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Abstract

This paper studies the governance of defined-benefit pension plans in the United Kingdom. We construct a governance measure, equal to the proportion of trustees of the pension plan who are also executive directors of the sponsoring company. Our findings indicate that pension plans of indebted companies with a higher proportion of insider-trustees: (i) invest a higher proportion of the pension plan assets into equities, (ii) contribute less into the pension plan, and (iii) have a larger dividend payout ratio. This evidence supports an agency view, whereby insider-trustees act in the interest of shareholders of the sponsoring company, and not necessarily pension plan members.

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1. Introduction

Many companies have promised their employees defined benefit (DB) pensions. The large increases in life expectancy that have occurred over the last decades, and the decline in interest rates that are used to calculate the present value of such liabilities, have led to significant increases in corporate pension liabilities. In addition, the recent decline in stock prices has substantially decreased the value of pension plan assets. As a result, many DB corporate pension plans now show substantial deficits.[1]

In the United Kingdom, which is the focus of this paper, defined benefit pension plans are set up in trusts, with the *trustees* being the persons responsible for these trusts. More precisely, the trustees must decide how to invest the assets of the pension plan, and must put in place a schedule of contributions for the sponsoring companies. These powers, combined with the size and deficit of the pension plans, mean that the actions of pension plan trustees have important implications not only for pension plan members, but also for the value and behavior of sponsoring firms.

But who are the trustees of these pension plans? The law specifies that the trustees of the pension plan may be employee or member representatives, independent individuals, or importantly, that they may also be directors of sponsoring companies. Obviously, and for the latter group of individuals, this can lead to conflicts of interest between their executive and trustee roles, which have been recognized by the regulatory authority:

> "As a trustee, your duties are to the scheme and not to any group or individual that you are connected with, such as the employer, a trade union or a particular group of members, such as pensioner members. Sometimes you may find yourself faced with difficult decisions because of your other interests, such as whether to pay surplus scheme funds to the employer." in "Pension Scheme Trustees" (2001), page 17.

The decision to pay resources back to the employer – if the fund is running a surplus – or, as it is more often the case in recent years, the decision to require employers to make additional

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[1] As a measure of magnitude, at the end of 2002 the average deficit in the DB pension plans of Footsie 100 companies was 20 percent of the value of assets of the plan, or 4.6 percent of the value of the firm assets. These numbers are based on our calculations from data obtained from the footnotes of the annual reports. We give more details below.

contributions into a plan in deficit are two instances when conflicts of interest may arise for insider-trustees, meaning trustees who are also executive directors of the sponsoring company. In this paper we study such conflicts of interest.[2]

Our departure point is that the presence of corporate insiders as trustees of the pension plan may allow the sponsoring company to exert more control over the pension fund. But how is such control exerted? More precisely, how does the presence of executive directors of the sponsoring company as trustees of the pension plan affect the way in which the pension plan assets are invested, and the level of contributions paid into the fund?

We focus on two alternative hypotheses. The first hypothesis is that the presence of insiders is a source of agency problems, if it allows insider-trustees to favor shareholders of the firm over members of the pension plan. As described by Treynor (1977), a company with a DB pension plan owns a put option. If the assets (the firm and DB assets) fall short of the pension fund liabilities, the firm has the option to give these assets to the DB beneficiaries as payment. Since the value of a put option increases with the risk of the underlying assets, insider-trustees may have the incentive to increase the risk of the assets (the firm and DB assets) beyond what is optimal for the members of the pension plan, for example by investing the pension plan assets into equities. The agency problems may also be reflected in the contributions paid into the pension plan. Pension plan liabilities are similar to long-term debt, and pension plan members are debt-holders of the company (see Webb, 2004). Insider-trustees who favour shareholders of the firm over pension plan members may have an incentive to reduce firm contributions to the plan.

The second hypothesis is that insider-trustees facilitate a more efficient management of tax liabilities, which may be positive for both shareholders and pension plan members. More precisely, companies may be able to generate tax savings if they integrate their financial and

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[2] In this paper we focus on agency problems between trustees who are directors of the company and members of the pension plan. As the quote mentions, conflicts of interest may also arise for trustees who belong to a particular group of pension plan members, e.g. pensioner members, and other members of the plan. For example: if a pension fund has a large deficit, it may be optimal for a pensioner member not to require that the firm pay additional contributions into the plan, if such contributions increase the likelihood of bankruptcy. This is because pensioner members may receive full benefits even if there is a deficit, and only a fraction of such benefits in the event of bankruptcy. We do not analyze such agency problem, since we do not know to which group of individuals trustees who are not executive directors of the sponsoring company belong to.

pension investment policies: If a company increases leverage, uses the proceeds to fund the pension plan, and invests these funds in bonds, it may generate tax savings without affecting financial risk (Black, 1980, Tepper, 1981). This is because the increase in leverage generates a debt tax shield, while the return on bonds held in the pension plan is tax-exempt.[3]

To test these alternative hypotheses we collect information on UK companies that have DB pension plans. We collect information on their pension plan assets (including how they are invested), pension plan liabilities, contributions paid into the pension plan, and actuarial assumptions. In addition, we collect information on the identity of the trustees of the pension plan, and whether they are executive directors of the sponsoring company. Finally, we collect a variety of information for sponsoring companies, including the total value of their assets, profitability, taxes paid, leverage, dividends paid, and investment.

We find evidence that supports the agency hypothesis, whereby insider-trustees act in the interest of shareholders of the sponsoring company, and not necessarily pension plan members. More precisely, we find that pension plans of more leveraged firms with a higher proportion of insider-trustees invest a higher proportion of the pension plan assets into equities. We also show that the presence of insider-trustees allows firms to make lower contributions into the plan. These results are robust to instrumental variables regressions that treat the proportion of insider-trustees as an endogenous variable. On the other hand, we find no support for the tax management hypothesis.

One further prediction of the agency hypothesis is that the lower pension plan contributions should be associated with higher dividend payouts to shareholders (Webb, 2004). Interestingly, and consistent with this prediction, we find that firms that pay a larger fraction of net income in the form of dividends, and whose pension plans have a higher proportion of insider-trustees, tend to make lower pension plan contributions. Finally, we look at the relation between corporate investment and pension plan contributions. We find evidence suggesting that insider-trustees allow companies to decrease contributions into the pension plan when investment is large. If such investment is efficient, having insiders as pension plan trustees is positive for both shareholders

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[3] In support of the tax hypothesis Frank (2002) finds, in a sample of U.S. firms, that the percentage of DB assets invested in bonds is positively correlated with the tax benefits from financing with corporate debt. However, Bodie, Light, Morck and Taggert (1987), find no evidence of a relation between firms' tax benefits and their DB's investment in bonds, after controlling for non-tax factors. Differently from these papers, we investigate whether the presence of insiders-trustees facilitate the management of tax liabilities.

and pension plan members. However, we find no evidence that the lower contributions are correlated with better investment opportunities.

The paper is organized as follows. In Section 2 we describe the rules for appointing trustees, trustee duties and powers. Section 3 discusses the agency and tax management hypotheses in detail, and offers some testable predictions. Section 4 describes how we have collected and constructed the data, including our governance measure, and presents descriptive statistics. Section 5 contains the main results. In Section 6 we present further evidence on pension contributions that supports the agency view described above, but that is also suggestive of further agency problems. Section 7 concludes.

2. The trustees of the pension plan

In this section we briefly describe the rules for appointing trustees, their duties and powers.[4] Most UK pension plans have a set of legal documents that set up the trust and the rules of the plan, which is called the trust deed. Unfortunately, the trust deeds are not generally publicly available. However, the trust deed normally gives the employer or the existing trustees the power to appoint trustees. Generally, any individual aged 18 or over and capable of holding property can be a trustee. In addition, since April 1997 pension plans have been legally required to allow the members of the plan to have a say in selecting and appointing trustees. This means that the employer has a choice of either to: (i) propose arrangements for choosing trustees and to put these arrangements for approval by the members under a statutory consultation procedure; (ii) or to leave it to the existing trustees to make the arrangements for choosing member-nominated trustees. In either case the arrangement must allow for at least one-third and two of the trustees to be member-nominated (or one of the trustees if the scheme has less than one hundred members). Thus, and importantly, employers may choose whether or not to appoint the majority of trustees of the plan, and whether to appoint insiders or outsiders.

Trustee powers differ from plan to plan, but usually the trust deed includes the powers to: (i) maintain financial records and appoint and remove suitable professional advisers (actuaries, auditors, investment advisers and managers, custodians, and solicitors); (ii) decide the investment

strategy for the assets of the plan; (iii) put in place and maintain a schedule of contributions, so that the level of contributions to the plan together with its current assets will be enough to meet its liabilities. Trustees should agree the schedule of contributions with the employer, but if they cannot agree, they will need to put one in place anyway after taking advice from the scheme actuary. Given these powers, it is clear that the actions of the trustees can affect the behavior of the firm in a significant way.

In deciding the schedule of contributions, the trustees must follow the rules set out in the Minimum Funding Requirement (MFR). If the actuarial valuation shows that the scheme has a shortfall, meaning that its liabilities are larger than its assets, then trustees must revise the schedule of contributions so as to eliminate the shortfall within ten years. This period is referred to as the 'schedule period.' Furthermore, if the actuarial valuation shows that the scheme is less than 90% funded, the scheme is said to have a serious shortfall. In this case, and as well as eliminating the shortfall by the end of the schedule period, the employer must also eliminate the serious shortfall within three years of the date of the signature of the valuation. Thus, and in the case of a pension fund shortfall, trustees are required to put in place a schedule of contributions that removes these shortfalls within these set time horizons. However, and unlike in the United States, there are no explicit funding rules linking pension plan shortfall to contributions. Thus trustees have a degree of flexibility when drawing the schedule of contributions. Furthermore, if more time is needed to ensure that the scheme is fully funded on an MFR basis, the trustees or the employer (or both), can apply to the Occupational Pensions Regulatory Authority for an extension.[5]

It is important to note that for most plans trustees are not allowed to invest more than 5% of the plan's assets in employer-related investments. These include shares in the employer's business, and acquiring property used in the business, such as the premises where the company operates. Thus, in the UK the investment of corporate DB pension plans assets in the sponsoring company equities are significantly restricted by law.

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[4] For a more detailed description see the "The Duties of a Trustee," which is available at http://www.opra.org.uk/pdf/trusteeguide.pdf.

[5] See the "The Minimum Funding Requirement" available at http://www.opra.gov.uk/pdf/mfr.pdf.

3. Hypotheses

Our approach is to use the fraction of corporate insiders among the trustees as a measure of the control that the sponsoring company can exert over the pension fund. In the existing literature there are two views of the implications of a tight control by a company over its pension plan.

The first view is that the presence of insiders is a source of agency problems. As described by Treynor (1977), a company with a DB pension plan effectively owns a put option: the firm can give its own assets and the DB assets to the DB beneficiaries as payment, if the value of these assets falls short of pension fund liabilities. Since the value of a put option increases with the risk of the underlying assets, insider-trustees may have the incentive to increase the risk of the assets (firm and pension plan assets) beyond what is optimal for the members of the pension plan

The second view emphasizes the positive consequences of insider-trustees for a more efficient management of tax liabilities. The idea is that a company can generate substantial tax savings by integrating its financial and pension investment policies. The remainder of the section describes in detail the specific testable predictions deriving from these theories for the choice of pension plan asset allocation, and the schedule of contributions.

3.1. Agency hypothesis

An important decision made by pension plan trustees is the investment strategy for the pension plan's assets. This means that trustees must choose the portfolio mix between riskier financial assets such as equities, and less risky financial assets such as bonds and cash. Obviously, trustees do not decide on each single asset investment that is made, but they must decide the overall investment strategy. But how is the share of pension plan assets that are invested in equities affected by the presence of trustees who are insiders?

It is theoretically clear that equity holders of highly leveraged firms wish to undertake riskier projects, since this results in a wealth transfer from debt holders to equity holders. However, it has proven more difficult to provide empirical evidence of this risk shifting. Part of the difficulty is in assessing the risk of the projects that firms can undertake. If we think of the share of pension assets invested in equities as a measure of the risk, then insider-trustees acting on behalf

of shareholders of the sponsoring company will wish to invest a higher proportion of the pension plan assets in equities. This effect should be stronger if the sponsoring company is highly leveraged, since in this case the put option is closer to being in the money. This leads us to our first testable hypothesis.

Agency prediction 1: Pension plan trustees who are corporate insiders will invest a larger fraction of the pension plan assets in equities, especially if the sponsoring company is highly leveraged.

A second important role of trustees is to put in place a schedule of contributions, so that the level of contributions to the plan together with its current assets will be enough to meet its liabilities. But how does the presence of insiders affect the contributions paid into the pension plan? Pension plan deficits are similar to long-term debt, and pension plan members of an under-funded pension plan are debt-holders of the sponsoring company (Besley and Prat, 2003, Webb, 2004). Insider-trustees acting on behalf of shareholders of the sponsoring company may have an incentive to minimize funds paid to debt-holders, and to an under-funded pension plan.[6] This is likely to be the case if the sponsoring company is highly leveraged. This is our second agency prediction:

Agency prediction 2: Pension plan trustees who are corporate insiders will make lower contributions into the pension plan, especially if the sponsoring company is highly leveraged.

3.2. Tax arbitrage hypothesis

Pension plan assets are held in trusts, separately from other firm assets, and are tax exempt. On the contrary, the return on the firm financial assets is taxed. Therefore, a firm that integrates its financial and pension investment policies may engage in tax arbitrage. The firm minimizes its tax bill by increasing leverage, and using the proceeds to fund the pension plan, whose assets are then invested in bonds. The increase in leverage provides a debt tax shield, but since the proceeds are invested in bonds the financial risk of the firm is unchanged. Furthermore, the asset returns held in the pension fund are not taxed. The firm can achieve this tax arbitrage provided that it

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[6] In addition insider-trustees acting on behalf of shareholders may have an incentive to terminate over-funded pension plans. See the analysis of Petersen (1992) and Pontiff, Shleifer, and Weisbach (1990) on pension reversions.

earns positive profits and needs to pay taxes (see Black 1980, Tepper, 1981, Bodie, Light, Morck and Taggert, 1987, and Frank, 2002).

But how does the presence of insiders as trustees of the pension plan affect this tax arbitrage argument? It is our hypothesis that the presence of insiders makes it easier to coordinate the financial policy and pension investment policy of the firm. This means that if the firm is profitable (pays taxes), and there is a large fraction of insiders, one should observe a pension investment tilted towards bonds and away from equities. This is summarized in the following prediction:

Tax arbitrage prediction 1: Pension plan trustees who are corporate insiders will invest a larger fraction of the pension plan assets in bonds, especially if the sponsoring firm is paying taxes.

One may reasonably think that the tax arbitrage view also offers some predictions for when contributions to the pension plan should be made. Since contributions are a cost for the sponsoring firm, firms may be better off making such contributions when they have to pay taxes. However, if firms are allowed to carry losses back and forward, as in the UK, the benefits of engaging in such tax arbitrage may be significantly reduced. Nevertheless, we summarize this prediction as:

Tax arbitrage prediction 2: Pension plan trustees who are corporate insiders will make larger contributions into the pension plan when the sponsoring firm faces a high tax rate.

3.3. Other hypotheses

Recent work by Rauh (2004) is suggestive of another instance when the presence of corporate insiders as trustees of the pension plan may be positive for shareholders, employees and pension plan members. Rauh (2004) finds for a sample of US firms that mandatory contributions into DB pension plans force financially constrained firms to reduce investment. In the UK there are not explicit rules linking pension plan deficits to firm contributions. It is up to the trustees to decide on the level and timing of such contributions (subject to the MFR rules). It is possible that the presence of insider-trustees allows companies to decrease contributions paid into the pension plan at times when the firm needs the resources for investment. In other words, the presence of

insider-trustees may allow companies to reduce contributions paid into the pension plan, and undertake investments that otherwise could not be undertaken. If this investment is efficient, having insider-trustees is of value for both shareholders and pension plan members. On the other hand, if this investment is inefficient, then there is an agency problem between corporate executives and pension plan trustees on one hand, and shareholders, employees and pension plan members on the other hand. We investigate this hypothesis in Section 6.

4. The Data

4.1. Sources

4.1.1. Pension plans data and accounting rules for pensions

We have hand-collected data on corporate pension plans from the annual reports of companies. From the footnotes to these reports we obtain information on whether the company has a DB plan, the market value of its assets, the actuarial value of the liabilities, and contributions to the plan. We also obtain information on the actuarial assumptions made for the valuation of liabilities, including price inflation, salary increases, and the rate at which the fund liabilities were discounted. Finally, we obtain information on the value of the investment of the assets of the plan in equities, bonds and other assets. It is important to note that it is only recently that companies have been required to disclose information in this form, in accordance to Financial Reporting Standard 17 (henceforth, FRS17).

The UK is in a transitional period, in terms of the accounting rules for pensions. The old rule, still adopted by almost all companies, is SSAP24. This old rule allows a discounted income method to be used for the valuation of assets, with the assumptions made for the growth rate of dividends not always disclosed. Second, SSAP24 does not specify which values should be used for the discount rate for liabilities. In practice, the lack of information disclosure, and the flexibility available in valuing assets and liabilities meant that it was very hard to assess the true deficit in the plans.

Even though SSAP24 is still widely adopted, companies must also report in the footnotes to the annual reports pension information according to FRS17. Under FRS17 the reported value for the

pension plan assets is the market value of these assets at the balance sheet date. In this respect FRS17 is similar to the accounting rules in the United States (FAS87). But there are other important differences. According to FRS17, any gains or losses, due for example to differences between the expected and actual return on the plan's assets, must be fully recognized in the statement of total recognized gains and losses in the year in which they occur. This is in contrast with FAS87 where gains and losses are generally spread over a number of years, and then recognized in the profit and loss account.

On the liabilities side, and for DB plans, a full actuarial valuation by a professionally qualified actuary must be done at least once every three years. The actuary must review the most recent valuation at the balance sheet date and update it to reflect current conditions. In addition, FRS 17 specifies the discount rate that should be used for pension fund liabilities: it should be equal to the current rate of return on a high quality corporate bond (AA rating) of equivalent currency and term to the plan's liabilities.

From the 2003 annual reports we obtain information for firms that have DB pension plans. Some of these pension plans are closed, i.e. they are not open to new members. Some companies also have pension plans abroad. When this is the case we collect information on the assumptions made for the valuation of UK pension liabilities, and on the UK pension assets and liabilities. The reason is that we are interested in the role of insiders as trustees of the pension plan, and the information that we have on trustees is for the UK pension funds.

A difficulty is that a small number of companies, which sponsor pension plans both in the UK and abroad, only report the total annual contributions paid into the plans. In other words, they do not distinguish between contributions to the UK plan and to the plans abroad. In these cases we collect information on the total contributions, but we are careful to keep track of the identity of such firms and perform robustness checks along this dimension. For those companies that publish their accounts in US dollars we use the exchange rate at the balance sheet date to translate the value of pension assets, liabilities, and contributions into pounds.

4.1.2. Insiders data

The publication entitled "Pension Funds and Their Advisers" contains information on the major UK pension funds. It contains information on the employer's activity, type of pension plan (defined benefit, defined contribution, or hybrid), number of pension plan members, who are the plan's advisers and actuaries, its assets, other financial information such as current contributions, and – crucial for our purposes – the names of the trustees of the plan. Not all of this information is available for all pension plans. Since we obtain information on the type of plan, its assets and liabilities, and contributions from the annual reports of the companies, from this publication we collect only information on the identity of the trustees and the number of pension plan members.

More precisely, for each Footsie 350 firm we inspect its annual report to learn whether it has a DB pension plan. Out of these 350 firms, only 203 have such a plan. We then use the book "Pension Funds and Their Advisers" to look for pension plan information for these 203 pension plans. Not all pension plans appear in this publication, and for a significant proportion of the pension plans that do appear, there is no information on the identity of the trustees. Because of these restrictions, our final sample contains 90 firms, which is 44% of the set of firms with DB pension plans. Obviously, we are concerned about a potential sample selection bias. If the availability of trustee information is correlated with firm or pension plan variables, it means that our trustee sample is biased.

To investigate these issues we have collected pension plan and firm data for all Footsie 100 firms, regardless of whether they appear on "Pension Funds and Their Advisers". Out of ninety-three of the Footsie 100 companies that have DB pension liabilities, nine of them do not appear in this publication. Closer examination shows that these nine companies tend to have smaller pension plans, as measured for example by the value of pension assets, than those that show up in the publication. The median pension plan asset values are 398 and 2,733 million pounds, respectively. For the remaining eighty-four pension plans, there is no information on who are the trustees for forty-two of them. In Section 4.2.3 we compare several pension plan and firm variables for pension plans with and without trustees information, to show that there are no statistically significant differences between the two samples.

Some companies have more than one pension plan. For instance HBOS – a bank created by the merger of Halifax plc and Royal Bank of Scotland – has two DB pension plans, one for Halifax and one for Royal Bank of Scotland employees. Others, like British Telecom plc, have one DB plan and one Defined Contribution (DC) plan. If a company has information on more than one pension plan, we collect only the names of the trustees of the largest DB pension plan.

For the pension plans for which we have the names of the trustees (90 observations), we search the firms' annual reports for these names to see whether they are insiders or not. We classify as insiders those trustees who are executive directors or the secretary of the sponsoring company. We construct our measure of insiders as being equal to the proportion of trustees who are insiders to the company.

4.1.3. Other data

We obtain financial information about the sponsoring firms from Datastream, including the total value of assets, profitability, leverage, taxes, investment, Tobin's Q, and number of employees. Book value of firm assets is the book value of total assets in 2002 (£ billion). Number of firm employees is the number of employees at the end of 2002. Profitability is the ratio of Earnings Before Interest and Taxes (EBIT) during 2003 and the book value of total assets at the end of 2002. Book leverage is the book value of total liabilities divided by the book value of total assets at the end of 2002. Average tax rate is the average income taxes paid divided by the average book value of total firm assets at the end of 2002.

One interesting variable is the fraction of independent directors on the sponsoring company's board of directors. This variable is intended to measure the quality of the corporate governance regime in the sponsoring company. The reason is that there is large evidence, starting with Weisbach (1988), that the correlation between CEO turnover and bad performance is greater in companies with more outside (or independent) directors.

In the appendix we provide a summary of the data sources and variable definitions.

4.2. Data description

4.2.1. Pension plan variables

We construct several variables from the pension data. The first two are measures of the surplus (or deficit) of the pension plan at the end of 2002:

$$\text{Pension plan surplus} \mid \frac{\text{Pension plan assets}_{2002} \ 4 \ \text{Pension plan liabilities}_{2002}}{\text{Pension plan liabilities}_{2002}} \tag{1}$$

$$\text{Pension surplus over firm asset} \mid \frac{\text{Pension assets}_{2002} \ 4 \ \text{Pension liabilities}_{2002}}{\text{Book value of firm assets}_{2002}} \tag{2}$$

The first variable measures the extent of over/under-funding of the pension plan, whereas the second one measures the extent of over/under-funding as a fraction of the value of the assets of the sponsoring firm. The latter is a better measure of the importance of the pension plan to the firm. To understand why, consider the case of a firm that has a large pension plan deficit according to (1), but very small according to (2). For this reason, and even though we report both measures in the summary statistics, for most of the regression analysis we use (2).

The third variable that we construct is a measure of portfolio allocation of the pension plan assets. More precisely, we calculate the share of total assets that is invested in equities in 2003 as:

$$\zeta^{Equities} \mid \frac{\text{Pension plan assets invested in equities}_{2003}}{\text{Pension plan assets}_{2003}} \tag{3}$$

The pension plan assets that are not invested in equities are mainly invested in bonds and cash, but some pension funds also hold a relatively small fraction of their assets in property (six percent on average for those which report owning property). The fourth variable that we construct is a measure of firm contributions into the plan. We scale firm contributions during 2003 by firm assets at beginning of the year, i.e. at the end of year 2002 such that:

$$\text{Contributions over firm asset} \mid \frac{\text{Contributions paid into the plan}_{2003}}{\text{Book value of firm assets}_{2002}} \tag{4}$$

4.2.2. Descriptive statistics

Table 1 shows summary statistics for the variables above defined. On average DB pension plans assets are 21% lower than pension plan liabilities. When measured as a fraction of the firm's assets the average pension plan deficit is equal to 4%. Both of these measures have considerable dispersion, as measured by the standard deviation. In fact, 13 out of the 90 firms have a pension plan surplus. The next row shows the number of pension plan members. We could not obtain information on this variable for ten out of the ninety plans. On average (and at the median) pension plans invest two thirds of the assets in equities.[7] The average value of firm pension plan contributions to firm assets is 0.8%, with the 25th and 75th percentiles being equal to 0.2% and 1.3%, respectively.

The next two rows show trustees information. The average number of trustees is 6, and the average proportion of trustees who are insiders is 0.25. It is interesting to see that there is considerable dispersion in the fraction of trustees who are corporate insiders: the inter-quartile range is equal to 0.4. One might be tempted to argue that what should matter is whether insiders have the majority among the pension trustees, i.e. whether the insider ratio is above 0.5. We have chosen not to use such a dummy variable for two reasons. First, there are only nine pension plans in our sample that have an insider ratio above 0.5, and eight pension plans that have an insider ratio exactly equal to 0.5. Second, we think that the proportion of corporate insiders who are pension plan trustees contains information about the power that insiders have, even when it is below 0.5. The last five rows of table 1 show information about several firm variables, including the fraction of independent directors, firm assets, number of employees, profitability, and leverage.

Table 2 shows pair-wise correlations between several variables. The fraction of pension plan assets invested in equities is negatively correlated with pension plan surplus. On the other hand, firm contributions are positively correlated with firm profitability, and negatively correlated with firm leverage and pension plan surplus. Thus, firms that have a higher pension surplus, tend to

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[7] The minimum value for the share of pension plan assets invested in equities in our sample is zero, and corresponds to the pension plan sponsored by The Boots Company PLC (see Viceira and Mitsui, 2003, for a case analysis). A zero or low share of pension plan assets invested in equities is the exception rather than rule, as can be seen from the summary statistics shown in Table 1. Just out of curiosity, the value for the insider ratio for Boots is also zero.

make lower contributions into the pension plan, or to have a "contribution holiday." The insider ratio variable is negatively correlated with the number of pension plan trustees, the log of the number of pension plan members, and the fraction of independent directors. The latter finding suggests that better governance in the sponsoring company (more independent directors) is associated with better governance in the pension fund (fewer insider-trustees).

The pair-wise correlations in Table 2 provide some support for the tax-arbitrage hypothesis. Firms with a larger pension plan surplus tend to invest a smaller fraction of the pension plan assets in equities (and a larger fraction in bonds), and tend to be more leveraged. This is consistent with firms increasing leverage to fund the pension plan, and shifting pension plan asset allocation towards bonds. However, recall that our tax-arbitrage hypotheses, is that insider-trustees *facilitate* such tax arbitrage. The pair-wise correlations in table 2 are not designed to address this.

4.2.3. Selection bias issues

Trustees' names and the insiders measure are only available for 44 pencent of the pension plans. We are concerned that this may lead to a sample selection bias. To investigate whether this is the case in Table 3 we compare pension plans and sponsoring firm variables for Footsie 100 firms with DB plans, and with and without trustee information. In columns two and three we show the mean, median, and standard deviation of several variables for each of the sub-samples. And, in the last column of the table we report the p-values for t-tests of equality of means (and medians between square brackets).

All variables examined – including firm size and profitability, pension plan surplus, share of the pension plan assets invested in equities, pension plan contributions, and fraction of independent directors – are not significantly different between the two samples. In fact, all p-values are higher than 20 percent. The lowest p-values are for pension plan assets (and liabilities), which are on average higher for pension plans with trustee information, than for those without trustee information. However, even for these variables the p-values are as high as 0.243 for assets (and 0.235 for liabilities), and the p-values are much larger when we instead consider differences in the medians. The numbers in Table 3 suggest that our sample is representative of the larger set of firms.

15

5. Results

5.1. Investment strategy

With both the agency and tax arbitrage predictions in mind, we first examine how the fraction of pension plan assets invested in equities is affected by the presence of insiders among the trustees. We estimate the following specification:

$$\zeta_i^{Equities} \mid \eta_1 * \text{Insider ratio}_i \; 2 \; \eta_2 * \text{Leverage}_i \; 2$$
$$2 \; \eta_3 * \text{Insider ratio}_i * \text{Leverage}_i \; 2 \; \nu * \text{Pension surplus over firm assets}_i \; 2 \; \kappa_i \tag{5}$$

where $\alpha_i^{equities}$ is the fraction of pension plan assets invested in equities, and ε_i is the residual. Among the independent variables we include the insider ratio, firm leverage, firm leverage interacted with insider ratio, and pension plan surplus over firm assets. Recall that the agency hypothesis predicts that more leveraged firms with a higher proportion of insiders should invest a higher fraction of the pension plan assets in equities, i.e. a β_3 coefficient greater than zero. The regression results are reported in Table 4.

In columns (1) through (3) we first include as independent variables the insider ratio, then add firm leverage, and then add the insider ratio interacted with firm leverage as well. Neither the direct effect of firm leverage, nor the direct effect of the insider ratio is significantly different from zero. However, from column (3), we see that the estimated coefficient on insider ratio interacted with firm leverage is positive and significantly different from zero (p-value equal to 7.4 percent). Thus, and as predicted by the agency hypothesis, more leveraged firms with a higher proportion of insider-trustees invest a higher proportion of the pension plan assets in riskier financial assets such as equities.

This result is also economically significant. To interpret economic magnitudes consider the estimated coefficients in column (3). For a company with a leverage ratio equal to 0.35 (the 75th percentile in our sample), and an insider ratio equal to 40 percent (the 75th percentile in our sample), the fraction of pension plan assets that are invested in equities is 6 percent higher (-0.129*0.4 + 0.8*0.4*0.35 = 0.061) than for a firm which has the same degree of leverage but an insider ratio equal to zero (the 25th percentile in our sample). When we instead consider a leverage ratio equal to 0.47 (the 90th percentile in our sample), the share invested in equities is 10

percent higher when the insider ratio is equal to 0.4 than when it is equal to zero. This result is consistent with the first prediction of the agency hypothesis. If a company is highly leveraged, insiders acting on behalf of shareholders have an incentive to engage in risk shifting, i.e. to increase the risk of the assets, which can be achieved by investing a higher proportion of the pension assets in equities.

Note also that a positive estimated coefficient on the insider ratio interacted with firm leverage is not what the tax-arbitrage hypothesis predicts. Recall that the tax arbitrage hypothesis predicts that firms increase leverage, use the proceeds to fund the pension plan, and at the same time invest pension assets into bonds. This implies a negative correlation between firm leverage and the share of pension plan assets invested in equities. In column (3) we see that the estimated coefficient on leverage although negative, is not significantly different from zero. Furthermore, if insider-trustees facilitate such tax arbitrage, a higher proportion of insiders and higher firm leverage should lead to a lower proportion of pension plan assets invested in equities, or a negative coefficient on the insiders ratio interacted with firm leverage variable. This is at odds with the estimated positive coefficient.

To provide further evidence on the tax arbitrage hypothesis, we note that the tax arbitrage view predicts that the higher the company's tax rate the larger the benefits of engaging in tax arbitrage. Thus we should observe a negative correlation between the firm's tax rate and the share invested in equities. And if insider-trustees facilitate such tax arbitrage, we should observe firms that face a higher tax rate and have a higher proportion of insiders investing a smaller fraction of pension assets in equities.

To test this we calculate a measure of the tax rate paid by sponsoring companies. More precisely, we follow Petersen (1996) and compute the average tax rate as the ratio of the corporate tax liabilities to firm assets. In column (4), and contrary to what the tax arbitrage view predicts, we estimate a positive, although not statistically significant, coefficient on the average tax rate. Furthermore, in column (5), where we do not control for firm leverage to give the average tax rate a better chance to work, we find no evidence in support of the prediction that insider-trustees allow firms to engage in tax arbitrage: the coefficient on the interaction term between the average tax rate and the insider ratio is not significantly different from zero.

In table 4, and for all of the estimated specifications, we control for pension funding over firm assets. For most of the specifications the estimated coefficient on pension surplus is negative and statistically different from zero. Thus firms with a higher pension plan surplus at the end of 2002, tend to invest a smaller fraction of the pension plan assets in equities in 2003. There are two possible (not mutually exclusive) reasons for this negative estimated coefficient. The first is that firms with a larger pension plan deficit are more willing to take risk with the pension plan assets, since investing in bonds would amount to recognizing that the firm will not be able to make the promised pension payments to employees. The second, and perhaps more plausible explanation is that, due to the recent declines in equity values, those firms that in the past had (and still have) an investment portfolio tilted towards equities are more likely to be in deficit.

Overall, the results in table 4 seem to provide support for agency prediction 1, and not for the tax arbitrage prediction 1 that insiders facilitate tax arbitrage.

5.2. Pension contributions

We now focus our attention on contributions to the pension plan. The dependent variable throughout is firm contributions during 2003 divided by book value of firm assets at the beginning of the year. We estimate the following specification:

$$\text{Contributions over firm assets}_i = \eta_1 * \text{Insider ratio}_i + \eta_2 * \text{Leverage}_i + \eta_3 * \text{Insider ratio}_i * \text{Leverage}_i + \nu * \text{Pension surplus over firm assets}_i + \kappa_i \tag{6}$$

Among the independent variables we include the insider ratio, firm leverage, firm leverage interacted with insider ratio, and pension plan surplus over firm assets. The results are shown in Table 5.

The first three columns estimate the effects of the insider ratio, firm leverage and average tax rate, also interacted with the insider ratio. None of these variables are statistically different from zero. In the first three columns the only variable that seems to matter is pension plan surplus over firm assets. The negative estimated coefficient implies that firms with a higher pension plan surplus (or a smaller deficit) at the beginning of the year make lower contributions into the pension plan during that year, a result which might have been expected.

Thus, from the first three columns of Table 5 we find no evidence in support of either agency prediction 2 or tax arbitrage prediction 2. One possible reason for this lack of statistical significance may be that the insider ratio is an *endogenous* variable: some firms (perhaps more leveraged firms) may have more of an incentive to place insiders as pension plan trustees. If pension plan members are aware of these incentives, they may try to prevent firms from doing so. We will now deal with the fact that the insider ratio may be endogenously determined by estimating instrumental variables (IV) regressions.

5.3. Instrumental variable regressions

To estimate IV regressions we need to obtain instruments for the insider ratio. Valid instruments are those that are correlated with the insider ratio, but uncorrelated with the dependent variables (share invested in equities and firm contributions into the pension plan). Table 2 offers some guidance in this respect. Both the log number of pension plan members and the number of pension plan trustees are negatively correlated with the insider ratio, but uncorrelated with the dependent variables. These are two of the instruments that we use for the insider ratio.

From an economic point of view, the log number of pension plan members makes sense as an instrument for the insider ratio. To understand why consider a situation in which executive directors of the sponsoring firm wish to place corporate insiders as pension plan trustees, and this is not necessarily good for pension plan members. Then the number of pension plan members may be a measure of the power of plan members, or of their ability to prevent directors of the sponsoring firm from nominating corporate insiders as trustees of the pension plan. The negative correlation between the log number of pension plan members and the insider ratio shown in Table 2 is consistent with this.

Our second instrument is the number of pension plan trustees. One might object to our use of this variable as an instrument based on the fact that it is also likely to be somewhat endogenous. While we agree with this, we note that if it is the case that the number of pension plan trustees is set first, and only afterwards are the trustees chosen, then the number of pension plan trustees is likely to be less endogenous than the insider ratio.

The third instrument that we use for the insider ratio is the fraction of independent directors of the sponsoring company, which is a common proxy for the quality of the corporate governance. If better corporate governance in the sponsoring company translates into better corporate governance in the pension fund, one would expect a negative relation between the fraction of independent directors and the insider ratio. This is consistent with the correlation result obtained in Table 2.

One objection to the use of the fraction of independent directors as an instrument for the insider ratio is that is not exogenous. The quality of the corporate governance may be the result of some underlying firm characteristics (Hermalin and Weisbach, 1998). However, if quality of corporate governance at the firm level is decided before pension plan trustees, then the fraction of independent directors of the sponsoring company is less endogenous than the insider ratio. This is likely to be the case because the board of directors appoints some of the trustees. This is why we have decided to use it as an instrument. However, the results that we report below are not significantly affected by excluding the fraction of independent directors from the set of instrumental variables.

To assess the quality of our instruments, we have regressed the insider ratio on these instruments. The R-squared of this first-stage regression is 21 percent, and all three estimated coefficients are negative and statistically different from zero.

Columns (4) to (6) of Table 5 show the second stage IV results for pension contributions. The main and important difference relative to the least squares regression shown in columns (1) to (3) is that the estimated coefficient for the insider ratio interacted with leverage is statistically significant. Thus more leveraged companies with a higher proportion of insider-trustees tend to make lower contributions into the pension plan. According to the results in column (5), for a company with a leverage ratio equal to 0.35 (the 75th percentile in our sample), and an insider ratio equal to 0.4 (the 75th percentile in our sample), the pension contributions over firm assets are 0.6% lower (0.015*0.4 - 0.088*0.4*0.35 = -0.0063), than for a firm that has the same degree of leverage but an insider ratio equal to zero (the 25th percentile in our sample). This is a large economic effect given that the average contributions equal 0.8%. This finding supports agency prediction 2.

20

Table 6 shows the second stage results for the share invested in equities. Comparing Tables 6 and 4 we see that the IV results are similar to those in table 4, but the statistical and economic significance of the variable insider ratio interacted with firm leverage is higher. Consider for example the estimated coefficients in column (3). For a company with a leverage ratio equal to 0.35, and an insider ratio equal to 0.4, the fraction of the pension plan assets that are invested in equities is 20% higher than for a firm that has the same degree of leverage, but an insider ratio equal to zero. Thus, leveraged firms with a higher proportion of insider-trustees invest a higher fraction of the pension plan assets in equities.

6. Further Evidence

6.1. Corporate dividends

The agency hypothesis described in Section 3, and for which we have provided empirical evidence, predicts that leveraged companies with a large proportion of insider-trustees wish to invest a larger fraction of the pension plan assets in equities, and make lower contributions to the pension plan. One further prediction of the agency hypothesis is that these lower pension plan contributions should be accompanied by higher dividend payouts to shareholders (see Webb, 2004). We now investigate whether in our data there is evidence for this prediction. Column (1) of Table 7 shows the regression results of pension contributions over firm assets on the insider ratio, dividend payout ratio, the interaction of the two, and further controls. We use profitability (rather than leverage) to control for firm performance because profitability is a natural determinant of the payout ratio.

Interestingly, and as predicted by the agency theory, we find that the estimated coefficient on the insider ratio interacted with the dividend payout ratio is negative and statistically significant. Thus firms that pay a larger fraction of net income in the form of dividends, and whose pension plans have a higher proportion of insider-trustees, tend to make lower pension plan contributions.

6.2. Corporate investment

There are some instances in which the presence of trustees who are corporate insiders may be positive for *both* pension plan members and equity-holders. In particular, corporate insiders who

are trustees may allow for a more efficient cash-flow management, by scheduling contributions to be paid into the pension plan so as to maximize the value of the firm. For instance, if external capital is expensive (as in asymmetric information models in the spirit of Myers and Majluf, 1984), a forced payment into the pension fund may have the impact of reducing corporate investment below the optimal level.[8]

This inefficiency may be avoided if the management has control over the actions of the pension plan trustees. This is because a reduction in pension plan contributions may allow the firm to undertake such investment, which increases firm value, and benefits both equity-holders and debt-holders. Of course, this assumes that investment is efficient. If not, i.e. if the presence of insiders allows a reduction in pension contributions, and inefficient investment to be undertaken, this creates an agency problem as in Jensen's (1986) free cash flow theory. However, this is an agency problem of a different nature than the one we previously described. In this case the agency problem is between the trustee-directors on the one hand, who wish to over-invest, and equity-holders and pension plan members on the other-hand, who are negatively affected by this over-investment.

We test these predictions in columns (2) and (3) of Table 7. More precisely, in column (2) we include corporate investment and corporate investment interacted with the insider ratio as independent variables. We find that sponsoring companies that undertake investments also increase contributions into the pension plan (the estimated coefficient on investment is positive and statistically significant). However, interestingly, a large fraction of insider-trustees allow companies to make lower contributions into the pension plan when investment is large (the estimated coefficient on insider ratio interacted with investment is negative).

The latter result indicates that insider-trustees are able to channel resources away from the corporate pension plan, and towards investment. The crucial issue, though, is whether this investment is efficient or not. With this in mind, in column (3), and instead of corporate investment, we include measures of investment efficiency, namely Tobin's Q, and Tobin's Q interacted with insiders. We do not find evidence that insider-trustees, by reducing pension contributions, enable firms to undertake efficient investment: the estimated coefficient on the

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[8] Consistent with this view, Rauh (2004) finds that capital expenditures decline with mandatory

interaction of insider ratio and Tobin's Q is not statistically significant.[9] Of course, it is possible that Tobin's Q does not accurately measure investment opportunities, and for this reason the insider-ratio interacted with Tobin's Q variable is not significant.

In spite of this measurement issue as a caveat to our analysis, the results in columns (2) and (3) of Table 7 seem to suggest that insider-trustees allow firms to make lower contributions to the pension plan when corporate investment is large, but that such investment is inefficient. This is an agency problem between directors of the sponsoring company on one hand, and shareholders and pension plan members on the other hand.

6.3. Pension plan deficit

We now investigate further how the pension plan surplus or deficit affects firm contributions, also in the presence of corporate insiders. We have previously tried to interact pension plan surplus with the insider ratio, and include it as an independent variable for explaining investment strategy, and pension plan contributions. However, the estimated coefficient on this variable was never statistically significant (and the estimation results were not reported).

In column (4) of Table 7 we report some positive evidence that we have obtained for this variable. We find that companies with a larger pension plan deficit contribute more to the pension plan (the estimated coefficient on the pension plan surplus is negative), but less so if there are a large proportion of trustees who are insiders (the estimated coefficient on the insider ratio interacted with pension plan surplus is positive). Thus firms increase contributions to the pension plan to reduce the deficit, but less so if there is a large proportion of insider-trustees. There are two differences in this regression relative to the previously estimated ones, which explain the significance of the results. The first is that we only include in the sample those firms that have a serious shortfall as defined by the MFR rules. Second, we use a measure of pension plan surplus not scaled by firm assets.

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contributions to DB pension plans in a sample of U.S. companies.

[9] As an alternative measure of investment efficiency, we have used operating cash flow over assets, also interacted with the insider ratio. The estimated coefficient on the interaction term was also non-significantly different from zero.

Unlike our previous results on contributions, the results in Table 7 on dividends, investment and pension funding are not robust to an instrumental variables approach. Nevertheless we believe that they are interesting and suggestive of the agency problems related to corporate pension plans, and therefore decided to report them.

6.4. Actuarial assumptions

There is evidence that US firms manipulate the assumptions that they use for the valuation of pension plan liabilities. More precisely, Bergstresser, Desai and Rauh (2004) find evidence that managers increase the assumed rate of return on equity so as to increase earnings, as they prepare to acquire other companies.[10] With these results in mind, we have investigated in our UK sample whether the actuarial assumptions used are correlated with the insider ratio, also interacted with leverage. More precisely, we have investigated whether pension plans with a higher proportion of insider trustees choose assumptions so as to minimize the present discounted value of pension plan liabilities, by using a higher discount rate and a lower rate of salary growth. We did not find any statistical significant effects of the insider ratio, or of any other variables with which we experimented. We have also studied the assumptions on the expected return on equities and other assets with similar results.

There may be several reasons for this. One possibility is that insider-trustees lack the flexibility to choose a higher discount rate to value the plan's liabilities. FRS17 specifies that the discount rate should be equal to rate of return on an AA-rated corporate bond of similar currency and maturity to the plan's liabilities. Furthermore, in the UK there is much less of an incentive than in the US to be aggressive in terms of the assumptions on expected return on equities and other assets. This is because any differences between the assumed and the realized rates of return must be fully recognized in the year that they occur, and cannot be spread over time. Or perhaps a simpler explanation is that the actuaries rather than the trustees choose the assumptions used for the valuation of the plan's liabilities, and they are largely independent from pension plan trustees and sponsoring firm.

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[10] See also Fabozzi and Ryan (2003) and Dimson, Marsh, and Staunton (2003)

7. Conclusion

Over the last decades improvements in life expectancy have led to significant increases in the liabilities of companies that have promised DB pensions to their employees. In addition, recent declines in equity values have reduced the value of pension plan assets. The resulting large deficits mean that decisions taken within corporate DB pension plans have important implications not only for their members, but also for the companies that sponsor them. In the United Kingdom corporate DB pension plans are set up in trusts, with trustees being responsible for deciding the investment strategy for the pension plan assets, and setting the contributions that the company is required to pay to the plan. In this paper we have investigated how these decisions are affected by the presence of trustees who are also directors of the sponsoring companies, or trustees who are insiders to the company.

We have found evidence that supports an agency view, whereby insider-trustees act in the interest of shareholders of the sponsoring company, and not necessarily in the interest of the members of the pension plan. In particular, pension plans of more leveraged firms with a higher proportion of insider-trustees invest a higher fraction of the pension plan assets in riskier financial assets such as equities, and make lower contributions into the pension plan. These lower contributions tend to be accompanied by a higher dividend-payout ratio than what would be the case in the absence of insider-trustees. This is further evidence in support of the agency view.

We have also found that insider-trustees enable firms to make lower contributions into the pension plan when corporate investment is large, which benefits both shareholders and pension plan members if the investment is efficient. However, there is no such effect when we use a measure of investment efficiency instead of investment. This is suggestive of a further agency problem between the management of the firm on one hand, and shareholders and pension plan members, on the other hand.

There are a final couple of issues that are important that we clarify. First, although we have provided evidence that a large fraction of insider-trustees is a source of agency problems, the optimal number of insider-trustees may not necessarily be zero. The presence of a small minority of insider-trustees may help information flow between the firm and the pension plan, and be beneficial for both shareholders and pension plan members. Second, our evidence in support of

the agency view is based on the effects that insider-trustees have on the investment strategy of the pension plan assets, and on the firm contributions paid into the plan. These are not measures of value destruction from having insider-trustees. Finding such direct evidence on value would be much harder.

Appendix – Definitions of variables and sources

From Datastream:

Book value of firm assets	Book value of total assets in 2002 (£ billion).
Number of firm employees	Number of employees at the end of 2002.
Profitability	Earnings Before Interest and Taxes (EBIT) during 2003 divided by the book value of total assets at the end of 2002.
Book leverage	Book value of total liabilities divided by the book value of total assets at the end of 2002.
Average tax rate	Average income taxes paid divided by the average book value of total firm assets at the end of 2002.
Dividend payout ratio	Average dividend payment to common shares divided by the average net income from 2000 to 2003. Companies with negative net income and positive dividend payment were given the highest dividend payout ratio.
Investment over firm assets	Average capital expenditures divided by the average book value of total firm assets from 2000 to 2003.
Tobin's q	Ratio of the average market value of assets to the average replacement value from 2000 to 2003. The market value of assets is proxied by the book value of assets minus the book value of equity minus deferred taxes plus the market value of common stock. The replacement value of assets is proxied by the book value of assets.

From the 2003 Annual reports:

Pension plan assets	Market value of pension assets at the end of 2002.
Pension plan liabilities	Present value of future pension liabilities at the end of 2002.
Pension plan surplus	Pension assets minus pension liabilities, divided by pension plan liabilities in 2002.
Pension surplus over firm	Pension assets minus pension liabilities, divided by the book value

assets	of firm assets in 2002.
Share invested in equities	Market value of the investment in equities divided by the market value of all pension assets at the end of 2003.
Contribution over firm assets	Contributions into the pension plan in 2003 divided by the book value of firm assets at the end of 2002.
Fraction of independent directors	Fraction of board of directors who are independent in 2003, where the definition of independence is based upon the Combined Code on Corporate Governance, Financial Services Authority (2003).

From the publication Pension Funds and their Advisers (2004):

Number of pension members	Number of members of the pension scheme.
Number of trustees	Number of trustees of the pension plan.
Insider ratio	Fraction of pension plan trustees who are executive directors in the sponsoring company. Among the executive directors we include the company secretary.

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Table 1. Descriptive statistics

The variables are defined in the Appendix.

Variable	Mean	Median	Std. deviation	25th percentile	75th percentile	Number of observations
Pension plan assets (£ billion)	1.392	0.219	0.055	0.770	3.842	90
Pension plan liabilities (£ billion)	1.530	0.289	0.082	0.764	4.073	90
Pension plan surplus	-0.211	-0.256	0.680	-0.320	-0.087	90
Pension surplus over firm assets	-0.040	-0.031	0.061	-0.067	-0.003	90
Number of pension members	22,139	7,629	51,037	1,823	16,004	80
Share invested in equity	0.667	0.690	0.146	0.597	0.764	90
Contribution over firm assets	0.008	0.005	0.008	0.002	0.013	90
Number of trustees	6	6	2	5	8	90
Insider ratio	0.252	0.250	0.206	0.000	0.400	90
Fraction of independent directors	0.514	0.500	0.104	0.273	0.750	90
Book value firm assets (£ billion)	15.618	1.413	55.566	0.723	4.836	90
Number of firm employees	24,699	9,301	48,096	3,998	24,267	90
Profitability	0.087	0.083	0.091	0.035	0.133	90
Book leverage	0.258	0.257	0.173	0.139	0.352	90

Table 2. Pair-wise correlations

All variables are defined in the Appendix. The p-values are reported in parentheses.

	Pension surplus over firm assets	Log (Number of pension members)	Share invested in equity	Contrib. over firm assets	Number of trustees	Insider ratio	Fraction of independent directors	Profitability
Log (Number of pension members)	0.071 (0.531)							
Share invested in equity	**-0.220** **(0.037)**	-0.174 (0.124)						
Contribution over firm assets	**-0.536** **(0.000)**	0.151 (0.181)	-0.082 (0.443)					
Number of trustees	-0.024 (0.820)	**0.532** **(0.000)**	-0.151 (0.155)	0.112 (0.297)				
Insider ratio	0.126 (0.237)	**-0.347** **(0.002)**	0.065 (0.546)	-0.143 (0.178)	**-0.311** **(0.003)**			
Fraction of independent directors	0.175 (0.121)	-0.019 (0.869)	**-0.258** **(0.021)**	-0.082 (0.472)	0.050 (0.662)	**-0.230** **(0.040)**		
Profitability	-0.155 (0.151)	-0.160 (0.161)	0.055 (0.615)	**0.262** **(0.014)**	**-0.189** **(0.079)**	-0.015 (0.888)	-0.065 (0.569)	
Book leverage	**0.190** **(0.073)**	0.040 (0.723)	-0.030 (0.778)	**-0.222** **(0.036)**	**0.183** **(0.085)**	-0.069 (0.516)	0.130 (0.251)	-0.136 (0.208)

Table 3. Addressing selection bias issues: FTSE 100

This table compares companies in the FTSE 100 with a DB pension plan and with and without information on the number and identity of the trustees. All variables are defined in Table 1. The test of equality of means is a t-test. The test of equality of medians is a non-parametric K-test. For both tests we report their p-values.

Variable	Sample with trustee information	Sample without trustees information	Test of equality of means and medians
	Mean [Median] (Std. deviation)	Mean [Median] (Std. deviation)	Means: p-value [Medians: p-value]
Number of observations	42	42	
Book value of firm assets (£ billion)	43.265 [6.841] (100.339)	48.322 [8.522] (115.474)	0.831 [0.663]
Profitability	0.056 [0.063] (0.120)	0.061 [0.058] (0.079)	0.818 [0.912]
Number of firm employees	48,449 [29,000] (65,361)	53,376 [38,051] (55,561)	0.714 [0.269]
Book leverage	0.301 [0.289] (0.173)	0.269 [0.261] (0.186)	0.414 [0.582]
Pension plan assets (£ billion)	3.297 [1.184] (5.547)	2.166 [1.050] (2.850)	0.243 [0.663]
Pension plan liabilities (£ billion)	4.067 [1.513] (6.730)	2.667 [1.266] (3.447)	0.235 [0.443]
Pension plan surplus	-0.207 [-0.226] (0.130)	-0.205 [-0.223] (0.112)	0.928 [0.912]
Pension surplus over firm assets	-0.047 [-0.035] (0.060)	-0.044 [-0.023] (0.055)	0.772 [0.322]
Share invested in equity	0.703 [0.730] (0.145)	0.669 [0.692] (0.185)	0.349 [0.443]
Contribution over firm assets	0.006 [0.004] (0.006)	0.006 [0.003] (0.006)	0.717 [0.238]
Fraction of independent directors	0.547 [0.536] (0.112)	0.532 [0.546] (0.121)	0.543 [0.662]

Table 4. Portfolio allocation in equities

The dependent variable is share invested in equity. All variables are defined in the Appendix. The p-values shown in parentheses are adjusted for heteroskedasticity using the Huber-White correction.

	(1)	(2)	(3)	(4)	(5)
Insider ratio	0.074 (0.447)	0.076 (0.442)	-0.129 (0.489)	-0.125 (0.502)	0.136 (0.278)
Book leverage		0.020 (0.847)	-0.189 (0.226)	-0.162 (0.277)	
Insider ratio * Book leverage			**0.800** **(0.074)**	**0.807** **(0.076)**	
Average tax rate				0.731 (0.261)	1.235 (0.384)
Insider ratio * Average tax rate					-2.451 (0.545)
Pension surplus over firm assets	**-0.619** **(0.025)**	**-0.631** **(0.039)**	**-0.614** **(0.049)**	-0.552 (0.105)	**-0.571** **(0.069)**
Constant	0.631 (0.000)	0.625 (0.000)	0.681 (0.000)	0.656 (0.000)	0.601 (0.000)
R^2	0.057	0.058	0.085	0.095	0.069
Number of obs.	90	90	90	90	90

Table 5. Pension contributions: OLS and IV results

The dependent variable is contribution over firm assets. In columns (4) to (6), insider ratio is instrumented by the logarithm of the number of pension plan members, the fraction of independent directors of the sponsoring company, and the number of pension plan trustees. The columns present the results of the second stage. The variables are defined in the Appendix. The p-values shown in parentheses are adjusted for heteroskedasticity using the Huber-White correction.

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	IV	IV	IV
Insider ratio	-0.003 (0.423)	-0.002 (0.774)	-0.003 (0.561)	-0.014 (0.106)	0.015 (0.435)	**-0.024 (0.077)**
Book leverage		-0.005 (0.576)			0.018 (0.256)	
Insider ratio * Book leverage		-0.005 (0.808)			**-0.088 (0.076)**	
Average tax rate			0.046 (0.348)			0.027 (0.715)
Insider ratio * Average tax rate			0.008 (0.962)			0.250 (0.383)
Pension surplus over firm assets	**-0.069 (0.000)**	**-0.065 (0.000)**	**-0.064 (0.000)**	**-0.058 (0.000)**	**-0.060 (0.000)**	**-0.049 (0.001)**
Constant	0.006 (0.000)	0.008 (0.005)	0.005 (0.008)	0.009 (0.000)	0.003 (0.664)	0.010 (0.033)
Number of obs.	90	90	90	80	80	80

Table 6. Portfolio allocation in equities: IV results

The dependent variable is share invested in equity. Insider ratio is instrumented by the logarithm of the number of pension plan members, the fraction of independent directors of the sponsoring company, and the number of pension plan trustees. The table presents the results of the second stage. The variables are defined in the Appendix. The p-values shown in parentheses are adjusted for heteroskedasticity using the Huber-White correction.

	(1)	(2)	(3)	(4)	(5)
Insider ratio	**0.481** **(0.017)**	**0.506** **(0.018)**	-0.272 (0.616)	-0.360 (0.531)	**0.644** **(0.043)**
Book leverage		0.107 (0.336)	-0.530 (0.205)	-0.561 (0.203)	
Insider ratio * Book leverage			**2.254** **(0.068)**	**2.452** **(0.059)**	
Average tax rate				0.962 (0.279)	2.268 (0.378)
Insider ratio * Average tax rate					-6.286 (0.522)
Pension surplus over firm assets	**-0.825** **(0.008)**	**-0.884** **(0.011)**	**-0.726** **(0.086)**	-0.642 (0.164)	**-0.788** **(0.017)**
Constant	0.522 (0.000)	0.486 (0.000)	0.716 (0.000)	0.713 (0.001)	0.464 (0.000)
Number of obs.	80	80	80	80	80

Table 7. Alternative agency hypotheses on pension contributions: OLS results

The dependent variable is contribution over firm assets. The variables are defined in the Appendix. The p-values shown in parentheses are adjusted for heteroskedasticity using the Huber-White correction.

	(1)	(2)	(3)	(4)
Insider ratio	0.002 (0.624)	0.004 (0.494)	0.002 (0.828)	**-0.077** **(0.028)**
Profitability	**0.029** **(0.003)**	**0.019** **(0.004)**	**0.019** **(0.061)**	**0.045** **(0.000)**
Dividend payout ratio	0.002 (0.139)			
Insider ratio * Dividend payout ratio	**-0.005** **(0.094)**			
Investment		**0.063** **(0.015)**		
Insider ratio * Investment		**-0.145** **(0.089)**		
Tobin's q			**0.002** **(0.072)**	
Insider ratio * Tobin's q			-0.002 (0.706)	
Pension surplus over firm assets	**-0.065** **(0.000)**	**-0.064** **(0.000)**	**-0.066** **(0.000)**	
Pension funding surplus				**-0.029** **(0.042)**
Insider ratio * Pension funding surplus				**0.105** **(0.042)**
Constant	0.002 (0.433)	0.002 (0.212)	0.002 (0.339)	0.026 (0.010)
R^2	0.362	0.355	0.350	0.198
Number of obs.	90	90	90	64
Excluded companies	None	None	None	Those with pension funding surplus > –10%

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