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Executive pensions and the pay–performance relation—Evidence from changes to pension legislation in the UK

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Abstract

This article evaluates the role of executive pensions in the relationship between executive compensation and corporate performance. As a natural experiment, we exploit a major change to the tax-free allowances governing executive pensions. This reform affected the cost of pensions for firms whose executives had accumulated pension benefits in excess of the prescribed limit. We find a strong reaction to the reform. After 6 April 2006, many executives saw their defined benefit pension schemes replaced with risk-free cash payments. This imposition of an exogenous constraint on the contracting over CEO pay significantly decreased the relationship between executive pay and firm performance.

JEL classifications: J32, J33, M12, M52

1. Introduction

Economists have thought carefully about how firms could set contracts with their senior executives to provide optimal pay incentives to deliver corporate performance. The formal theoretical contracting models of Holmstrom (1979) and Grossman and Hart (1983) detail the mechanics by which firms link performance and reward. The empirical counterpart, the sensitivity of the link between executive pay and corporate performance, has become the benchmark in testing theories of corporate governance (Jensen and Murphy, 1990; Conyon *et al.*, 2011; Gregory-Smith, 2012; Gregory-Smith and Main, 2015; Bell and Van Reenen, 2016).

However, a major omission in the empirical literature is the size and form of executive pensions. We argue that an understanding of the pension element of executive remuneration is crucial to a fully informed public debate regarding the pay–performance relation. Until recently, pension benefits have not been disclosed with sufficient clarity to permit comparison between companies on a consistent basis over time. The pension data in this

study show that pensions form a significant part of executive remuneration (as has been acknowledged in the US literature [Bebchuk and Jackson, 2005]). More significantly, we argue that pension benefits are likely to impact not only on total reward but also on the pay–performance relation in several ways that are not immediately obvious. For example, a company's defined benefit (DB) pension can serve as a retention device because the value of a DB pension increases the longer the director stays in service with the company. Over time, this provides an incentive for high-performing directors to remain and increases the cost to the company of retaining underperforming directors.

An analysis of the impact of recent changes in legislation relating to pensions offers a unique opportunity to test the impact of exogenous changes on remuneration where previously the endogenous nature of the pay–performance relation has confounded its estimation. For example, the structure of a CEO's pay contract and how performance is rewarded are the result of negotiations between the CEO and the firm's remuneration committee. In such circumstances, the fact that estimates of the pay–performance relation have sometimes been lower than expected (Jensen and Murphy, 1990) could be attributed to an inability to observe the firm's desire to provide insurance for its executives (Garen, 1994).[1] An advantage of this study over the prior literature is that it exploits the introduction of a radical reform in pension tax law in the UK on 6 April 2006 (known as 'A-day'). This natural experiment exogenously affected executive pension provision and also provided a control group of UK executives who were not affected by the legislation. This allows us to estimate the pay–performance relation for both the treated and untreated groups of executives, before and after A-day. We also examine a subsequent reform to the A-day rules in April 2011.

We find a strong reaction to A-day in terms of changes to executive pensions. After A-day, many executives saw their DB scheme replaced with supplementary cash payments. While the value of DB accruals is linked to company performance through the retention of higher-performing directors, supplementary cash payments are risk-free and paid immediately. Our estimates suggest that this change had the unintended consequence of imposing a constraint on contracting over CEO pay and led to a significant decrease in the relationship between executive pay and firm performance for those executives affected by the reform. Quite simply, these directors had 'less skin in the game' (Jensen *et al.*, 2004) post A-day.

The following section reviews the pay–performance literature and how executive pensions have been conceptualized. We then present the details of the A-day reform (Section 3) and sample descriptives (Section 4). Our econometric analysis is conducted in two stages. The first stage shows that the A-day reform imparts an exogenous shock to executive pension provision (Section 5). The second stage shows this shock significantly decreased the pay–performance relation for those executives affected by the reform (Section 6). Section 6 also checks for robustness and investigates the mechanisms linking pensions and performance. Section 7 concludes.

2. Literature

In the executive compensation literature, the pay–performance relation is examined by evaluating the estimated coefficient β from the following equation:

1 Albeit more recent estimates report a somewhat stronger pay-performance relation as discussed below.

$$y_{it} = \gamma_i + \alpha_t + \beta(\text{Performance})_{it} + \lambda(X)_{it} + \mu_{it} \quad (1)$$

where y_{it} is executive compensation in firm i and time t (usually in logs), γ_i is an unobserved time-invariant firm specific effect, α_t is a common time effect, Performance is firm performance, most often measured by total shareholder return (TSR) which captures dividends and share price growth, and X is a vector of firm-level controls, such as firm size.

The size of β measures the extent to which executive pay varies with the returns to the principal's investment. That is, pay-for-performance. A higher level of β transfers risk from shareholders to the executive. Given imperfect monitoring, a large and positive β provides economically meaningful incentives for the executive by rewarding performance and punishing failure.[2] The pay–performance literature has typically ignored the pension element of executive pay. That is not to say that executive pensions have never been considered. Below, we discuss how executive pensions have been conceptualized in the literature to date and explain why they might play a key part in establishing the pay–performance relation. Our contribution to this literature is to examine the role that executive pensions play in delivering returns to shareholders.

Bebchuk and Jackson (2005) represent the first attempt to document executive pension benefits. The authors established that pensions are a significant part of the executive remuneration package in the USA with a median value of $15 M amongst retiring S&P500 CEOs in 2003/4. They argue that executive pensions, being sizable and opaque, are a device used by executives to inflate their total pay without attracting outrage from outsiders who might otherwise attempt to constrain their pay. In other words, pensions are stealth payments, consistent with the Bebchuk and Fried (2003) 'managerial power' thesis that portrays CEOs as having captured the pay-setting process.

The leading alternative view to Bebchuk and Jackson (2005) is put forward by Sundaram and Yermack (2007) who argue that executive pensions are part of an optimal contract, constrained by market forces. It is argued that DB pensions, because they are 'inside debt', can be used to align managerial interests with those of bondholders. While employee DB pension funds in the UK are insured by the Pension Protection Fund (Goh and Li, 2015), a typical executive's pension far exceeds the insured amounts (which range from £18,000 to £36,000 per year subject to an employee's age). It follows that a CEO who is sitting on a multi-million pound pension stands to lose nearly all of it if they take risks that result in company bankruptcy (Edmans and Gabaix, 2009).[3] Sundaram and Yermack (2007) show, in a sample of 237 CEOs, that those with large DB pensions behave more conservatively (lower risk of firm default).

An objection to this view is that equity payments to CEOs, in the form of share options, may act in the opposite direction and provide CEOs with incentives to undertake risky projects. Arguably, it is counterintuitive for firms to simultaneously provide to their CEOs sizeable amounts of both equity and inside debt. This suggests that pensions may play some role other than aligning managerial interests with those of bondholders. A second objection with the Sundaram and Yermack's (2007) finding is that they do not attempt to establish a causal relationship between inside debt and the level of risk taking by CEOs. Hence an alternative explanation for their finding is that the association between conservative

2 See Gregory-Smith and Main (2015) for recent estimates.

3 Albeit that in practice a company might honour its pension obligations before those to other creditors (Bebchuk and Jackson, 2005).

behaviour and pension entitlement is simply a function of an ageing CEO or a maturing market. To address these objections, Edmans and Liu (2011) provide a formal theoretical model showing that the use of pensions as inside debt alongside the use of equity payments can be optimal in several settings. Additionally, Wei and Yermack (2011) provide empirical evidence supporting the use of pensions as inside debt.

The novelty of our contribution is to propose that executive pensions can align the interests of the executive with those of shareholders, not just bondholders, and in so doing strengthen the pay–performance relation. While it is intuitive to model executive pensions as inside debt, we argue that certain types of executive pensions may additionally provide easy to overlook, but significant, performance incentives. For example, DB pensions can act as a means to secure retention of key employees with each subsequent year on a DB being, on average, more valuable than the last, a form of 'deferred compensation' (Lazear, 1979). Therefore, the incentives for good performers remain increase, while from the firms' perspective the retention of poor performers becomes more costly. This introduces a greater number of good performers on well-paid DBs into the data, as a result of pension incentives designed by the firm.

Empirical work on this topic is rare. Goh and Li (2015) find that pensions substitute for performance-based pay for FTSE100 executives between 2004 and 2011. Since such behaviour is seen to occur more intensively in companies with weaker corporate governance controls, the authors interpret this finding as evidence for the Bebchuk and Jackson (2005) view of pensions as stealth compensation. One difficulty with this interpretation is that the corporate governance variables used to proxy the strength of monitoring may be endogenous with respect to compensation design (Hermalin and Weisbach, 2003). Monitoring and pensions may be negatively related not just because of managerial power but because decisions on monitoring, pensions, and performance pay have been taken simultaneously. For example, if, as we argue, pensions increase the pay–performance relation, then a greater use of pensions would mitigate the need for the more obvious, if actuarially more expensive, performance linked reward components of bonuses and share options. In the absence of any exogenous variation in these variables, it is hard to distinguish between the competing interpretations. To address this problem, and identify the causal effect of pensions on the pay–performance relation, our study will exploit the reform of UK pension legislation introduced in 2006, which represented an exogenous shock to the design of reward arrangements.

3. Reform of UK pension legislation

The 6 April 2006 saw the introduction of a major reform to UK pensions (known as 'A-Day') designed to combine eight distinct sets of pension legislation into one simpler system. The main novel feature of the legislation was the introduction of annual and lifetime allowances initially set at £215,000 and £1.5 million, respectively. These allowances represented caps on the amount of pension, which could benefit from tax relief. If the value of the accumulated pension benefits exceeded the allowance, then the excess pension was subject to a tax surcharge of 25%. Given that individuals who earn enough to breach the allowances were highly likely to be in the 45% tax bracket, this amounted to a 58.75% tax on pensions in excess of the allowance. A 58.75% tax rate also applied to the part of any lump sum payment that is in excess of the allowance.

The UK tax year runs from 6 April to 5 April the following year. Directors' payments for the year are disclosed at each company's financial year-end. Therefore, if the company's financial year-end is on or after the 6 April 2006, the pension payments in our data are subject to the allowances. In December 2004, a Government White Paper was published which contained the outline of the proposals that became A-day. During the data collection phase, we looked for evidence of anticipation of the pension tax allowances by companies. In some financial statements for 2005, we found reference to the pending changes but it did not appear to be the case that this was acted upon until the year in question. The most likely explanation for this is that remuneration policy is reviewed annually, first being set by an independent committee and then voted upon by shareholders at the Annual General Meeting, and consequently is subject to inertia.

From A-Day until the 2010 tax year, the annual allowance increased by £40,000–255,000. This then fell considerably to a £50,000 cap from 2011 onwards, with a further reduction to £40,000 from 2014. Similarly, the lifetime allowance increased incrementally for the first 5 years following the reform, from £1.5 million to £1.8 million, but was then reduced between 2011 and 2014 to £1.25 million.

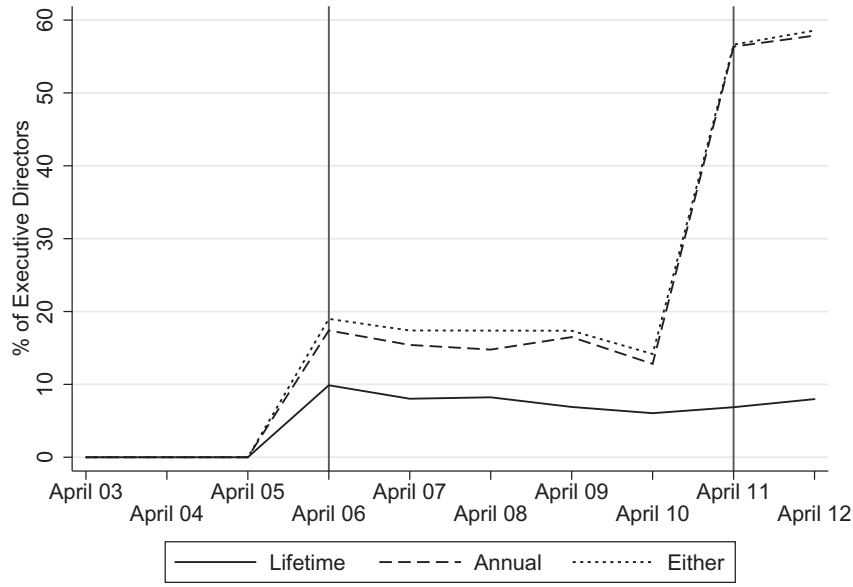
Figure 1 provides an indication of the proportion of executives in the FTSE350 who have been affected by these reforms to the pension system.[4] There are two clear discontinuities, at 2006 and 2011. With the initial introduction of the £215,000 annual allowance and £1.5 million lifetime allowance just under 20% of executives were caught by one of the two allowances, with the annual allowance catching more executives than the lifetime allowance.[5] The subsequent modest changes to the pension caps between 2006 and 2011 did not substantially change the proportion of executives in excess of the allowances. However, the significant tightening of the annual allowance effective from April 2011 had a large effect, with an approximate 40% point increase in those affected to over half of all executive directors in the sample.

4. Data

The dataset used in this study is based on executives in 794 companies listed on the London Stock Exchange with a financial year end between 1 January 2003 and 31 December 2012

4 In the years post 2006, the figure becomes an underestimate of the total number of executives 'affected' because, as shown below, after A-day a significant number of executives switched out of their defined benefit pensions specifically to avoid the allowances introduced by A-day. Only directors with defined benefit schemes can be identified as exceeding the lifetime allowance because UK legislation only requires the accumulated transfer value of defined benefit schemes to be disclosed. In practice, very few directors will be able to exceed the lifetime limit through a defined contribution scheme without also exceeding the annual allowance (which is identified for all schemes).

5 Unfortunately, only pension benefits held at the company of employment are required to be disclosed under UK listing rules. Therefore, a director may have outstanding pension benefits with previous employers unless these have been transferred across to the current company's scheme. Therefore, while the number of directors caught by the annual allowance is accurate, we may be underestimating the number of directors affected by the lifetime allowance. To the extent this occurs, our subsequent analysis underestimates the differences between the treated and control groups. However, in practice, Figure 1 shows there are very few directors who are caught by lifetime allowance who are not also caught by the annual allowance.



Notes: The figure shows the proportion of executive directors in our sample that were in breach of the pension allowances introduced on the 6th April 2006 and the subsequent changes to those allowances.

Fig. 1. Percentage of executives in excess of A-day pension allowances.

(inclusive). Minerva Analytics Ltd has collected pension information since 2006. In order to capture trends prior to A-day, we backfilled the pension information to 2003 by purchasing companies' annual report and accounts that are archived at Companies House. Only 22 company-years were dropped because we could not find any pensions information, i.e. the pension benefits were missing rather than disclosed as zero.

Our sample period covers 3 years prior to A-Day and includes both the introduction of the allowances at A-Day and the substantial reduction of the annual allowance in April 2011. The sample is restricted to executive directors until they reach retirement age, resulting in a panel data set of 21,687 executive-firm-years.

4.1 Variables

The key variables of interest are the executives' pension benefits and total direct compensation (TDC). TDC is constructed as the summation of salaries, bonuses, long-term incentive plans (LTIPs), share options, pensions, and other perquisites. Options and LTIPs are valued at grant date. We control for executive equity ownership albeit we are unable to observe historical unexercised, but not yet lapsed, share options.[6] As we have precise appointment

6 We would like to measure changes in total wealth, including changes to the value of the executive's option portfolio (Edmans and Gabaix, 2016). However, our data during the sample period do not identify historical option grants and unexercised (but not lapsed) options with sufficient detail to calculate changes to the executive's portfolio.

and resignation dates, we are able to annualize the pay of executives who did not serve a full financial year.

Data are available for the annual pension benefit under three types of pension scheme: DB, defined contribution, and cash salary supplements in lieu of pension. Defined contribution and cash-in-lieu payments are defined simply as the payments made by the firm to an executive's pension arrangement or as a salary supplement as stated in the annual report and accounts.

Since DB pensions pay an annual sum based on an executive's salary and length of service on retirement, an annual valuation for this type of pension scheme is less straightforward. Companies are required to disclose the transfer value, which represents the total cost to the company of the pension liability. This enables an annual valuation for this type of pension benefit to be calculated by taking the change in the transfer value. It is important to note that this is an imperfect measure, first because market movements and actuarial assumptions influence the figure. Secondly, it does not necessarily equal the value that the executive would place on that additional year of service. Nevertheless, the figure is audited to actuarial standards and is the most objective measure of pension value available. Moreover, to the extent that there are fixed effects between companies or common changes in actuarial practice over time, these will be controlled for in our subsequent econometric analysis.

Director-level control variables include age, tenure, gender, and position on the board. Other key variables include firm performance, measured as TSR. TSR is obtained from the annual change in the log of the return index supplied by Datastream. We also have information on firms' sales revenues that we use as a proxy for firm size. Variation in corporate governance is captured using variables for board size, the percentage of non-executive directors on the board who are considered independent, joint CEO/Chairmanship, and institutional ownership.

4.2 Descriptive statistics

Table 1 shows the sample means of the key variables of interest before and after A-day for both the treated and control directors. The treated directors are those captured by either the annual or lifetime allowance prior to 2006 and all other directors are designated as controls. Notably, while compensation generally increases over the period, the change in DB transfer values decreases dramatically for the treated group. However, whether or not this is due to A-day cannot be concluded at this stage because other variables are changing over time as well as exhibiting differences between the treated and control group. These differences will be controlled for in our subsequent analysis.

The movements in the distribution of pension payments over time are shown in Table 2. One key feature is the shift away from DB payments, which fall from 40% of total executive pension payments to 20% between the 2003 and 2012 tax years. This is matched by a steady increase in the proportion of payments captured by cash supplements, which increases by 20% points from 10% to just over 30%, becoming more prevalent than DB payments after 2010.

There are strong indications that pension reform has influenced these trends. Despite the pre-existing decline in the popularity of DB payments,[7] there is a noticeable drop in payments following A-Day by almost 10% points between the 2005 and 2006 tax years.

7 By 2003, defined benefit pension schemes were being replaced by many companies and were being closed to new entrants, with only incumbent executives accruing benefits. The steady decline in the proportion of defined benefit payments partly reflects executives switching firms and being unable to access defined benefit schemes in their new firm.

Table 1. Mean value of variables before and after A-day

	Pre A-day 2003–6			Post A-day: 2006–12		
	(1) Treated	(2) Control	(3) Diff *t*-test	(4) Treated	(5) Control	(6) Diff *t*-test
Salary (£000 s)	473.905	279.232	***	468.878	294.399	***
			(–30.53)			(–34.87)
Bonus (£000 s)	212.058	120.978	***	323.008	196.994	***
			(–10.23)			(–13.63)
Long-term Incentives (£000 s)	354.116	170.263	***	631.322	270.627	***
			(–4.97)			(–17.07)
Other pay (£000 s)	41.921	32.653	***	56.002	29.561	***
			(–3.11)			(–8.46)
Total pension (£000 s)	575.748	42.514	***	440.953	56.911	***
			(–22.74)			(–41.08)
Defined Benefit Transfer Value Change (£000 s)	535.692	10.135	***	373.621	8.939	***
			(–22.46)			(–40.44)
Defined Contribution (£000 s)	32.817	23.083	***	32.165	31.202	
			(–4.59)			(–0.47)
Cash-in-lieu of Pension (£000 s)	7.239	9.296	*	35.207	16.784	***
			(1.72)			(–13.12)
Age	51.435	47.867	***	52.317	49.127	***
			(–21.28)			(–22.72)
Tenure	4.947	3.732	***	5.526	3.934	***
			(–10.25)			(–15.02)
CEO	0.272	0.269		0.319	0.300	*
			(–0.30)			(–1.93)
Sales (£m)	6.466	1.006	***	11.472	1.848	***
			(–21.58)			(–26.70)
Total Assets (£m)	22.431	3.488	***	45.050	11.447	***
			(–15.96)			(–12.97)
FTSE100	0.365	0.076	***	0.401	0.121	***
			(–34.66)			(–34.66)
Board Size	10.824	8.857	***	10.723	8.887	***
			(–25.73)			(–28.04)
TSR	0.165	0.129	***	0.002	–0.068	***
			(–3.44)			(–5.27)
Number of observations	2415	5771	8186	2710	9269	11979

Source: Authors' calculations.

Notes: This table gives the mean values of the key variables used in the analysis, broken down by group, before and after A-day. 'Treated' directors are those that were in breach of either the annual or lifetime allowance in 2006. All other directors are in the 'control' group. The columns 'Diff *t*-test' reports the significance level and *t*-statistic for the difference in mean values between the treated and control group.*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Initially, defined contribution payments increased in relative terms after A-Day but after 2009 begin to decline, at which point an upswing in cash-in-lieu payments took place. The increase in the use of cash salary supplements is particularly noticeable after 2010, when the annual allowance was substantially reduced.

Table 2. Pension payments 2003–12

		% of Total payments			Mean value (€)		
Tax Year	Firms	DB	DC	Cash	DB	DC	Cash
2003	605	41	48	10	162,140	29,888	9,213
2004	581	39	50	11	215,610	32,553	11,583
2005	548	38	50	12	254,869	35,478	11,769
2006	541	31	53	15	137,656	36,903	18,168
2007	517	30	55	15	117,316	38,969	19,803
2008	498	28	57	15	111,456	43,170	22,021
2009	480	27	57	16	131,098	43,690	23,668
2010	472	24	55	21	90,889	39,418	27,973
2011	440	20	52	28	103,944	34,629	36,684
2012	299	20	48	32	83,585	27,730	44,716

Source: Authors' calculations.
Notes: This table shows the percentage of total payments, and the mean values, accounted for. Mean values are in nominal pounds sterling. The data are structured to the tax year ending in April with the sample ending in December 2012 (hence the smaller number of firms in 2012).

Table 2 also shows the generosity of DB payments compared to defined contribution payments or cash-in-lieu payments. Prior to A-Day, the mean annual DB pension was many times more the mean value of either of the other two types of pension provision. This reflects the increased valuation of DB schemes arising from lengthening tenure on the job. The impact of A-Day on DB values appears to have been substantial, halting the year-on-year increase in their mean value, and falling by over £100,000 in the year immediately following implementation.

The mean value of defined contribution scheme payments continued to steadily increase after A-Day, reaching a peak in 2009 before declining. The mean cash payment in lieu of pension has consistently increased over time, exceeding the mean of defined contribution payments after 2011. The average DB is still larger than both defined contributions and cash payments but this gap has narrowed substantially over our sample period and in particular since A-Day.

We present the main determinants of pensions in Table A1 of the Appendix, both in terms of the type of pension provided and value of that pension. To summarize here, CEOs relative to executive directors have larger pensions overall but are not systematically more likely to have DB pensions. Older directors are more likely to be on a DB scheme along with directors in larger companies and companies with higher leverage. The proxies for corporate governance (institutional ownership, board size, and the proportion of independent non-executive directors) do not explain much of the variation in pension type or pension value in our data. We control for these director-level and firm-level determinants in our analysis below.

5. The impact of A-day on executive pensions

Since we propose that the A-day change in regulations constrained executive pensions and that this decreased the pay–performance relation, our econometric analysis is conducted in

Table 3. Definition of treatment and control groups

Variable name	Treatment definition	Control definition
	Treatment/control groups for A-Day:	
$Treat^{06}$	Executives who exceeded the lifetime allowance or the annual allowance at any point prior to A-Day	Executives who did not exceed either allowance prior to A-day
	Treatment/control groups for 2011:	
$Treat^{06}$	Executives active in 2011 who exceeded the lifetime allowance or the annual allowance at any point prior to A-Day 2006	Executives who never exceeded either allowance
$Treat^{11}$	Executives not affected prior to A-Day but who exceed the £50,000 annual allowance or lifetime allowance prior to 2011	Executives who never exceeded either allowance

two stages. In this section, we estimate the first stage that is we demonstrate that the April 2006 UK pension legislation reforms significantly changed executive pension provision. Using a difference-in-difference (DiD) framework, we show the legislation changed both the amount of pension received and the type of pension arrangement. The value of executive pensions fell significantly after 2006, with DB/final salary schemes being replaced with either defined contributions or risk-free cash supplements. Later, the second stage of our analysis will demonstrate these changes impacted negatively on pay–performance sensitivity.

We examine the impact of both A-Day in April 2006 and the subsequent 2011 reduction in the annual allowance to £50,000. We separately identify the three treatment groups that are defined in Table 3 below.

We estimate a panel data model with individual director-firm fixed effects:

$$y_{ijt} = \tau_1(\text{Treat}^{06} \times \text{Post}^{06})_{it} + \tau_2(\text{Treat}^{06} \times \text{Post}^{11})_{it} + \tau_3(\text{Treat}^{11} \times \text{Post}^{11})_{it} + \alpha' \overline{X}_{ijt} + \eta_{ij} + \delta_t + \epsilon_{ijt} \quad (2)$$

In Equation (2), the τ parameters denote estimates of the average treatment effect on the treated (ATT). τ_1 is the effect of A-Day on the treated executives, τ_2 is the effect of the 2011 reduction on those executives already treated by A-Day in 2006, and τ_3 is the effect of the 2011 reduction on those previously unaffected. In each case, y_{ijt} denotes the dependent variable, which is either a continuous variable of the value of the pension or a binary variable indicating membership of that type of pension arrangement. There are three types of pension benefits: DBs, defined contributions, and cash-in-lieu of pension arrangements.

All specifications include the control vector $\overline{X}$. This comprises log of sales to proxy firm size, the executive's age and tenure, an indicator of whether the executive is a CEO, a dummy indicating whether the executive is employed by a FTSE100 firm, and TSR to measure firm performance. In order to capture risk and uncertainty in firm performance, we include a performance volatility variable. This is created as the standard deviation of firm

performance over the most recent five financial years. To control for corporate governance, we include the percentage of shares owned by investment companies, the percentage of independent non-executive directors on the board, and the total number of directors on the board. η_{ij} denotes the executive-firm fixed effects and δ_t year fixed effects. Treatment effects for extensive pension provision[8] are estimated in a linear probability model with fixed effects.

The results of this analysis are presented in Table 4. The first row shows that the main impact of A-Day was on the level and provision of DB schemes. Relative to the control group, those affected by A-Day saw a large reduction in their annual DB pension after A-day. The first four columns report the intensive margin that captures the change in the value of each type of pension arrangement. The final three columns report the extensive margin that represents a dummy variable for scheme participation. With the dependent variable in log form, the estimated coefficient on the value of DB s of −1.12 is equal at the mean to a reduction of approximately £270,000 per year (see second column, Intensive margin). In addition to being statistically significant, this estimate is economically significant, being approximately equal to 50% of the treated group's average salary and it is consistent with what is observed in the descriptive statistics in Table 1. Defined contributions were not significantly reduced immediately after A-day. The contrast between the two schemes is explained by the initial generosity of DB schemes compared to defined contributions. That is, the tax thresholds introduced on A-day were such that, in the majority of cases, only those on DB schemes would have been affected.

We also observe executives switching out of DB arrangements into cash supplements (extensive margin). Consistent with the descriptive statistics shown earlier, we estimate an 8% point reduction in the use of DB schemes and a 12% point increase in the use of cash payments. However, the increase in cash payments (approximately £25,000 per year at the mean) is substantially less than the reduction in the value of DBs. Given that we observe first hand from company financial disclosures that many companies used cash payments to compensate their executives for a loss of pension benefits after A-day, it is perhaps curious that the compensation appears to fall short of fully offsetting the loss in DB pension provision. A possible explanation might be that the control group also started to receive cash payments around the same time, and so the DiD estimate understates the total amount of cash compensation. We observe a positive and significant increase in the use of cash for both groups over time (approximately £10,000 per year), which accounts for some, but not all, of the discrepancy. Additionally, total compensation for these executives did not fall over the sample period. In fact, during this sample period other elements of executive pay, such as bonuses and the value of equity incentives, increased.

The second and third rows of Table 4 demonstrate that the reform to the tax thresholds in 2011 also had a significant impact on pension arrangements. Those executives who were initially affected by A-Day ($Treat^{06}$) were once again caught by the reduction in tax allowance. On the intensive margin, the reduction to DB schemes is approximately equal to £180,000 per year at the mean (column 2, row 2). Additionally, some executives, not affected in 2006, also saw a reduction in their pension benefits in 2011 ($Treat^{11}$). The 2011 reduction in annual allowance was such that even those on defined contribution schemes

8 The intensive model analyses change in the values of each pension type, whereas the extensive model analyses change in the incidence of each type of pension arrangement (Blundell et al., 2013).

Table 4. Pension reform treatment effects

	Intensive margin				Extensive margin		
	All	DB	DC	Cash	DB	DC	Cash
$Treat^{06}$. $Post^{06}$	−0.90***	−1.12***	0.00	1.39***	−0.08***	0.02	0.12***
	(−4.84)	(-6.03)	(−0.02)	(6.27)	(−5.96)	(1.07)	(6.08)
$Treat^{06}$. $Post^{11}$	−0.98***	−1.06***	−0.51**	1.83***	−0.09***	−0.04*	0.16***
	(−3.53)	(−3.73)	(−2.02)	(5.92)	(−4.22)	(−1.79)	(5.76)
$Treat^{11}$. $Post^{11}$	−0.60***	−0.17	−1.42***	1.91***	−0.02	−0.12***	0.18***
	(−2.92)	(−1.24)	(−5.77)	(7.32)	(−1.42)	(−5.07)	(7.27)
Log(Sales)	−0.01	0.06	0.06	−0.04	0.01	0.00	−0.00
	(−0.14)	(0.94)	(0.66)	(−0.61)	(1.61)	(0.46)	(−0.50)
Age	1.42***	0.58**	1.99***	−0.72*	0.03**	0.19***	−0.06*
	(3.57)	(2.24)	(3.41)	(−1.80)	(2.27)	(3.70)	(−1.73)
Age^2	−0.01***	−0.01***	−0.01***	0.00	−0.00***	−0.00***	0.00
	(−5.15)	(−4.21)	(−5.55)	(0.66)	(−3.48)	(−5.07)	(0.39)
CEO	0.06	−0.13	0.07	0.23	−0.02	−0.00	0.01
	(0.27)	(−0.94)	(0.37)	(1.62)	(−1.49)	(−0.04)	(1.15)
TSR	0.14**	0.07	0.16***	0.02	0.01*	0.02***	0.00
	(2.47)	(1.47)	(2.72)	(0.48)	(1.75)	(2.65)	(0.48)
σ^{TSR}	0.07	−0.26*	0.34*	0.34**	−0.02	0.03	0.03**
	(0.43)	(−1.67)	(1.68)	(2.03)	(−1.35)	(1.47)	(1.96)
FTSE100	0.59**	0.14	0.69**	−0.12	−0.01	0.06**	−0.02
	(2.27)	(0.58)	(2.32)	(−0.46)	(−0.40)	(2.38)	(−0.65)
FTSE250	0.31**	0.11	0.34**	−0.01	0.00	0.04**	−0.00
	(2.50)	(1.05)	(2.29)	(−0.10)	(0.33)	(2.51)	(−0.01)
% IC Owned	0.01***	0.01**	0.01**	−0.00	0.00*	0.00***	−0.00
	(2.74)	(2.12)	(2.30)	(-1.60)	(1.65)	(2.98)	(-1.56)
% Independent NED's	0.58*	−0.31	1.12***	0.36	0.01	0.11***	0.03
	(1.83)	(−1.25)	(3.24)	(1.29)	(0.46)	(3.38)	(1.07)
Board Size	−0.11***	−0.01	−0.12***	−0.02	−0.00	−0.01***	−0.00
	(−4.86)	(−0.53)	(−5.20)	(−1.09)	(−1.38)	(−5.38)	(−0.81)
Leverage	−0.12	0.27*	−0.25	−0.17	0.02**	−0.02	−0.02
	(−0.61)	(1.81)	(−1.23)	(−1.00)	(2.03)	(−0.97)	(−1.03)
Tenure	−0.01	−0.01	0.02	−0.01	−0.00	0.00	−0.00
	(−0.59)	(−0.80)	(0.90)	(−0.40)	(−0.01)	(0.87)	(−0.20)
Salary/ 100,000	0.081***	0.035***	0.046***	0.021***	0.003***	0.004***	0.002***
	(4.40)	(4.15)	(4.46)	(4.00)	(4.16)	(4.20)	(3.99)
N	19347	19347	19347	19347	19347	19347	19347
Director-Firms	4787	4787	4787	4787	4787	4787	4787
F-Stat	13.2	7.77	8.47	16.2	6.25	7.81	15.7
R^2	0.157	0.070	0.065	0.107	0.075	0.055	0.101

Source: Authors' calculations.

Notes: This table reports the estimated coefficients for Equation (2). The dependent variable when estimating the intensive margin is specified as $\ln(1+y)$, where y is the annual payment under the respective pension type. The dependent variable when estimating the extensive margin is binary, indicating participation in the scheme. Each specification controls for executive-firm fixed effects. *t*-statistics in parentheses adjusted for clustering at executive-firm level; $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

saw significant changes to their pension tax liabilities. Thus, we observe an increase in the use of cash supplements to offset this reduction by approximately £32,000 per year at the mean (column 4, row 3). On the extensive margin, we see an additional exit in 2011 from both DB and defined contribution schemes (12 percentage points) and an uptake of cash supplements (18 percentage points). Taken together, these results reveal that the pension reforms imposed major changes to the structure of executive pension arrangements.[9]

6. Pension reform and pay–performance

We now turn to the second stage of the analysis, where we examine how the exogenous shock to pensions caused by the legislation reform impacted on the pay–performance sensitivity of those executives affected. We again adopt a DiD framework to examine how A-day affected pay–performance sensitivity for our treated and control groups, by modifying Equation (1) by interacting a treatment dummy, post-reform dummy, and TSR performance as follows:

$$\begin{aligned}\log(\text{pay})_{\text{ijt}} &= \beta_1(\text{Treat}^{06}) + \beta_2\text{Post}_t^{06} + \beta_3\text{TSR}_{\text{jt}} + \beta_4(\text{Treat}^{06} \times \text{Post}^{06}) \\ &+\beta_5(\text{Treat}^{06} \times \text{TSR}) + \beta_6(\text{Post}^{06} \times \text{TSR}) \\ &+\beta_7(\text{Treat}^{06} \times \text{Post}^{06} \times \text{TSR}) + \alpha'\overline{X}_{ijt} + \eta_{\text{ij}} + \epsilon_{\text{ijt}}\end{aligned} \tag{3}$$

The estimates of the β coefficients in Equation (4) are presented in Table 5.[10] The estimate of the causal effect of the reform on total pay–performance sensitivity is shown in the final row. These results show that the executives treated on A-day saw their pay–performance sensitivity decrease after A-day, compared to those executives not affected by the reform. The DiD estimates range from a decline of 30% points (column 1) with no controls to 20% points when a full set of firm-level and individual-level controls is included (column 2).

Column (2), our preferred specification, reveals what lies behind the large decline in pay–performance sensitivity for the treated executives. The pay–performance sensitivity of the treated group (0.227) is substantially larger than that of the control group (0.035) prior to A-Day. Post-reform, the treated group and untreated group have pay–performance elasticities of 0.11 and 0.12, respectively (rows labelled [2] and [4]).

To examine the extent to which these changes in total pay sensitivity are driven by the change in pension arrangements, we re-estimate the model, first without pension benefits included in the measure of total pay (columns (3) and (4)) and then with pensions as the dependent variable (columns (5) and (6)). It can be seen that when benefits are excluded (column (4)), then DiD estimate is substantially reduced due to a fall in the estimated pay sensitivity of the treated group pre-reform.[11] In contrast, when total pension is used as the dependent variable (column 6), the estimated fall in the pay sensitivity of the treated groups increases in magnitude, as does the DiD estimate (row DiD).

9 The conclusions of this section are robust to the use of a matched sample, as shown in the Appendix.

10 For brevity, only the β coefficients are reported. The estimated coefficients on the control variables are very similar to those reported in Appendix Table A3 and are available on request.

11 The measured increase in the pay sensitivity of the control group in column (4) is almost identical to that in column (2) (0.085 compared to 0.084), reflecting the general trend in the market toward more bonuses and equity incentives over the period.

Table 5. Effect of pension reform on pay–performance sensitivity

	Total pay (inc pension)		Total pay (excl pension)		Total pension	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated Pre [1]	0.237***	0.227***	0.137***	0.158***	0.344***	0.270***
$\beta_3 + \beta_5$	(5.92)	(5.64)	(3.99)	(4.45)	(3.84)	(3.11)
Treated Post [2]	0.082***	0.111***	0.102***	0.136***	0.008	–0.010
$\beta_3 + \beta_5 + \beta_6 + \beta_7$	(3.41)	(4.32)	(4.51)	(5.48)	(0.18)	(–0.22)
Difference [2] – [1]	–0.155***	–0.116**	–0.035	–0.023	–0.336***	–0.281***
$\beta_6 + \beta_7$	(–3.39)	(–2.45)	(–0.86)	(–0.52)	(–3.47)	(–3.00)
Control Pre [3]	–0.054***	0.035	–0.049**	0.042*	–0.115***	0.010
β_3	(–2.76)	(1.64)	(–2.46)	(1.94)	(–4.99)	(0.38)
Control Post [4]	0.096***	0.119***	0.100***	0.126***	–0.015	–0.023
$\beta_3 + \beta_6$	(7.96)	(8.18)	(7.97)	(8.33)	(–1.11)	(–1.27)
Control Difference	0.150***	0.084***	0.149***	0.085***	0.100***	–0.033
[4] – [3]	(6.52)	(3.31)	(6.34)	(3.26)	(3.72)	(–1.04)
β_6						
DiD ([2]–[1]) –	–0.305***	–0.199***	–0.184***	–0.107**	–0.435***	–0.248***
([4] – [3])	(–5.95)	(–3.95)	(–3.92)	(–2.29)	(–4.34)	(–2.61)
β_7						
Control variables	No	Yes	No	Yes	No	Yes
Observations	18125	18125	18125	18125	15396	15396
Executive Firms	4595	4595	4595	4595	3933	3933
F-Stat	36	25.1	39.1	22.1	14	22.9
R^2	0.019	0.078	0.019	0.073	0.011	0.083

Source: Authors' calculations.

Notes: This table presents the estimates of pay–performance sensitivity for the treated and control groups before and after A-day from Equation (3). Columns 1 and 2 use total pay as the dependent variable. Columns 3 and 4 exclude pensions from total pay and columns 5 and 6 use pensions only. The first of the columns in each pair reports the raw sensitivity, with the second including the set of observable control variables shown in Table 4.

The table also indicates the extent to which the omission of pension benefits impacts the estimation of pay–performance sensitivity. In the post-period, the difference in the estimated sensitivity is marginal and not statistically significant. However, the omission of pension benefits underestimates the pay–performance sensitivity of the treated group (essentially those directors with DB pensions) by 6.9% points (row [1], column (4) minus column (2)), i.e. just under one-third in relative terms.

6.1 Robustness

We have undertaken a number of checks to examine the robustness of the results obtained by the DiD estimator. First, we more tightly control for potential differences between the treatment and control group prior to A-day by the use of propensity score matching (Appendix Table A4, column (5)). The estimated coefficients are essentially unchanged. We also allow for a difference in the pre-reform trend of pay–performance sensitivity of the two groups; the common trends assumption (column (4)). Again, our results are not sensitive to this assumption.

Appendix Table A4, column (6) conducts the test only on CEOs in our sample and the result remains. This is perhaps unsurprising given that there is likely to be more variation in CEO pay–performance sensitivity than executive pay–performance sensitivity.

We also examine whether our results are sensitive to the fact our data sample spans the financial crisis in 2008, which caused a decline in TSR. Appendix Table A4 column (7) excludes the 2008 financial crisis year, and column (8) excludes both CEOs and the financial crisis year. In both cases, the size and statistical significance of the effect remain robust. This rules out the possibility that our results are driven by CEOs experiencing lower pay–performance sensitivities during the crisis.

Finally, we also explicitly include directors treated by the 2011 reduction in annual pension allowance (Table A4, column (3)), again with little effect on our original finding that A-day imposed a constraint on contracting over executive pay and reduced the pay–performance sensitivity of those executives affected by the reform.

To summarize, we find robust evidence that the reforms to UK pension legislation implemented in 2006 exogenously reduced the pay–performance relation of those executives with relatively large pensions, bringing them in line with the lower pay–performance sensitivity of the control group of directors. Since A-Day had its largest impact on those with DB pensions, the results presented indicate that such pensions may have constituted part of an optimal contract in which executive pension arrangements were related to performance.

6.2 Investigating mechanisms

Executive pensions, whether DB schemes or contributory schemes, are not typically considered as a means of linking executive compensation and firm performance. In the mandated disclosures within a company's remuneration report, pensions are presented as part of 'fixed' pay rather than 'variable' compensation. At first glance therefore, our result that pensions play an important role in shaping executive incentives is unexpected. However, it is possible to consider a number of potential mechanisms that would result in a positive pension-performance sensitivity. These are retention of more able directors in firms with DB schemes; the retention of DB pension schemes by high-performing firms; the link between final salary and accumulated performance; and the co-existence of pension with performance incentives schemes. We consider each of these mechanisms in turn.

6.2.1 Director retention A potential mechanism-linking pension to performance occurs through the retention on DB schemes of better performing executive directors. Table 6 shows the results from four different specifications estimating the determinants of executive survival within the firm. The hazard ratio shows that, as might be expected, the likelihood of exit falls[12] as sales increase and TSR rises. It also shows that those on DB schemes are more likely to stay with the firm, suggesting that such schemes could be used by the firm as a retention mechanism for more able directors.

Evidence to support this contention is provided in Table 7, which shows that better performing individuals are, on average, longer tenured, and such individuals are more likely to

12 As the coefficient is less than one.

Table 6. Survival model estimates for executive exit

	(1) Cox	(2) Gompertz	(3) Exponential	(4) Weibull
DB	0.608***	0.630***	0.753***	0.625***
	(–7.72)	(–7.26)	(–4.71)	(–7.37)
TSR	0.587***	0.621***	0.668***	0.581***
	(–5.66)	(–5.28)	(–4.73)	(–5.73)
Log Sales	0.713***	0.730***	0.750***	0.709***
	(–4.52)	(–4.34)	(–4.22)	(–4.60)
CEO	0.812***	0.813***	0.846***	0.818***
	(–4.87)	(–4.85)	(–4.08)	(–4.74)
Male	0.898	0.900	0.925	0.901
	(–1.11)	(–1.10)	(–0.84)	(–1.07)
Age	1.027	1.037	1.001	1.020
	(0.75)	(1.04)	(0.04)	(0.57)
Age^2	0.999	0.999*	1.000	1.000
	(–1.37)	(–1.66)	(–0.27)	(–1.11)
Board Size	1.216***	1.205***	1.164***	1.213***
	(7.46)	(7.35)	(6.27)	(7.35)
Firm Fixed Effects	Yes	Yes	Yes	Yes
N	4474	4474	4474	4474
Log Likelihood	–25253	–4911	–5215	–4860
Chi-square	2594.7	2501.4	1894.3	2575.9

Source: Authors' calculations. *t*-statistics in parentheses $^*p < 0.1$, $^{***}p < 0.01$.
Notes: This table presents the hazard ratios for the four survival models indicated by the column headings. A hazard ratio less than one indicates a reduction in the likelihood of an executive exiting from the firm.

be on DB pensions and have a DB pension of high value. This emphasizes the importance of DB pensions in fostering retention.

6.2.2 Retention of DB schemes A related alternative to the director retention hypothesis is that better performing firms, with the better directors, are more likely to retain their DB schemes.[13] Table 8 considers all firms with an active DB scheme at the start of the sample in 2003 and relates whether the firm is still operating its DB scheme to firm-level performance. Although DB retention is correlated with firm-level performance in the raw data, the strength of the association diminishes with the addition of controls and loses statistical significance when firm fixed effects are controlled for (column 4). Thus, within firm variation in TSR does not significantly impact upon DB retention. While this is a demanding

13 The authors wish to thank an anonymous referee for this suggestion.

Table 7. Pay, performance, and pensions by tenure

Tenure	Salary £000s	Total pay £000s	TSR	DB	Value £000 s	Transfer £000 s
< 1	347	1,018	–0.034	0.223	369	1,054
1–3	366	1,106	0.039	0.301	321	1,108
3–6	376	1,229	0.045	0.355	429	1,376
6–9	357	1,140	0.058	0.348	396	1,285
9+	343	1,080	0.059	0.377	454	1,640
Total	359	1,106	0.023	0.303	391	1,264

Source: Authors' calculations.
Notes: The table presents the mean values of pay, performance, and pensions by levels of executive tenure. 'DB' reports the proportion of executives with a DB pension. 'Value' reports the mean annual increase in the transfer value of the DB pension. 'Transfer' reports the mean total transfer value of the DB pension.

specification, it does suggest that the retention mechanism is not the dominant mechanism explaining the link between pensions and performance in the DiD estimations above (which also control for firm fixed effects).

6.2.2.1 Salary and performance. A third possible mechanism that may generate a correlation between pensions and performance occurs because the value of a DB pension is a function of the final salary of the executive. If this final salary is an accumulation of upward salary adjustments as a reward for good performance, then the DB pension could be a function of the firm's performance over the tenure of the executive. The manner in which a DB scheme is an accumulation of rewards for good performance means that it could act as a mechanism to invest in firm-specific human capital and incentivize high effort throughout an executive's career until retirement age.[14]

It is interesting to note that annual salary and total compensation decline, on average, after 6 years and the consequent link between pay and performance is weak. Appendix Table A3 shows the association between salary and TSR. While there is a small positive association in the raw data (column 1), once fixed effects or a reasonable set of observable controls are included, the relationship is statistically insignificant (column 2). This is true for both the control and the treated groups (columns 3 and 4).

Column (5) considers the performance sensitivity of final salary against TSR returned over an executive's tenure. Consistent with the absence of a link between salary and performance in the short run, column (5) shows no statistically significant relationship between TSR and final salary. When the career TSR is split at zero to show those that create (destroy) value during their career, a positive relationship is observed for the top-performing, value-creating, managers. However, this relation disappears upon controlling for tenure (column 7). This suggests salary adjustments due to performance are not the principal mechanism driving the pension-performance sensitivity in the paper.

14 Although this explanation is not inconsistent with our preferred explanation of retention of high performers, we feel that it likely to be of secondary importance for a number of reasons: firstly, the estimates of pay-performance sensitivity used in this study are annual, suggesting a more immediate adjustment of executive pensions to performance; secondly, the long-term link between salary and performance is weak once tenure is controlled for.

Table 8. Firm-level performance and the retention of DB schemes

	(1) DB	(2) DB	(3) DB	(4) DB
TSR	0.086***	0.045***	0.035*	0.023
	(5.39)	(2.86)	(1.93)	(1.40)
Controls	No	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes	Yes
Firm Fixed Effects	No	No	No	Yes
N	2334	2243	2243	2243
F-Stat	29.09395	29.01454	24.76116	25.8872
R^2	0.0123	0.145	0.197	0.229

Source: Authors' calculations.

Notes: This table presents the impact of TSR on the firm level retention of a DB scheme. A linear probability model is estimated, with the dependent variable indicating whether the firm is still operating its DB scheme for the currently serving executives in the firm at time *t*. *t*-statistics in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

6.2.3 Pensions and other pay incentives A final possibility to consider is via the link between pensions and other performance incentive mechanisms. For example, it is possible that executives with DB schemes may feel more comfortably insured for retirement and so might agree to more performance-related terms in their annual remuneration contract. This may then lead to an apparent relation between performance and DB schemes. We find some evidence to support this mechanism in Table 5: the treated group have a higher pay–performance sensitivity than the control group prior to A-day, even when we exclude pensions from total pay (0.158 column (4), row [1]), with this sensitivity dropping slightly (0.136 column (4), row [2]) when this group suffers a reduction in their DB pensions post A-day. However, we observe a much larger decline in performance sensitivity for the treated group once pensions are taken into account.[15]

As a final check, Appendix Table A5 examines the reaction of other non-pension elements of pay to A-Day. It finds no evidence of differential impact between the treated and control groups, again suggesting that the changes in pension-performance sensitivity that we observe are due to pensions and not other parts of the compensation package.

7. Conclusion

This article has sought to identify whether a causal link exists between the provision of executive pensions and firm performance. It does this by exploiting the introduction of the 2006 'A-day' pension-simplification legislation in the UK. Prior to A-day, executive pension benefits were widely used and comprised a significant proportion of the compensation package. The change to the tax law exogenously increased the cost of executive pensions and the terms of contracting over executive pay. This resulted in large changes to executive compensation packages. While DB schemes had already been declining in popularity prior to A-day, there is no doubt that the introduction of A-day significantly accelerated this

15 A more thorough exploration of this indirect link would require additional detailed information on the performance conditions and vesting schedules of the long-term incentive schemes.

process, with many executives seeing their DB pension arrangements replaced by other forms of payment.

The official documents relating to the law change did not mention any anticipated effects in relation to executive incentives, with the intention of the legislation being to simplify the law and impose a cap on tax relief. Nevertheless, we find a strong and negative impact upon the strength of the pay–performance sensitivity among those who were affected by the legislation, which suggests that DB pensions in the UK were serving to enhance executive pay–performance sensitivity prior to A-day. Just as much of the earlier compensation literature was later shown to have underestimated pay–performance sensitivity because, due to data limitations, they omitted a complete measure of long-term incentives (Main *et al.*, 1996; Hall and Liebman, 1998; Hall and Murphy, 2002), our results suggest that pay–performance sensitivity may be underestimated if pension benefits are omitted. For executives who hold sizable DB benefits in the pre-reform era, pay–performance sensitivity would be underestimated by almost one-third. However, with the end of DB benefits in the post-reform era, pay–performance sensitivity can be well approximated without pension data.

We interpret our results as indirect support for the body of literature that views pension benefits as a component of an optimal contract (Edmans and Liu, 2011), and designed to align executive incentives with the providers of a firm's capital. While past research has emphasized incentive alignment with the firm's bondholders (Thanassoulis and Tanaka, 2016), our paper finds an alignment with the firm's shareholders that was adversely affected by the 2006 A-day reform.[16]

By what mechanism could this alignment have operated? We considered four potential mechanisms in this article: retention of more able directors in firms with DB schemes; the retention of DB pension schemes by high-performing firms; the link between final salary and accumulated performance; and the co-existence of pension with performance incentive schemes. Our preferred explanation is that the DB pension served to retain high-performing executives. Better performing executives are longer tenured, and such individuals are observed more frequently on a DB pension and have a DB pension of higher value. With each subsequent year on a DB scheme, on average, being more valuable than the last, the incentive of the firm to remove poor performers also increased year on year. A more detailed examination of this mechanism remains for future research.

Supplementary material

Supplementary material is available on the OUP website. These are the replication files and the online appendix. The data can be accessed by purchasing the required licence from Mineva Analytics www.manifest.co.uk.

Funding

There is no funding to report.

16 We do not have sufficient data on bondholders in our sample, so we are unable to confirm whether or not pensions were also acting as inside debt. The contribution of this paper is to demonstrate that defined benefit pensions can play a role in aligning executive incentives with those of their shareholders.

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