Corporate Pension Plans as Takeover Deterrents

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I Introduction

There has recently been an increased interest in corporate sponsored pension plans and how their existence affects firms' real (investment) and financial decisions. Our paper contributes to this literature by showing that defined-benefit (DB) pension liabilities discourage potential bidders from acquiring the sponsoring companies. More precisely we use United Kingdom (UK) data to show that firms that sponsor DB pension plans are less likely to be targeted in an acquisition, particularly when they have a large pension deficit relative to the market value of their equity. Moreover, conditional on an attempted acquisition, completion is less likely if the target firms sponsor a DB pension plan.

The explanation that we propose is that the presence of DB pension plans, particularly those with a large deficit, represents a source of risk for potential acquirers, which deters them from bidding for such firms.[1] 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 depends on the risk of the pension plan liabilities, 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 is why DB pension plans may act as a takeover deterrent: potential acquirers of the company shares may be worried that they are buying a *lemon*. Hence, they may need to invest a lot in due diligence before doing a deal and, if they are not willing to do so, adverse selection in the market for equity may lead to a market breakdown.

[1]The pension plans that we study are not allowed to own shares of the sponsoring company, or any other assets that are related to it (e.g. the pension plan cannot own property that is leased out to the sponsoring company). Furthermore, we are not arguing that firms adopt DB pension plans for the explicit purpose of fending off hostile takeovers. DB pension plans were set up decades ago mainly as a form of labor compensation to provide employees with income after retirement. What we show is that an unintended consequence of DB pension plans is that firms that have them are less likely to be taken over.

In an M&A setting in which asymmetric information exists, the medium of exchange can facilitate the transaction. The model of Eckbo, Giammarino, and Heinkel (1990) predicts that acquiring firms subject to 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 in exchange for their own shares.[2] If DB pension plans increase asymmetric information problems, sponsoring firms should be more likely to use cash as a means of payment in acquisitions. Furthermore, the announcement of a cash acquisition would be a positive signal, and be reflected on positive announcement returns. We test these predictions on our data and find that indeed firms with DB pension plans (particularly when they have large deficits) are more likely to use cash when they acquire other companies, and that the announcement of a cash acquisition has positive abnormal returns. These announcement effects provide strong support for our explanation that information asymmetries related to company sponsored DB pension plans affect firms' decisions.

It is important to note that all our results are robust to controlling for a measure of firm leverage, that treats the pension deficit as debt for the sponsoring company. Hence, they are not due to debt overhang and the fact that companies that sponsor DB pension plans tend to be more highly levered (Shivdasani and Stefanescu (2010)). We also show that our results hold when we control for measures of asymmetric information that may arise from sources other than the pension plan. Finally, and to further test the asymmetric information hypothesis, we analyze one other economic settings in which it may have an impact, namely the decision to raise equity through Seasoned Equity Offerings (SEOs). If our hypothesis is correct then firms that sponsor a DB pension plan should be less likely to raise equity.[3]

[2]For evidence on the relation between means of payment and information asymmetries see 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).

[3]Diekerns (1991) has shown that the presence of asymmetric information (proxied by the standard deviation of abnormal returns) makes it more difficult for firms to raise outside equity. Bayless and Chaplinsky (1994) have shown 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.

Interestingly, we find that firms that this is the case.

The data that we use for our study is from the UK. There are three main reasons why we have used this data. First, unlike in many other countries, in the UK pension plans are prevented from investing in the shares of the sponsoring company. Second, there is large variation with respect to the size and deficit of company sponsored DB pension plans. About two-thirds of the companies in our sample sponsor DB pension plans, and within the latter group the value of the pension deficit relative to the market value of the firms' equity ranges from 49 percent to −13 percent. Third, accounting rules require firms to disclose the market value of the pension assets and other pension data in the footnotes to the companies' annual reports. We hand-collected this data and combined it with firm-level information from Worldscope, SEOs and M&A activity data from SDC Platinum, and share price data from Datastream.

In addition to the M&A and SEOs literature, our paper contributes to a growing literature on the interdependence between various aspects of corporate financial policy and corporate pension plans. For instance, Rauh (2006b) shows that mandatory pension contributions can affect the level of corporate investment due to financial constraints; the price impact of mandatory pension contributions depends on whether the firm is under- or overinvesting (Franzoni (2009)); while Shivdasani and Stefanescu (2010) show that firms with DB pension plans are more highly levered.[4]

There is an ongoing debate on whether markets are able to correctly price firms with DB pension plans. On the one hand, 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

[4]Other papers that study company sponsored pension plans are Treynor (1977), Black (1980), and Tepper (1981) who focus 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 also on how pension plan assets are invested (Frank (2002), and Rauh (2009)).

in determining the cost of equity capital for the sponsoring firms. Our results suggest that investors are concerned 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)).

Rauh (2006a) finds in US data that employee ownership of the stock of the sponsoring firm via a defined-contribution pension plan reduces the probability of a takeover. Since employees may be against a takeover (maybe because generous pension benefits are more likely to be terminated following hostile takeovers as shown by Pontiff, Shleifer and Weisbach (1990)), the mechanism at work in the US is an agency one: the employees and the management of the sponsoring company use shares owned by the pension plan to prevent a takeover. The economic mechanism at work in the UK is very different from this, and as we show it is based on asymmetric information.

The remainder of the paper is structured as follows. We start with an example to motivate our use of DB pension plans as a source of information asymmetries, and their implications for the market for corporate control. Section 2 then 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 results that show how the presence of a DB pension plan acts as a takeover deterrent are presented and discussed in Section 3. This section also presents evidence on the means of payment and announcement effects. Further tests are included in Section 4. Section 5 concludes.

A. 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 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, so that the sponsoring of a DB pension plan may act as a takeover deterrent.

As an example of the relevance of corporate sponsored DB pension plans for 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 because of concerns about the size of BA's pension deficit and its implications for 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 an equity 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 travellers, 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 pension liabilities can affect M&A activity. Naturally, asymmetric information can be reduced by the disclosure of information, which happened during the BA negotiations. However, bidders may still be worried about selective disclosure of information by the target. The medium of exchange could also have played a role in facilitating the transaction, but the large size of the deal meant that the use of cash was not an alternative. 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.

II The Data

In order to investigate whether company sponsored DB pension plans act as a takeover deterrents we use UK data on the FTSE 350 companies. FTSE 350 is an index that includes the largest 350 companies (by market capitalization) listed on the London Stock Exchange. To avoid survivorship bias, we select the FTSE 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 FTSE 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, 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. Prior to this year the reported information on UK company sponsored pension plans is very scarce. Many companies report solely the contributions that they have made into the pension plan during the fiscal year. 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. Our data comes from four different sources, which we now describe in detail.

A. 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 property, plant and equipment (PPE). On the liabilities' side,

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 return volatility which is the standard deviation of the share return 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.

B. 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. 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 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 of 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.

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 employee mobility and longevity were not always made explicit during the period of analysis. We argue that the complexity behind the valuation of pension liabilities (and the large impact that alternative assumptions have on the value of pension deficits) is a likely source of uncertainty and risk in the valuation of firms that sponsor DB pension plans.[5]

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 life expectancy. For example, there are a variety of assumptions that firms and their actuaries use to model mortality. In the Appendix, we illustrate the quantitative impact of differences in these assumptions on the value of DB pension liabilities.

C. M&A Data

We collect data on M&A activity from SDC platinum. We select all the 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

[5]In the last years 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 empirical analysis.

large pension deficit. Both of these seemed to be a concern in the merger discussions between Iberia and British Airways that we have previously described.

More precisely, we collect information on whether the firms in our sample were, in each year, the target in a completed, withdrawn or rumoured 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. Since the fiscal year end differs across firms, the balance sheet information and pension data for year t is matched with information on the takeover activity that take place in the 12 months that follow the 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.

D. 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 during the period of 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]

The last panel of Table 1, Panel C, reports summary statistics for the variables related to M&A activity. There has been a takeover attempt in 9.2% of the firm/year observations in our sample, which corresponds to 134 attempts, and the takeover was completed for roughly 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 (2010) 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

[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.

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 last rows of Panel A of Table 2 show the results for univariate tests for the M&A variables. The (unconditional) probability that a firm that sponsors a DB pension plan is the target of a takeover attempt is not statistically different from the probability for a firm that does not sponsor a DB pension plan. However, the likelihood that a firm in our sample is taken over is significantly lower for firms that sponsor a DB pension plan: 2.6% compared to 5.5% for firms that do not sponsor a 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 financial companies. Interestingly, we find that non-financial firms which sponsor a DB pension plan are less likely to be the target in a takeover attempt and they are less likely to be taken over. The magnitude of the differences is economically meaningful. 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 M&A activity. In order to do so we turn our attention to multivariate regressions.

III M&A Activity

A. Probability of a Takeover

We use regression analysis to study the effects of the sponsoring of DB pension plans on M&A activity. The regressions that we estimate are:

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

where $T_{i,t+1}$ 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, 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 engage in M&A activity 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 also estimate similar regressions to the above in which the dependent variable is the dummy variable that takes the value of one if the company is successfully acquired, and zero otherwise (both unconditionally and conditional on a takeover being attempted).

We investigate the effects of two pension plan variables on the decision to engage in M&A activity, namely of $DB\ Dummy_{it}$ which is a dummy variable that takes the value of one if firm i 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 M&A activity, 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. Panel A reports the estimation results for the full sample, whereas Panel B reports the estimation results when we exclude financial firms from the sample.

The first two Columns of Panel A 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: the probability of a completed takeover drops by roughly 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 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 3), and particularly so if the pension deficit is large relative to their market capitalization (Column 6).

We also estimate regressions similar to those in Panel A of Table 3, 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 is 5.6% lower for firms that sponsor a DB pension plan, as can be seen from Column 1. Furthermore, the

probability of being the target of a completed deal is 4.3% lower for firms that sponsor a DB pension plan (Column 3). Finally, the probability that the takeover is completed, conditional on being attempted, is 45% lower for firms that sponsor a DB pension plan.

The results in Table 3 show that the sponsoring of a DB pension plan works as a takeover deterrent. The effects are statistically and economically very meaningful. Our proposed explanation is that acquiring firms are worried they may be buying a *lemon* due to the presence of company sponsored DB pension liabilities. We provide evidence in support of this explanation in the following analysis.

B. Means of Payment in M&A: 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 variable of interest is the proportion of cash used in acquisitions by the FTSE 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 that controls for other variables to estimate the effects of the pension plan variables on the means a payment. We use a set of controls similar to the ones that we have previously used, including year and industry fixed effects. The dependent variable, $c_{i,t+1}$, is the proportion of cash used in the acquisitions completed by firm i in year $t + 1$.

The results are show in Table 4. 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.

C. Announcement Effects

The literature on M&A activity in the presence of asymmetric information has predictions for announcement effects, in relation to the medium of exchange. In an influential paper Eckbo, Giammarino, and Heinkel (1990) solve a model in which bidders have private information about their firms' value, and in which they may select a cash-security mix for their offer. This introduces a signalling role for cash. They show that in equilibrium bidders will offer cash if their equity is relatively undervalued. The higher the proportion of cash in the offer, the stronger is the signalling effect, and the higher is the announcement effect. Therefore, their model predicts a monotonic and increasing relationship between the percentage of cash in the offer and the announcement effect.

In order to study announcement effects we collect from Datastream information on daily closing stock prices for the firms in our sample. We calculate daily abnormal returns as the difference between the daily return on the firm's share price and the daily return on the market (we use as a measure of the market the Footsie 350 index). We calculate cumulative abnormal returns (CARs) for each firm for two different event windows. The first is three days, from day -1 to day $+1$, with 0 being the announcement day. The second is five days, from day -2 to day $+2$ around the announcement date. We merge the CARs data with the data on company sponsored pension plans and other firm characteristics.

In our setting the asymmetric information arises from the bidder's sponsored DB pension plans, assuming that bidders have better information on the pension plan that they sponsor than outsiders do. The DB pension plan as a source of asymmetric information is likely be more important the larger is its deficit relative to the market value of the sponsor. In order to test this hypothesis we estimate the following regression, where the dependent variable is the CAR_{it}^{j} for acquirer i at time t over event window j (we estimate the regression for $j = 3$ and $j = 5$):

$$(2) \qquad \begin{aligned} CAR_{it}^{j} &= \alpha + \beta X_{it} + \gamma(\text{DB Dummy})_{it} + \theta_1 Cash_{it} \\ &\quad + \theta_2 Pensiondeficit_{it} + \theta_3 Pensiondeficit_{it} \times Cash_{it} + \epsilon_{it} \end{aligned}$$

where the vector X_{it} controls for firm characteristics (such as size, total leverage, return on

assets, and others) at the time of the acquisition (denoted by t), $Cash_{it}$ is the proportion of cash used in the acquisition, and ϵ_{it} is the residual. The signalling effects of cash should be particularly strong for acquisitions by firms that sponsor a pension plan with a large deficit. For these firms asymmetric information concerns are likely to be more important. Thus, the interaction term between Pension Deficit and the proportion of cash used in the acquisition is the key regressor in our analysis. The prediction of Eckbo, Giammarino, and Heinkel (1990) is that its coefficient (θ_3) should be positive.

The results are reported in Table 5. In Column 1, we estimate a positive and statistically significant θ_3, so that the announcement of a cash acquisition by a firm that sponsors a DB pension plan with a large deficit is seen by the market as a positive signal. In contrast, the announcement effect of a stock acquisition (the variable cash is equal to zero) by firms that sponsor plans with a large pension deficit is negative and statistically significant (as measured by the estimated value for θ_2).

Some of the acquisitions carried out by the firms in our sample are fairly small, for which one would not expect any announcement effect for the bidders. With this in mind, in Columns 3 to 6, we exclude from the analysis the observations corresponding to small acquisitions (the bottom quarter, which corresponds to acquisitions smaller than roughly £10 million pounds). This data restriction means that we have information for 366 acquisitions that we use to estimate the above regression. The effect becomes statistically more significant and economically more meaningful: for a firm with the average pension deficit of 5% a cash acquisition is associated with a higher announcement return of 1.8% ($= 5\% \times 0.353$) compared with a stock acquisition.

Table 5 also shows that these results are robust to considering a three or five day window, and to the exclusion of acquisitions by financial firms from the sample (the last two Columns of Table 5). These results support the idea that indeed acquiring firms use the medium of exchange to alleviate the asymmetric information problem and facilitate the transaction.

We also study announcement effects for target companies in our sample, and the impact of the sponsoring of a DB pension plan by these target companies. In this case the source of asymmetric information is the target firm. The acquisition, and the medium of exchange

used, may still have a signalling role since the acquiring firm may have better information about the target than other potential bidders, as in the models of Hansen (1987) and Fishman (1989). For example, the bidder company may have hired, prior to the announcement, pension consultants to gather information on the pension plan of the target. In such a setting an offer with a large proportion of cash may be used to signal a high valuation for the target, so as to preempt a potential competing bidder. However, due to the fact that a large proportion of cash may lead to a reduction in competition for the bidder, the target's share price response to a cash offer may vary. Fishman (1989) predicts a target share price increase (decrease) if such an offer is accepted (rejected), while in Hansen (1987) the reverse is predicted.

We have estimated a regression similar to the one above for target firms. Table 6 shows the results. As one might expect, we find a positive and statistically significant θ_1: the higher the proportion of cash used in the acquisition the larger the CARs. However, neither the estimated coefficient on the pension deficit nor the estimated coefficient on the interaction term are statistically different from zero. The reason may be the positive signalling effect of cash is counteracted by the reduced competition for the bidder that may result from the announcement of a cash offer. Alternatively, the lack of statistical power may be due to the relatively small number of instances in which a Footsie 350 company is acquired during the sample period (51 observations).

IV Further Tests

In this section we provide further evidence on the role of DB pension liabilities as a source of information asymmetries. If our hypothesis that company sponsored pension plans act as a takeover deterrent because of information asymmetries, then such asymmetries should also affect other corporate decisions. More precisely, information asymmetries should affect firms that sponsor a DB pension plan ability to raise equity through an SEO. We investigate whether that is the case in our data in section 4.1. In section 4.2 we show that our main results to the inclusion of additional control variables. In section 4.3 we consider alternative

explanations.

A. Seasoned Equity Offerings

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. 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.

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 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. We scale the total amount issued during the fiscal year variables by the beginning of the year market value of the firm's equity.

Table 7 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.

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:

$$(3) \qquad S_{i,t+1} = \begin{cases} 0 \text{ if } \alpha + \beta X_{it} + \gamma\,(\text{DB Dummy})_{it} + \delta\,(\text{Pension Deficit})_{it} + \varepsilon_{it} \leq 0 \\ \\ 1 \text{ if } \alpha + \beta X_{it} + \gamma\,(\text{DB Dummy})_{it} + \delta\,(\text{Pension Deficit})_{it} + \varepsilon_{it} > 0 \end{cases}$$

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 $N(0,1)$.

The results are reported in Table 8. As before, 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 shareholders of firms with DB plans are worried when the pension deficit is large compared with the firm's equity, 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 4.2% 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 8 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 this purpose, we estimate a tobit model where the dependent variable $y_{i,t+1}$ is the total proceed from SEO issues by firm i in year $t+1$ and the independent variables are the same as in specification (3). The results are shown in Table 9. 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 8. 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.

B. 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 return 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 return 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 10 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.

The interpretation of the coefficients on the control variables is difficult as some of the variables are likely to be highly correlated among themselves. The 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 stock return 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. Furthermore, and importantly, the announcement of a cash acquisition by a bidder who sponsors a DB pension plan with a large deficit has a positive signal, reflective in the positive CAR associated with the announcement.

C. Alternative Explanations

One possible explanation for the reason why companies with DB pension liabilities may be less likely to be taken over and to issue shares is debt overhang (Myers (1977)). According to this view, the presence of a large debt discourages shareholders from investing in new project by raising funds that are junior to existing debt because all benefits would be enjoyed by existing creditors. In all our regressions we control for total leverage (which is the sum of financial leverage and the pension leverage). Hence, our result cannot be due to debt overhang.

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%.

Another possible explanation is that firms which sponsor DB pension plans are overvalued (as shown by Franzoni and Marin (2006)), acquirers know this and do not bid for them. This explanation relies on an asymmetry between potential acquirers and the market: while acquirers are aware of the overvaluation, the market does not know about it and thus does not correct it. This explanation is consistent with our results on M&A activity but is not supported by our findings on SEOs. Indeed, if the market is not aware of the overvaluation, firms should have no difficulties in issuing equity. In fact, one would expect them to take

advantage of the overvaluation by issuing even more equity. However, we find that firms with DB pension liabilities are less likely to engage in SEOs, a result which is difficult to reconcile with an overvaluation explanation.

V Conclusion

In this paper we have shown that defined-benefit corporate pension plans act as a takeover deterrent. More precisely, UK firms that sponsor a DB pension plan are less likely to be the target in an acquisition, and conditional on being targeted, the deal is less likely to be completed. The effects that we have documented are statistically significant and economically meaningful. They are robust to a variety of controls, including a measure of leverage that treats the deficit in the pension plan as debt to the sponsoring company.

Our proposed explanation is that firms that sponsor DB pension plans are subject to greater informational asymmetry than similar firms that do not sponsor such plans, and that this deters potential acquirers. The shortfall between the market value of pension assets and the present value of the pension liabilities is a liability for the sponsoring firm. Because of the complexity of evaluating pension liabilities, the sponsoring firm's managers are likely to enjoy and informational advantage with respect to the market.

We have provided support for this explanation by studying announcement effects, in relation to the medium of exchange used by acquiring firms that sponsor a DB pension plan. The information asymmetry hypothesis predicts that firms that are subject to such sources of asymmetries are more likely to use cash when acquiring other firms, since target shareholders will be more reluctant to accept the equity of the acquiring firm. Furthermore, the announcement of a cash acquisition by a bidder firm that is subject to information asymmetries should have a positive signalling role, reflected in positive cumulative abnormal returns. Interestingly, we have found this to be the case. Thus, our paper has provided evidence of the role played by information asymmetries, arising from the sponsoring of DB pension plans, in M&A activity, and of how the medium of exchange can be used as a signal and to facilitate the transaction.

Appendix: Mortality Assumptions

In this appendix we illustrate how longevity and employee mobility assumptions affect the value of DB pension deficits. In the UK, the most widely used mortality tables for the valuation of pension liabilities 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 A1 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 A1 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.[7]

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 A1 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.

[7] As a curiosity, in 2008 British Airways reported that a one year increase in life expectancy would have increased the deficit by £150 million in NAPS and £120 million in APS, or a total of £270 million. This is to be contrasted with the market capitalization of BA which stood at roughly £2 billion.

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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 the firm sponsors a DB pension plan; Asset Tangibility, which is equal to the value of PPE over total assets; Return Volatility is the volatility of the company's stock return 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 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 rumours 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
Return 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: 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 several variables for firms with and without DB pension plans, and t-tests on the differences between these means. The variables are presented in Table 1: Return on Assets, Financial Leverage, Total Leverage, Cash Holdings, Firm Size, Takeover Chance, Completed Takeover, and Acquisition Cash. The latter variable is defined only if the firm announces 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
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: Financial Companies Excluded.

	With DB Pension	Without DB	T-test
	Mean	Mean	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
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: 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: Financial Companies 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 4: 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 5: Announcement Effects for Acquirors

This table presents estimations from OLS regressions of the cumulative abnormal returns for the acquiring firm as a function of the cash used in acquisitions, the size of the deficit of the defined-benefit pension plan of the acquiror and the interaction of these two variables. Control variables are the Logarithm of Deal Value, Firm Size, Total Leverage, Cash Holdings, ROA and DB dummy. In Columns 1, 3 and 5 the dependent variable is CAR $[-1, +1]$, which is the cumulative abnormal return from day -1 to day +1 around the announcement date 0. In Columns 2, 4 and 6 the dependent variable is CAR $[-2, +2]$, which is the cumulative abnormal return from day -2 to day +2 around the announcement date 0. Only the firms/years that announce an acquisition are included in the sample. All observations are included in Columns 1 and 2. Acquisitions in the bottom quartile are excluded from the regressions in Columns 3 to 6. Financial firms are excluded from the regressions 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 are included (but their coefficients are not reported).

Dependent variable	CAR[-1,+1]	CAR[-2,+2]	CAR[-1,+1]	CAR[-2,+2]	CAR[-1,+1]	CAR[-2,+2]
	(1)	(2)	(3)	(4)	(5)	(6)
Cash	-0.003	-0.010	-0.007	-0.010	-0.011	-0.015
	[0.013]	[0.015]	[0.014]	[0.017]	[0.015]	[0.018]
Pension deficit	-0.223*	-0.267	-0.340**	-0.391**	-0.330**	-0.416**
	[0.134]	[0.169]	[0.136]	[0.169]	[0.154]	[0.190]
Pension deficit x Cash	0.241*	0.315*	0.353**	0.408**	0.355**	0.433**
	[0.149]	[0.189]	[0.145]	[0.188]	[0.164]	[0.210]
Log(Deal Value)	-0.001	-0.001	-0.001	-0.003	-0.002	-0.003
	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.003]
Firm size	0.004*	0.006**	0.004**	0.007**	0.006**	0.007**
	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]
Total leverage	0.003	0.011	0.000	0.016	-0.005	0.022
	[0.015]	[0.016]	[0.017]	[0.019]	[0.021]	[0.023]
Cash holdings	0.059**	0.047	0.068**	0.064*	0.080***	0.080**
	[0.023]	[0.032]	[0.029]	[0.039]	[0.029]	[0.039]
ROA	0.037	0.058	0.039	0.065	0.034	0.070
	[0.033]	[0.039]	[0.040]	[0.047]	[0.042]	[0.049]
DB dummy	-0.005	-0.010	0.002	-0.003	0.005	0.000
	[0.008]	[0.009]	[0.009]	[0.011]	[0.010]	[0.012]
Sample:	Full	Full	No Small Acq	No Small Acq	No Small Acq & Fin	No Small Acq & Fin
Observations	467	467	366	366	329	329
R-squared	0.082	0.077	0.101	0.099	0.125	0.114

TABLE 6: Announcement Effects for Targets

This table presents estimations from OLS regressions of the cumulative abnormal return for the target firms as a function of the cash used in acquisitions, the size of the deficit of the defined-benefit pension plan of the target and the interaction of these two variables. Control variables are the Firm Size and DB dummy. In Columns 1 and 3 the dependent variable is CAR $[-1, +1]$, which is the cumulative abnormal return from day -1 to day +1 around the announcement date 0. In Columns 2 and 4 the dependent variable is CAR $[-2, +2]$, which is the cumulative abnormal return from day -2 to day +2 around the announcement date 0. 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.

Dependent variable	CAR[-1,+1]	CAR[-2,+2]	CAR[-1,+1]	CAR[-2,+2]
	(1)	(2)	(3)	(4)
Cash	0.120***	0.101***	0.131**	0.119**
	[0.038]	[0.034]	[0.051]	[0.046]
Pension deficit	1.513	0.617	1.429	0.854
	[1.640]	[1.647]	[2.052]	[1.746]
Pension deficit x Cash	-1.550	-0.424	-1.545	-0.711
	[1.625]	[1.661]	[1.934]	[1.669]
Firm size	0.019	0.022	0.030	0.029
	[0.013]	[0.013]	[0.022]	[0.021]
DB dummy	-0.010	-0.004	-0.030	-0.025
	[0.054]	[0.053]	[0.061]	[0.058]
Sample:	Full	Full	No Fin	No Fin
Observations	51	51	44	44
R-squared	0.114	0.128	0.150	0.166

TABLE 7: Summary Statistics: SEOs

This table shows summary statistics for 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.

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

TABLE 8: 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. The variables are defined in Tables 1 and 4. 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 9: 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. The variables are defined in Tables 1 and 4. 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

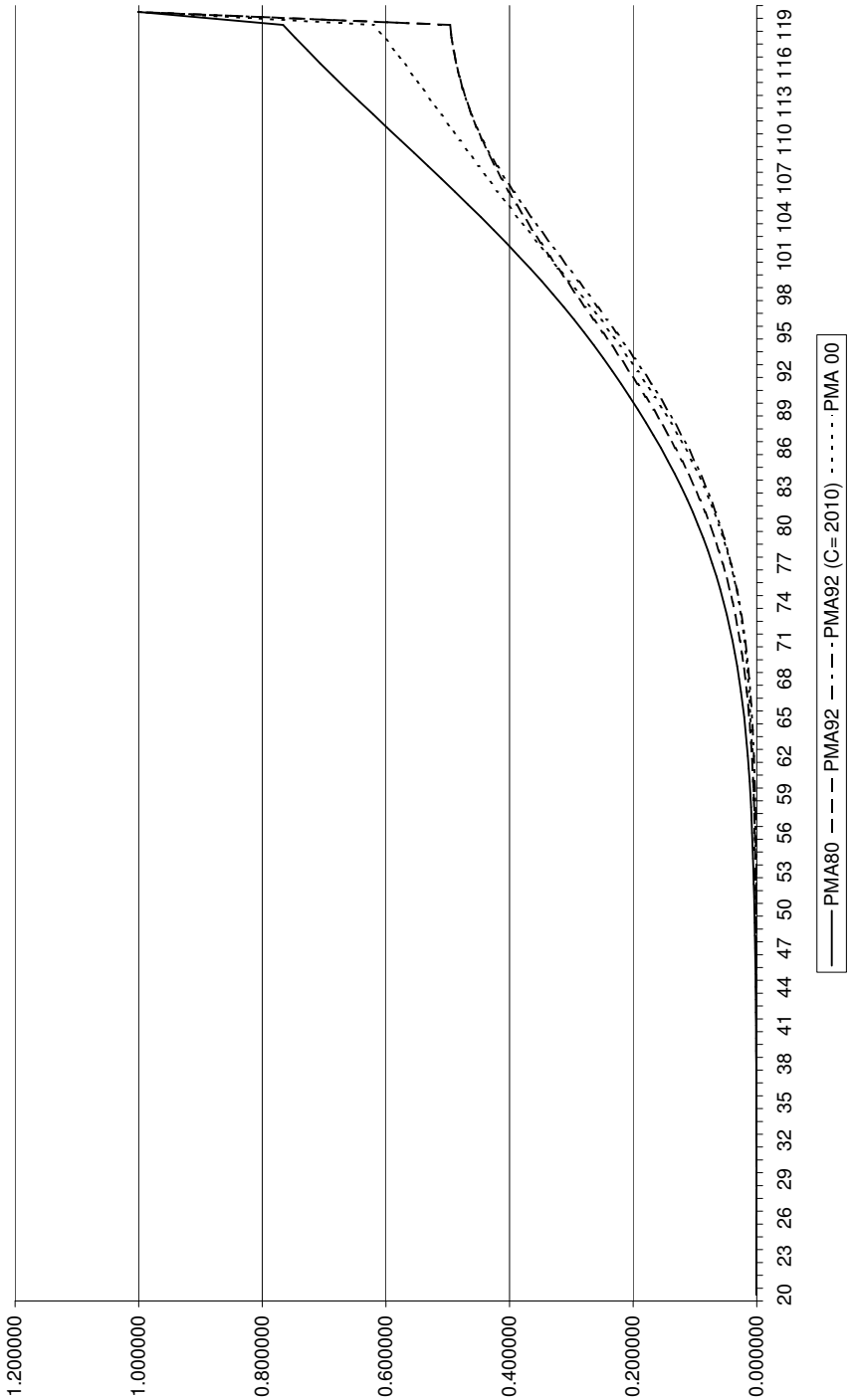
TABLE 10: Robustness

This table presents regression estimates of the M&A Activity and the SEO decision on the DB Pension dummy and the pension deficit. 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 Takeover Chance in 1, Completed Takeover in 2, and Acquisition Cash in Column 3, CAR3 in acquisitions in Column 4, and the SEO dummy in Column 5. A probit model is estimated in Columns 1, 2 and 5; a Tobit model in Column 3; and OLS model in Column 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:	T. Chance	Completed T.	Acq. Cash	CAR[-1,+1]	SEO dummy
	(1)	(2)	(3)	(4)	(5)
Firm Size	0.0054	-0.0032*	-0.1701***	0.0030	0.0063
	[0.0059]	[0.0017]	[0.0592]	[0.0026]	[0.0049]
Total Leverage	0.0079	0.0090	-0.0490	0.0075	0.1356***
	[0.0444]	[0.0113]	[0.5408]	[0.0201]	[0.0382]
Cash Holdings	-0.1981**	-0.0635**	0.6678	0.0400	-0.058
	[0.0970]	[0.0262]	[0.9952]	[0.0288]	[0.0822]
ROA	-0.2007*	-0.0775**	2.0211	0.0447	-0.0819
	[0.1092]	[0.0329]	[1.3007]	[0.0449]	[0.0932]
Market to Book	-0.0112	-0.0011	-0.0547	-0.0044	-0.0115
	[0.0082]	[0.0021]	[0.0940]	[0.0033]	[0.0075]
Asset tangibility	-0.0159	-0.0048	-0.1438	0.0033	-0.0193
	[0.0281]	[0.0061]	[0.3085]	[0.0082]	[0.0239]
Price volatility	0.0002	-0.0005**	-0.0071	-0.0001	0.0011
	[0.0010]	[0.0003]	[0.0093]	[0.0003]	[0.0008]
Closely held sh	-0.0001	-0.0001	0.0022	-0.0000	0.0008**
	[0.0004]	[0.0001]	[0.0043]	[0.0001]	[0.0004]
DB dummy	-0.0323	-0.0086	0.0230	0.0030	0.0126
	[0.0238]	[0.0069]	[0.2375]	[0.0100]	[0.0175]
Pension deficit	-0.2079**	-0.0996**	2.6230**	-0.3159**	-0.1713*
	[0.0985]	[0.0394]	[1.1175]	[0.1315]	[0.0985]
Cash				-0.0033	
				[0.0155]	
Pension deficit x Cash				0.3372**	
				[0.1440]	
Estimation method	Probit	Probit	Tobit	OLS	Probit
Observations	1236	1047	426	331	1236
Pseudo R^2	0.107	0.222	0.048	0.129	0.115

FIGURE A1: Importance of Mortality Assumptions

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.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PMA80
PMA92
PMA92 (C= 2010)
PMA 00