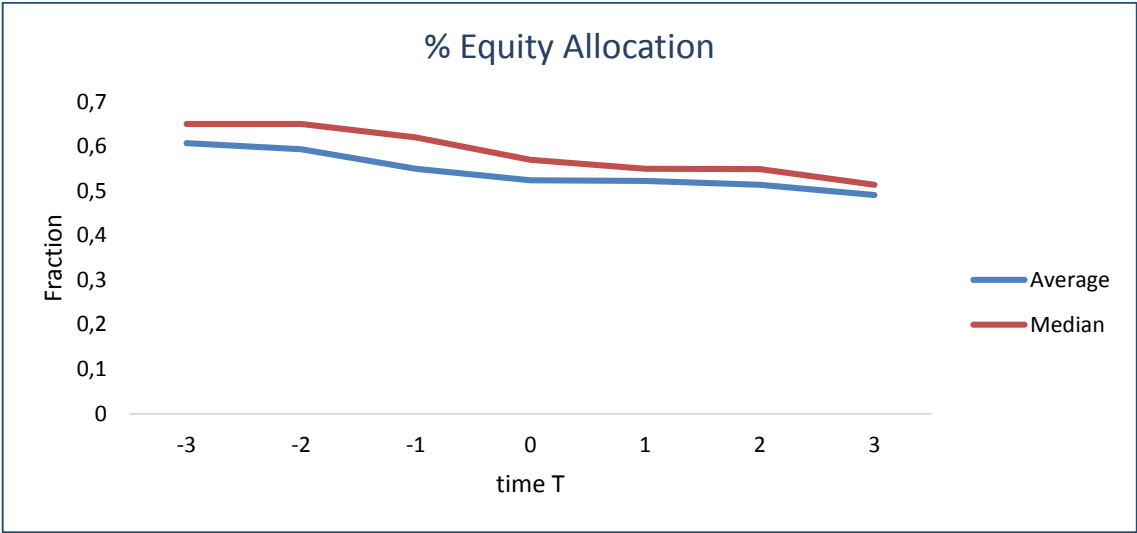


Figure 5: % Equity Allocation from t-3 to t+3

The equity allocation is a proxy for pension plan asset allocation risk-taking by management and shows a downward trend. Over the period 2001-2015, equity allocations have decreased also in a response to the financial crisis of 2008, which could influence this trend line as well.

Figure 6 shows the pre- to post-investment trend line for the fourth strategy, the expected return on assets of a defined benefit pension plan. As can be gleaned from figure 6, the expected return the portfolio companies set have decreased from pre- to post investment.

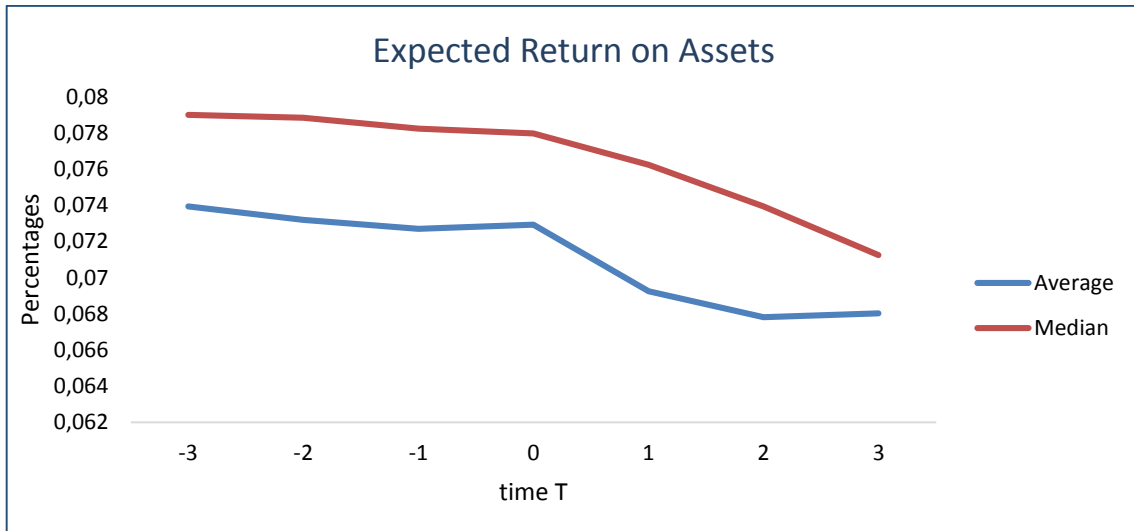


Figure 6: Expected Return on Assets from t-3 to t+3

Finally, the last figure displays the trend line for the fifth and last value-redistribution strategy. The pension discount rate is decreasing over time, which agrees with a decreasing long-term interest rate in the financial markets.

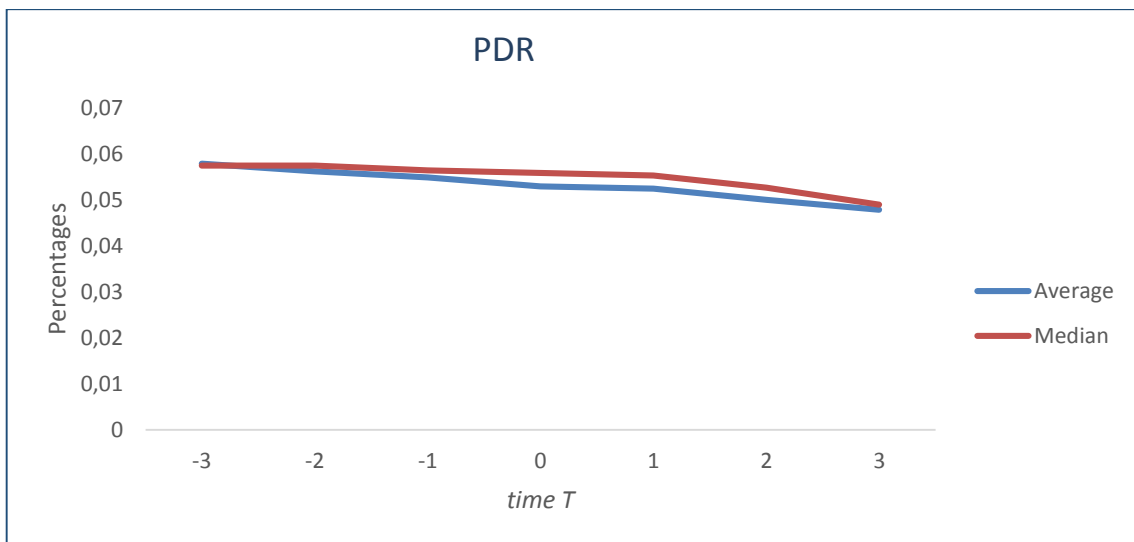


Figure 7: Pension Discount Rate from t-3 to t+3

4. Results

4.1 Results for Strategy I: Retrenching pension arrangements

Table 9						
Dependent variable: PSC/E						
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-investment		Post-investment		PE-sample	
PE	-338.79 (-1.58)	-216.22 (-1.00)	-382.08 (-2.20)**	-243.08 (-1.38)	-229.70 (-0.91)	-228.44 (-0.91)
PDR	88.60 (2.09)**	26.37 (0.59)	69.55 (1.72)*	1.42 (0.03)	-227.88 (-1.98)**	-221.17 (-1.87)*
Profitability	-191.83 (-0.31)	-69.13 (-0.11)	-326.06 (-0.66)	-234.96 (-0.47)	1453.39 (1.16)	1474.01 (1.17)
Funding Ratio		1303.53 (5.56)***		1478.23 (6.44)***		-120.15 (-0.24)
Constant	1297.64 (5.58)***	622.80 (2.14)**	1404.83 (6.38)***	624.90 (2.27)**	2655.03 (3.97)***	2699.11 (3.89)***
Prob > Chi-sq	0.046	0.000	0.036	0.000	0.161	0.267
Observations	1,636	1578	1,678	1620	222	222
Cross-sections	168	166	166	164	38	38

This table contains the results of the cross-sectional feasible GLS regression of pension costs per employee (PSC/E) on an indicator variable indicating private equity involvement, the pension discount rate (PDR), profitability as measured by EBIT/Total Assets and a constant. In columns 1-4, the PE dummy equals "1" for every private equity target company and "0" for the listed non-PE companies. In columns 5-6, the PE dummy equals "1" for every post-investment firm-year and "0" otherwise. Data was extracted from Worldscope, Preqin and Thomson One Banker. The time period under investigation is from 2001-2015. Values between brackets are t-statistics. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are clustered at the company level.

Table 9 displays the results for the regressions on the pension service cost per employee and as can be seen, the coefficient of private equity is negative for all regressions. Pre-investment, the PE coefficient is not significantly different from zero, while it is negative and significant at the 5% level in the period of private equity involvement. This points to a negative effect of private equity in determining the pension costs per employee. In the private equity sample, the coefficient was not significantly different from zero although the sign is once again negative. This could be due to the fact that the sample size was considerably smaller. It should however be remembered that the PSC/E data was widely dispersed due to the fact that large companies often have different pension plans. The pension discount rate (PDR) is positive and significant in most regressions, where a negative value would be expected. Since a higher discount rate leads to a lower service cost, this result is puzzling. The financial slack hypothesis leads to an expected positive value for the profitability measure. The coefficient on profitability is negative for regression 1-4 but not significantly different from zero, while it is positive in the regression of the private equity sample. No evidence was found for the financial slack hypothesis. The funding ratio as included in regressions (2), (4) and (6) and is positive and significant in regressions (2) and (4).

4.2 Results for Strategy II: Decrease pension funding

Table 10			
Dependent variable: Funding Ratio			
	(1)	(2)	(3)
	Pre-investment	Post-investment	PE-sample
PE	-0.062 (-3.07)***	-0.115 (-7.07)***	-0.039 (-1.44)
Equity performance	0.137 (2.66)***	0.152 (3.03)	0.286 (2.30)**
Bonds performance	-0.814 (-2.03)**	-0.443 (-1.17)	-0.350 (-0.41)
PDR	0.012 (2.73)***	0.012 (2.76)***	0.032 (2.55)**
Constant	0.747 (28.43)***	0.742 (29.54)***	0.564 (7.23)***
Prob > Chi-sq	0.000	0.000	0.005
Observations	1,571	1,626	254
Cross-sections	164	167	40

This table contains the results of the cross-sectional feasible GLS regression of the funding ratio on an indicator variable indicating private equity involvement, the performances of equities and bonds, the pension discount rate (PDR) and a constant. In columns 1-2, the PE dummy equals "1" for every private equity target company and "0" for the listed non-PE companies. In column 3, the PE dummy equals "1" for every post-investment firm year and "0" otherwise. Data was extracted from Worldscope, Preqin and Thomson One Banker. The time period under investigation is from 2000-2015. Values between brackets are t-statistics. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are clustered at the company level.

Table 10 displays the results for the second redistribution strategy with the funding ratio as the dependent variable. The private equity coefficient was expected to be negative for the post-investment sample compared to controls and was expected not to be significantly different from zero in the regression including the firm-years prior to the investment. The coefficient of the private equity dummy variable is negative and significant in regressions 1-2. This shows the target companies of private equity firms had worse funding ratios even before the buyout or investment, although the effect seems to be stronger after PE involvement. The private equity dummy in the PE sample is negative, but insignificant. Regression 3 looks only at the PE sample, but although the value of PE has the correct sign it is not significant. The effect of private equity involvement is therefore witnessed modestly in pension funding. The equity performance variable is positive and significant in all regressions, while bond performance is negative. This could be due to the fact that the Barclays U.S. Aggregate Bond index returns were positive in crisis years (5.24% in 2008, f.e.), while the equity returns were very poor (-38.70% in 2008). Overall performance was often negative, leading to a lower funding ratio. This could possibly explain the negative coefficient for Bonds performance. The pension discount rate is positive and significant in most regressions, while a negative sign was expected.

4.3 Results for Strategy III: Increase pension allocation risk-taking

Table 11			
Dependent variable: Equity Allocation			
	(1)	(2)	(3)
	Pre-investment	Post-investment	PE-sample
PE	0.0480 (2.345)**	-0.014 (-1.05)	-0.064 (-2.56)***
Funding Ratio	-0.0127 (-0.57)	-0.004 (-0.20)	-0.057 (-1.00)
Lagged Equity Performance	0.025 (0.57)	0.010 (0.24)	-0.122 (-1.15)
Lagged Bond Performance	-4.123 (-11.33)***	-4.490 (-13.02)***	-8.545 (-10.99)***
Constant	0.620 (30.67)***	0.621 (31.47)***	0.794 (15.43)***
Prob > Chi-sq	0.000	0.000	0.000
Observations	1,413	1,502	216
Cross-sections	161	166	39

This table contains the results of the cross-sectional feasible GLS regression of the equity allocation on an indicator variable indicating private equity involvement, the funding ratio, the lagged performances of equities and bonds and a constant. In columns 1-2, the PE dummy equals "1" for every private equity target company and "0" for the listed non-PE companies. In column 3, the PE dummy equals "1" for every post-investment firm year and "0" otherwise. Data was extracted from Worldscope, Preqin and Thomson One Banker. The time period under investigation is from 2000-2015. Values between brackets are t-statistics. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are clustered at the company level.

Table 11 displays the results for pension redistribution strategy III, in which the allocation to risky assets as measured by the equity allocation is the variable of interest. Based on the hypotheses, the value of PE is expected to be positive and significant in regressions (2) and (3). In both cases, it is negative however and it significant in regression (3). The effect of a buyout seems to decrease the equity allocation by 6.4%. This points to less risk taken in the pension plan following a buyout or investment by private equity. Given the increased use of leverage in portfolio companies, this could point to a form of risk-management by private equity firms. The negative sign of the funding ratio coefficient also points to the risk-management hypothesis developed by Rauh (2009), although the coefficient is never significant. The lagged performance of equity is not significantly different from zero, while the bond performance is negative and significant in all cases. This is correct, since a positive bond performance increases the relative weight of bonds in the portfolio. Given the fact that the Barclays U.S. Aggregate had positive returns in crisis years (2001, 2002, 2008), while equity returns perished in these years.

4.4 Results for Strategy IV: Expected return on pension assets

Table 12						
Dependent variable: Expected ROA						
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-investment		Post-investment		PE-sample	
PE	-0.002 (-1.24)	-0.001 (-1.27)	-0.003 (-2.67)***	-0.003 (-2.89)***	-0.001 (-0.41)	-0.002 (-1.19)
Equity Allocation	0.020 (8.52)***	0.022 (9.93)***	0.020 (8.47)***	0.022 (9.79)***	-0.001 (-0.06)	-0.002 (-0.26)
Bond Allocation	-0.011 (-4.03)***	-0.011 (-4.07)***	-0.014 (-4.90)***	-0.012 (4.65)***	-0.041 (-3.85)***	0.039 (-4.21)***
Lagged Equity performance	-0.007 (-2.44)**		-0.008 (-2.71)***		-0.006 (-0.69)	
Lagged Bond Performance	-0.003 (-0.13)		1.272 (0.47)		0.062 (0.74)	
Lagged Actual Performance (estim.)		-0.892 (-3.14)***		-0.001 (-2.87)***		0.003 (0.38)
Constant	0.068 (34.16)***	0.067 (35.12)***	0.070 (34.12)***	0.068 (34.81)***	0.088 (9.84)***	0.090 (10.90)***
Prob > Chi-sq	0.000	0.000	0.000	0.000	0.000	0.000
Observations	1,401	1,568	1,489	1,618	217	257
Cross-sections	161	165	166	167	39	40

This table contains the results of the cross-sectional feasible GLS regression of the expected return on plan assets on an indicator variable indicating private equity involvement, the equity and bond allocation, the lagged performances of equities and bonds and a constant. In columns 1-2, the PE dummy equals "1" for every private equity target company and "0" for the listed non-PE companies. In columns 3, the PE dummy equals "1" for every post-investment firm year and "0" otherwise. Data was extracted from Worldscope, Preqin and Thomson One Banker. The time period under investigation is from 2000-2015. Values between brackets are t-statistics. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are clustered at the company level.

Table 12 displays the results for the regressions of the expected return on plan assets, pension redistribution strategy IV. As a robustness check, lagged performance was measured in two different ways. Given the managerial discretion involved with the setting of the expected ROA, the private equity coefficient was expected to be positive and significant for regressions (3)-(6) and not significantly different from zero for the first two regressions. However, PE is negative and significant in regressions (3) and (4) and negative but insignificant in regressions (5) and (6). Post-investment, portfolio companies have on average decreased their expected return on assets by 0.3%. The allocation to equity is positively related to the expected ROA, which was the expected sign because a higher allocation to equities will increase risk and return, ceteris paribus. For bonds, the sign is negative. This is also in line with expectations by a similar reasoning. Lagged performances were included to reject the hypothesis that expected returns are based on past performance. Lagged equity performance is found to be negative and significant when included, while the coefficient on lagged bond performance is not significantly different from zero. A lower equity performance leads to a higher expected ROA, which could be explained by an anticipated positive return following a negative yearly return.

4.5 Results for Strategy V: Increase pension discount rate

Table 13						
Dependent variable: PDR						
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-investment		Post-investment		PE-sample	
PE	-0.000 (-0.031)	0.000 (0.04)	-0.001 (-1.56)	-0.001 (-1.40)	-0.002 (-1.65)*	-0.002 (-1.65)*
LTIR	0.007 (35.15)***	0.007 (35.36)***	0.008 (35.67)***	0.008 (35.85)***	0.006 (7.97)***	0.006 (7.97)***
Profitability		0.009 (3.30)***		0.008 (3.54)***		0.003 (0.48)
Constant	0.013 (11.39)***	0.012 (10.42)***	0.013 (11.12)***	0.012 (10.38)***	0.024 (5.78)***	0.024 (5.75)***
Prob > Chi-sq	0.000	0.000	0.000	0.000	0.000	0.000
Observations	1,805	1,805	1,860	1,860	263	263
Cross-sections	173	173	174	174	41	41

This table contains the results of the cross-sectional feasible GLS regression of the pension discount rate on an indicator variable indicating private equity involvement, the long-term interest rate on corporate bonds rated AA, profitability as measured by EBIT/TA and a constant. In columns 1 and 2, the PE dummy equals "1" for every private equity target company and "0" for the listed non-PE companies. In column 3, the PE dummy equals "1" for every post-investment firm year and "0" otherwise. Data was extracted from Worldscope, Preqin and Thomson One Banker. The time period under investigation is from 2000-2015. Values between brackets are t-statistics. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level respectively. Standard errors are clustered at the company level.

Table 13 includes the results of the final pension value-redistribution strategy where the pension discount rate (PDR) is the dependent variable. Given the regulatory guidelines on setting the PDR, the expected sign for private equity involvement was expected to be positive or insignificant. The results show that the private equity targets did not differ from their listed peers before the transaction (columns (1)-(2)) and were negative but insignificant in the post-investment regressions (3) and (4). This opposes the expectations on the PDR. In the regressions including only the PE sample, the PE dummy also had a negative value, indicating the invested companies on average decreased the pension discount rate. Since the profitability of the private equity sample increased on average in the firm-years following the investment, it might be a way for private equity investors to increase the tax-deductibility of its contributions. However, when profitability was included in column (6), the PE dummy remains negative. The long-term interest rate control variable is positive and significant in all regressions as was expected due to regulation. A 1% increase in the LTIR is found to increase the PDR by 0.7% on average. Finally, profitability is positive and significant when included as expected. Profitable companies can use the pension discount rate to increase underfunding and thereby decrease pre-tax profits.

5. Conclusion and discussion

5.1 Chapter Overview

In this chapter, concluding remarks on all five strategies will be presented followed by a conclusion on value-redistribution from workers to shareholders in general. Difficulties encountered in examining the field of private equity will be discussed in the discussion and a paragraph providing guidance on an alternative methodological approach, a plan-level analysis approach, is included. The chapter will finish by presenting policy implications for practitioners and regulators.

5.2 Concluding remarks on Strategies I – V

5.2.1 Strategy I

The empirical results found on the first strategy were found to be in line with the hypothesized effect of private equity on the pension service cost per employee. The pension service cost is based on actuarial assumptions concerning longevity and wage-increases due to higher productivity for example. By altering the assumptions underlying the calculations, private equity firms can reduce the annual pension service cost in portfolio companies, leading to higher earnings before interest and taxes. In evaluating the results of this strategy however, it must be noted that the firm-level of analysis disturbs the results to a certain extent. A single company might have several pension schemes for its employees due to merger activity or the decision to soft freeze its defined benefit plan by opening a defined contribution plan for its new employees (Rauh, Stefanescu and Zeldes, 2015). As a consequence, the scaling of the pension service cost by the total number of employees might cause the empirical results to be inconsistent. To what extent this is true for the sample population is not known, but it is a caveat that must be taken in mind when interpreting the results.

When compared to the results found by Davis et al. (2014) of an average 2.4% decline in earnings per worker relative to the control group, the results found in this study for Strategy I are in line with the negative effects of private equity on the level of benefits received by employees and pensioners. This is evidence in favour of value-redistribution from workers to shareholders and the ‘breach of trust’ theory by Shleifer and Summers (1988). The negative effects of private equity found in the empirical investigation of strategy I are also in agreement with (changes in) the regulatory framework in the U.S. Although the signing of the Pension Protection Act in 2006 resulted in increased minimum funding requirements for defined benefit sponsors and PBGC underfunding premiums have gradually increased over the years, there is leeway for corporate sponsors to minimize the pension

service cost through changing actuarial assumptions. In addition, it has often been the changes in regulation that made defined benefit pension agreements relatively more unattractive compared to defined contribution, contributing to the shift away from defined benefit plans (Munnell and Soto, 2007, Love, Smith and Wilcox, 2011).

5.2.2 Strategy II

In paragraph 4.2, it was empirically tested whether private equity firms decrease the level of funding in portfolio companies. Interestingly, funding ratios of private equity invested companies were found to be lower even before the transaction year. This is a signal of the endogeneity that could be present in this sample since private equity firms tend to look for relatively poor performing companies that have potential for value-creation and subsequently might already have an underfunded pension plan. The results found suggest that the degree of underfunding worsens after private equity involvement, which is in line with expectations. Funding the pension plan negatively affects the cash flows that remain for paying off debt or doing investments (Rauh, 2006). However, the results found are not in agreement with evidence found by Cocco and Volpin (2013), who report companies with a pension deficit are less likely to become a takeover target.

Furthermore, several studies (Coronado et al., 2008, Franzoni and Marín, 2006) have shown that market participants are unable to value a pension deficit correctly. Despite regulatory changes impeding companies to recognize pension deficits on their balance sheet, the lack of transparency in pension accounting seems to be a flaw exploited by private equity firms. On the other hand, Franzoni (2009) finds that the value of a company is decreased for every dollar of mandatory contributions it has to make to finance its pension scheme, leading to a lower exit value for private equity investors. Apparently, the firms in this sample are able to use the Funding Standard Account (FSA) to evade these mandatory contributions.

5.2.3 Strategy III

Concerning the third strategy of increasing the risk in the plan's asset allocation, the results found in this study did not report an effect of private equity on the asset mix. Pre-investment, the private equity treatment group already showed a higher allocation to equities compared to the control group, while this effect disappeared after the buyout. This points to a decrease in asset allocation risk. The regression comparing pre- to post-investment showed a similar effect.

The decrease of asset allocation risk points to private equity firms managing financial risk, perhaps by balancing the increased risk in the capital structure of a portfolio company that has arisen due to debt financing of the investment in the company. Note that earlier, no evidence was found when testing the relationship between balance sheet debt ratios and pension plan asset allocation (Rauh, 2009). There are two other explanations possible for the decline in asset allocation risk among private equity owned companies. Firstly, due to the time period under investigation. Following the financial crisis of 2008, allocation to risky assets (equities) decreased due to two reasons: (1) the 30% decline in the capital markets lowered the value of these assets relative to fixed income investments and (2) pension plans moved away from equities as a response to the crisis. This is visible in the graph on equity allocation presented in paragraph 3.4 and is also reported by Andonov, Bauer and Cremers (2015) on private pension plans. Secondly, the risk-appetite of those responsible for the asset mix might have decreased due to the larger stake of management's personal wealth in the pension plan (Anantharaman and Lee, 2014). Since the incentives of managers of a portfolio company are linked stronger to firm-performance following private equity involvement, this might influence the allocation to risky assets.

5.2.4 Strategy IV

The results of the fourth value-redistributing strategy, presented in paragraph 4.4, do not confirm the private equity hypothesis. The amount of managerial discretion present in setting the expected (or assumed) return on assets for a portfolio company is substantial and the IBM case has shown this. Considering the search for an exit opportunity, private equity firms were expected to employ this strategy relatively more often than their listed controls. Involvement of private equity was therefore expected to generate a positive effect on the expected return on plan assets, but a negative effect was found in the empirical results.

Two alternative explanations might explain why the hypothesis was found to be untrue. Firstly, recall it was found by Bergstresser, Desai and Rauh (2006) that companies tend to increase the expected return prior to merger or investment activity. This could explain the negative effect of private equity, since expected returns are possibly lowered following the transaction. Although the pre-investment average expected return is lower (7.3% versus 7.5%) than for the control group, this could have affected strategic decision-making in the post-investment phase. A second explanation relies on the accounting framework for defined benefit plans. In a GAO report from 2005 concerning defined benefit plan contributions, the use of the Funding Standard Account (FSA) is discussed as a way of forgoing cash contributions to the pension plan. The difference between the actual return and the

expected return on assets is allowed to be amortized over several years, resulting in an existing credit balance for a company. If the credit balance is at least as high as its FSA charges, the company does not have to make a contribution (GAO, 2005). By lowering the expected rate of return, the amortization number increases, which leads to a higher credit balance available for forgoing cash contributions. Given the preference for private equity to make interest payments and reduce their debt, this could provide a possible explanation.

5.2.5 Strategy V

The results of the fifth regression on the effect of private equity on the pension discount rate did not confirm the hypothesis as formulated in paragraph 2.4. Private equity involvement was expected to have a positive effect on the pension discount rate as increasing this rate significantly lowers the level of pension liabilities. As mentioned earlier, however, the regulatory environment prevents companies sponsoring private pension plans from exerting such behaviour since the discount rate is linked to the yield on long-term AA rated corporate bonds. Andonov, Bauer and Cremers (2015) highlight the effect of such regulation by comparing private pension plans to public plans in which the discount rate is linked to asset returns, creating perverse incentives.

A different reason why the effect of private equity does possibly not have the anticipated effect on the discount rate is because from 2002 to 2015, the 15-year AA corporate bond rate has decreased from 7.28% to 4.17%. Although this effect is largely captured by including it in the regression equation, private equity sponsored companies might have been quicker to adapt the discount rate to the 15-year rate. A reason for using a conservative discount rate might be a consequence of the sponsor trying to make a plan look more underfunded; in which case negotiating on freezing the plan would become more realistic (Rauh, Stefanescu and Zeldes, 2015). Unfortunately, this assertion could not be tested empirically.

5.2.6 Main conclusion

By formulating five strategies which private equity firms might apply to increase operational performance in a portfolio company by redistributing value in the form of deferred income from workers and pensioners to their shareholders, the main research question this thesis tried to answer was: *Are defined benefit pension plans used for value-redistribution from workers and pensioners to shareholders by private equity investors?*

Having examined these five strategies by conducting empirical research and presenting three case studies, it can be concluded that private equity firms make limited use of value-redistributing opportunities present in portfolio companies with a defined benefit pension plan. Although the case studies in this study and in other academic work illustrate that private equity investors do create value for their shareholders at the expense of employees, the empirical results did not confirm this image persuasively. With the exception of Strategy I and II, the private equity dummy variables did not have the expected sign and the other hypotheses are therefore rejected. For Strategy I, a caveat is the scaling factor. For every strategy, there are different reasons potentially mitigating or altering the hypothesized effect.

5.3 Discussion

In the discussion, potential drawbacks of the methodological set-up of this study and difficulties regarding private equity research in general will be addressed. By addressing these four points, guidance for future research is given as to prevent researchers from walking into certain pitfalls.

Firstly, it proved to be difficult to provide general insights in the private equity sector because it has many different forms. Different types of transactions, different buyout sizes, divisional buyouts and complex building strategies all contribute to the heterogeneous properties of the private equity sector. The heterogeneity present in the field of private equity also posed limitations to the data set under examination. In addition, it also shows one of the shortcomings of this study, which is the firm-level analysis instead of a plan-level analysis. By looking at Form 5500 data filed with the Internal Revenue Service and the Department of Labor, it is possible to isolate a single defined benefit plan. This is important since larger companies often have more than one pension scheme for their employees. Especially for Strategy I, which scales the pension cost by total employees, this would generate economically more meaningful results since the numbers are not affected by add-on building strategies by private equity, the sale of an unprofitable division or the erection of a defined contribution plan for new employees. In the following paragraph, more extensive guidance on the use of Form 5500 data for a plan-level analysis will be given. Overcoming the difficulties associated with studying human capital can also be achieved by performing analysis at the level of the individual employee, a methodological approach used by Antoni, Maug and Obernberger (2015) in a study on the effects of private equity on German employees. Availability of the data might however be an issue with respect to privacy legislation.

Secondly, the question is whether private equity really uses a defined benefit plan in one of its portfolio companies as a source of value-redistribution in isolation. Shivdasani and Stefanescu (2009)

found that the pension plan is potentially the missing link in certain capital structure issues. They find pension fund contributions constitute up to one third of tax reductions in a firm-year. Love, Smith and Wilcox (2011) examine the impact and consequences of regulation on the optimal pension strategy and find that the impact of regulation on pension funding as measured by the stringency of minimum funding requirements is an important determinant. In addition, they mention the costs of financial distress as an important determinant. The costs of financial distress are also the foundation for the risk-management theory of pension funding by Rauh (2009). Given the weakness of the evidence to support the five tested hypotheses on pension redistribution strategies and taking into account that pension contributions, pension funding and pension asset allocation are linked to the costs of financial distress and consequent capital structure decisions, this might suggest private equity firms do not look at a defined benefit plan in isolation as a way of redistributing value from workers and pensioners to shareholders. Instead, they might regard the pension fund as a subsidiary of the portfolio company they invest in and take decisions considering the financial position of the entire company by balancing the costs of financial distress with financial risk-taking.

Thirdly, private equity firms might prefer other strategies such as freezing defined benefit agreements in a soft or hard way over the retrenching strategies evaluated in this study. A soft freeze is defined as closing the defined benefit plan for newly hired employees and opening a defined contribution plan for them. A hard freeze constitutes a change from defined benefit to defined contribution for all employees at the company (Rauh, Stefanescu and Zeldes, 2015). Recall Rauh, Stefanescu and Zeldes (2015) report companies freezing their defined benefit plan could save between 2.7% and 3.6% of annual payroll cost. Combined with the results found by Pontiff et al. (1990) on plan reversions as a source of takeover gains and evidence found by Petersen (1992) on pension plan freezes as a way of breaching implicit promises of future compensation, this area of research could prove to yield additional insights on the influence of private equity on worker's pension agreements and the possibility of renegeing on implicit contracts. Unfortunately, investigating whether pension plan freezes occur more frequently after a private equity sponsored buyout was outside the scope of this study. Given the average 3% in annual payroll reduction, it does however seem an appealing strategy for private equity to employ and it would be an interesting subject to further examine. A possible way to extend the research on the effects of private equity on human capital by studying defined benefit pension plan freezes will be discussed in the following paragraph in more detail.

Fourthly, a problem with private equity research is related to endogeneity. The selection of a company for its portfolio by a private equity firm could be partially based on the financial status of its pension plan, leading to endogeneity. Although it is difficult to assess to what extent a pension deficit or surplus actually plays a role in the selection of the company for an LBO or investment, it cannot be

ruled out completely given the estimated 35% increase in leverage the average defined benefit sponsor company experiences when the pension plan is treated as a fully-owned subsidiary (Shivdasani and Stefanescu, 2009). This is also reflected in the difference in funding levels and profitability between the pre-investment private equity companies and the listed peers.

Finally, in addition to the four takeaways mentioned above it would also be interesting to find out whether wealth of workers and pensioners with a defined contribution plan is transferred to shareholders. Do employer-matched contributions decrease for example? Given that the majority of workers are now covered by a defined contribution pension scheme, the relation between workers and pensioners covered by defined contribution plans and private equity is perhaps even more relevant (Sialm, Starks and Zhang, 2015). Do companies with a private equity sponsor offer different investment options to their employees? Is there a difference in the allocation to company stock in default options for employees? These last two questions have an indirect link to this research, since they concern the fiduciary duty of the sponsor company and have less to do with value-redistribution. They are interesting research subjects nonetheless.

5.4 Research recommendations for a plan-level analysis

Because of the encountered shortcomings in this study, shortcomings that seem to be inherent to a firm-level analysis of defined benefit pension arrangements, it is important to propose an alternative methodological approach that is able to overcome some of these inadequacies.

A plan-level analysis is a methodological approach that focusses on a specific defined benefit pension plan. By conducting a plan-level analysis instead of a firm-level analysis, several benefits can be achieved. Firstly, the availability of data is expected to increase. Every company employing more than 50 employees is obliged to submit Form 5500 data annually with the IRS and the DOL, while reporting standards are increased when more than 1,000 employees are covered by the plan (Rauh, Stefanescu and Zeldes, 2015). Since the reporting standards do not differ between private and listed companies, pre- and post-investment data of (taken) private portfolio companies is expected to be more readily obtainable. Secondly, the quality of the available data is expected to increase. For this study pension data was acquired from Worldscope, which originally retrieved it from financial statements. The data suffered from missing values and inconsistencies. Given the mandatory nature of the application of Form 5500, the quality of the pension data is expected to be higher relative to firm-level data, also in terms of consistency. Thirdly, additional relevant pension data is reported on attachments to Form 5500. For example, the share of active participants, relevant to assess the maturity of the pension fund and applicable as a control variable, is provided whereas this information

was not provided by the Worldscope database. Form 5500 data and data from its attachments is available on the website of the US Department of Labor in comma delimited Excel files.

A study employing this methodology is found in a working paper by Rauh, Stefanescu and Zeldes (2015), who combine the plan level pension data with firm-level financial data such as profitability and the leverage ratio of the sponsor company. The combination of plan-level and firm-level data is done by matching the employer identification number (EIN) or name mentioned on Form 5500 to other databases. The matching process is complicated by the potential consolidation of subsidiaries into the parent company, however. Subsidiaries may choose to file Form 5500 separate from their parent company under their own name, while consolidated firm-level data is correspondent with the parent company. Once the matching process of private equity invested companies with their defined benefit pension plans has been completed, a rich data set can be obtained. The variables used in this study are all reported on Form 5500: total assets and liabilities of the plan, asset allocation, discount rate used, expected rate of return used and the service cost. The data for these variables is found with the financial information of the plan and is reported in Schedule H, an attachment to Form 5500 which is also available on the website of the DOL.

Additionally, by using plan-level data it would be possible to investigate whether defined benefit plan freezes occur more frequently than for listed companies following a buyout by a private equity firm. Employers must report the freeze of a pension plan when they file Form 5500. In contrast with the quantitative retrenchments examined in this study, freezing the defined benefit plan for new employees or converting the pension plan to a defined contribution plan altogether could be classified as a qualitative retrenchment. Plan freezes by private equity invested companies should however not be studied separate from the general trend away from defined benefit plans. Research by Towers Watson (2016) showed that only 17% of Fortune 500 companies still offered some form of a defined benefit pension in 2015, down from 60% in 1998. There has been an uptick in plan freezes following the 2008 global financial crisis and companies freezing at least one of their defined benefit plans went up 18% over the period 2009-2015 (Towers Watson, 2016).

5.5 Policy implications for practitioners and regulators

In this paragraph, policy advice and implications will be proposed for practitioners and regulators as well as the public at large. The Private Equity Bad Man by Elizabeth Lewis (2015) is not a self-contained critique on the private equity sector. Different authors and academics have tried to shed light on how value is created and/or redistributed from other stakeholders of a portfolio company. At times, their personal view on private equity resonates through their work. As mentioned earlier, empirical

evidence on the effects of private equity on labour growth, productivity growth and value created for the economy as a whole differs per sample and this is also true for studies on excess returns earned for the limited and general partners. This study will try not to go into policy implications for the private equity sector as a whole, but merely on the effects it has on human capital as measured by employees' deferred income, as that remains the subject of this study. The case study of Friendly's Ice Cream, in which the companies' pension liabilities were dumped onto the PBGC in bankruptcy, is a negative example of the effects of private equity. In other cases however, the negative consequences for workers' and pensioners' deferred income might be negligible or even positive, as was found for some of the value-redistributing strategies examined in this study such as the asset allocation to risky assets (Strategy III).

For private equity practitioners and consequently for the U.S. private equity sector, it is therefore advised to increase transparency on the effects of buyouts or investments on defined benefit pensions. For example, the Private Equity Reporting Group (PERG, former Walker Guidelines Monitoring Group) publishes an annual report on the performance of large portfolio companies in the U.K. in collaboration with the British Private Equity and Venture Capital Association (BVCA) and EY. The report focusses on the effects of private equity on different stakeholders in the portfolio companies and the economy. The aim is to inform businesses, regulatory bodies and the public on private equity (PERG, 2015). By increasing transparency in the U.S., the private equity sector can improve its image and at the same time provide academics with the opportunity to investigate it in an unbiased manner. Furthermore, the regulator should also induce private equity firms to report financials of its portfolio companies by aggravating reporting standards for the sector.

In addition to aggravating reporting standards, regulators should also look at the pension cost per employee and pension funding as these two value-redistributing strategies were found to be employed by private equity firms. By altering actuarial assumptions underlying the calculation of the annual pension cost and the possible use of the Funding Standard Account in forgoing contributions, private equity firms can breach implicit contracts. They should be forced to honour those implicit agreements made with employees and pensioners. It must be noted however, that regulatory changes might have unintended side effects. Increasing the stringency of defined benefit accounting or funding rules might induce companies to freeze their defined benefit plans instead of fully funding them.

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