Does Asymmetric Information Affect SEOs and M&A? Evidence from Corporate Pension Plans

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Abstract

We present evidence of the impact of asymmetric information on firms' likelihood to issue equity and to be acquired. We argue that the existence of corporate sponsored defined benefit pension liabilities, and their magnitude, are a source of risk for buyers of the firm's shares. We show that firms that sponsor DB pension plans and have a large pension deficit relative to their market capitalization are less likely: (i) to raise equity through SEOs; (ii) to be the target in an acquisition and to be taken over; and (iii) to use stock when they acquire other companies or assets.

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1 Introduction

There is a vast theoretical literature emphasizing the importance of asymmetric information for corporate financial decisions, with perhaps the most famous contribution being the pecking order theory of capital structure proposed by Myers and Majluf (1984) and Myers (1984).[1] The basic idea behind these papers is Akerlof (1970)'s *lemons principle*: in the presence of information asymmetries between the firm and the market it is costly for firms to sell equity to outsiders. As in Akerlof's used car market, adverse selection in the market for equity may lead to a market breakdown.

In contrast to the vast theoretical literature, evidence on the impact of asymmetric information on firms' financial decisions has been harder to obtain. This is to some extent due to the difficulty in measuring asymmetric information across a large group of firms. Our idea is to use company-sponsored defined benefit (DB) pension plans as a source of asymmetric information for the value of the shares of the companies that sponsor such plans.

The deficit in DB pension plans (that is the difference between pension liabilities and pension assets) is a liability for the sponsoring company. The size of this deficit is difficult to determine since its value is very sensitive to the assumptions, which are not always made explicit, regarding discount rates, pension plan members longevity, employee mobility, among others. Naturally, uncertainty with respect to the value of the pension deficit translates into uncertainty with respect to the value of the sponsoring firm's equity. Furthermore, the management of the companies that sponsor such plans have more information on the assumptions used and on the value of the deficit than outsiders do. This may make it difficult for firms that sponsor a DB pension plan to sell equity to outsiders: potential acquirers of the company shares may be worried that they are buying a *lemon*.

We investigate whether this is the case in two different situations in which firms sell equity to outsiders: Seasoned Equity Offerings (SEOs) and Mergers and Acquisitions (M&A). More precisely we investigate whether firms that sponsor DB pension plans, and in particular those that sponsor plans with large deficits, are less likely to issue equity in a SEO, to be taken over, and to use equity as a means of payment in acquisitions.

[1] Early contributions in this literature include Ross (1977) on the signaling role of debt, Leland and Pyle (1977) on the informational content of inside ownership, and Bhattacharya (1979) on the signaling role of dividends.

In our study we use United Kingdom (UK) data for the 2002-2008 period. The universe of firms in our sample are the Footsie 350 companies in 2002, the first year in our dataset. Our choice of large companies is motivated by the fact that we would like a sample with variation with respect to the significance of company sponsored DB pension plans. About two-thirds of these companies sponsor DB pension plans, and among the latter there is significant variation in the value of the pension deficit relative to the market value of the firms' equity, ranging from 49 percent to -13 percent. We have hand-collected the value of the deficits and other pension data from the footnotes to the companies' annual reports. In addition, we use firm-level data from Worldscope, and SEOs and M&A activity data from SDC Platinum.

To assess whether firms that sponsor DB pension plans, and particularly those that sponsor plans with large deficits relative to market capitalization, are less likely to issue equity, we estimate probit regressions of the decision to issue as a function of pension plan variables. We control for several firm characteristics, including size, profitability, leverage, among others. Interestingly, we find that firms with a large pension deficit relative to the market value of their equity are less likely to issue and to raise a significant amount of equity. It is important to note that we obtain this result controlling for a measure of firm leverage, that treats the pension deficit as debt for the sponsoring company. That is: our results are not due to the fact that companies that sponsor DB pension plans tend to be more highly leveraged (Shivdasani and Stefanescu, 2009). Hence, our result is consistent with the view that DB pension plans are a source of asymmetric information for the sponsoring firm.

In addition, we find that the sponsoring of DB pension plans has an impact on M&A activity which is consistent with the asymmetric information theory. More precisely, we find that firms which sponsor DB pension plans are less likely to be targeted in M&A acquisitions, particularly when they have a large pension deficit relative to the market value of their equity. And conditional on being attempted, acquisitions that target firms which sponsor DB pension plans are less likely to be completed. These findings lend support to the idea that DB pension plans act as an implicit poison pill that discourages potential (and actual) bidders from acquiring the sponsoring companies.

Although our result that company sponsored pension plans act as a takeover defense resembles the results in Rauh (2006b), it is important to note that the economic mechanism at work in our paper is different. Rauh shows that US companies that sponsor pension plans that invest in the shares of the sponsoring company are less likely to be taken over. The mechanism at

work in his paper is an agency one, with the employees and the management of the sponsoring company using shares owned by the pension plan to prevent a takeover.[2] In contrast, in the UK pension plans are not allowed to invest their assets in the shares of the sponsoring company, nor own assets that are related to the sponsoring company (e.g. the pension plan cannot own property that is rented out to the sponsoring company). Therefore, in our paper another mechanism is at work. Namely, the presence of a DB pension plan, particularly when running a large deficit, represents a source of risk for potential acquirers of the sponsoring firm's equity.

We also find an effect of pension plan variables on the means of payment in M&A activity. The theoretical work of Hansen (1987) and Fishman (1988) predicts that acquiring firms for which there are information asymmetries should use cash as the means of payment when acquiring other firms. This is because target firms will be reluctant to accept the shares of the acquirer as a means of payment. Consistent with this prediction, we find that firms that sponsor DB pension plans with larger deficits are more likely to use cash when they acquire other companies. This result lends support to the idea that information asymmetries related to company sponsored DB pension plans affect firms financial decisions.[3]

The remainder of the paper is structured as follows. In the remainder of this section we discuss related literature and we motivate our use of DB pension plans as a source of information asymmetries, and their implications for equity sales. We do so using an illustrative example that describes recent events related to a company in our sample. Section 2 describes the data that we use for our study, and it also includes a description of the methods used to determine the pension deficit. Our main results are presented and discussed in Section 3. Robustness checks are in Section 4. Section 5 concludes.

1.1 An Illustrative Example

The idea that we wish to investigate in this paper is simple but, we believe, important. The value of the equity of a firm that sponsors a DB pension plan depends on the value of its corporate

[2] The employees may be against a takeover since as Pontiff, Shleifer and Weisbach (1990) show DB pension plans are more likely to be terminated following hostile rather than friendly takeovers.

[3] It also complements the early evidence on the relation between means of payment and information asymmetries in Travlos (1987), Eckbo, Giammarino, and Heinkel (1990) and Franks, Harris and Titman (1991), and the more recent evidence provided by Moeller, Schlingemann and Stulz (2004), Officer (2007), and Raman, Shivakumar, and Tamayo (2008).

pension deficit (pension liabilities net of pension assets) relative to its market capitalization. Because of the complexity in evaluating the assets and liabilities in a pension plan, corporate insiders (managers and large shareholders) may have more information than the market about the true value of the pension deficit. As a consequence, investors may be reluctant to buy the firm's shares. This will affect the firm's ability to sell its equity, either in seasoned equity offerings or in M&A activity.

As an example of the relevance of corporate sponsored DB pension plans for SEOs and M&A activity we discuss recent events related to British Airways, which is one of the firms in our sample. In July 2008, British Airways (BA) and Iberia of Spain announced that they were planning to merge their operations, creating a £3.8 billion company that would benefit from Iberia's presence in Latin America and BA's market share in North America and Asia. Industry analysts believed the two companies to be a good "strategic fit," since there would be considerable cost savings generated by bringing their operations together.

However, in the months following the announcement of the all-share merger, discussions stalled on concerns about the size of BA's pension deficit and on stakes valuation. In March 2008, BA's pension deficit was £437 million, while BA's market capitalization had declined to £2 billion pounds. Later that year, BA admitted that on September 18 the trustees of the pension plan had calculated the deficit to be equal to £1.74 billion. Industry experts believed that the deficit might be even larger.

The size of the BA pension scheme deficit, and the large fluctuations in its value were a concern to Iberia, which by December 2008, after months of struggling to understand it, had hired Mercer, a pension consulting firm, to review BA's pension schemes. Fernando Conte, Iberia Chairman, said that unless Iberia could protect itself from the BA scheme, it would be "bonkers" to enter into a transaction where it was "on the hook" for it (The Daily Telegraph, 28 December 2008).

By February 2009 signs of difficulty in reaching a deal were apparent. Nick van den Brull, an analyst with BNP Paribas, said "I don't see anything happening before the pension deficit is known. Directors [at Iberia] would wish to know the maximum extent of the liabilities before proceeding." (The New York Times, 8 February 2009). It was this uncertainty, and the worry that it may be buying a *lemon*, that led Iberia, three months later, to propose that the merger contains a post-deal adjustment to account for BA's pension deficit. More precisely, Iberia proposed an all-share merger ratio that would be adjusted if the deficit widens because of such

things as increased longevity assumptions. However, BA fiercely resisted demands for such adjustment mechanism, believing it would be impossible to sell such an open-ended deal to its shareholders (The Daily Telegraph, 22 May 2009).

At the same time, British Airways' Chairman Martin Broughton was blaming the firm's spiralling pension scheme deficit on the processes employed by actuaries and accountants. "It's little wonder that the Spanish have such difficulty understanding [our pensions]. It's clearly time that the actuarial and the accounting world got together and recognized the folly of having mechanical processes in place that produce such divergent results, neither of which really seem in touch with reality." At the same time he called for an overhaul of the system to help BA shareholders and Iberia understand the situation (Pensions Week, 25 June 2009).

One month later BA acknowledged that due to the crisis it needed to increase liquidity, but at the same time its Chairman Martin Broughton ruled out a rights issue, arguing that it was not a good time for the firm to carry it out. This happened amid questions about the sustainability of the firm's business model, geared towards premium travelers, and the firm's pension deficit (Dow Jones Market Watch, 14 July 2009).

On November 12, after many months of discussions, BA and Iberia announced that they had reached a preliminary agreement for a merger expected to be completed in late 2010. Under its terms Iberia would take a 45% stake and BA a 55% stake. However, Iberia said it can pull out if BA fails to resolve its pension deficit problem (BBC news, 12 November 2009).

The BA example illustrates how concerns about the value of the company sponsored pension deficit, and information asymmetries regarding the value of this deficit, can affect M&A activity and the decision to issue equity. Although the events described suggest that there is such an effect for BA, the purpose of this paper is to find out how relevant such considerations are for a wider sample of firms. For that reason we have collected data for a large sample of UK firms.

1.2 Related Literature

There is a related literature that studies the effects of asymmetric information on equity issuance and M&A activity. Early contributions include Dierkens (1991) who shows that there are more negative abnormal returns associated with equity issues in firms with larger standard deviation of abnormal returns (associated with earnings announcements). Bayless and Chaplinsky (1994)

show that there are good and bad times to issue equity, depending on the companies recent performance, which is used as a proxy for the severity of asymmetric information. With respect to M&A activity, a recent contribution is Moeller, Schlingemann and Stulz (2007) who find that acquirer abnormal returns are negatively related to proxies for information asymmetry for the target company, including idiosyncratic stock return volatility.

More recently, Bharath, Pasquariello and Wu (2009), use market microstructure measures of stock liquidity to proxy for adverse selection, and they study their impact on leverage. Our measure of asymmetric information is the presence of (and the magnitude of the deficit in) corporate sponsored DB pension plans. A difference between the two papers is that they produce a high-frequency measure of asymmetric information while we suggest a low-frequency one.

Our results also add to a growing literature on the interdependence between various aspects of corporate financial policy and corporate pension plans. Coronado and Sharpe (2003) and Franzoni and Marin (2006) argue that the market price of the companies shares does not fully reflect the potential liabilities associated with underfunded pension plans. On the other hand, Jin, Merton and Bodie (2006) find that investors recognize pension assets and liabilities and incorporate them in determining the cost of equity capital for the sponsoring firms. Our results suggest that investors do understand and are worried about the value of the liabilities associated with company sponsored pension plans. This is because the deficit in the pension plans is difficult to determine, company insiders have better information about these deficits than the market, and they may also manipulate the assumptions used for the valuation of pension assets and liabilities (Bergstresser, Desai, and Rauh, 2006). Our contribution is to show that the sponsoring of a pension plan is a source of asymmetric information which constrains the sponsoring firm's ability to issue equity.

We would also like to acknowledge other papers that focus on several implications of company sponsored pension plans. Classical references include Treynor (1977) on the mechanics of DB pension plans, and Black (1980) and Tepper (1981) on the optimal asset allocation within pension plans. More recent papers focus on the decision to terminate a pension plan (Petersen, 1992), on the impact of pension liabilities on debt ratings (Carroll and Niehaus, 1998), on the relation between cash-flow volatility and pension liabilities (Petersen, 1994), and on how pension plan assets are invested (Frank, 2002, and Rauh, 2009). Finally Rauh (2006a) shows that mandatory pension contributions can affect the level of corporate investment due to financial

constraints.

2 The Data

In order to investigate the prediction that uncertainty and asymmetric information arising from company sponsored DB pension plans affect equity sales we use UK data on the Footsie 350 companies. To avoid survivorship bias, we select the Footsie 350 companies in 2002, the first year in our sample, as the universe of companies in our study, and we track them over time. We chose the Footsie 350 companies since company sponsored DB pension plans are more significant for larger firms. Among smaller companies, company sponsored DB pension plans tend to be less prevalent, and when they do exist they tend to cover a very limited number of employees. For this set of companies we collected data on firm and pension plan variables, SEOs and M&A activity for the 2002-2008 period.

We start our sample in the year 2002 since this is the first year in which pension data reported under the Financial Reporting Standards 17 (FRS 17) accounting rules has become widely available. FRS 17, which replaced SSAP 24, was introduced in 2000 but it only had to be applied in full after accounting periods ending on or after June 2003. Nonetheless, many companies already report such information in 2002, so that we have decided to start our sample in this year. We will discuss the rules in FRS 17 regarding pension valuation below, when we describe how we have obtained the pension data.

Our data comes from four different sources, which we now describe in detail.

2.1 Firm Data

For each of the firms in our sample we collect annual data, from 2002 to 2008, from Worldscope. On the assets side, we use the value of book assets, cash and other marketable securities and the value of power plant and equipment (PPE). On the liabilities, we focus on the book value of short and long term debt, and on the book value of equity. From the income statement we obtain data on the value of the earnings before interest and tax (EBIT). In addition to these accounting variables, we obtain, for each firm, data on its market capitalization at the end of the fiscal year.

We use this data to construct several variables that we use in the regression analysis. Profitability, or return on assets, is EBIT during the fiscal year divided by the beginning of period book value of the assets. Firm size is the logarithm of the value of total assets; the Market-to-book ratio is equal to the market value of equity over the book value of equity; Asset Tangibility is equal to the value of PPE over the value of the assets; Cash holdings is cash divided by total assets; and Financial leverage is equal to the value of short plus long term debt, divided by total assets. When variables are reported in US dollars (or Euros) we use end of month/fiscal year exchange rates to convert them into pounds. We winsorize all firm variables at the 1% level to take care of potential outliers.

In addition to the previously described variables we obtain for each firm/year a measure of share price volatility which is the standard deviation of the firm share price over the previous year, and a measure of closely held shares which is the proportion of shares that are held by corporate insiders (officers, directors, and their immediate families) and by individuals who own more than five percent of the firm shares.

2.2 Pension Data

We have hand-collected pension data from the footnotes of the annual reports. In the UK the accounting rules for company sponsored defined pensions are set by FRS 17 (Financial Reporting Standard 17). FRS 17, which replaced SSAP 24, was introduced in 2000. FRS 17 only had to be applied in full after accounting periods ending on or after June 2003. Relative to its predecessor, FRS 17 abandoned the use of actuarial values for assets in the pension scheme in favor of a market value based approach. Pension liabilities are projected for the future based on inflation, expected pension and salary growth, employee mobility, and longevity assumptions. Such liabilities are then discounted at the yield on an AA corporate bond. The pension deficit is calculated as the difference between the market value of the assets and the present value of the liabilities.

Accounting standards under FRS 17 are better than under than under its predecessor, since assets are valued at market values and a specific discount rate has to be used for the valuation of pension liabilities. Therefore, the assumed expected rate return on assets does not play any role in the determining the pension deficit, and unlike in the US, firms in the UK do not have flexibility with respect to the choice of the discount rate (see Bergstresser, Desai, and

Rauh, 2006). This is why we do not focus on these assumptions in our study. However, as our discussion of the British Airways example illustrated, even under FRS 17 there is considerable uncertainty with respect to what the actual deficit is, and to what the reported values really mean.

The deficit in a DB pension plan depends on the ages of the members of the pension plan, on whether they are active or deferred members, on the assumptions made regarding employee mobility, and on the assumptions made regarding current and future life expectancy. For example, there are a variety of assumptions that firms and their actuaries use to model mortality. In the UK, the most widely used tables are those produced by the Continuous Mortality Investigation Bureau (www.actuaries.org.uk), which were calculated using data on pensioners, i.e. those drawing pension annuities from pension schemes insured with life offices. Data on male and females is usually reported separately, and these tables analyze both lives and amounts. For males this results in the so called PMA tables (Pensioners Male Amounts). In order to produce these tables, mortality data is analyzed in 4-year periods. And new tables are produced every 12 years or so. More precisely, PMA80 which has base 1980 was produced by analyzing data from 1979 to 1982, PMA92 was produced with data from 1991 to 1994, and PMA00 was produced using data from 1999 to 2002.

Figure 1 plots conditional death probabilities for PMA80, PMA92, and PMA00, i.e. the probability that the individual will die between age t and $t+1$ conditional on being alive at age t. These tables assume that the individual will die at age 120 with probability one if he is still alive at that age. Figure 1 shows the improvements in survival probabilities that have occurred over the last couple of decades, reflected in the downward shift of the curve. In order to better illustrate what such different mortality assumptions imply in terms of the present value of the pension deficits, we have calculated the present value of an actuarially fair annuity that pays one pound in real terms per year as long as the individual is alive, and zero otherwise. We have calculated the value of such an annuity as of age 65, which is the typical retirement age.

The present value of an annuity using PMA80 and a real discount rate of 1% is 13.1 pounds. It increases to 15 pounds if one uses PMA92, and to 16.3 pounds for PMA00. That is to say: the present value of such an annuity, and of pension liabilities, is roughly 25% higher if one uses the most recent mortality tables instead of PMA80. Given that the average value of pension deficit, for the companies in our sample that sponsor a DB pension plan, is roughly 200 million pounds, this means that using PMA00 instead of PMA80 amounts to a difference of 50 million

pounds in pension liabilities.[4]

The value of the liabilities and of pension deficits also depends to a large extent on the assumptions made regarding future improvements in life expectancy. Figure 1 also plots PMA92 (C=2010) which assumes improvements in life-expectancy until 2010. The actuarially fair price of an annuity calculated at age 65 using PMA92 (C= 2010) is 11.5% higher than if one uses PMA92 (assuming a real discount rate of 1% and no real pension growth). This percentage difference becomes larger, equal to 14%, if one considers instead the present value of a pound, paid every year to an individual after he reaches age 65, and as long as he is alive, if the individual is currently 50 years of age. This is because there are more years ahead for the future assumed improvements in life expectancy to affect the present value of the annuity.

The pension deficit will also depend crucially on the assumptions made regarding future job mobility. Consider for example the case of an individual who is 50 years old and who has accumulated benefits equal to one real pound per year during retirement (after 65). The present value of such annuity is 12.03 pounds, assuming a real discount rate of 1% and using the PMA92 tables. That is, these calculations assume that there is no future real growth in the retirement benefits already earned, as it typically is the case for a deferred pension plan member, i.e. an individual who is entitled to benefits but who is no longer contributing to the scheme (may be because he/she no longer works for the company). If instead we assume that these annual pension benefits will grow at a real rate of 1% until age 65, their present value is 13.97 pounds. This will be the case for an individual who keeps on working for the company until retirement age, and whose salary increases at the real rate of 1% per year. The percentage difference in the values is equal to 16%. Thus, the assumptions made regarding employee mobility have a large impact on the value of the pension deficit.

We have done these calculations to illustrate the complexity behind the valuation of pension liabilities, and the large impact that alternative assumptions have on the value of pension deficits, which are a liability for the sponsoring company. Although FRS 17 specifies the discount rate to be used in the valuation of pension liabilities, and this information is disclosed in the footnotes to the annual reports, the assumptions made regarding mobility and longevity were not always made explicit during the period of analysis.[5]

[4] The values are an order of magnitude similar if one considers instead a real discount rate of 2%.

[5] The exception is that in the last two years, and especially in the last year of our sample, some firms disclose longevity assumptions in the footnotes to the annual report. We have collected this data, but due to its limited availability we have decided not to use it in our main empirical analysis. As a curiosity, in 2008 BA used pa92

A natural question to ask is why we focus our analysis on the period post introduction of FRS 17, if relative to its predecessor (SSAP 24), FRS 17 increased transparency in the valuation of pension assets and liabilities. One may reasonably argue that uncertainty and asymmetric information regarding pension deficits was higher prior to 2002. While we agree with this, it is also the case that prior to 2002 investors and company managers were much less aware of the potential burden that company sponsored DB plans represent. For this reason, we have decided to start the analysis in 2002, with the advantage that there are the same accounting rules in place throughout the sample.

2.3 SEO Data

We obtain data on Seasoned Equity Offerings (SEOs) from SDC platinum. The information we obtain includes the issuer, the issue date, the type of security (common shares, convertibles, or other) and the amount issued.

The firm financial information obtained from Worldscope and the pension data obtained from the footnotes to the companies reports have an annual frequency. In the SEO data each observation corresponds to an offering. Furthermore, there are instances of firms making more than one equity offering in the same fiscal year, albeit these different offerings tend to be small in terms of amount issued. In those instances we have decided to sum the amount of the different offerings. Since the fiscal year end differs across firms, the balance sheet information and pension data for year t is matched with information on the share offerings that take place in the 12 months that follow the fiscal year end.

We use the SEO data to construct four variables. The first variable is a dummy variable that takes the value of one if the firm issues equity in fiscal year $t+1$ and zero otherwise. That is we will try explain equity issuance in fiscal year $t+1$ based on firm and pension plan information for the previous fiscal year end, i.e. t. The second variable that we construct is the total amount of equity that the firm has issued in the fiscal year. We construct analogous variables using the issuance of common shares. More precisely, we construct a dummy variable that takes the

and pa00 to value the liabilities in their pension plans, NAPS and APS, respectively. It also reported that a one year increase in life expectancy would have increased the deficit by £150 million in NAPS and £120 million in NAPS, or a total of £270 million. This is to be contrasted with the market capitalization of BA which stood at roughly £2 billion.

value of one if the company issued common shares during year $t+1$ and zero otherwise, and a variable that is the sum of the total amount of common shares issued. These two variables exclude mainly the issuance of convertibles, which are an hybrid security. We scale the total amount issued during the fiscal year variables by the beginning of the year market value of the firm's equity.

2.4 M&A Activity Data

We collect data on M&A activity from SDC platinum. We collect data on events in which firms in our sample were the targets in M&A activity, and on events in which they were the acquirers. We use the former to investigate if the presence of DB pension liabilities affects the likelihood that the firm is the target of a takeover attempt, and the likelihood that the deal is completed. We use the latter to investigate whether target firms are reluctant to accept stock as a means of payment from a firm that sponsors a DB pension plan with a large pension deficit. Both of these seemed to be a concern in the merger discussions between Iberia and British Airways that we have described in Section 2.

More precisely, we collect information on whether the firms in our sample were, in each year, the target in a completed, withdrawn or rumored takeover deal. From this data, we create two dummies. One for the existence of some kind of M&A activity, and another for whether the deal was completed. Similarly to the SEO data, year $t+1$ data corresponds to M&A activity that take place in the 12 months following the year t fiscal year end. For the acquisitions carried out by the firms in our sample, we collect data on the means of payment used in these acquisitions. For each firm/year we compute the value-weighted proportion of the cash used in the acquisitions that were announced in the 12 months following the fiscal year end.

2.5 Summary Statistics

Table 1 reports summary statistics for the variables that we have constructed. Our sample has 1,463 observations, that correspond to 319 different firms. We have lost 31 firms out of the initial 350 because they do not have balance sheet information in Worldscope. The vast majority of these are investment funds. We use all 319 firms in the main regression analysis but we will also report regression results in which we exclude financial companies. Data is not

available for all years because in the first couple of years of our sample some of the firms do not report pension information under FRS 17. Moreover, some of the companies in our sample were acquired and/or taken private during the period analysis, so that we do not have information on them post-acquisition. Therefore, we use an unbalanced panel for our analysis.

Panel A of Table 1 reports summary statistics for firm variables. On average, firms in our sample have a return on assets equal to 8%, a market-to-book value of equity equal to 1.38, and leverage equal to 24%. The latter value increases to 27% when we include the deficit in the pension plan to calculate total leverage. For all of these variables there is considerable cross-sectional heterogeneity, as can be seen from the standard deviation, minimum and maximum values reported in the table. Roughly two-thirds of the firm-year observations that we have correspond to firms that sponsor a DB pension plan.

Panel B shows summary statistics for the pension deficit relative to the market value of the equity and relative to the market value of total assets (obtained by adding market capitalization and book debt) of the sponsoring company. Pension deficits are on average 4 percent of the company's assets, but there is significant variation across firms, with some firms having a surplus, while others have a deficit as high as one quarter of firm assets. Naturally, the variation is larger when we consider the value of the pension deficit as a fraction of the market capitalization of the sponsoring company, with values as high as 50%. There are also companies that have a surplus in the pension plan that they sponsor, with a maximum value of 13% of their market capitalization.[6]

Panel C shows summary statistics for the SEO variables. On average 8.72 percent of the firm/years in our sample have issued some form of equity. The average is slightly lower when we construct a dummy using the issuance of common shares. The average unconditional total proceeds are 1.1 percent of the value of the equity, but this value increases significantly, to 12.6 percent, when we condition the sample on those that did issue equity. In addition, there is significant variation across firms in terms of the amount issued, with some issuing an amount as high as 40 percent of their market capitalization.

The last panel of Table 1, Panel D, reports summary statistics for the variables related to M&A activity. There has been a takeover attempt for 9.17% of the firm/year observations in our sample, which corresponds to 134 attempts, and the takeover was completed for roughly

[6] In the UK companies are not allowed to take out the assets of the pension plans that have a surplus, although they could reduce their contributions.

one third of these attempts. In terms of acquisitions by the FTSE 350 companies in our sample, there were 499 firm/years for which at least one acquisition took place. Therefore, and as one would expect given that we study large companies, the companies in our sample are more likely to acquire others than to be the target in a takeover attempt. Interestingly, there is considerable variability in the means of payment used in these acquisitions. The weighted average proportion of cash used was 44%, and the standard deviation is an order of magnitude similar.

In Panel A of Table 2 we compare the companies that sponsor a DB pension plan to those that do not sponsor such a plan. The two sub-samples differ along many dimensions. Firms that sponsor a DB pension plan are on average larger, as measured by the logarithm of the total value of the assets. Furthermore, firms that sponsor are more profitable and more highly levered, both in terms of financial leverage and total leverage (inclusive of pension deficit). Shivdasani and Stefanescu (2009) also show, for a sample of US firms, that leverage ratios (inclusive of the pension deficit) are higher for firms that sponsor a pension plan than for those that do not do so. Not only firms that sponsor a DB pension plan are more highly levered, they also have lower cash holdings. The second part of Panel A of Table 2 shows the results for univariate tests for the SEO and M&A variables. Most of the variables are not statistically significant different across the two sub-samples. The exception being the likelihood that a firm in our sample is taken over, which is significantly lower for firms that sponsor a DB pension plan.

In Panel B of Table 2 we present similar univariate tests, but excluding financial companies from our sample. Some firm variables such as leverage are difficult to interpret for the latter. Interestingly, we find that non-financial firms which sponsor a DB pension plan are less likely to issue equity and the amount of equity issued is smaller. In addition, they are less likely to be the target in a takeover attempt and they are less likely to be taken over. The results in Table 2, although interesting, are univariate and it is important to control for firm characteristics such as size, profitability, and leverage, when studying the effects of the sponsoring of pension plans on equity issues and M&A activity. In order to do so we turn our attention to multivariate regressions.

Our analysis will focus on the likelihood of equity issuance and on the likelihood of being taken over rather than on the price at which the company is able to issue or the price at which the company is taken over. There are two reasons for this. First, the theory on trading in the presence of asymmetric information suggests that the effect of asymmetric information on

the likelihood of a trade or on quantities, may be more significant than on prices. The second reason is data limitations. The dataset that we use has information on the date of the equity issue, but not on the announcement date.

3 Regression Analysis

3.1 SEOs

In order to study the effects of the sponsoring of DB pension plans on the firm's decision to issue equity we estimate the following probit model:

$$S_{i,t+1} = \begin{cases} 0 \text{ if } \alpha + \beta X_{it} + \gamma \left(\text{DB Dummy}\right)_{it} + \delta \left(\text{Pension Deficit}\right)_{it} + \varepsilon_{it} \leq 0 \\ 1 \text{ if } \alpha + \beta X_{it} + \gamma \left(\text{DB Dummy}\right)_{it} + \delta \left(\text{Pension Deficit}\right)_{it} + \varepsilon_{it} > 0 \end{cases} \tag{1}$$

where $S_{i,t+1}$ is a dummy variable that takes the value of one if the firm decides to issue equity in year $t+1$ and zero otherwise, X_{it} is a vector of control variables, and $\varepsilon_{i,t+1}$ is the residual which is assumed to be $N(0,1)$. In these regressions the timing of the variables is such that t refers to variables measured at the fiscal year end, and $t+1$ refers to the decision to issue equity in the twelve calendar months following the fiscal year end. In order to facilitate the interpretation of the results, we report the estimated coefficients as the marginal effect on the dependent variable due to changes in the regressors.

We investigate the effects of two pension plan variables on the decision to issue equity, namely of DB $Dummy_{it}$ which is a dummy variable that takes the value of one if the firm sponsors a DB pension plan in year t and zero otherwise, and of $Pension\ Deficit_{it}$ which is the value of the pension deficit scaled by the firm's market capitalization. The first variable captures the difference between firms with and without DB pension plans. However, some firms with DB pension plans have very small plans and others run a surplus. Therefore, we also include in our regression the second variable ($Pension\ Deficit_{it}$), which allows for a differential effect for those companies that sponsor plans whose deficit is large relative to market capitalization. Although there may be considerable uncertainty with respect to the extent to which this reported deficit reflects the firm liability associated with the pension plan, such reported deficit can be a signal of the extent to which the sponsoring of the pension plan is a concern for the investors in the firm shares.

The control variables in this main specification include firm size, firm profitability (measured by ROA), cash holdings, and total leverage. It is important to remember that our measure of total leverage includes the value of the pension deficit, i.e. the pension deficit is treated as debt of the sponsoring firm and added to the firm financial leverage to obtain total leverage. Thus, the pension deficit variable in specification (1) captures the effects of pension liabilities on the decision to issue equity, beyond the effect that such liabilities have on the total leverage of the firm. We include year and industry fixed effects in all the regressions (but their coefficients are not reported). In the robustness section below, we will control for further variables.

The results are reported in Table 3. Below the estimated coefficients we report standard errors which are robust for heteroskedasticity and clustered at the firm level. Columns 1 and 2 report the estimation results for the full sample, whereas columns 3 and 4 report the estimation results when we exclude financial firms from the sample. For the full sample, the existence of a company sponsored DB pension plan does not affect the likelihood that equity is issued, but a large value of pension deficit relative to the market capitalization of the firm makes it less likely that the firm issues equity. This indicates that potential acquirers of firms with DB plans are only worried when the pension deficit is large compared with the firm's assets, as shown in Column 2.

The results are stronger when we restrict the sample to non-financial firms (as can be seen comparing Column 3 with Column 1). The sponsoring of a DB pension plan reduces the likelihood that the firm issues equity. This effect is statistically significant and economically meaningful: the probability of an equity issue is 4.23% lower for firms that sponsor a DB pension plan than for firms that do not do so. In Column 4, we include the pension deficit in addition to the dummy variable for the sponsoring of a DB pension plan. These results show that likelihood of equity issues is lower for firms whose pension plans have a large reported deficit, and that the effects do not arise simply because of the company sponsoring a DB pension plan.

Some of the control variables are significant as well. More precisely, we find that more leveraged firms are more likely to issue equity and more profitable firms, as measured by ROA, are less likely to issue equity. The first result may be due to the fact that SEOs are a way to reduce firm leverage; while the second finding is due to the fact that profitable firms do not need to raise as much external capital as less profitable ones. In the last two columns of Table 3 we report the estimation results when the dependent dummy variable for equity issues was constructed using the issuance of common shares only. These results confirm those in columns

1 and 2. There is little difference in the results as most firms issue common shares rather than preferred shares.

We also investigate the effects of the sponsoring of a DB pension plan on the total amount raised through SEOs. For these purpose, we estimate a tobit model:

$$y_{i,t+1} = \begin{cases} 0 \text{ if } \alpha + \beta X_{it} + \gamma \left(\text{DB Dummy}\right)_{it} + \delta \left(\text{Pension Deficit}\right)_{it} + \eta_{i,t+1} \leq 0 \\ \alpha + \beta X_{it} + \gamma \left(\text{DB Dummy}\right)_{it} + \delta \left(\text{Pension Deficit}\right)_{it} + \eta_{i,t+1} \text{ otherwise} \end{cases} \tag{2}$$

where the dependent variable $y_{i,t+1}$ are the total proceeds from SEO issues by firm i in year $t+1$ and the independent variables are the same as in specification (1). The results are shown in Table 4. The first four columns show the results for the total proceeds for the full sample and for the sample excluding financial firms. The last two columns report the results for the total proceeds of common share issues. The results in terms of quantities mirror those for the decision to issue equity shown in Table 3. For instance, for the sample of non-financial firms we find that firms that sponsor a DB pension plan are less likely to raise large amounts through equity issues, a result driven by those firms that have a large pension deficit relative to their market capitalization.

Thus these results indicate that firms that sponsor DB pension plans, and in particular those that sponsor pension plans with a large deficit, are less likely to issue equity and to raise significant amounts of capital via SEOs. This result is consistent with the view that DB pension plans represent a source of asymmetric information for the sponsoring firms.

3.2 M&A Activity: Target Firms

We turn our attention to the effects of the sponsoring of DB pension plans on M&A activity, another setting in which companies sell their shares, now to other companies. We consider the effects on two different dependent variables. The first is a dummy variable that takes the value of one if there is a rumor that the company that sponsors the pension plan is the target of takeover activity and zero otherwise. The second is a dummy variable that takes the value of one if the company is successfully acquired, and zero otherwise. The timing of the variables is similar to that for the SEOs. That is we study M&A activity in fiscal year $t+1$ using end of fiscal year t variables. In addition, and as before, we control for year and industry fixed effects, and we report standard errors which are robust for heteroskedasticity and which are clustered at the firm level.

To study the effects of the sponsoring of DB pension plans on the likelihood of a takeover, we estimate the a probit model similar to (1) but where the dependent variable, $T_{i,t+1}$, is a dummy variable that takes the value of one if the firm is a target of a takeover in year $t+1$ and zero otherwise. We consider two alternative measures of takeover activity: as the first indicator, we consider all attempted (and even simple rumored) takeovers; as the second measure, we consider only completed takeovers. The independent variables are the same as in specification (1). As before, we report the estimated coefficients as the marginal effect on the dependent variable due to changes in the regressors.

The results of these probit regressions are shown in Panel A of Table 5. The first two columns show that firms that sponsor a DB pension plan with a large deficit relative to their market capitalization are less likely to be the target in a takeover attempt. Furthermore, the results in Column 3 show that companies that sponsor a DB pension plan are less likely to be acquired. The effect is economically significant as the probability of a completed takeover drops by 2% for firms that sponsor DB pension plans. This effect is economically very large as the average probability of completed takeover is 3.6%, as shown in Table 1.

This effect arises mainly from those companies for which the pension plan that they sponsor has a large deficit relative to the market capitalization (Column 4). It is important to note that this is result is not simply due to the companies that sponsor pension plans with a larger deficit having higher leverage, since we control for a leverage measure (Total leverage) that treats the pension deficit as leverage.

The results for whether the firm is acquired are also significant when we condition the sample on a takeover attempt. More precisely, conditional on being the target of takeover attempt, firms that sponsor a DB pension plan are less likely to be acquired (roughly one third less likely, Column 5 of Table 5), and particularly so if the pension deficit is large relative to their market capitalization (column 6). This may be because acquiring firms are worried about the presence of the company sponsored DB pension liabilities, and that they may be buying a *lemon*.

We also estimate regressions similar to those in Panel A of Table 5, but excluding financial firms from the sample. The results are reported in Panel B. As can be seen from this panel the effects of the sponsoring of DB pension plan on M&A activity are stronger for this subsample of firms. The probability of being the target of a takeover attempt (of a completed deal) is 5.6% lower (4.3% lower) for firms that sponsor a DB pension plan, as can be seen from column 1 (column 3). These results support the idea that DB pension plans are a source of asymmetric

information for potential acquirers.

3.3 M&A Activity: Acquiring Firms

If due to the presence of company sponsored DB pension plans, buyers of the firm shares are worried that they may be buying a lemon, when the acquiring firm sponsors such plan, then target shareholders may be reluctant to accept the acquiring firm's shares as a means of payment. With this in mind we study the choice of the means of payment in acquisitions. The dependent variable is the proportion of cash used in acquisitions by the Footsie 350 firms in our sample in fiscal year $t+1$, which we can compute only for firms in our sample that carry out at least one acquisition in that year. We use a Tobit model to estimate the effects of the pension plan variables on the means a payment, and as before control for year and industry fixed effects.

For these purpose, we estimate a tobit model similar to the one in (2 but where the dependent variable, $c_{i,t+1}$, is the proportion of cash used in the acquisitions completed by firm i in year $t+1$. Interestingly, in Column 2 we find that firms that sponsor a DB pension plan with a large deficit are more likely to use cash as a means of payment in acquisitions. In Column 4, we show that the results are robust to the exclusion of financial companies. However, as shown in columns 1 and 3 we find no effect of the presence of DB pension plans by itself: what matters is the size of the DB pension deficit relative to the firm's market capitalization. As for the previously reported results, this finding may be due to the sponsoring of a DB pension plan being a source of asymmetric information.

4 Robustness

4.1 Additional Control Variables

In the main analysis we have controlled for firm size, profitability, cash holdings, and total firm leverage. In this section we investigate the robustness of our results to the inclusion of additional control variables that may affect the decision to issue equity and/or M&A activity. Specifically, the decision to raise equity may be associated with: (i) higher valuation (as proxied by the market to book ratio), as argued by a large finance literature starting with Marsh (1982);

(ii) lower debt capacity (as proxied by lower asset tangibility, and profitability), as argued by the trade-off theory (see Mackie-Mason, 1990); and (iii) asymmetric information due to other sources than the DB pension plans (as proxied by higher stock price volatility, and lower ownership concentration), as argued by Mackie-Mason (1990) and Dierkens (1991).

Similarly, the likelihood of a takeover decreases with: (i) higher market to book ratio, as argued by Servaes (1991); (ii) lower cash holdings, as argued by Jensen (1986); and (iii) asymmetric information from sources other than DB pension plans (as proxied by higher stock price volatility, and lower ownership concentration), as argued by Moeller, Schlingemann, and Stulz (2007). The use of cash in acquisitions may also be affected by asymmetric information problems unrelated to the sponsoring of a DB pension plan.

In Table 7 we show the estimation results for five different specifications which include these additional control variables. The dependent variables are: the SEO dummy in Column 1; SEO Proceeds in Column 2; Takeover Chance dummy in Column 3; Completed Takeover dummy in Column 4; and proportion of Cash used in acquisitions in Column 5. We estimate a probit model in columns 1, 3 and 4, and a Tobit model in columns 2 and 5. The results on the effects of the pension variables on equity issuance and M&A activity are robust to the inclusion of these control variables.

However, the interpretation of the coefficients on the control variables is difficult as some of the variables are likely to highly correlated among themselves. The only clear findings are that firms with closely held shares are more likely to issue equity. This may be because information asymmetries are less severe for firms with large shareholders. Larger firms and firms with large share price volatility are less likely to be acquired.

Taken together our results show that firms with large DB pension plans are less likely to sell equity to investors. This happens in a variety of different situations, namely in SEOs, as a target in M&A activity, and when choosing the means of payment in acquisitions of other firms. It is striking to see that the effects of the presence of a company sponsored DB pension plan, in particular if it has a large deficit, are consistent across all these different situations. Although, there may be alternative explanations for each separate finding, asymmetric information induced by the presence of DB pension plans is an explanation for all of them: prospective equity investors in a firm sponsoring a DB pension plan may be deterred from acquiring shares because they are worried that they may be buying a lemon.

4.2 Alternative Explanation

An alternative (and complementary) explanation for the reason why companies with DB pension plans are less likely to be taken over is the possibility that trustees of the pension plan demand that potential acquirers make significant cash contributions to the plan. Trustees may be particularly concerned when the acquirer is financing the acquisition with debt as it happens in Leveraged Buyouts (LBOs). In this case, we would expect that private equity investors are less likely to complete successfully a takeover of a firm with a DB pension plan, compared to firms without DB plans. We have investigated whether this is the case.

In our sample, there are 28 firms that are targeted by private equity investors, with 12 of these attempted takeovers being successful. We find that firms with DB pension plans are equally likely to be targeted by a private equity investor than firms without a DB plan. When we look at the probability that a successful takeover of a firm with a DB pension plan, conditional on being attempted, we find no significant difference between LBOs and other acquirers: the probability that LBO deals of firms with DB pension plans are completed is 33%, while the probability that deals by other acquirers are completed is 27%. Therefore, we do not find evidence in favor of this alternative explanation.

5 Conclusion

In this paper we provide evidence that asymmetric information affects corporate finance choices using data on corporate-sponsored DB pension plans. The idea behind our analysis is that firms that sponsor DB pension plans are subject to greater informational asymmetry than similar firms that do not sponsor such plans. The shortfall between the market value of pension assets and the present value of the pension liabilities is a liability for the sponsoring firm. Evaluating pension liabilities is very complex since it requires detailed information on the workforce, their age composition, their salaries, their mortality risk, their wage growth, and many other variables. Because of this complexity, the sponsoring firm's managers are likely to enjoy and informational advantage with respect to the market.

If indeed firms that sponsor DB pension plans face greater asymmetric information we would expect investors to be more reluctant to buy the equity of these firms, since they may be buying a *lemon*. We find evidence in favor of this prediction. Specifically, we show that firms that

sponsor DB pension plans (particularly when they have large deficits) are less likely to engage in seasoned equity offers, are less likely to be taken over, and are more likely to use cash when they acquire other firms or assets. These findings are supportive of the prediction that these firms face greater asymmetric information and therefore are less likely to sell equity to outsiders. These results are new evidence that DB pension plans affect financial and economic decisions of sponsoring firms.

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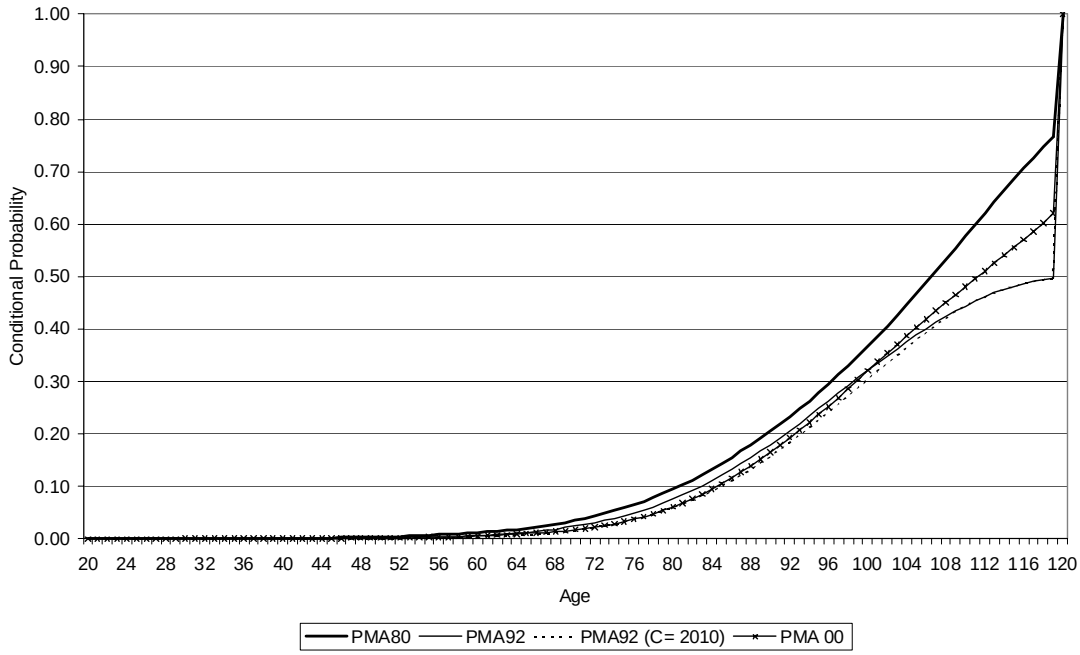

Figure 1: The figure plots the conditional death probabilities for different sets of mortality assumptions. PMA80 reflects the mortality probabilities calculated using data for 1979-1982, PMA92 does the same for 1991-1994 data, and PMA00 for 1999-2002 data. PMA92 (C=2010) is based on the PMA92 data but it assumes improvements in life-expectancy up to 2010.

Table 1. Summary statistics

This table shows summary statistics. Panel A lists the firm-level variables (from Worldscope): Return on Assets, which is equal to EBIT over total assets; Financial Leverage, which is defined as short plus long term debt divided by total assets; Total leverage, which is defined as short plus long term debt, plus the value of the pension deficit divided by total assets; Cash Holdings, which is the value of cash holdings as a fraction of total assets; firm size which is equal to the log of total assets; Market-to-Book ratio, which is the ratio of market value of equity over book value of equity; Defined Benefit dummy, which takes value 1 if a firm has a DB pension plan; Asset Tangibility, which is equal to the value of PPE over total assets; Price Volatility is the volatility of the company's share price over the previous year; and Closely Held shares is the proportion of the firm shares which are closely held. Panel B lists DB pension plan data (from annual reports): Pension deficit is scaled by total assets or by the market value of the equity of the sponsoring company. Panel C presents the SEO data (from SDC Platinum): SEO dummy takes value 1 if the firm has issued any form of equity in year t and zero otherwise; SEO Common Shares dummy takes value 1 if the company issued common shares during year t and zero otherwise; SEO Total Proceeds is the total amount of equity that the firm has issued in the same year as a fraction of the market capitalization at the beginning of the year; SEO Common Shares Proceeds is the total amount issued in common shares scaled by the market value of the firm's equity. Panel D reports the M&A variables (from SDC Platinum): Takeover Chance is a dummy variable that takes value 1 if there was an attempted, completed takeover or rumors of a possible takeover and 0 otherwise; Completed Takeover is a dummy variable takes value 1 if there was a completed takeover and 0 otherwise; and Acquisition Cash is the proportion of cash used in acquisitions, provided that at least one acquisition was announced in a given year.

Panel A: Firm variables

Variable	Mean	Median	Std Dev	Min	Max	No Obs.
Return on Assets	0.0843	0.0782	0.0948	-0.2578	0.3766	1463
Financial Leverage	0.2442	0.2178	0.1867	0	0.9144	1463
Total Leverage	0.2721	0.2586	0.1933	-0.0519	0.9814	1463
Cash Holdings	0.0751	0.0438	0.0863	0	0.4176	1463
Firm Size	14.2674	14.0509	1.4636	11.5193	19.6562	1463
Market to Book Ratio	1.3822	1.1193	1.0991	0.024	6.3801	1463
Defined Benefit Dummy	0.6609	1	0.4735	0	1	1463
Asset Tangibility	0.299	0.1929	0.2887	0	0.9602	1375
Price Volatility (%)	28.1946	26.595	8.9562	13.23	56.45	1328
Closely Held Shares (%)	15.9185	11.165	18.3832	0.01	74.81	1449

Panel B: Pension plan variables

Variable	Mean	Median	Std Dev	Min	Max	No Obs.
Pension deficit/total assets	0.0407	0.0194	0.0616	-0.0519	0.2821	967
Pension deficit/market cap	0.0512	0.021	0.0929	-0.1303	0.4901	967

Panel C: SEO variables

Variable	Mean	Median	Std Dev	Min	Max	No Obs.
SEO dummy	0.0872	0	0.2822	0	1	1463
SEO Common shares dummy	0.0853	0	0.2794	0	1	1463
SEO total proceeds	0.011	0	0.0519	0	0.4158	1463
SEO common shares proceeds	0.0104	0	0.0496	0	0.4037	1463

Panel D: M&A activity variables

Variable	Mean	Median	Std Dev	Min	Max	No Obs.
Takeover Chance	0.0917	0	0.2886	0	1	1463
Completed Takeover	0.0359	0	0.1861	0	1	1463
Acquisition Cash	0.4446	0.3371	0.4462	0	1	499

Table 2: Univariate Tests

This table reports the means for firms with and without DB pension plans, and t-tests on the differences between these means for most of the variables presented in Table 1: Return on Assets, Financial Leverage, Total Leverage, Cash Holdings, Firm Size, SEO dummy, SEO Ord Shares dummy, SEO Total Proceeds, SEO Ord Shares Proceeds, Takeover Chance, Completed Takeover, and Acquisition Cash. The latter variable is defined only if the firm announce at least one acquisition in a given year. Hence, the number of observations reported refers to all variables but Acquisition Cash, for which the total number of observations is 499 in Panel A, and 412 in Panel B.

Panel A: Complete sample.

	With DB Pension Mean	Without DB Mean	T-test p-value
ROA	0.0908	0.0629	0.000
Financial Leverage	0.2677	0.1991	0.000
Total Leverage	0.3084	0.1991	0.000
Cash Holdings	0.0685	0.0878	0.000
Firm Size	14.870	13.449	0.000
SEO Dummy	0.0909	0.0797	0.455
SEO Ord Shares Dummy	0.0880	0.0797	0.575
SEO Total Proceeds	0.0110	0.0108	0.938
SEO Ord Shares Proceeds	0.0105	0.0100	0.836
Takeover Chance	0.0939	0.0873	0.669
Completed Takeover	0.0261	0.0550	0.004
Acquisition Cash	0.440	0.467	0.693
Observations	967	496	1463

Panel B: Financials Excluded.

	With DB Pension Mean	Without DB Mean	T-test p-value
ROA	0.1001	0.0933	0.288
Financial Leverage	0.2706	0.2156	0.000
Total Leverage	0.3188	0.2156	0.000
Cash Holdings	0.0710	0.1211	0.000
Firm Size	14.564	13.229	0.000
SEO Dummy	0.0692	0.1164	0.013
SEO Ord Shares Dummy	0.0656	0.1164	0.001
SEO Total Proceeds	0.0081	0.0169	0.012
SEO Ord Shares Proceeds	0.0076	0.0157	0.017
Takeover Chance	0.0948	0.1418	0.029
Completed Takeover	0.0292	0.0945	0.000
Acquisition Cash	0.465	0.468	0.969
Observations	823	275	1098

Table 3: SEO Decision

This table presents estimations from probit regressions of SEO decisions on the DB Pension dummy and the Pension Deficit (scaled by market capitalization). Control variables are Firm Size, Total Leverage, Cash Holdings, and ROA. The dependent variable is SEO dummy in Columns 1, 2, 3 and 4; and the SEO Common shares dummy in Columns 5 and 6. All variables are defined in Table 1. The whole sample is used in Columns 1,2, 5 and 6; financial firms are excluded from the regressions in Columns 3 and 4. The standard errors in brackets are heteroskedasticity robust and clustered at the firm level. *, **, ***, indicates significance at the 10%, 5% and 1% respectively. Year and industry fixed effects included (but their coefficients are not reported).

Dep variable:	SEO Dummy		SEO Dummy		SEO Ord Dummy	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Size	0.0091	0.0091	0.0049	0.0049	0.0084	0.0084
	[0.0057]	[0.0059]	[0.0059]	[0.0062]	[0.0056]	[0.0057]
Total Leverage	0.0978**	0.1154***	0.1023**	0.1240***	0.1005***	0.1165***
	[0.0381]	[0.0377]	[0.0437]	[0.0438]	[0.0369]	[0.0366]
Cash Holdings	0.1174	0.1378*	-0.0009	0.0249	0.1176	0.1366*
	[0.0807]	[0.0766]	[0.0902]	[0.0872]	[0.0789]	[0.0751]
ROA	-0.2232***	-0.2552***	-0.2620***	-0.2824***	-0.2203***	-0.2507***
	[0.0842]	[0.0850]	[0.0802]	[0.0816]	[0.0815]	[0.0826]
DB Dummy	0.0075	0.0165	-0.0423*	-0.0281	0.0064	0.0148
	[0.0209]	[0.0205]	[0.0287]	[0.0289]	[0.0205]	[0.0201]
Pension Deficit		-0.2615**		-0.2009*		-0.2413**
		[0.1185]		[0.1094]		[0.1146]
Sample:	Full	Full	No Fin	No Fin	Full	Full
Observations	1463	1463	1098	1098	1463	1463
Pseudo R^2	0.091	0.100	0.114	0.122	0.093	0.102

Table 4: Proceeds from SEOs

This table presents estimations from tobit regressions of SEO decisions on the DB Pension dummy and the Pension Deficit scaled by market capitalization. Control variables are Firm Size, Total Leverage, Cash Holdings, and ROA. The dependent variables are SEO Total Proceeds in Columns 1-4; and the SEO Common shares proceeds in Columns 5-6. All variables are defined in Table 1. The whole sample is used in Columns 1-2 and 5-6; financial firms are excluded from the regressions in Columns 3 and 4. The standard errors in brackets are heteroskedasticity robust and clustered at the firm level. *, **, ***, indicates significance at the 10%, 5% and 1% respectively. Year and industry fixed effects included (but their coefficients are not reported).

Dep variable:	SEO Total Proceeds		SEO Total Proceeds		SEO Ord Proceeds	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Size	0.0092	0.0095	-0.004	-0.0036	0.0083	0.0086
	[0.0114]	[0.0114]	[0.0142]	[0.0141]	[0.0112]	[0.0112]
Total Leverage	0.2393***	0.2849***	0.2749***	0.3349***	0.2462***	0.2883***
	[0.0704]	[0.0715]	[0.0918]	[0.0944]	[0.0694]	[0.0705]
Cash Holdings	0.2115	0.2655	-0.0383	0.0317	0.1983	0.2488
	[0.1655]	[0.1650]	[0.1912]	[0.1911]	[0.1628]	[0.1624]
ROA	-0.5565***	-0.6392***	-0.6671***	-0.7278***	-0.5295***	-0.6075***
	[0.1625]	[0.1655]	[0.1761]	[0.1783]	[0.1596]	[0.1626]
DB Dummy	0.0204	0.0434	-0.0861*	-0.0568	0.0179	0.0394
	[0.0383]	[0.0385]	[0.0466]	[0.0471]	[0.0375]	[0.0378]
Pension Deficit		-0.6386***		-0.5326**		-0.5942***
		[0.2161]		[0.2199]		[0.2112]
Sample:	Full	Full	No Fin	No Fin	Full	Full
Observations	1463	1463	1098	1098	1463	1463
Pseudo R^2	0.125	0.142	0.165	0.180	0.129	0.144

Table 5: Likelihood of a Takeover

This table presents estimations from probit regressions of M&A Activity on the DB Pension dummy and the Pension Deficit scaled by market capitalization. Control variables are Firm Size, Total Leverage, Cash Holdings, and ROA. The dependent variables are the Takeover chance dummy in Columns 1 and 2; and the Completed takeover dummy in Columns 3 to 6. All variables are defined in Table 1. The whole sample is used in Columns 1-4; only the firms/years with Takeover Chance = 1 are included in Columns 5 and 6. The standard errors in brackets are heteroskedasticity robust and clustered at the firm level. *, **, ***, indicates significance at the 10%, 5% and 1% respectively. Year and industry fixed effects included (but their coefficients are not reported).

Panel A: Complete sample.

Dep variable:	Takeover Chance		Completed Takeover		Completed Takeover	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Size	0.0051	0.0048	-0.0014	-0.0016	-0.0693	-0.0667
	[0.0058]	[0.0058]	[0.0019]	[0.0016]	[0.0449]	[0.0468]
Total Leverage	-0.0317	-0.0177	-0.0006	0.0056	0.1243	0.2169
	[0.0418]	[0.0422]	[0.0138]	[0.0125]	[0.2341]	[0.2401]
Cash Holdings	-0.0664	-0.0523	-0.0672***	-0.0552**	-0.7604	-0.634
	[0.0869]	[0.0865]	[0.0258]	[0.0244]	[0.6494]	[0.6437]
ROA	-0.135	-0.1550*	-0.0379	-0.0405	-0.9247*	-0.9502*
	[0.0856]	[0.0856]	[0.0261]	[0.0255]	[0.4942]	[0.4958]
DB Dummy	-0.0135	-0.0055	-0.0193**	-0.0112	-0.3615**	-0.2858*
	[0.0212]	[0.0205]	[0.0089]	[0.0078]	[0.1480]	[0.1525]
Pension Deficit		-0.1808*		-0.1076**		-2.1964*
		[0.0937]		[0.0464]		[1.1327]
Sample:	Full	Full	Full	Full	Takeover Chance = 1	
Observations	1463	1463	1256	1256	125	125
Pseudo R^2	0.092	0.095	0.158	0.173	0.306	0.332

Panel B: Financials excluded.

Dep variable:	Takeover Chance		Completed Takeover		Completed Takeover	
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Size	0.0038	0.0034	-0.0039	-0.0038	-0.1153**	-0.1152**
	[0.0078]	[0.0077]	[0.0026]	[0.0024]	[0.0564]	[0.0577]
Total leverage	-0.0215	-0.0027	0.0097	0.0172	0.3159	0.4069
	[0.0589]	[0.0601]	[0.0228]	[0.0213]	[0.2877]	[0.3130]
Cash Holdings	-0.2265**	-0.2058*	-0.1389***	-0.1159***	-0.9523	-0.8265
	[0.1144]	[0.1139]	[0.0445]	[0.0416]	[0.8251]	[0.8232]
ROA	-0.2037*	-0.2235**	-0.0526	-0.0553	-0.9789*	-0.9741*
	[0.1044]	[0.1045]	[0.0405]	[0.0379]	[0.5457]	[0.5462]
DB Dummy	-0.0561*	-0.043	-0.0430**	-0.0276*	-0.4450**	-0.3863**
	[0.0312]	[0.0299]	[0.0203]	[0.0158]	[0.1782]	[0.1870]
Pension deficit		-0.2047*		-0.1357**		-1.7221
		[0.1137]		[0.0545]		[1.1840]
Sample:	No Fin	No Fin	No Fin	No Fin	Takeover Chance = 1	
Observations	1098	1098	942	942	107	107
Pseudo R^2	0.088	0.092	0.154	0.165	0.329	0.344

Table 6: Means of Payment in Acquisitions

This table presents estimations from tobit regressions of the proportion of cash used in acquisitions. Control variables are Firm Size, Total Leverage, Cash Holdings, and ROA. All variables are defined in Table 1. The dependent variable is Acquisition Cash, which measures the proportion of cash used in acquisitions by a given firm in a given year. Only the firms/years that announce an acquisition are included in the sample. Financial firms are excluded from the regressions in Columns 3 and 4. The standard errors in brackets are heteroskedasticity robust and clustered at the firm level. *, **, ***, indicates significance at the 10%, 5% and 1% respectively. Year and industry fixed effects included (but their coefficients are not reported).

	(1)	(2)	(3)	(4)
Firm size	-0.1804***	-0.1639***	-0.2280***	-0.2112***
	[0.0538]	[0.0536]	[0.0584]	[0.0584]
Total leverage	0.0783	-0.1665	0.2016	-0.055
	[0.3895]	[0.4006]	[0.4169]	[0.4338]
Cash holdings	0.4223	0.2078	0.6947	0.5116
	[0.8351]	[0.8337]	[0.8626]	[0.8619]
ROA	1.4106*	1.6800**	1.6982**	1.9086**
	[0.7965]	[0.8026]	[0.7986]	[0.8048]
DB dummy	0.0592	-0.0736	0.1869	0.0786
	[0.2088]	[0.2142]	[0.2216]	[0.2264]
Pension deficit		2.2866**		1.8725**
		[0.9224]		[0.9126]
Sample:	Full	Full	No Fin	No Fin
Observations	471	471	412	412
Pseudo R^2	0.042	0.048	0.048	0.053

Table 7: Robustness

This table presents regression estimates of the SEO decision and M&A Activity on the DB Pension dummy and the Pension Deficit scaled by market capitalization. Control variables are Firm Size, Total Leverage, Cash Holdings, ROA, Market to Book ratio, Tangibility (PPE over total assets), Price volatility, and Closely Held shares. The dependent variables are the SEO dummy in Column 1, SEO Proceeds in 2, Takeover Chance in 3, Completed Takeover in 4, and Acquisition Cash in Column 5. A probit model is estimated in Columns 1, 3 and 4; a Tobit model in Columns 2 and 5. The standard errors in brackets are heteroskedasticity robust and clustered at the firm level. *, **, ***, indicates significance at the 10%, 5% and 1% respectively. Year and industry fixed effects included (but their coefficients are not reported).

Dep variable:	SEO dummy	SEO proc.	T. Chance	Competed T.	Acq. Cash
	(1)	(2)	(3)	(4)	(5)
Firm Size	0.0063	0.0061	0.0054	-0.0032*	-0.1701***
	[0.0049]	[0.0131]	[0.0059]	[0.0017]	[0.0592]
Total Leverage	0.1356***	0.3549***	0.0079	0.009	-0.049
	[0.0382]	[0.0901]	[0.0444]	[0.0113]	[0.5408]
Cash Holdings	-0.058	-0.2067	-0.1981**	-0.0635**	0.6678
	[0.0822]	[0.2355]	[0.0970]	[0.0262]	[0.9952]
ROA	-0.0819	-0.2221	-0.2007*	-0.0775**	2.0211
	[0.0932]	[0.2179]	[0.1092]	[0.0329]	[1.3007]
Market to Book	-0.0115	-0.0299*	-0.0112	-0.0011	-0.0547
	[0.0075]	[0.0176]	[0.0082]	[0.0021]	[0.0940]
Asset tangibility	-0.0193	-0.0747	-0.0159	-0.0048	-0.1438
	[0.0239]	[0.0557]	[0.0281]	[0.0061]	[0.3085]
Price volatility	0.0011	0.003	0.0002	-0.0005**	-0.0071
	[0.0008]	[0.0020]	[0.0010]	[0.0003]	[0.0093]
Closely held sh	0.0008**	0.0019**	-0.0001	-0.0001	0.0022
	[0.0004]	[0.0009]	[0.0004]	[0.0001]	[0.0043]
DB dummy	0.0126	0.0401	-0.0323	-0.0086	0.023
	[0.0175]	[0.0450]	[0.0238]	[0.0069]	[0.2375]
Pension deficit	-0.1713*	-0.4524*	-0.2079**	-0.0996**	2.6230**
	[0.0985]	[0.2329]	[0.0985]	[0.0394]	[1.1175]
Estimation method	Probit	Tobit	Probit	Probit	Tobit
Observations	1236	1236	1236	1047	426
Pseudo R^2	0.115	0.156	0.107	0.222	0.048