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Managerial Shareholding Policies and Retention of Vested Equity Incentives

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Abstract: Previous literature documents that executives tend to cash out equity incentives when equity-linked compensation vests. Such a behavior destroys long-term incentives and hence is costly to outside shareholders. It is recommended that the unloading of incentives can be limited when the firm adopts a minimum executive shareholding policy. We provide the first evidence of the effectiveness of such policies in that respect. Using data for UK FTSE 350 companies we show that executives whose ownership is below the minimum set by the policy retain more newly vesting equity and the incentives to retain shares weaken when the holdings are above the minimum. We also document economic implications of compliance with the policy and we find higher firm valuations when actual ownership increases relative to the minimum holdings required. Our results have implications for the debate on executive remuneration regulations and practices.

JEL classification: G32, M52

Keywords: Equity-linked pay, cashing out, shareholding policies

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1. Introduction

To align the interests of managers and shareholders and to give managers ‘skin in the game’, companies are recommended to move towards compensation schemes with a larger equity-based component (e.g., Greenbury, 1995).¹ Theoretical underpinnings of the recommendation go back to the seminal work by Jensen and Meckling (1976), who show that managers with larger holdings are more likely to act in outside shareholders’ interest and undertake value-increasing actions rather than opportunistically extract private benefits. Equity-based compensation is effectively expected to increase managerial equity holdings.²

Does the equity-based pay indeed succeed in increasing managerial equity exposure? Ofek and Yermack (2000) provide striking evidence that the answer is no. They show that managers hedge their exposure by selling shares already held in response to new option and stock grants, and they also sell almost all shares acquired from exercised options. The result casts doubt on actual incentives created by equity-linked pay, and as noted by Jensen et al. (2004) ‘we have been mystified for many years as to why boards do not formally restrict managers’ freedom to unwind the incentives the remuneration committee constructs for them’ (p. 67). Ofek and Yermack (2000) suggest that to limit the unwinding of equity-linked incentives, firms could adopt minimum shareholding policies for executives. In this paper we provide the first test of whether such policies prevent executives from the unloading of equity incentives.

¹ In line with the recommendations, the structure of executive remuneration has been moving towards a greater importance of equity-based components. For example, the value of option and share awards accounted for 26% of the average total US CEO compensation in the 1980s, 47% of the total compensation in the 1990s and as much as 60% of the total compensation after 2000 (Frydman and Jenter, 2010). In 1997, 72% of CEOs in the USA and 50% in the UK were awarded options, and 19% and 32% of CEOs in the two countries, respectively, were granted long-term incentive plan (LTIP) shares (Conyon and Murphy, 2000). As of 2006 the equity-based element became a significant part of total compensation worldwide (Fernandes et al., 2011).

² For example, the Greenbury Report (Greenbury, 2005), the world’s first corporate governance code to look specifically at executive compensation, explicitly says that share option schemes ‘enable directors to build up holdings of shares in the company’ (point 6.27, p. 40) and that LTIP share schemes encourage executives ‘to build up shareholdings in their companies’ (point 6.34, p. 42).

Our particular focus is on the retention of shares acquired from exercised options and from vested LTIP share schemes. Once equity-linked compensation vests, executives generally have freedom to sell the newly acquired shares and hence cash out equity incentives. Such a behavior is costly to shareholders (Holmstrom and Kaplan, 2003; Bebchuk and Fried, 2004, 2010). First, to maintain the desired equity exposure of executives, it requires further equity-linked incentives to be granted to replace the incentives cashed out. Those further grants in turn dilute outside shareholders' ownership and claims on the firm. Second, and more important, the unloading of shares shortly after vesting and exercising leads to a focus on short-term stock prices, and executives who plan to cash out equity incentives look for ways to boost the stock price over the short run even at the expense of long-term value creation. For example, it is documented that managers are likely to reduce real investment when the amount of newly vesting equity increases because the effects of the investment are usually visible in the long run while the investment reduces earnings and cash flows over the short horizon (Edmans et al., 2013; Ladika and Sautner, 2013). It is also found that managers manipulate reported earnings to increase the share price at the time when they exercise stock options to maximize the proceeds from cashing out (Bartov and Mohanram, 2004; Bergstresser and Philippon, 2006). The short-termism caused by remuneration practices has been widely blamed for significantly contributing to the recent financial crisis.³

There are proposals and recommendations coming from both academics and policy-makers to address the problem of the unwinding of equity incentives (e.g., Holmstrom and Kaplan, 2003; Jensen et al., 2004; Bebchuk and Fried, 2004, 2010; Bebchuk et al., 2010). For example, Bebchuk and Fried (2010) argue that the key principle in restoring long-term incentives is to require executives to hold a large percentage of equity-linked incentives after they vest. In their Principle 1 they propose that 'executives should not be free to unload restricted stock and options as soon as they vest, except to the extent necessary to cover any taxes arising from vesting' (p. 9). In a similar vein, the Greenbury

³ For example, the US treasury secretary, Tim Geithner, in his statement on executive compensation said that 'this financial crisis had many significant causes, but executive compensation practices were a contributing factor. Incentives for short-term gains overwhelmed the checks and balances meant to mitigate against the risk of excess leverage' (<http://www.treasury.gov/press-center/press-releases/Pages/tg163.aspx>).

Report and all subsequent corporate governance codes in the UK recommend⁴ that ‘directors should be encouraged to hold their shares for a further period after vesting or exercise, subject to the need to finance any costs of acquisition and associated tax liabilities’ (Greenbury, 1995, point 6.34, p. 42).

The statement by the US treasury secretary, Tim Geithner, on compensation from June 2009 calls for compensation practices that are aligned with the long-term value of the firm and recommends that ‘asking executives to hold stock for a longer period of time may be the most effective means of doing this’.⁵ Similarly in the UK, the Walker Report (Walker, 2009) that looks at corporate governance in financial institutions amid the recent financial crisis recommends that executives ‘should be expected to maintain a shareholding or retain a portion of vested awards’ (Recommendation 34, p. 118). Holmstrom and Kaplan (2003) argue that the benefit of improved incentives when executives are restricted in selling shares after exercising options outweigh the costs of the lack of diversification of managerial portfolios.⁶ Ofek and Yermack (2000) suggest that a minimum managerial holding policy could be a specific mechanism put in place by the board to address the problem of the unloading of equity incentives.

Over the years, minimum shareholding policies have gained increasing popularity. Core and Larcker (2002) provide early evidence from the USA and find a growing number of adopters between 1991, when the first US firms adopted the policy, and 1994. According to a report by a consulting firm Frederick W. Cook & Co, in 2009, 87% of the 250 largest US corporations had formal stock-

⁴ Corporate governance codes operate in the UK as codes of good practice and they are based on the ‘comply or explain’ principle. The compliance is not mandatory but it is based on full disclosure, and firms that do not comply have to explain their non-compliance (see, e.g., MacNeil and Li, 2006).

⁵ <http://www.treasury.gov/press-center/press-releases/Pages/tg163.aspx>.

⁶ Executives have a large portion of personal wealth that is tied to the company that they serve, in terms of both human capital (e.g., Mehran 1995) and shareholdings. According to the portfolio-diversification view, they sell shares already held in response to new equity-linked incentives to diversify their personal wealth in the company. Grout and Zalewska (2012) identify conditions under which there is complementarity between option and stock holdings, in contrast with the traditional view of substitutability that leads to the demand for diversification.

ownership guidelines for executives.⁷ Similarly, there are a rising number of UK firms that adopt minimum holding policies. In the group of FTSE 350 firms analyzed in this paper, we find that as few as 12 had the policy in place in 2000, and the number rose to 172 in 2009. Core and Larcker (2002) find that the probability of policy adoption is driven by low executive shareholding and weak stock performance. They also show that ownership rises after the adoption of the minimum holding policy. However, Core and Larcker (2002) do not explicitly investigate the effectiveness of minimum holding policies in addressing the problem of the unloading of equity incentives acquired from share-based compensation schemes.⁸ This leaves an important, yet untouched, question in the literature: how effective are the minimum holding policies in preventing executives from cashing out shares acquired from equity-linked compensation? This study attempts to answer this question.

Our main variable of interest is defined as the annual change in the number of shares held by the executive divided by the sum of exercised options and vested LTIP shares over the year. We find that the median executive in the sample adds 47 shares to their holdings for every 100 newly acquired shares, indicating that more than a half of the shares are cashed out. In a set of regressions we find that, for every 100 shares from vesting compensation, executives whose shareholdings are below the minimum set by the policy retain 13 to 17 shares more than executives with holdings above the minimum. We find that the magnitude of retention is linked to the size of the gap between actual ownership and required ownership when executives are below the minimum set by the policy, with executives further below the minimum retaining more shares. However, the relation disappears once executives are above the required shareholding level. The results are robust to controlling for the self-selection of firms to introduce the shareholding policy and to alternative regression-estimation methods.

⁷ http://www.fwcook.com/alert_letters/Stock-Ownership-Guidelines-Report-10-23-09.pdf.

⁸ The sample period analyzed by Core and Larcker (2002) coincides with the period of great popularity of loans companies made to executives, for example, to finance stock purchases. Bebchuk and Fried (2003) report that 75% of the 1,500 largest US corporations made loans to their executives in the 1990s, and Kahle and Shastri (2004) find that loans to finance stock purchases were particularly given to managers with low stock ownership. The Sarbanes-Oxley Act of 2002 prohibited executive loans in the USA. In the UK they were prohibited much earlier by the Company Act of 1985.

In further tests we find that the difference between actual and required shareholdings has implications for firm value. Valuations increase with the difference between the two but we also find that simply moving from below to above the minimum does not have significant economic implications. Taken together with the result of the asymmetric effect of the ownership gap on share retention which changes around the minimum required, the result suggests that the minimum holding set by the policy may be too low. In a descriptive analysis of minimum shareholding policies we find that companies require their executives to hold, on average, shares of a value equal to the value of their base salary, which indeed is not very demanding.

The rest of the paper is structured as follows. Section 2 presents the sample and data sources. Section 3 provides a description of minimum shareholding companies introduced by UK firms. Section 4 presents the analysis of the impact of minimum shareholding policies of the retention of newly vested equity and Section 5 presents the valuation impact of compliance with the policy. Section 6 concludes the paper and outlines its policy implications.

2. Sample and data sources

We investigate UK FTSE 350⁹ non-financial companies from 2000 to 2009. To avoid the survivorship bias, for each year in the sample we include all constituent companies in that year. Information about minimum holding policies is collected manually from individual annual reports. We search each

⁹ The FTSE 350 index is designed to represent performance of the 350 largest UK companies. Only Premium Listed Equity Shares traded on the London Stock Exchange (LSE) are eligible for inclusion in the index, and the constituent companies do not have to be incorporated in the UK but they have to be assigned 'UK nationality'. As a result, our sample does not include non-UK firms cross-listed in London. On the one hand, cross-listed firms are normally not assigned UK nationality and have the nationality of their home country. On the other hand, Depositary Receipts, one of the methods to enter the UK market, are not eligible for inclusion in the index because they are not premium-listed. Moreover, most foreign firms that list as ordinary issues in London are not eligible for inclusion either because they seek a secondary listing in London, with primary listing normally in their home country (Doidge et al., 2009), and hence they do not qualify for premium listing. By the requirement of premium LSE listing, all FTSE 350 constituent firms have to comply or explain non-compliance with UK Corporate Governance Code and hence are a fairly homogenous group for the purposes of this study.

annual report and record whether the minimum holding policy is in place for the given company-year and extract details of the holding policy.

BoardEx, Hemscott and Datastream are the main sources of compensation and other firm- and executive-level data. BoardEx provides information about the executives' base salary, their ownership in the firm (number of shares held), the time (in years) spent by directors in the current role, the board structure (the number of executive and non-executive directors) and the number of shares outstanding. In the analysis we focus on executives who are in the role for the full year for any given year. Hemscott provides director share-transaction data which are primarily sourced from RNS announcements. In particular, we look at directors' option exercises and LTIP shares vesting details, and collect information about the number of shares involved in a transaction. In BoardEx, managerial ownership is defined as beneficiary shares held by directors and it excludes options (whether unexercisable or exercisable) and performance-related LTIP shares that are not yet vested. Once options are exercised or LTIP shares are vested, shares are then counted as part of the executive shareholdings. According to this definition, we should see a change in reported shareholdings when LTIP shares vest and options are exercised. Lastly, we source companies' stock price and other financial data from Datastream.

While historically it was usual practice to allow options to become exercisable over time in the USA without any further vesting conditions, option vesting is often additionally subject to performance criteria in the UK. The performance-related vesting of equity-linked compensation is designed to be more challenging to executives and to offer stronger long-term incentives. Performance-based vesting conditions have gained increasing popularity in the USA only recently (Bettis et al., 2010). It is also most common to grant long-term incentive plan (LTIP) shares in the UK. These vest subject to the fulfillment of certain performance-related conditions. In fact, grants of performance shares have overtaken options as the main form of equity-linked compensation by UK companies in recent years (Jensen et al., 2004). As documented by Carter et al. (2009), 30% of performance-vested equity grants do not vest failing the performance condition, and about 25% vest only partially.

3. Characteristics of minimum shareholding policies

British Airways plc states in the remuneration section of its 2009 annual report that it is the board's intention to align managers' interests with those of shareholders by adopting the minimum holding policy:

‘A shareholding guideline is operated to further align the interests of executives and shareholders. Executives are expected to retain no fewer than 50 per cent of the shares (net of tax) which vest from the DSP [Deferred Share Plan] and the PSP [Performance Share Plan] until they have a personal shareholding equivalent to 100 per cent of base salary.’ (Annual report dated 31 March 2010, p. 59)

Different companies present their minimum holding requirements with various levels of detail. However, for all companies that adopt the minimum holding, the policy is clearly presented as a tool to align the interests of managers and shareholders. Most commonly, managers are encouraged to achieve the minimum holding by retaining shares that are acquired from vested awards or option exercises, which explicitly prevents directors from undoing the ownership impact of equity-based compensation. Furthermore, the policies in nearly all firms define the minimum holdings in value terms and not as the number of shares or the percentage of shares outstanding. Such a design implies that executives are required to increase holdings when the company does badly and stock prices decrease. In other words, they are required to increase their exposure (in percentage terms) in bad times and can scale it down in good times.

A minority of firms mentions a penalty for non-compliance with the policy, and the penalty normally involves limitation or total exclusion from participation in further incentive schemes. Some companies say that participation in equity-linked compensation schemes is strictly conditional on compliance with the policy, but some use much softer language and mention that the remuneration committee ‘takes into account’ the compliance when deciding on further grants, or that the lack of compliance ‘may’ result in exclusion from future incentive schemes. Even the wording of the policy

differs and some firms present the policy as a requirement, while others as an encouragement to build up shareholdings, or as an expectation.

In total we have 209 companies that have the policy in place at some point during the sample period. Although the majority of them set the minimum holding as a multiple of the base salary, three companies set it as a specified number of shares. Following Core and Larcker (2002), for these companies we convert the minimum holding into a base salary multiple. This is achieved by multiplying the minimum number of shares by the company's stock price at the financial year-end. This number is then divided by the base salary of the year. Table 1 shows descriptive statistics for the minimum holding policy and actual shareholding levels.

Panel A shows the minimum ownership requirement set by companies. The median multiple of the base salary is 1.0, with the mean at 1.3. As reported by Core and Larcker (2002), US executives are required to hold larger multiples, with the means of 4.0 for CEOs and 2.5 for other executives, which also reveals a more stringent requirement imposed on CEOs than on other officers, consistent with the hierarchy of power. We find that in the UK the relative value of shareholdings required from CEOs and other executives is similar. For the 93 companies in our sample that provide information on the period over which executives are expected to build-up their holdings and start complying with the policy, we observe that firms typically employ a five-year period, which is similar to their US counterparts. There are 36 adopting companies in the sample that increase the minimum multiple during the sample period, and none of the adopting firms drops the minimum holding policy.

Panel B shows the actual ownership multiples achieved by each executive. To do this we first multiply executive year-end shareholdings by the company's year-end stock price. The number is then divided by the base salary. The median actual ownership multiple stands at 1.1 and is higher for CEOs (1.4) than for other executive directors (0.9). As reported by Core and Larcker (2002), US executives achieve much larger multiples with the medians for CEOs at 5.6 and for other executives at 2.4. Panel C shows that 54% of the time in our sample, executives are below the minimum holding required.

CEOs tend to be below the minimum less often (46%) than other executives (57%). These numbers are larger than the 38% and 49%, respectively, reported by Core and Larcker (2002) for US firms.

Figure 1 shows an increasing number of FTSE 350 companies that have a minimum holding policy in place during each year of our sample period. From 2000 to 2009, the percentage of firms with the policy increases from 4% to 55%. Figure 2 illustrates the percentage of executives who have shareholdings above the minimum in adopting firms from 2000 to 2009. In general, the compliance rate trends upwards throughout the period. There are two periods when the percentages drop. The first decrease occurs during the early 2000s when the internet bubble burst and the second drop occurs during the second half of 2007 and the first half of 2008 amid the global financial crisis. Recall that the minimum holding is expressed in terms of shareholding value as a certain multiple of the executive base salary. A change in the ownership value can be caused by stock-price fluctuation without executives purchasing or selling shares. Therefore both drops are potentially caused by drops in stock market values during the two periods. In a similar vein, the number increases at the fastest pace during 2003 to 2007 when the market generally prospers. During 2009, the percentage also starts to pick up again as the market recovers.

The descriptive statistics reported in this section reveal that there is considerable cross-sectional and time variation in policy adoptions, required ownership levels and meeting the minimum shareholding requirement, all of which allow for meaningful tests of the impact of minimum holding policies on the retention of equity incentives.

4. Retention of vested equity incentives: methodology and results

4.1 Methodology and variables

The aim of this paper is to investigate whether minimum shareholding policies have an impact on the retention of vested equity incentives. We measure retention at the executive-year level as the ratio of the annual change in the number of shares held by the executive and the sum of exercised options and

vested LTIP shares during the year. The ratio can be interpreted as the number of shares added to holdings in response to every share acquired from vested equity-linked compensation. If an executive retains all shares acquired and does not make any other share transaction, the ratio is equal to one. Selling some of the shares acquired lowers the ratio, and open-market purchases or other transactions increasing holdings – for example, under dividend reinvestment plans – increase the ratio. A value of the retention ratio above one implies that the executive not only retains all equity exposure related to the vested share-linked compensation but also adds further shares. As the ultimate question is whether shareholding policies effectively prevent the unloading of incentives, it is not necessary to track or explain the source of the extra shares acquired. Our approach is similar to empirical tests by Ofek and Yermack (2000) who analyze executive rebalancing behavior in a set of regressions of changes in shareholdings on the amount of equity-linked incentives granted or vested.

By definition the sample investigated in the tests is limited to executive-year observations with exercised options and/or vested LTIP shares, to allow for the calculation of the retention ratio. The key regressions are hence run in a sample of 1,292 executive-year observations, which is 49% of all executive-years in firms with the policy.

The retention ratio is regressed on a set of independent variables. The key variables of interest measure the actual value of managerial shareholdings at the beginning of the year in relation to the minimum holding level required by the policy in that year. The latter is computed by multiplying the current year minimum holding multiple by the current year base salary. We use two variables: continuous and a dummy. The ownership gap is a continuous variable measuring the percentage deviation from the required value of shareholdings. It is defined as actual ownership less the minimum ownership required, divided by the ownership required. We also test for the asymmetric effect of the variable on the retention ratio to see if the impact of the ownership gap depends on whether the executive is below or above the minimum. The policy is expected to have a stronger impact if the executive is below the minimum required, and the incentives to retain shares are expected to be much weaker when the executive is above the minimum. In alternative specifications, a dummy variable is used. The dummy is equal to one if the actual ownership is lower than required

(i.e., when the ownership gap is negative), and zero otherwise. The approach ignores the distance between the actual and required ownership and simply tests whether being below the minimum triggers higher retention.

In each regression we control for the structure of vesting awards measured as the ratio of exercised options and the sum of exercised options and vested LTIP shares during the year. One would expect the retention to be lower for option exercises than for LTIP share-vesting because executives have to pay the exercise price when exercising options, while LTIP shares vest without any cash flow being involved, excluding the tax liability. The option exercise price is normally covered by the value of some of the shares delivered to the company.¹⁰ Hence the importance of option exercises in total vested equity incentives is expected to be negatively related to the retention ratio.

Further control variables include the market-to-book (MTB) ratio and prior year stock return to control for contrarian behavior or executives who are likely to increase ownership to a larger extent in firms with a low MTB ratio and weak past performance (Jenter, 2005). We also control for firm size proxied by the log of the market value of equity. Furthermore, we control for a set of executive-level variables. Tenure and age are expected to capture the executive's horizon. Executives with a longer tenure, closer to retirement, are expected to start scaling down their equity exposure, maintain fewer shares and move towards cash. The log of the total wealth proxied by the value of total shareholdings, option holdings and holdings of LTIP shares is included to control for changes in risk aversion that drive incentives to retain risky shares. Increasing wealth can move the manager into a more or less risk-averse part of the utility function (e.g., Ross, 2004). To capture the executive's exposure to the risk of the company we also control for the percentage stake in the firm that the executive holds. The CEO dummy is expected to capture the difference in behavior between CEOs and other executives. CEOs are more visible and hence more likely to be scrutinized, and we expect them to retain a larger fraction of vesting equity.

¹⁰ Cicero (2009) provides an analysis of executive stock option exercise strategies, including delivering shares to the company to cover the exercise price and, alternatively, exercising with cash.

Moreover, we control for the percentage of non-executive directors on the firm's board as a proxy for board monitoring and internal governance. A number of studies have examined the monitoring advantage of independent boards (e.g., Weisbach, 1988; Hermalin and Weisbach, 1991), and Mura (2007) confirms the monitoring role of non-executive directors in the UK as he finds that firm performance improves with the ratio of non-executive directors on the board. We do not have a clear prediction of the expected sign of the relation between the variable and the retention of vested equity, though. On the one hand, if cashing out vested equity is viewed as managers' self-interested behavior, which is detrimental to outside shareholders, we expect more share retention in firms with a larger percentage of non-executive directors on the board. On the other hand, if executive shareholdings and board monitoring are substitute governance mechanisms, the link between share retention and the percentage of non-executive directors is expected to be negative.

To reduce the possible impact of outliers and data errors on the results, we winsorize all variables at the 5th and 95th percentile.¹¹ In particular, we aim to reduce the impact of outliers in the dependent variable – there are cases of large changes in shareholdings which lead to extremely high values of the ratio used as the dependent variable. Similarly, as presented in Table 1, some executives have large holdings, by far exceeding the required minimum ownership. Those outliers can distort the analysis of the impact of the ownership gap on share retention.

To further minimize the impact of extreme observations on estimated coefficients of the regressions, we estimate the key models using the median (least absolute deviation) regression method. Median regressions express the median of the conditional distribution of the dependent variable as function of the independent variables. The significance of estimated coefficients in the main tests is gauged based on robust standard errors.¹² As a robustness check we also re-estimate the models using alternative least-squares models.

¹¹ The main results are quantitatively and qualitatively similar when variables are winsorized at the 1st and 99th percentile.

¹² It is likely that standard errors are not independent across observations (e.g., within an executive or within a firm), and robust standard errors do not capture that dependence. However, we are not aware of a method of

4.2 Descriptive statistics

Descriptive statistics of both dependent and independent variables are presented in Table 2. The number of observations is smaller than the numbers reported in Table 1 because the sample is now restricted to executive-years with exercised options and/or vested LTIP shares.

The median retention ratio (change in the number of shares held, divided by the sum of exercised options and vested LTIP shares) in the full sample is 0.47, which means that the median executive adds 47 shares to their holdings for every 100 acquired from newly vested equity grants. The result indicates that more than half of the shares are cashed out. The variable is right skewed, though, and the mean stands at 1.25. The split of the sample into executives who are below and above the minimum shareholding required reveals the first evidence of the effectiveness of minimum shareholding policies in increasing share retention. Executives below the minimum retain significantly more of the vested equity incentives. The median retention ratio in the subsample below the minimum is 71% higher than the median in the subsample above the minimum (0.58 vs. 0.34), and the mean retention is 64% higher (1.54 vs. 0.94). The effect of the policy is hence economically very significant.

In 52% of observations in the sample the executive is below the minimum holding set by the policy. The median ownership gap is -7% but the variable is skewed with some executives holding very large stakes which gives the mean gap of $+95\%$. Executives are more likely to be above the minimum after better prior year stock-price performance, which is not surprising given the policy characteristics that define the minimum holding in value terms. Hence managerial ownership is more likely to meet the requirement after share-price increases. The descriptive statistics also show that executives who are above the minimum holding have longer tenure and are older, indicating that managers build up their holdings over time. Not surprisingly, the mean and median wealth and percentage holdings are also higher in the subsample of observations above the minimum. Firms whose executives are above the minimum do not differ significantly from firms whose executives are below the minimum in terms of calculating clustered standard errors in quantile (including median) regressions. We cluster standard errors in least-squares estimation presented below as robustness checks.

the MTB ratio or the market value of equity, but they have a lower percentage of non-executive directors on the board. Consistent with the data reported in Table 1, there are more CEOs in the subsample of executives with holdings above the required minimum than in the subsample of executives who do not comply with the shareholding policy.

4.3 Regression results

Results of the median regressions are presented in Table 3. We find statistically significant evidence that being subject to a minimum shareholding policy imposed by the firm has an impact on retention of newly vested equity. In columns (1)–(3), coefficients of *Ownership gap* are negative and significant. They indicate that when the gap is negative and large (i.e., when actual ownership is far below the required minimum), executives retain the largest amount of shares and the retention decreases as the ownership gap closes and further becomes positive. The results presented in columns (4)–(6) show, though, that the effect of the ownership gap is asymmetric and changes depending on whether the executive has holdings below or above the minimum. The negative relation between the retention ratio and ownership gap comes from observations below the minimum as reflected in the significantly negative coefficients of *Ownership gap* \times *Below minimum*. A larger gap between actual and required ownership leads to greater share retention by executives who miss the required minimum, but there is no link between retention and the gap for executives who already comply with the minimum requirement. The effect of the gap on share retention by executives who are below the minimum is economically significant. To illustrate, with all else constant, an executive who is 75% below the required holding retains for every 100 newly acquired shares 11 shares¹³ more than an executive who misses the requirement by 25%. As reported in Table 2, the unconditional median retention in the full sample is 47 shares. The effect of the gap is hence sizeable.

¹³ Calculated as $(-0.018 - 0.207) \times -0.5 \times 100$ – that is, the sum of coefficients of *Ownership gap* and *Ownership gap* \times *Below minimum*, multiplied by the hypothetical difference in the ownership gap of 50% and by 100 shares.

The effect of compliance with the policy is also confirmed in specifications presented in columns (7)–(9). Coefficients of the *Below minimum* dummy are positive and highly significant. We find that, controlling for other factors, executives whose shareholdings are below the minimum set by the policy retain on average 13–17 shares more than executives who comply with the minimum requirement. Again, compared with the median retention in the full sample, the economic effect is large.

Among the control variables only two are statistically significant across specifications. As expected, we find a significant effect of the structure of newly vesting equity. The larger is the fraction of exercised options in the sources of new equity, the lower is the increase in shareholdings. This is consistent with the tendency to cover the option exercise price with the value of new shares delivered to the company. The other variable that becomes significant in the majority of specifications is the MTB ratio. Consistent with the results of Jenter (2005), we find that executives are more likely to increase holdings, retaining more shares and also possibly acquiring further shares in low MTB ('value') firms. The result reflects the contrarian views of executives. All other coefficients are, by and large, insignificant.

Our results indicate that the retention of newly vested equity increases when executives are below the required level of holdings, and consistent with this finding there is an upward trend in the percentage of executives who comply with the policy reported in Figure 2. A caveat is in order here, though. Figure 2 can be misleading in direct comparison as the data in the figure include newly adopting firms and hence a growing number of executives year on year. When new firms and executives enter the sample they are likely to have small holdings, as otherwise the company may decide not to introduce the policy (see Core and Larcker, 2002). When we limit the time comparison to a group of executives who are in the sample each year during the period 2005–2009 (going further back might be too restrictive on the sample size), we find a sharper time trend. The percentage of executives complying with the policy in 2005 is 36%, and it rises monotonically to 72% in 2008 but then drops to 62% in 2009. Still, a relatively large fraction of executives in the restricted sample do not comply and there are various factors behind the lack of compliance. First, even though executives whose holdings are below the minimum required increase their share retention, the retention may be too small to quickly

cover the deficit. Policies themselves are fairly flexible in this respect and allow required shareholdings to be built up over a few years, as reported in Table 1.¹⁴ Second, as presented in Table 1, there are companies in our sample that increase the required salary multiple over time, which moves the level of required holdings upwards. Third, the growth in base salaries over time increases the required level of holdings even when the multiple set by the policy remains unchanged. We find that the mean base salary of executives in FTSE 350 non-financial companies increased, on average, by 5.5% annually between 2000 and 2009.

4.4 Robustness checks

We perform a set of further tests to check the robustness of our main results. First, we run two-stage Heckman (1979) estimation to control for possible self-selection of firms to introduce the minimum holding policy. The main regressions of interest are run in a sample of firms with the policy, and the decision to adopt the policy is not random. If the decision to adopt the policy is correlated with the explanatory variables in the retention regression, the specification suffers from the omitted-variable bias and the estimated coefficients of the regressions are inconsistent. For example, the decision to introduce a policy can be correlated, as indicated by Core and Larcker (2002), with actual managerial ownership, which, as we find, in conjunction with the minimum shareholding required, determines the retention of vesting equity.

The estimation is not straightforward, though. The retention regressions are run in a sample of executive-year observations while the decision to introduce the policy is made at the firm level. The key variables used in the second stage (the retention regression) are executive-year-specific and hence cannot enter directly the first-stage regression (the policy adoption decision regression). Moreover, to

¹⁴ In unreported tests we use data for the 93 firms which define a specific build-up period in their policies to explore whether the effects of *Ownership gap* and the *Below minimum* dummy on share retention differ between the build-up and the binding period. We do not find any statistically significant difference between the two periods, which indicates that executives indeed use the build-up period to gradually accumulate shares rather than wait and increase holdings sharply when the policy becomes binding.

satisfy the requirement for exclusion restrictions, an instrument is needed which determines the adoption decision but is not related to share retention.

We decide to take the following empirical approach. We estimate the first-stage probit regression closely following the specification in Core and Larcker (2002) and adding an instrument. As a by-product of the estimation we are also able to verify whether the decisions to adopt the policy in the UK are similar to the findings for the USA presented by Core and Larcker (2002). The instrument we use is the percentage of size peers who have the policy in place, with size groups defined as annually revised market capitalization deciles of FTSE 350. It is reasonable to expect firm policies to be influenced by what peers do, and at the same time the popularity of shareholding policies among peers is unlikely to determine the magnitude of share retention by the executive.

The first-stage probit regression is estimated on all FTSE 350 firm-years in our broad sample with the dependent variable equal to one if the firm has the minimum shareholding policy in place, and zero otherwise. Two explanatory variables follow Core and Larcker (2002). *Ownership residual* is the residual from a regression of $\log(\text{stock value}/\text{salary})$, calculated jointly for all executives in the firm, on \log equity market value, stock return volatility, stock return volatility squared, book-to-market ratio, and year and industry dummies. The second variable included in the probit model is the prior year industry-adjusted stock return. Throughout the paper we use the ten-industry FTSE Industry Classification Benchmark codes. The instrument, as outlined above, is the percentage of size peers with the policy in place. The first-stage regression also includes year and industry dummies.

Results of the first-stage regression are presented in Panel A of Table 4. We find that having the policy in place is determined by the popularity of the policy among peers (the instrument), and similarly to Core and Larcker (2002) we find that managerial ownership in firms with the policy is low compared with other firms, and the policy firms underperform the industry. The pseudo-R-square of the model is 28%, which indicates that the model tracks determinants of having a policy in place reasonably well.

Lambda, the inverse Mills ratio, from the first stage is then included in the second-stage regression in addition to all variables presented in the specifications in Table 3. By definition, *Lambda* is measured at the firm level and is the same for all executives in the firm in the given year. Results from alternative specifications of the second-stage regression are presented in Panel B of Table 4. The regressions are estimated using ordinary least squares (OLS), and standard errors are clustered at the firm level. Coefficients of *Lambda* are insignificant, which suggests that our original specification does not suffer from the omitted-variable bias.

The results confirm our main findings that the percentage difference between actual and required ownership determines the retention but the effect is concentrated in observations where the actual ownership is below the required holdings. We also find a statistically significant positive coefficient of the *Below minimum* dummy variable. Because the second-stage regression is estimated using the least-squares approach, the magnitude of coefficients changes compared with the least absolute deviation approach in Table 3. Coefficients in the least-squares approach are to a larger extent influenced by outliers.

Control variables that are significant in the second stage include, as in the median regressions reported in Table 3, the structure of vesting equity (exercised options vs. vested LTIP shares) and the MTB ratio. Other variables that are now significant are past stock return, firm size and the executive's wealth. Executives retain more shares in firms with stronger past performance, inconsistent with the contrarian behavior, in larger firms and when their wealth is smaller. We also find some evidence that CEOs retain more equity than other executives.

As further robustness tests, we re-estimate regressions from Table 3 using alternative least-squares estimations: pooled OLS estimation with standard errors clustered at the firm level, executive fixed-effect estimation with standard errors clustered at the executive level and firm fixed-effect estimation with standard errors clustered at the firm level. The pooled OLS estimation is a least-squares equivalent of median regressions presented in Table 3 but we are able to allow for clustering of standard errors within a firm. Executive fixed-effect estimation controls for any time-invariant

unobserved individual heterogeneity, such as different preferences, personal circumstances or risk attitudes, which are imperfectly captured by observable executive-level variables included in the regressions. Executive fixed-effect also capture shareholding levels at the time the policy was introduced, another time-invariant executive-level characteristic that may have an impact on share retention. Firm fixed effects control for unobservable firm characteristics and the approach offers important insights into the link between shareholding policies and the retention of equity incentives. First, firm fixed effects capture characteristics of the policy introduced by the firm that are difficult to quantify, as long as they are time invariant. The characteristics include the tone of the policy (e.g., a strict requirement as opposed to encouragement), enforcement mechanism or penalty for non-compliance. Moreover, firm fixed effects also capture unobservable firm characteristics that lead to the policy adoption, such as corporate culture or alternative corporate governance mechanisms in place, and hence to some extent address the self-selection problem mentioned above. The drawback of fixed-effect estimation is that fixed effects wipe out any variation across executives or firms and lead to the estimation of regression coefficients on the basis of within executive or within firm variation only. If observable characteristics included in the regressions do not change much over time, fixed-effect estimation is likely to reduce the significance of their respective coefficients.

The results of the alternative least-squares regressions are presented in Table 5. There are some changes to the significance of control variables, but the signs and significance of the key variables of interest measuring actual ownership in relation to the holdings required remains unchanged. The results confirm that the size of the gap between actual and required ownership is an important determinant of share retention but the effect is concentrated in observations where executive holdings are below the required level. The coefficient of the *Below minimum* dummy is positive and strongly significant across all specifications.

To summarize, the main results indicating that executives respond to the policy by retaining more newly vested equity when they are below the minimum holding required are very robust to alternative specifications and estimation methods.

5. Compliance with the policy and firm performance

So far the results indicate that the minimum shareholding policies have a positive impact on share retention from vesting equity-linked compensation. The ultimate question one may be interested in is whether it matters for firm performance. Core and Larcker (2002) provide preliminary evidence that excess accounting returns and stock returns increase after a managerial ownership plan is adopted. In their test they do not distinguish, though, between firms in which executives meet and do not meet the ownership requirement. In our tests we aim to shed more light on this issue.

Determining the link between managerial ownership and firm performance empirically is inherently difficult because of the potential endogeneity of the relation (e.g., Coles et al., 2012). In our setting the task is even more challenging because not only can there be a reversed causality between ownership and performance, or they can be simultaneously driven by other factors, but also the adoption of the ownership policy can be endogenously determined. Nevertheless, we attempt to shed some light on the issue by analyzing how the difference between the actual managerial shareholdings and the minimum shareholdings required by the policy affects firm valuation, correcting for the self-selection of firms to adopt the policy. Actual and required holdings are defined at the firm level based on the sum of actual holdings and the sum of minimum shareholdings required for all executives in the firm. To deal with the self-selection issue, we carry out a Heckman (1979) two-stage test, with the first stage as in the share retention tests presented in Section 4.4. In the second stage we regress the firm's Tobin's Q on either *Ownership gap* or the *Below minimum* dummy variable. As before, we also allow the effect of *Ownership gap* to differ depending on whether managerial holdings are above or below the minimum set by the policy. The control variables follow recent studies (e.g., Coles et al., 2012; Fahlenbrach and Stulz, 2009; Himmelberg et al., 1999; Kim and Yu, 2011; Laeven and Levine, 2008). All models include also year and industry dummies. *Lambda*, the inverse Mills ratio from the first-stage model, is included to control for self-selection. The second-stage regressions are estimated using OLS, and standard errors are clustered at the firm level. The results are presented in Table 6.

We find that valuations increase with the difference between the actual and required managerial ownership, as reflected in the positive and significant coefficient of *Ownership gap* in specification (1). Specification (2) reveals that the positive effect is larger in magnitude in firms in which managerial holdings are below the minimum required (the coefficient of *Ownership gap* \times *Below minimum* is positive) but the difference remains statistically insignificant. The coefficient of *Below minimum* is negative but also statistically insignificant. Taken together, the results indicate positive valuation effects of complying with the policy but the effects are significant when the difference between the actual and required holdings is large. Simply moving from below to above the minimum does not have significant economic implications.

Considering that, as reported in Section 4, we find an asymmetric effect of the *Ownership gap* on share retention which changes around the minimum required, the valuation result suggests that the minimum holding set by the policy may be too low to have strong performance effects. In a descriptive analysis of minimum shareholding policies presented in Section 3 we show that companies require their executives to hold, on average, shares of a value equal to their base salary, which indeed is not very demanding. For illustration, we convert the value of the sum of the minimum holdings set by the policy for all executives in the firm into percentage of the company market capitalization and find that the average is 0.3%. Earlier studies using UK data find that firm performance improves with managerial shareholdings at low levels of ownership and it is locally maximized for managerial ownership of 7% of shares outstanding (Davies et al., 2005), or in an alternative specification it is found to be locally maximized at 20% (Short and Keasey, 1999). Those estimates together with our results call for more demanding shareholding policies that set the required ownership higher.

Control variables present a picture consistent with other studies. We find higher valuations for profitable and smaller firms, and for firms with lower tangibility of assets and higher R&D expenditures.

6. Conclusions

In this paper we analyze whether executives cash out fewer shares acquired from newly vested equity-linked compensation if they are subject to a minimum shareholding policy imposed by the firm. It is argued that the unloading of equity incentives is costly to outside shareholders and can be value-decreasing (Holmstrom and Kaplan, 2003; Bebchuk and Fried, 2004, 2010). Both academics and policy-makers call for remuneration practices that would encourage share retention by executives and hence create long-term incentives.

We analyze data for FTSE 350 non-financial firms over the period 2000–2009 and document the growing popularity of minimum shareholding policies. Analyzing changes in executive shareholdings in relation to the number of shares acquired from exercised options and vested LTIP schemes, we find that the median executive adds to their holdings 47 shares for every 100 newly acquired shares. A large proportion of incentives is hence cashed out. In a set of regressions we find that the magnitude of share retention depends on the requirements set by the shareholding policy. Executives whose holdings are below the minimum set by the policy retain between 13 and 17 shares more than executives above the minimum level of holdings. We find that the percentage difference between the actual and required holdings drives the magnitude of share retention but the effect is concentrated in observations below the required minimum holdings. The results are robust to alternative estimation methods. In further tests we show economic benefits in the form of higher valuations for firms in which executives have holdings in excess of the required minimum. The valuation effect depends on the size of the difference between actual and required holdings and does not arise when executives simply move from below to above the minimum holding set by the policy.

Our results have important policy implications. They contribute to the debate about the design of compensation policies to create long-term incentives for executives, and to avoid short-termism and its consequences, which can be destructive, as we have recently witnessed. It is widely argued that one way to improve incentives is to increase share retention from equity-linked compensation. We test managerial shareholding policies, a specific mechanism that could be put in place, and find that they

have a positive impact on the retention of vested equity. The question remains open, though, as to whether the policies are designed correctly to do enough to improve managerial incentives. We show that they may lead to improvements in firm performance and valuation, but still the ownership mandated by the policies is likely to be too low and hence not at the level to benefit outside shareholders most.

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Figure 1 Number of firms with minimum holding policies

The figure shows the number of firms with and without minimum shareholding policies among FTSE 350 constituents from 2000 to 2009. The vertical axis indicates the percentage of firms with policies in the total number of constituent companies each year. Financial companies are excluded. Data on minimum holding policies are hand-collected from companies' annual reports.

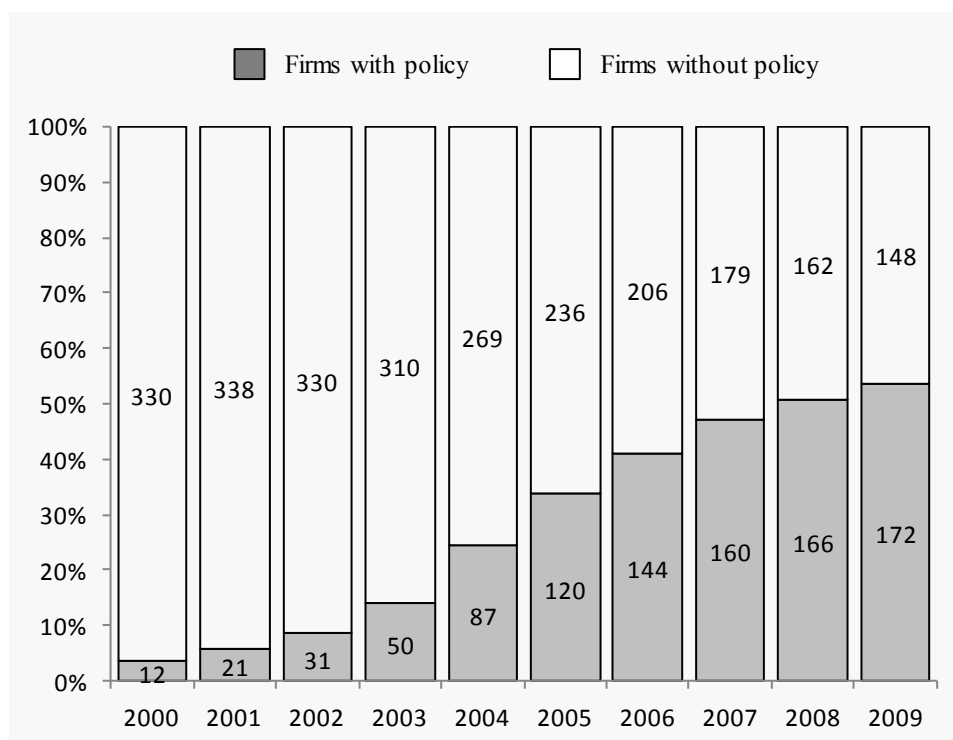


Figure 2 Time trend of percentage of executives with ownership above the minimum level

This figure shows a time series of the percentage of executive directors who have share ownership above the minimum level set by the shareholding policy. BoardEx provides information about executive compensation and shares owned, and share prices are sourced from Datastream. Data on minimum holding policies are hand-collected from companies' annual reports. The sample includes non-financial firms in the FTSE 350.

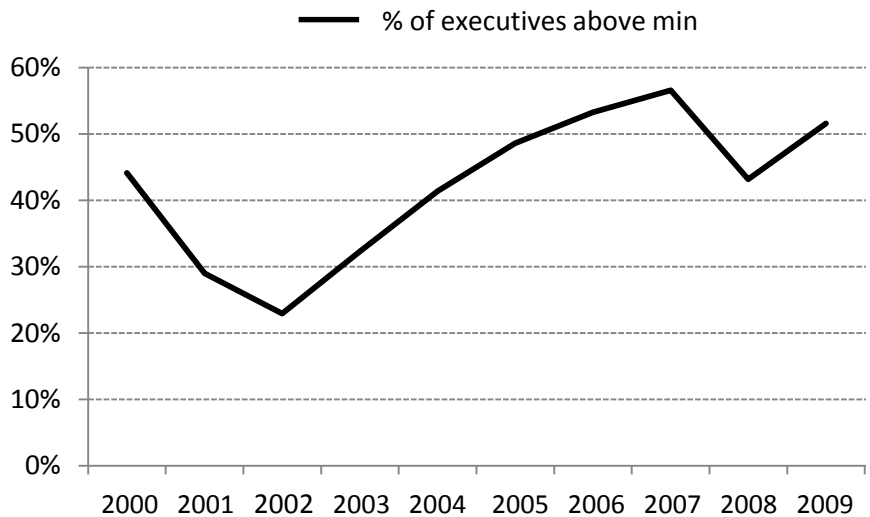


Table 1 Characteristics of minimum holding policies

The sample consists of 209 companies adopting minimum holding policies. Panel A shows descriptive statistics for the holding multiples and the time allowed for executives to satisfy the minimum holding. ‘Number’ is the number of executive-year observations for executives, and is the number of firms for the ‘compliance period’ and ‘increasing minimum multiple during the sample period’. Panel B shows descriptive statistics of actual ownership multiples for executive directors. The multiples are calculated as the value of shares held divided by the base salary. Panel C shows descriptive statistics for the number of executive-years for which the actual ownership multiple is less than the multiple required by the company. The sample includes non-financial firms in the FTSE 350 index over the period 2000–2009.

<i>Panel A Minimum multiples and compliance periods</i>							
	Number	Mean	Min	25%	Median	75%	Max
All executives (executive-years)	2,625	1.3	0.2	1.0	1.0	1.5	5.0
CEO (executive-years)	799	1.5	0.2	1.0	1.0	2.0	5.0
Other executives (executive-years)	1,826	1.3	0.4	1.0	1.0	1.5	5.0
Compliance period (years) (number of firms)	93	4.6	2.0	5.0	5.0	5.0	8.0
Increasing minimum multiple during sample period (number of firms)	36						
<i>Panel B Actual ownership multiples</i>							
All executives (executive-years)	2,601	6.0	0.0	0.4	1.1	2.7	773.1
CEO (executive-years)	791	6.5	0.0	0.5	1.4	3.9	515.9
Other executives (executive-years)	1,810	5.7	0.0	0.3	0.9	2.4	733.1
<i>Panel C Executives below the minimum holding</i>							
	Total number	Number below minimum	Percent below minimum				
All executive directors (executive-years)	2,601	1,398	54				
CEO (executive-years)	791	367	46				
Other executives (executive-years)	1,810	1,031	57				

Table 2 Descriptive statistics

The table shows descriptive statistics of dependent and independent variables used in regression tests. The data are based on the subsample of vested LTIP shares in firms with the minimum shareholding policy. It is further restricted to non-financial constituents of the FTSE 350 index. Columns (1)–(3) are based on all executive-years, columns (4)–(6) are based on executive-years where managerial ownership does not satisfy the minimum requirement, and columns (7)–(9) are based on executive-years where managerial ownership satisfies the minimum requirement. Columns (10) and (11) show the p-value of the test for difference between executive-years that are below and above the minimum requirement. *Change in shares held* is the change in current year executive stockholdings less the change in the prior year. *Change in shares held* is the change in current year executive stockholdings less the change in the prior year. *Exercised options* is the number of shares obtained through exercising share options during the year. *Vested shares* is the number of vested shares at the end of the year. *Ownership gap* is measured as actual ownership less the minimum ownership required, divided by the ownership required. *Below minimum ownership* is below the minimum required, and is equal to zero otherwise. *Lagged MTB* is the lagged value of the MTB ratio. *Lagged log wealth* is the lagged value of executive's wealth, which is defined as the sum of the value of total shareholdings in the firm, the estimated option value (using the Black-Scholes model), and the value of restricted stock. *Percentage of NED* is the percentage of non-executive directors on the board. Data are sourced from BoardEx, Hemscoff and Datastream. All variables are hand-collected from companies' annual reports.

	<i>Full sample</i> (<i>n</i> = 1,292)			<i>Below minimum</i> (<i>n</i> = 677)			<i>Above minimum</i> (<i>n</i> = 325)
	Mean	Median	Std dev	Mean	Median	Std dev	Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Dependent variable</i>							
Change in shares held/(exercised options + vested shares)	1.25	0.47	2.58	1.54	0.58	2.77	0.94
<i>Independent variables</i>							
Ownership gap	0.95	-0.07	2.67	-0.59	-0.63	0.29	2.64
Below minimum ownership dummy	0.52	1.00	0.50	1.00	1.00	0.00	0.00
Exercised options/(exercised options + vested shares)	0.55	0.79	0.47	0.55	0.86	0.47	0.54
Lag MTB	3.30	2.58	2.53	3.26	2.54	2.49	3.34
Prior year stock return	0.15	0.15	0.32	0.13	0.11	0.32	0.18
Lag log equity market value	7.60	7.47	1.36	7.64	7.57	1.36	7.56
Log tenure	1.48	1.53	0.67	1.27	1.28	0.59	1.72
Log age	3.93	3.93	0.12	3.90	3.91	0.12	3.96
Lag log wealth	14.65	14.67	1.07	14.26	14.23	1.06	15.08
Lag shares held/shares outstanding (×100)	0.09	0.02	0.22	0.02	0.01	0.04	0.18
CEO dummy	0.31	0.00	0.46	0.25	0.00	0.43	0.38
Percentage of NED	0.53	0.54	0.11	0.54	0.56	0.11	0.52

Table 3 Determinants of retention of vested equity incentives – median regressions

The table shows the results of the median (least absolute deviation) regression analysis. The dependent variable is defined as the change in the number of shares held over the sum of exercised options and vested LTIP shares. All independent variables are defined as in Table 2. Robust t-statistics are reported in parentheses. Coefficients marked with ^a, ^b and ^c are significant at the 1%, 5% and 10% level, respectively. Data are sourced from BoardEx, Hemscott and Datastream, and the details of minimum holding policies are hand-collected from companies' annual reports. The sample includes non-financial constituents of the FTSE 350 index over the period 2000–2009.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ownership gap	-0.020 ^b (-2.47)	-0.028 ^c (-1.94)	-0.029 ^c (-1.91)	-0.012 (-1.27)	-0.018 (-1.12)	-0.018 (-1.08)			
Ownership gap × Below min				-0.130 ^c (-1.80)	-0.193 ^b (-2.12)	-0.207 ^b (-2.20)			
Below minimum							0.129 ^a (3.02)	0.146 ^b (2.40)	0.165 ^a (2.68)
Ex opt/(ex opt + vest shrs)	-0.439 ^a (-9.33)	-0.410 ^a (-7.56)	-0.402 ^a (-7.31)	-0.461 ^a (-9.79)	-0.435 ^a (-7.79)	-0.430 ^a (-7.42)	-0.451 ^a (-9.83)	-0.435 ^a (-7.92)	-0.409 ^a (-7.34)
Lag MTB	-0.023 ^a (-2.59)	-0.019 ^c (-1.92)	-0.019 ^c (-1.90)	-0.018 ^b (-2.05)	-0.015 (-1.49)	-0.016 (-1.54)	-0.019 ^b (-2.22)	-0.020 ^b (-1.98)	-0.019 ^c (-1.87)
Prior year stock return	-0.070 (-1.00)	-0.045 (-0.56)	-0.042 (-0.52)	-0.085 (-1.22)	-0.062 (-0.76)	-0.047 (-0.56)	-0.059 (-0.87)	-0.008 (-0.11)	-0.034 (-0.42)
Lag log equity market value	-0.013 (-0.76)	-0.007 (-0.25)	0.006 (0.21)	-0.020 (-1.21)	-0.007 (-0.25)	0.009 (0.30)	-0.020 (-1.26)	-0.000 (-0.00)	0.012 (0.43)
Log tenure		-0.027 (-0.64)	-0.034 (-0.80)		-0.006 (-0.13)	0.010 (0.21)		-0.007 (-0.15)	-0.001 (-0.02)
Log age		0.156 (0.67)	0.185 (0.78)		0.288 (1.20)	0.177 (0.70)		0.281 (1.19)	0.338 (1.39)
Lag log wealth		-0.043 (-1.29)	-0.044 (-1.18)		-0.034 (-0.98)	-0.053 (-1.34)		-0.053 (-1.58)	-0.065 ^c (-1.76)
Lag shares held/shares outs		12.590 (0.73)	13.530 (0.77)		9.098 (0.51)	14.54 (0.78)		-0.062 (-0.00)	3.440 (0.24)
CEO dummy			0.026 (0.42)			0.054 (0.83)			0.065 (1.05)
Percentage of NED			-0.202 (-0.83)			-0.059 (-0.23)			-0.040 (-0.16)
Constant	0.866 ^a (6.48)	0.849 (0.93)	0.752 (0.77)	0.883 ^a (6.37)	0.117 (0.12)	0.685 (0.66)	0.842 ^a (6.43)	0.357 (0.37)	0.174 (0.17)
Observations	1,292	1,069	1,069	1,292	1,069	1,069	1,292	1,069	1,069
Pseudo R-sqr	0.029	0.030	0.030	0.030	0.031	0.031	0.029	0.031	0.031

Table 4 Determinants of retention of vested equity incentives – two-stage Heckman regressions

This table shows the results of a multivariate Heckman (1979) two-stage regression analysis. Panel A shows coefficients of the first-stage probit regression based on firm-year observations. The dependent variable is a dummy equal to one if the firm has the minimum shareholding policy in place, and zero otherwise. Firm size groups are defined as market capitalization deciles of FTSE 350. *Ownership residual* is the residual from a regression of $\log(\text{stock value}/\text{salary})$, calculated jointly for all executives in the firm, on \log equity market value, stock return volatility, stock return volatility squared, book-to-market ratio, and year and industry dummies. Panel B shows coefficients of second-stage regressions analyzing determinants of retention of vested equity incentives based on executive-years. All variables are defined as in Table 2. *Lambda* denotes the inverse Mills ratio of the first-stage probit regression from Panel A. T-statistics based on standard errors clustered at the firm level are reported in parentheses. Coefficients marked with ^a, ^b and ^c are significant at the 1%, 5% and 10% level, respectively. Data are sourced from BoardEx, Hemscoff and Datastream, and the details of minimum holding policies are hand-collected from companies' annual reports. The sample includes non-financial constituent firms of the FTSE 350 index over the period 2000–2009.

<i>Panel A: First stage</i>		<i>Panel B: Second stage</i>			
<i>Determinants of policy adoption</i>		<i>Dependent variable: change in shares held/(exercised options + vested shares)</i>			
	(1)		(2)	(3)	(4)
% of peer firms in the same firm size group with policy	4.027 ^a (6.68)	Ownership gap	-0.076 (-0.98)	-0.032 (-0.39)	
Ownership residual	-0.538 ^a (-5.76)	Ownership gap × Below min		-0.702 ^b (-2.13)	
Prior industry-adjusted return	-0.244 ^c (-1.84)	Below minimum			0.789 ^a (3.92)
Year dummies	Yes	Ex opt/(ex opt + vested shares)	-0.495 ^c (-1.71)	-0.499 ^c (-1.72)	-0.521 ^c (-1.85)
Industry dummies	Yes				
Constant	-1.197 (-1.57)	Lag MTB	-0.064 ^c (-1.72)	-0.066 ^c (-1.68)	-0.063 (-1.58)
		Prior year stock return	0.663 ^c (1.95)	0.661 ^c (1.95)	0.683 ^b (2.01)
		Lag log equity market value	0.262 ^b (2.34)	0.247 ^b (2.17)	0.254 ^b (2.30)
		Log tenure	0.095 (0.77)	0.166 (1.34)	0.201 (1.56)
		Log age	0.226 (0.30)	0.389 (0.50)	0.535 (0.68)
		Lag log wealth	-0.352 ^a (-2.80)	-0.301 ^b (-2.36)	-0.291 ^b (-2.36)
		Lag shares held/shares outst	31.31 (0.64)	17.05 (0.35)	13.35 (0.28)
		CEO dummy	0.293 (1.55)	0.319 ^c (1.67)	0.319 ^c (1.76)
		Percentage of NED	0.204 (0.18)	0.169 (0.15)	0.134 (0.13)
		Lambda (coeff × 1,000)	-0.680 (-0.02)	1.770 (0.04)	-3.920 (-0.09)
		Constant	3.583 (1.08)	1.974 (0.59)	0.948 (0.29)
Observations	2,172	Observations	982	982	982
Pseudo R-sq	0.282	Adjusted R-sqr	0.024	0.029	0.038

Table 5 Determinants of retention of vested equity incentives – least-squares regressions

The table shows the results of alternative least-squares estimations: pooled OLS regression and regressions with either executive or firm fixed effects. The dependent variable is defined as the change in the number of shares held over the sum of exercised options and vested LTIP shares. All independent variables are defined as in Table 2. T-statistics are reported in parentheses. Coefficients marked with ^a, ^b and ^c are significant at the 1%, 5% and 10% level, respectively. Data are sourced from BoardEx, Hemscoff and Datastream, and the details of minimum holding policies are hand-collected from companies' annual reports. The sample includes non-financial constituents of the FTSE 350 index over the period 2000–2009.

	<i>Pooled OLS</i> <i>(SE clustered at firm)</i>			<i>Executive fixed effects</i> <i>(SE clustered at executive)</i>			<i>Firm fixed effects</i> <i>(SE clustered at firm)</i>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ownership gap	-0.071 (-0.98)	-0.028 (-0.37)		-0.172 ^b (-2.04)	-0.028 (-0.37)		-0.078 (-0.88)	-0.040 (-0.44)	
Ownership gap × Below min		-0.670 ^b (-2.11)			-1.163 ^a (-2.97)			-0.895 ^b (-2.20)	
Below minimum			0.716 ^a (3.78)			1.163 ^a (3.87)			0.850 ^a (3.88)
Ex opt/(ex opt + vest shrs)	-0.457 ^c (-1.73)	-0.459 ^c (-1.74)	-0.466 ^c (-1.81)	-0.901 ^b (-2.56)	-0.891 ^b (-2.52)	-0.814 ^b (-2.41)	-0.667 ^c (-1.80)	-0.619 ^c (-1.67)	-0.609 ^c (-1.69)
Lag MTB	-0.057 (-1.52)	-0.058 (-1.49)	-0.056 (-1.42)	-0.103 ^c (-1.78)	-0.112 ^c (-1.95)	-0.112 ^b (-2.02)	-0.050 (-0.87)	-0.055 (-0.97)	-0.057 (-1.08)
Prior year stock return	0.567 ^c (1.77)	0.557 ^c (1.75)	0.577 ^c (1.80)	0.784 ^b (2.04)	0.728 ^c (1.86)	0.831 ^b (2.13)	0.459 (1.25)	0.384 (1.03)	0.451 (1.23)
Lag log equity market value	0.260 ^a (2.86)	0.248 ^a (2.68)	0.249 ^a (2.77)	0.289 (0.69)	0.326 (0.80)	0.389 (0.98)	-0.013 (-0.04)	0.003 (0.01)	0.038 (0.11)
Log tenure	0.067 (0.56)	0.139 (1.16)	0.165 (1.33)	-0.484 (-1.55)	-0.408 (-1.35)	-0.308 (-1.03)	-0.037 (-0.30)	0.025 (0.21)	0.041 (0.33)
Log age	-0.022 (-0.03)	0.115 (0.15)	0.238 (0.31)	7.607 (1.38)	8.037 (1.47)	7.940 (1.48)	1.127 (1.47)	1.366 ^c (1.72)	1.513 ^c (1.91)
Lag log wealth	-0.334 ^a (-2.88)	-0.289 ^b (-2.49)	-0.281 ^b (-2.57)	-0.402 (-1.50)	-0.265 (-0.95)	-0.444 ^c (-1.74)	-0.303 (-1.36)	-0.167 (-0.72)	-0.203 (-0.85)
Lag shares held/shares outs	34.65 (0.77)	20.86 (0.47)	18.31 (0.39)	-472.4 ^a (-2.94)	-458.2 ^a (-3.13)	-533.1 ^a (-3.78)	-78.81 (-1.18)	-95.40 (-1.45)	-103.6 ^b (-2.44)
CEO dummy	0.263 (1.42)	0.295 (1.58)	0.289 (1.63)	-0.472 (-0.73)	-0.198 (-0.34)	-0.021 (-0.04)	0.376 ^c (1.67)	0.362 (1.62)	0.377 ^c (1.77)
Percentage of NED	0.006 (0.01)	-0.055 (-0.05)	-0.091 (-0.10)	2.441 (1.20)	2.628 (1.27)	2.794 (1.34)	0.721 (0.36)	0.867 (0.43)	0.860 (0.43)
Constant	4.399 (1.38)	2.980 (0.91)	2.152 (0.68)	-24.100 (-1.25)	-28.740 (-1.50)	-26.880 (-1.44)	1.485 (0.36)	-2.035 (-0.46)	-2.583 (-0.65)
Observations	1,069	1,069	1,069	1,069	1,069	1,069	1,069	1,069	1,069
Adjusted R-sqr	0.022	0.027	0.034	0.085	0.091	0.098	0.028	0.035	0.042

Table 6 Actual ownership, required ownership and firm valuation

The table shows results of Heckman second-stage regression of the firm's Tobin's Q on variables reflecting compliance with the minimum ownership policy by the firm's executives and a set of control variables. The dependent variable is Tobin's Q calculated as the sum of market value of equity and book value of total debt divided by total assets. *Ownership gap* and *Below minimum* dummy are defined at the firm level based on the sum of actual holdings and the sum of minimum shareholdings required for all executives in the firm. *Ownership gap* is measured as actual ownership less the minimum ownership required, divided by the ownership required. *Below minimum* is equal to one if managerial ownership is below the minimum required, and is equal to zero otherwise. PPE stands for property, plant and equipment, and NED stands for non-executive directors. The first-stage probit regression is as reported in Table 4 Panel A, and *Lambda* denotes the inverse Mills ratio of the first-stage regression. T-statistics based on standard errors clustered at the firm level are reported in parentheses. Coefficients marked with ^a, ^b and ^c are significant at the 1%, 5% and 10% level, respectively. Data are sourced from BoardEx, Hemscott and Datastream, and the details of minimum holding policies are hand-collected from companies' annual reports. The sample includes non-financial constituents of the FTSE 350 index over the period 2000–2009.

	(1)	(2)	(3)
Ownership gap	0.029 ^b (2.03)	0.027 ^c (1.73)	
Ownership gap × Below minimum		0.044 (0.42)	
Below minimum			-0.081 (-1.07)
EBIT/sales	3.494 ^a (6.19)	3.476 ^a (6.18)	3.545 ^a (6.15)
Leverage	0.267 (1.12)	0.275 (1.17)	0.293 (1.23)
Log sales	-0.071 ^c (-1.74)	-0.074 ^c (-1.76)	-0.074 ^c (-1.71)
Capex/PPE	-0.564 (-1.38)	-0.568 (-1.39)	-0.484 (-1.16)
PPE/sales	-0.433 ^a (-5.39)	-0.433 ^a (-5.38)	-0.439 ^a (-5.39)
R&D/PPE	0.133 ^a (3.22)	0.131 ^a (3.21)	0.126 ^a (2.88)
R&D dummy	0.212 ^c (1.74)	0.214 ^c (1.76)	0.183 (1.58)
Percentage of NED	0.163 (0.51)	0.168 (0.53)	0.017 (0.06)
Lambda (coeff × 1,000)	-0.650 (-0.10)	-0.171 (-0.03)	-0.243 (-0.38)
Year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Constant	1.658 ^a (3.01)	1.741 ^a (2.84)	1.848 ^a (3.00)
Observations	505	505	505
Adjusted R-sqr	0.393	0.392	0.380