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Pension Fund Performance and Risk-Taking Under Decentralized Investment Management

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Pension Fund Performance and Risk-Taking Under Decentralized Investment Management

Abstract

This paper studies the widespread shift of pension funds--who manage over $18 trillion worldwide--from centralized to decentralized management over the past few decades. We ask whether this shift has been rational, given the problem of coordinating multiple fund managers, as modeled by van Binsbergen et al (2008), or whether this shift has occurred for other secular reasons. Our proprietary dataset on UK pension funds allows us to uniquely examine this issue: we study the returns of the same fund manager in a particular asset class (e.g., UK equities) across different decentralization schemes, as well as the relation between pension fund sponsor characteristics and the decentralization choice. Pension fund sponsors may decentralize their pension funds by (1) employing a single specialist manager within each asset class, rather than a balanced manager across all asset classes, and (2) by employing multiple managers (specialist and/or balanced) within a single asset class. We find that funds switch from single- to multiple-managers partly to minimize diseconomies-of-scale as they grow. Indeed, sponsors appear to properly anticipate and make the switch before performance substantially deteriorates. However, competition between multiple specialist managers also improves performance, after controlling for size of assets and fund management company-level skill effects. Further, pension fund sponsors using multiple managers allocate lower risk budgets to each manager, which helps to compensate for the suboptimal diversification that arises from the difficulty of coordinating multiple managers. Finally, pension funds allocate more money to managers with good past performance, and these managers persist in outperforming. Overall, our results provide support for the conjecture that pension fund sponsors rationally choose their delegation structure.

Pension funds hold a significant share of the market portfolio. During 2005, worldwide pension fund assets exceeded $18 trillion, or more than 88% of OECD GDP; by comparison, worldwide mutual fund assets during 2005 amounted to about $17 trillion.[1] Typically, sponsors of defined benefit pension plans employ fund managers to oversee their investment portfolios in an arrangement known as delegated portfolio management. But the details of these investment mandates differ. Sometimes, a pension fund employs a single fund manager with a " balanced mandate" across all asset classes, while, in other cases, the pension fund employs multiple managers with a " specialist mandate" in one or more asset classes.

The practice of using multiple managers, referred to as " decentralized investment management" by Sharpe (1981), may at first appear surprising. Specifically, van Binsbergen et al (2008) model the potential for suboptimal portfolio diversification, leading to a " diversification loss," where individual managers do not account for the correlation of their own portfolio returns with the returns of other managers in the fund.[2] Moreover, employing separate fund managers to oversee investments in individual asset classes, rather than hiring a single manager to oversee all asset classes, shifts the responsibility for sector allocation, or market-timing, away from fund managers.[3] However, there are potential benefits from employing multiple managers. For example, pension funds may be able to diversify the strategies used to generate alpha, thus, avoiding diseconomies-of-scale, or to exploit the skills of specialist active managers to achieve higher fund alphas due to their superior knowledge of a particular asset class (Sharpe, 1981, van Binsbergen et al (2009)). They may also employ multiple managers to induce yardstick competition, and given the similarities between different managers, benefit from the resulting higher effort levels exerted by these managers (Shleifer, 1985).

Despite the large fraction of financial assets controlled by pension funds, prior studies (Lakonishok et al, 1992) do not control for the effect of the specific delegation arrangement on performance and risk-taking, due to the unavailability of data on specific fund mandates. Our paper, by contrast, studies a dataset on UK pension funds between March 1984 and March 2004 which uniquely contains, in addition to quarterly returns and total assets under management (AUM), information on the type of mandate (balanced or specialist) followed by each pension fund manager/sponsor pairing over time. For instance, we know each fund manager's investment mandate type for UK

[1]See oecd.org/daf/pensions/gps for pension fund statistics and ici.org/stats/mf for mutual fund statistics.
[2]This " coordination problem" can be reduced (but not eliminated) through well-designed manager incentive contracts, as shown by van Binsbergen et al (2008).
[3]Furthermore, since our dataset does not contain information on pension liabilities, we are not able to assess the extent to which asset allocations and changes to them correspond to attempts by the sponsor or fund managers to match both liabilities and liability dynamics.

equities for each pension fund sponsor during each quarter, which allows us to test for differences in a given fund manager's performance across different mandates--single balanced through multiple specialist--as well as the fund manager's performance under these mandates in different asset classes over time. With this information, we are uniquely able to test whether particular types of mandates lead to differential performance and/or risk-taking. For instance, we examine whether specialist mandates produce higher stock-selection alphas, relative to balanced mandates, to test the specialization hypothesis of Sharpe (1981). As another example, we examine whether sponsors limit the risk-taking of multiple competing managers, due to the coordination problem.[4]

The overall theme of our paper is to investigate whether the trend toward decentralization in management by pension fund sponsors is rational, given the greater coordination problem that decentralization poses. First, we investigate whether sponsors have switched from balanced to specialist managers, a form of decentralization, because specialists have superior skills. Our results show that specialist managers indeed display significant stock-selection skills, while balanced fund managers do not exhibit skills, but compete through lower fees.[5] Specifically, the pre-fee performance of balanced managers is less than that of specialist managers, which is consistent with the higher management fees charged by specialists. These findings are consistent with hidden-action (or hidden-ability) principal-agent models, such as our pension fund sponsor/manager setting, where the principal offers a menu of contracts to different types of agents to induce the agents to self-select into particular contracts in a separating equilibrium. In our setting, specialist and balanced fund managers--the agents--self-select into their preferred contractual arrangements: specialist managers choose to emphasize stock-selectivity skills, while balanced managers choose to emphasize either market-timing abilities or lower fees, due to the management of larger asset pools across several asset classes.

Second, we find that sponsors are more likely to shift from balanced to specialist managers when balanced managers underperform their benchmarks. This effect is partially related to the diseconomies-of-scale that arise with

[4]We note that van Binsbergen et al (2008) assume that all managers have equal skills. Therefore, in their setting, the decision to decentralize fund management (which is made outside of their model) always produces suboptimal outcomes. Our setting makes no such assumptions; we study performance and risk-taking in a unified empirical framework, where managers may have differential skills. As such, besides studying the decentralization issues highlighted by van Binsbergen et al (2008), we also study the rationality of the decentralization decision itself.
[5]Our dataset does not contain information on the fees charged by the fund managers, although we know from industry surveys that the fees of specialists are higher than those of balanced managers, so we may infer that specialists capture at least some of the rents from their superior skills or greater efforts (see, e.g., Berk and Green (2004)).

increasing fund size. However, independent of the size effect, sponsors switch to specialists to improve performance.

Third, decentralized management is more typical of large funds, which face diseconomies-of-scale in investment. These large fund sponsors tend to employ multiple fund managers, another form of decentralization, to reduce the diseconomies (a benefit of decentralization), but are then faced with the problem of coordinating diversification across multiple managers.[6] We find that sponsors react to this coordination problem by controlling risk levels, as predicted by van Binsbergen et al (2008). Specifically, fund sponsors appear to allocate risk budgets to their managers, such that the overall pension fund risk level is lower under decentralized investment management (a cost of decentralization). Overall, the benefits and costs of decentralization produce a Sharpe ratio that is comparable with that of funds that have not decentralized. That is, decentralization improves performance sufficiently to compensate for a non-optimal overall risk level. This finding indicates that the shift to decentralized management has not resulted in a deterioration in performance for the overall pension fund portfolios, due to the sponsors understanding the coordination problem. This shift can, therefore, be interpreted as rational, since it provides funds with growing assets-under-management with a strategy for reducing the effects of diseconomies-of-scale.[7]

Finally, we find evidence that sponsors employ multiple managers to introduce competitive incentives for managers to perform well, similar to the incentives for outsourced mutual fund management documented by Chen et al (2006). Specifically, we find negative and significant abnormal returns during the two quarters prior to a switch from a single to multiple fund managers; the probability of switching from single-managed to multi-managed mandates also increases if past (relative) performance is poor.[8] Further, we find a significant relation between future allocations of assets to managers and past-return performance, measured relative to managers in the same asset class, indicating that fund sponsors may also " partially fire" underperforming managers in this competitive setting. These results indicate that manager replacements, and the allocation of assets to managers, is at least partially based on the inferred skills of managers.

[6]We also find that the dispersion of performance of pension funds employing multiple managers is lower than funds employing single managers, which is another benefit.
[7]Indeed, had funds not decentralized in order to split assets between a number of fund managers, Sharpe ratios would have fallen, since, over the sample period, assets under management were growing quickly.
[8]During our sample period, funds switched much more frequently from a single manager to multiple managers than the reverse. This should not be surprising, as it is likely that funds begin with a single fund manager, then switch to multiple managers for a couple possible reasons: either they become dissatisfied with the performance of their fund manager, or the fund becomes too large to be managed by a single manager and the sponsor may employ several managers without incurring huge fees. Poor pre-fee investment performance during the periods prior to a switch is consistent with either explanation.

Overall, our paper provides support for rationality in the choice of pension fund mandate. Decentralization from balanced to specialist managers is chosen when balanced managers underperform, while decentralization from single to multiple managers is chosen either when the single manager underperforms, and/or the fund becomes too large for the single manager.

The remainder of the paper is organized as follows. In section I, we describe the different types of investment mandates and set out the hypotheses we wish to test from reviewing the existing literature. Section II describes the data. Section III analyzes empirically the relationship between pension fund performance and mandate type, distinguishing between specialist and balanced mandates. Section IV explores the effect of decentralized investment management on the return and risk characteristics of the pension funds. Section V looks at the incentive effects of funds' hiring and firing decisions and how past performance impacts inflow of funds to different managers. Section VI presents conclusions.

1 Decentralized Investment Management: Theory and Empirical Predictions

Following the decision to outsource the investment management of the pension fund, plan sponsors must decide on the best investment delegation arrangement.[9,10] There are two important dimensions through which the centralization/decentralization decision might be made.

First, the sponsor must decide whether to employ generalist managers, under a " balanced mandate" or a " multi-asset mandate," or specialist managers, under a " specialist mandate." Under a balanced mandate, the fund manager is responsible for investing across the full range of assets permitted by the sponsor.[11] The sponsor chooses the strategic asset allocation,[12] usually with

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[9]Our study assumes that the decision to outsource has already been made by the fund sponsor. Although this decision is also interesting, our dataset (which we will describe shortly) does not allow us to differentiate between pension fund sponsors who decide to manage money in-house and those who do not.
[10]In the UK, a pension plan operates under " trust law" (see, e.g., Blake, 2003). This means that a pension plan is run by independent trustees in the best interests of the plan members. The plan sponsor appoints the trustees, although up to one third can, if the members choose, be elected by them. Legally, all decisions are made by the trustees, although they generally delegate investment decisions to investment professionals, and they have a duty to take into account the views of the sponsor, although they are not obliged to implement those views. Nevertheless, since the sponsor has an obligation to fund the plan on a balance-of-cost basis, it would be unusual for the trustees to completely disregard the views of the sponsor. In this paper, we do not have information on the governance structure of different pension funds (such as information on the trustees). Therefore, for simplicity, we refer to the " sponsor" as being the decision-maker, even though, legally, this role is held by the trustees.
[11]Our data set consists of a maximum of seven asset classes: UK equities, UK bonds, international equities, international bonds, index-linked bonds, cash and property.

the guidance of an actuarial or investment consultant, but the balanced manager can make both market timing (or tactical asset allocation)[13] and security selection decisions. Under a specialist mandate, a manager is allowed to make security selection decisions within a subclass of assets and very limited market timing decisions.[14] Under a multi-asset mandate, a manager can invest in more than a single asset category, but in less than the full range available to the balanced manager; the manager can also engage in more sophisticated market timing strategies than the specialist manager. As in the case of balanced management, the sponsor chooses the strategic asset allocation under the last two mandates.

Second, the sponsor must decide whether to employ a single manager or multiple managers. For instance, a sponsor might decide to employ multiple balanced managers, who invest across all asset classes, or multiple specialist managers within a single asset class. Alternatively, the sponsor might use a single balanced manager or have a single specialist manager for each asset class. Even more complex arrangements can occur. For example, a sponsor might employ both balanced, multi-asset and specialist managers simultaneously, as well as employing a single manager within some asset classes and multiple managers within others.

1.1 Balanced versus multi-asset versus specialist mandates

Figure 1 shows the evolution in the proportion of UK equity mandates in our sample using a balanced, multi-asset or specialist strategy; these proportions are separately depicted for each type and further separated into proportions of each type that are in a single- or multi-managed mandate.[15] The figure illustrates the secular move among UK pension funds away from balanced managers and toward multi-asset and specialist managers during the period March 1984 to March 2004. Roughly 99% of portfolios were allocated to balanced mandates during 1984, but only about 12% by 2004. By 2004, 63% of mandates were multi-asset and 25% were specialist. To facilitate interpretation of our results, it is of interest to know whether multi-asset managers are more like

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[12]This is the target asset mix across all permitted assets. It is chosen to reflect the maturity structure of the pension liabilities, and will be more heavily weighted towards bonds as pension funds mature.

[13]The balanced fund manager is generally able to make short-term market timing deviations from the SAA within boundaries set by the sponsor.

[14]The market timing possibilities open to specialists are considered later.

[15]To compute these percentages, we count the number of sponsor asset classes managed under each type of arrangement. For instance, a pension fund with a balanced manager who oversees management in all seven asset classes would count as having seven balanced manager accounts, while a pension fund with a single balanced manager and seven specialists (one in each asset class) would count as having seven balanced and seven specialist manager contracts. Also, in the first case, the seven balanced managers would all count under a single management contract, while, in the second case, they would count as seven multiple balanced manager contracts and seven multiple specialist contracts, reflecting the fact that they are part of a system of competitive managers within individual asset classes.

balanced managers or more like specialist managers. Appendix A shows that they are more like balanced managers, although there are sufficient differences not to merge them with balanced managers in our study.

One dimension of the decentralization decision is whether to employ a single balanced or several specialist managers. As modeled by van Binsbergen et al (2008), the use of specialist managers may result in less efficient portfolio diversification. van Binsbergen et al (2008) illustrate how to minimize the loss of diversification through a well-designed benchmark choice for each asset class, but they show that it is not possible to completely eliminate the effects of this negative externality. However, Sharpe (1981) provides insight into a benefit of specialist over generalist managers. Specifically, specialists might have superior private information on securities within an asset class, giving them a higher expected performance than generalists.

In our context, if the movement toward specialist managers is rational, then specialist managers should deliver better performance than balanced managers to compensate for the diversification loss. On the other hand, balanced fund managers should exhibit lower fees and/or market-timing ability, since they are hired across several asset classes.[16] Therefore, if fund sponsors optimally choose between balanced and specialist managers, then specialists should exhibit higher pre-fee performance -- mainly through security selection -- than balanced managers to compensate for higher fees as well as for the diversification loss.[17] This leads to our first hypothesis:

<u>Hypothesis 1. Specialization of Investment Skills:</u> *The measured performance and performance persistence of fund managers depends on mandate type: (i) specialist fund managers will exhibit better stock-selection skills; (ii) balanced fund managers will exhibit lower fees and/or better market-timing skills; (iii) given that there is a diversification loss with the use of specialists, the average performance of specialist managers will exceed that of balanced managers to compensate; and (iv) the performance of multi-asset managers is greater than balanced, but less than specialist managers' performance.*

[16]We do not have information on fees in our data set, but Mercer (2006) surveys global investment management fees, and reports that, in 2006, the median annual fee for a balanced mandate is 57bp (basis points) per year (of assets under management), whereas specialist mandates command fees from 60 to 100bp per year, depending on the asset class. Further, McKinsey (2006) reports, from its survey of US institutional asset managers, that, in 2005, the average asset management fee for a balanced mandate was 50bp per year, while it was 54bp per year for large-cap equity specialist funds and 64 bp per year for mid-cap equity specialist funds.
[17]Obviously, all fund managers would prefer to maximize their fee income, and, therefore, might claim to have stock-selection skills. Therefore, the higher pre-fee performance of specialists depends on pension fund sponsors offering contracts to balanced and specialist managers that provide incentives to maximize their abnormal performance (for a given risk budget). Under such a contract, fund managers with better market-timing skills (but worse selectivity skills) will choose to emphasize market-timing performance.

1.2 Single versus multiple managers

The pension funds in our sample use both single and multiple managers. Sponsors who wish to employ a balanced strategy might hire either one or more balanced managers across all the asset categories. Similarly, a sponsor who wishes to employ a specialist strategy might hire either one or more specialist managers within each asset class. Either approach is a choice of centralization vs. decentralization.

Figure 1 shows the trend toward multiple managed asset classes during our sample period for balanced, multi-asset, and specialist mandates. For instance, the figure shows that the use of multiple balanced mandates within a pension fund has decreased over time, but that it has dramatically increased as a proportion of all balanced mandates. Similar trends are apparent among multi-asset and specialist managers. Clearly, pension funds have moved over the sample period toward decentralization, even within asset classes.

Why might pension fund sponsors consider employing multiple managers? According to standard principal-agent theory (Holmstrom, 1982), a principal employs multiple agents for two reasons: (i) to take advantage of a technology only available to a particular agent and (ii) to provide information to induce incentive effects. Under the first explanation, the principal requires multiple tasks to be performed and a single agent is unable to perform all these tasks adequately, particularly when specialist knowledge is required, so the principal employs multiple agents. In our context, a " value" manager and a " growth" manager would be examples of specialists within the equity class. Since strong diseconomies-of-scale exist in fund management (before fees), we would expect that sponsors would be especially keen to switch to multiple managers when their funds have grown too large for a single manager to maintain acceptable performance (see, e.g., Chen et al (2004)).

With respect to incentive effects, hiring multiple managers induces an internal yardstick competition (Shleifer, (1985)), allowing the principal to assess the managers' comparative performance and helping to overcome the problems of shirking and hidden actions. Mookherjee (1984) shows that, with multiple agents, relative performance evaluation when agents' outputs are correlated enables the principal to obtain first-best outcomes. Blake et al (1999), on the other hand, argue that managers' desire to avoid *relative* underperformance in a yardstick competition may result in the construction of conservative portfolios that herd around that of the median fund manager in the peer group.

Hiring multiple managers introduces another coordination problem within an asset class, in addition to the cross-asset class coordination problem discussed in the last section. van Binsbergen et al (2008), in their analysis of optimal decentralized investment decisions, argue that the sponsor will contract with each fund manager in a way that induces the manager to optimally choose a more conservative (i.e., lower risk) portfolio than would be chosen without the coordination problem. This risk-reduction is a way to compensate for the diversification loss arising from the suboptimal coordination between individual managers' decentralized decisions. The resulting total portfolio risk level is also lower with multiple-manager structures, compared with single-manager structures. Sponsors choosing a multiple-manager arrangement should be compensated with higher abnormal performance, since the sponsor is pushed away from the optimal (centralized) risk-expected return portfolio due to the coordination problem and, perhaps, as a result of competition effects.[18] In addition, the use of multiple managers results in higher fee levels, since managers offer strong economies-of-scale in fees.

Further, if fund trustees do not know the manager's true skills, they may want to employ multiple managers as a way to diversify the alpha-risk. Suppose fund managers have specialist skills that fit the needs of the pension fund, but sponsors have only noisy information about the skills of any particular fund manager. In such a case, Kapur and Timmermann (2005) show that pension funds will employ multiple managers to diversify the risk of employing a low-skill fund manager. If this effect is important, we would expect to find a tighter distribution of alphas among multi-managed funds than among single-managed funds.[19]

Finally, the decision to move to a multi-manager setting may be a consequence of diseconomies-of-scale in pre-fee performance, as fund performance is anticipated to decline when assets under management (AUM) grow larger. Our next hypothesis formalizes these predictions:

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[18]The diversification loss can be reduced, however, by lowering the correlation between returns on the portfolios of individual managers. One way to accomplish this is to let different managers control separate asset classes (e.g., equities, bonds, cash and property) which are likely to be far more weakly correlated than, say, individual stocks. Or, within an asset class, multiple managers may be employed to cover different sectors or styles, such as transportation vs. technology stocks or large-capitalization value vs. small-capitalization growth stocks. Indeed, the vast majority of multiple-manager arrangements in our dataset use specialist managers, rather than multiple balanced managers.

[19]Sharpe (1981), in examining decentralized investment management, distinguishes between diversification of style (where funds employ multiple managers with different investment approaches) and diversification of judgment (where multiple managers are employed to analyze the same subset of securities). The latter is related to uncertainty about the true level of each manager's alpha. Given the weak evidence of persistence in performance evaluation studies, there may be a large amount of uncertainty about a given manager's talents.

Hypothesis 2. Coordination of Fund Managers: *The decision to employ multiple managers affects both fund performance and fund risk. Compared with single-managed funds, multi-managed funds have (i) better pre-fee performance; (ii) lower risk; and (iii) lower dispersion of performance to compensate for the decrease in diversification and the higher fee levels that result from the use of multiple managers.*

1.3 Dynamics of mandate-type and numbers of managers

Having considered the performance of funds by type of mandate in Hypothesis 1, and the performance and risk of decentralized investment management in Hypothesis 2, we now examine what the implications of these hypotheses are for the switch from balanced to specialist mandates, and the switch from single to multiple managers, which may even occur within asset classes as illustrated in Figure 1. Our data has the unique feature that it contains information on fund performance prior to and following a shift from balanced to specialist mandates. This allows us to explore the reasons why funds switch from a balanced to a specialist mandate and the (short-term) effects of such a shift. To this end, we study the instances in our sample where a fund switched from a balanced to a specialist mandate.

Fund sponsors may switch to multiple managers within an asset class for a number of reasons, as discussed when we introduced Hypothesis 2. First, a sponsor may expect its single fund manager to underperform in the future, due to the increasing size of AUM and the corresponding diseconomies-of-scale in fund management. In this case, we would expect the sponsor to hire additional fund managers, each specializing in a particular sector (e.g., large-capitalization growth). Second, the sponsor may wish to set up a competition between managers to improve performance. In this case, we would expect managers to cover the same universe of stocks, but to use different strategies. Poor investment performance in the period prior to a switch, followed by average performance would provide evidence supporting the first explanation, while above-average investment performance after the switch would provide evidence for the second.

Hypothesis 3. Dynamics of mandate-type and number of managers: *(i) The decision to switch to a specialist mandate will depend on past performance of the balanced mandate. Moreover, sponsors rationally anticipating the effects of diseconomies-of-scale will switch from single to multiple managers (ii) before abnormal returns deteriorate substantially; and (iii) in response to a growth in fund assets.*

1.4 Performance and Managerial Incentives

On an ongoing basis, the sponsor decides how to allocate assets to each fund manager. Of course, each fund manager will wish to maximize AUM, since fees are usually based on AUM. In cases with significant incentive-based fees, the desire of managers to maximize AUM will be reduced, but we understand that incentive-based fees produce a relatively minor portion of fund manager total fees over our sample period.[20]

Khorana (1996, 2001) examines the determinants and effects of mutual fund manager turnover. Khorana (1996) suggests that shareholder redemptions and managerial dismissal are, respectively, external and internal control mechanisms that can be used to discipline under-performing fund managers. He reports an inverse relation between the probability of managerial change and past performance. Khorana (2001) goes on to examine the effect of a change in manager on a fund's subsequent performance, and finds underperforming funds subsequently improve post-replacement performance. In addition, he finds that a change in manager for outperforming funds -- for example, because a star manager is poached -- results in a deterioration in post-replacement performance. Further, manager turnover in underperforming funds is preceded by decreases in net inflows into the fund.

The fund management company (FMC) itself has an indirect incentive to control the fund manager's performance. Superior performance leads to high inflows and increases fee income. Consequently, several studies document an inverse relationship between fund performance and manager turnover (e.g., Ding and Wermers (2009)). Promotions -- the manager subsequently manages a larger fund -- are positively linked, and demotions -- the fund manager subsequently manages a smaller fund -- are negatively linked to past performance. However, rather than firing an underperforming manager, investment companies might close or merge the losing fund, then open a new one, since small, young funds tend to exhibit a higher flow sensitivity than large, old funds. It has been documented that funds which disappear due to merger or death tend to have poor performance immediately prior to disappearance (Lunde et al 1999). In line with the findings of Khorana (2001), after the replacement of an underperforming manager, returns improve significantly, and, after an outperforming manager leaves, returns deteriorate.[21] These results

[20]Elton and Gruber (2003) show that fewer than 10% of mutual funds have incentive-based fees. Further, a survey by the UK's Investment Management Association (2006) suggests that, for institutional investors, only 27% of assets under management were subject to performance-related fees in 2006 which would have been much higher than in the years covered by our data.
[21]However, these results are based on performance measures that do not account for mean reversion in fund returns over time.

underscore the importance of internal governance mechanisms that lead to a replacement of bad managers, while at the same time retaining good managers.

Chen et al (2006) investigate the effects of managerial outsourcing on the incentives and performance of mutual funds. They note that many families delegate the management of their funds to unaffiliated advisory firms, and they find that funds managed externally significantly underperform those that are run internally. Having controlled for the causality of this relationship, they argue that contractual externalities due to firm boundaries make it more difficult to extract performance from an outsourced relationship, and this leads them to test two additional predictions: (i) an outsourced fund faces higher-powered incentives than internally-managed funds in that the likelihood of fund closure or managerial termination is more sensitive to poor past performance for outsourced than internally managed funds; and (ii) risk-taking behavior by outsourced managed funds is less than the norm, since fund families closely monitor the outsourced funds.

The focus of our paper is on managerial outsourcing arrangements in the pension industry. We would also expect pension fund sponsors to take account of the past performance of outsourced pension fund managers, when allocating investment mandates. Sirri and Tufano (1998) find that net flows to mutual funds from retail investors are strongly related to short-term past returns, although Del Guerdio and Tkac (2002) find that pension funds are much less sensitive to short-term past performance than mutual funds, which they argue is because pension fund sponsors take a long-term view of fund performance.

Our final hypothesis formalizes our predictions about the rational allocation of assets to fund managers, by the pension fund sponsor, as well as about the hiring and firing decision under a rational framework:

Hypothesis 4. Performance and incentives: *(i) the probability of replacing a manager is negatively related to past peer-adjusted return performance; and (ii) portfolio allocations to fund managers are positively related to their past peer-adjusted return performance.*[22]

2 Data

[22] A peer-adjusted return is the return on a fund in excess of that on a peer-group benchmark return, such as the CAPS peer-group median return.

The dataset used in this study was provided by BNY Mellon Asset Servicing (formerly Russell-Mellon-CAPS -- commonly known as " CAPS") and consists of quarterly returns on the investment portfolios of 2,385 UK pension funds that had their performance monitored by CAPS at some stage between March 1984 and March 2004. These pension funds hold the assets of occupational defined benefit -- principally final salary -- pension plans. The investment portfolios of each pension fund are allocated across seven asset classes: UK equities, UK bonds, international equities, international bonds, index-linked bonds, cash and property. In addition, for each unique fund-quarter, the coded identity of the fund manager (or managers) and the size (asset value) of the investment mandate under management are provided. All the pension funds in this particular CAPS dataset have " segregated" (i.e., bespoke) as distinct from " pooled" (i.e., co-mingled) investment mandates. The assets of these pension funds were managed by up to 364 different FMCs, including external and in-house management teams.[23]

Panel A of Table 1 shows the total size of pension fund assets, in constant 2004 pounds, and the aggregate asset allocation at three evenly spaced dates over the sample period for our dataset. Our CAPS dataset covers about half (by value) of all pension funds in the UK. There is one other major provider of pension fund performance measurement services in the UK and this organization monitors the other half of the sample. The real value of pension fund assets in our sample grew by 262% between 1984 and 1994, and fell by 23% between 1994 and 2004. This contraction over the second half of the period reflects a combination of the closure of some defined benefit pension plans to new members and low investment returns over the period 2000-2003.

The most striking feature of the strategic asset allocation is the increased allocation to UK equities during the first half of the period, followed by a rapid reduction during the second half. Apart from the fact that the UK equity market in 2000 fell by more than other equity markets, the reduced allocation to UK equities is the result of the increased maturity of pension plan liabilities over the second half of the sample period -- making volatile equities a less suitable matching asset -- together with a change in the tax rules in 1997 that ended UK pension funds' right to reclaim the tax paid on UK dividends. There was some substitution to international equities over the whole period, so that the total allocation to equities (UK plus international), by 2004, was almost the same as during 1984. There is a corresponding inverse pattern in the allocation to UK bonds, with the weighting first falling, then returning to its original level by the end of the sample period. Again reflecting the increasing maturity of pension

[23]The CAPS dataset has coded information on the fund management house that operates the investment mandate. We use the terms fund manager and fund management house interchangeably in the paper, even though we have no information on the specific individuals from the fund management house who manage the assets of a specified fund.

liabilities -- a significant proportion of which are inflation indexed -- the allocation to index-linked bonds has increased steadily. Of the remaining asset categories, there is little discernible pattern, except for a steadily declining weight to property. The three most important asset classes are UK equities, UK bonds and international equities which together account for more than 85% of the total asset value, and we mostly focus on these three assets in the remainder of the paper.

Panel B of Table 1 shows the number of pension funds and fund manager mandates across the different asset classes for three different time periods. UK equities is the only asset class in which every pension fund in the sample invests. The table illustrates that both the number of funds and the number of managers have contracted over time. This is partly explained by the closure of funds and the merger or closure of FMCs, but also possible switches to CAPS's rival performance measurement service.

We have already seen in Figure 1 that there has been a switch from balanced to specialist and multi-asset mandates, and an increased use of multiple-manager mandates in a given asset class over the sample period. As well as showing the coded identity of the fund manager employed by the pension fund during any quarter, the CAPS dataset also reports the investment mandate under which the fund manager is operating. Table 2 provides further information on the use of multiple-manager mandates and the move to specialist mandates. Panel A shows the average size of a fund manager mandate by number of fund managers employed across asset categories at three different dates. Panel B shows the distribution of funds and the number of fund managers employed for each of the investment mandates, again across asset classes and at the three different dates.

From Panel A, it can be seen that, during 1984, over 80% of contracts in each asset class were for a single fund manager as part of a balanced mandate. The remaining contracts employed two or more managers, as part of competing balanced mandates. The size of the mandate was approximately constant within an asset class, irrespective of the number of managers employed, and, in the case of UK equities, the mean mandate size was £30.87 million. Panel A also shows that, in asset classes such as UK equities, almost half of all mandates involved multiple managers by 2004. However, in other asset classes, such as property and the various bond categories, the preferred delegation arrangement remained single-manager mandates.

Panel B shows that the dominant investment mandate in 1984 was balanced.[24] Even during 1984, property was sometimes recognized as a specialist asset category, and our classification of balanced mandates includes those mandates that were balanced-excluding-property (BXP), with any property holdings managed by specialist managers. In UK equities, the average number of fund managers per balanced mandate was 1.26. There were negligible (non-property) specialist mandates operating in 1984.

Over time, there was an increase in the use of multiple-manager balanced mandates (as Figure 1 shows): by 1991, 35% of mandates were multiple-balanced. However, the proportion of balanced mandates has fallen throughout the remaining period to around 15% of total mandates by 2004, as pension funds turned to more specialist and multi-asset mandates. By 1994, for UK equities, international bonds and international equities, the picture of a single fund manager operating a balanced mandate was changing, with increased use of two or more managers per asset class. Balanced and BXP mandates had fallen to around 75% of the total; although they were still the dominant mandate-type, they were being replaced by active multi-asset mandates and specialist equity mandates. Pension funds were becoming aware that a single FMC might not have sufficient expertise across all asset classes. Some FMCs were able to demonstrate superior skills in managing equities, while others were better in managing bonds.

By the end of our sample period, balanced mandates had been largely replaced by a mix of active multi-asset, specialist UK equity and international equity mandates, as well as a smaller number of passive mandates in each of these categories.[25] Specialist equity mandates accounted for 7.5% of the total, covering such specialities as small, medium, and large cap stocks, as well as Pan-European and Pacific Basin equities. The mean size of mandates employing multiple managers, relative to the size of single-manager funds, had also increased. This result implies that it was the larger pension funds that were increasingly decentralizing their investment management through the use of multiple managers. For example, in international equities in 2004, the mean size of the mandate of funds employing a single manager in that asset class was £ 35.96 million, whereas for funds employing three or more managers, the mean fund size was £ 62.35 million.

[24]Note that the number of funds in each asset class is not the same--although fund managers would have been operating under a balanced mandate, they might have chosen not to invest in certain asset classes, and therefore the CAPS data would not include these funds as reporting returns in those assets classes.
[25]Similar switches had taken place in the other key asset classes.

3 Performance and Mandate Type

3.1 Methodology

We now turn to our empirical results, concentrating on the three main asset classes, UK equities, UK bonds and international equities. The first two components of Hypothesis 1, namely that specialist fund managers possess stock-selection skills, while balanced fund managers possess market-timing skills, can be tested as follows.

To test for stock selection skills in UK equities, we estimate a four-factor model and save the intercept coefficients as a measure of the Jensen-alpha in the regression:

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} r_{mt} + \beta_{2i,f} SMB_t + \beta_{3i,f} HML_t + \beta_{4i,f} MOM_t + \varepsilon_{i,f,t}, \qquad (1)$$

where $r_{i,f,t}$ is the pre-fee excess return of pension fund f by fund manager i in quarter t, r_{mt} is the excess return on the benchmark UK equity portfolio, SMB_t, HML_t and MOM_t are the Fama-French (1993) size and value common risk factors augmented by the Carhart (1997) momentum factor.[26] Under the null hypothesis of no-abnormal performance, $\alpha_{i,f}$ should be equal to zero. We can test for abnormal performance across, for example, all specialist pension fund mandates, by testing for the significance of the average, $\bar{\alpha}$ when there are F funds and M fund managers in the sample:

$$\bar{\alpha} = \frac{1}{F}\sum_{f=1}^{F}\frac{1}{M}\sum_{i=1}^{M}\alpha_{i,f} \qquad (2)$$

To conduct inference about the statistical significance of this alpha estimate, we use a bootstrap procedure. For each bootstrap iteration, we sample with replacement from the fund-manager-specific error terms. Using these innovations, we generate bootstrapped returns from (1), imposing $\alpha_i = 0$, reflecting the null of no abnormal performance. We then re-estimate the model and obtain a fitted value for each fund-manager alpha in that bootstrap. These are averaged cross-sectionally to form an average bootstrapped alpha. Repeating this for $b = 1,\ldots, B$ bootstraps, we obtain a bootstrapped distribution of the average alpha estimate which can be used to compute the p-value for the average alpha estimate obtained in the actual data. This procedure preserves cross-sectional differences in sample lengths across fund-manager

[26] CAPS use the total return on the FTSE All-Share Index as the benchmark for UK equities. We take the excess return over the UK Treasury bill rate (Thomson Financial Datastream code IUQAJNB). SMB_t, HML_t and MOM_t are UK versions of these factors supplied by Professor Alan Gregory of Exeter University.

relationships, and, so, replicates the variability in the α-estimates due to heterogeneity in fund-manager durations.

To separate selectivity from timing skills, we apply the Treynor-Mazuy (1966) test, using the four-factor model, augmented by a quadratic term on the excess return on the market:

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} r_{mt} + \beta_{2i,f} SMB_t + \beta_{3i,f} HML_t + \beta_{4i,f} MOM_t + \beta_{5i,f} r_{mt}^2 + \varepsilon_{i,f,t}. \quad (3)$$

We can test for the significance of the average market-timing term $\overline{\beta}_5$ using a bootstrap procedure similar to the one described above. Then, the Treynor-Mazuy total performance measure (*TM*) for each pension fund manager is defined as:

$$TM_{i,f} = \alpha_{i,f} + \beta_{5i,f} Var(r_m), \quad (4)$$

where $\alpha_{i,f}$ and $\beta_{5i,f}$ are the coefficients in (3) and $Var(r_m)$ is the variance of the excess returns on the market.

To test for selection skills in UK bonds, we estimate a two-factor model consisting of the excess returns on the FTSE-A All Gilts (GOVB) and UK consol government bonds (CONS) portfolios, again measured relative to the UK T-bill rate:

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} GOVB_t + \beta_{2i,f} CONS_t + \varepsilon_{i,f,t}. \quad (5)$$

The market-timing and TM performance measures are then based on the following estimates:

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} GOVBr_{mt} + \beta_{2i,f} CONS_t + \beta_{3i,f} GOVB_t^2 + \beta_{4i,f} CONS_t^2 + \varepsilon_{i,f,t},$$
$$TM_{i,f} = \alpha_{i,f} + \beta_{3i,f} Var(GOVB_t) + \beta_{4i,f} Var(CONS_t). \quad (6)$$

For international equities, we use a four-factor model that includes sterling-denominated excess returns on the North American (NA) and Europe Australasia Far Eastern Ex UK (EAFEX) stock market portfolios, plus global SMB and HML factors:[27]

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} NA_t + \beta_{2i,f} EAFEX_t + \beta_{3i,f} SMB_t + \beta_{4i,f} HML_t + \varepsilon_{i,f,t}, \quad (7)$$

We separate the global equity return into North American and EAFE components because of the evidence in Timmermann and Blake (2005), who show that UK pension fund weights in North America differed significantly from the market capitalization weights over the sample studied here. Finally, estimates of the market-timing and TM performance measures can be based on the following equations:

[27]As the value factor, we use the sterling return on the World ex UK Standard Value Index (MSCI Barra). As the growth factor, we use the sterling return on the World ex UK Standard Growth Index (MSCI Barra).

$$r_{i,f,t} = \alpha_{i,f} + \beta_{1i,f} NA_t + \beta_{2i,f} EAFEX_t + \beta_{3i,f} SMB_t + \beta_{4i,f} HML_t + \beta_{5i,f} NA_t^2 + \beta_{6i,f} EAFEX_t^2 + \varepsilon_{i,f,t},$$
$$TM_{i,f} = \alpha_{i,f} + \beta_{5i,f} Var(GOVB_t) + \beta_{6i,f} Var(CONS_t). \quad (8)$$

3.2 Empirical results

Table 3 presents percentiles of the distribution of return performance for the three key asset classes. Panel A reports the distribution of mean returns measured across funds, and we can see that the mean of the distribution is highest for UK equities, next highest for international equities, and lowest for UK bonds. Notice the lower mean returns when weighted by AUM compared with the simple unweighted mean returns. This shows that large funds underperformed small funds on average over our sample.

Panels B and C report the distribution of the alpha and beta estimates. The mean annual alpha for UK equities is -3 basis points, while, for UK bonds and international equities, the annual alpha is 67 and 30 basis points, respectively. As we will see shortly, these results change when we condition on the investment mandate. The mean beta results suggest that the models for UK equities and UK bonds are appropriate, while the model for UK bonds is marginally less satisfactory, since the mean beta estimate is not quite centered on unity.

Table 4 presents the results of the security selection and market-timing measures of performance for each mandate type, with bootstrapped p-values. The results show that specialist managers outperform balanced managers in all three asset classes, under the selectivity and most of the timing performance measures: the alpha from the simple performance regression (1), the alpha from the model that accounts for market-timing skills (3), the TM measure from (4), and the corresponding measures for managers investing in UK bonds and international equities discussed above. Typically, the results for the multi-asset mandates lie between the specialist and balanced mandates. Specifically, for UK equities, the average alpha for specialist mandates is a significant 67 basis points, and these mandates also display positive measures of market-timing (at greater than a 90% confidence level). Multi-asset mandates also display significant selectivity skills, particularly in International equities, where they exhibit an average alpha of 1.91%/year. These results confirm Hypothesis 1, parts *(i)* and *(iii)*--specialist fund managers display significant stock selection abilities, and their pre-fee performance exceeds that of balanced managers. Part *(iv)* is also supported as the performance of the managers operating under a multi-asset mandate falls between that of the specialist and balanced managers. However the results fail to confirm part *(ii)* of Hypothesis 1, since balanced mandates generally underperform specialists at market-timing (the difference between the Jensen alpha and the Treynor-Mazuy measure). These results on performance measures contrast with the results in Table 3, and confirm that splitting the data according to investment mandate allows us to identify evidence of outperformance in a way that is not possible when the data are in an aggregated form.

Figure 2 presents the outcome of a non-parametric bootstrap for the cross-sectional distribution of the TM performance measure by the three mandate types: specialist, multi-asset and balanced. For each mandate type, we show the percentage of funds that generated a TM performance estimate greater than what we would have expected, as represented by the 45-degree line tracking significance levels between 1% and 10%. For example, in UK equities, we find that 8.5% of the specialists generated superior performance in excess of the fifth percentile of the bootstrapped distribution – which is computed under the null that managers have no skills – compared with only 6.4% and 6.1% for the multi-asset and balanced managers. In general, the best specialists and multi-asset managers deliver superior performance across all three asset classes, with specialists generally performing the best. In contrast, there is little evidence of superior performance for the balanced managers, regardless of the asset class.

An alternative approach to testing Hypothesis 1 part *(i)* is to follow Grinblatt and Titman (1993) and use the portfolio change measure (PCM) for selectivity, denoted SEL_i

$$SEL_i = \frac{1}{T}\sum_{t=1}^{T}\sum_{j=1}^{J} w_{i,j,t}(r_{i,j,t} - r_{j,t}^{Index}), \qquad (9)$$

where there are J asset classes, $r_{i,j,t}$ is the return produced by manager i in asset class j during period t, and $r_{j,t}^{Index}$ is the benchmark return on asset class j during period t. We compute SEL_i for each manager over the life, T, of the fund that they manage. A number of papers (e.g., Admati and Ross (1985), Admati et al (1986), and Dybvig and Ross (1985)) have examined whether it is possible to separate selectivity and timing elements of fund manager performance using observed fund returns. In general, this is quite difficult and motivates using portfolio allocations to measure timing skills.

Panel A of Table 5 shows the results of this test. The average SEL_i is positive for specialist managers (0.63% per year), but insignificant for multi-asset managers, and significantly negative for balanced managers (-0.21% per year). Further, roughly three times the number of specialist managers have a significantly positive SEL_i (at the 5% significance level) compared with the balanced managers. These results confirm that specialist managers are more skilled at selecting securities, especially relative to balanced managers.

The corresponding timing measure for testing Hypothesis 1 part *(ii)* across asset categories is

$$TIM_i = \frac{1}{T}\sum_{t=1}^{T}\sum_{j=1}^{J}\Delta w_{i,j,t-1} r_{j,t}^{Index}, \tag{10}$$

where $\Delta w_{i,j,t-1}$ is the change in manager i's weight in asset class j between period $t-1$ and $t-2$.

Panel B of Table 5 shows the outcome of this test. The average timing estimate is positive and significant at the 5% level among specialists, negative but insignificant for the multi-asset managers, and significantly negative for the balanced managers.

Given the very nature of specialist mandates, how can specialists be credited with timing skills? We can think of three possibilities. First, specialists can move in and out of high beta securities within their designated asset class in anticipation of bull and bear markets, respectively: the success in doing this is precisely what β_{5i}^{f} in (3) and (4) is intended to capture. Second, as shown in Appendix Table A, specialists operate in 1.75 asset classes, on average, with the combination of UK equity and international equity being, by far, the most common combination of asset classes. It is therefore possible that a manager with specialist knowledge of UK and international equities could engage in market timing by switching between these asset categories. The other possibility is that specialists do not perform market timing, but that this task is left to the consultants advising the pension funds. We see this as less likely: if consultants were better at market timing than the balanced or multi asset managers, then it is likely that the tactical asset allocation decision as well as the strategic asset allocation decision would fully reside with the consultants which is not the case.

To summarize the results from this section, we find evidence consistent with Hypothesis 1. That is, specialist managers and multi-asset managers outperform balanced managers, before fees, and their outperformance is due to their security-selection skills. Though as we have previously noted, the higher fees charged for specialist mandates (Mercer, 2006) will dissipate a segment of this outperformance. Nevertheless, the results go some way to explaining the systematic switch away from balanced mandates over the sample period, despite the diversification loss highlighted by van Binsbergen et al (2008).

3.3 Persistence in performance and mandate type

There is little consensus about persistence in pension fund performance. Tonks (2005) finds evidence of persistence in a sample of UK pension funds at the one-year horizon, whereas Bauer et al (2007) fail to establish persistence for a sample of US pension plans. Whether persistence might be related to mandate type has not, however, been explored. One might expect that the ability to repeat strong performance is highest among the specialists, since they are the most skilled managers. Another reason to expect this outcome is that specialists are more highly compensated than, say, balanced managers. If trustees' were unable to differentiate between over- and under-performing specialists, they would be less likely to pay them higher fees.

To test for persistence in the performance of a given fund/manager pairing, we divide the data into non-overlapping three-year periods. For each period, we first run the performance regression (3), and obtain estimates of performance, such as $\hat{\alpha}$, $\hat{\beta}_5$, and the TM measure listed in (4). In the second step, we test whether the value of the performance estimate obtained during one three-year period predicts its value during the subsequent three-year period. Such evidence would suggest that there is persistence in fund manager performance.

In particular, to explore if a fund's prior ability to generate above-median alpha performance increases the likelihood that it will generate above-median alpha performance in the current period, we estimate the following regression in the second step:

$$I_{\{\hat{\alpha}>\overline{\alpha}\}} = \beta_0 + \beta_1 I_{\{\hat{\alpha}_{-1}>\overline{\alpha}_{-1}\}} + \varepsilon, \qquad (11)$$

where $I_{\{\hat{\alpha}>\overline{\alpha}\}}$ is a zero-one indicator variable that equals one when $\hat{\alpha} > \overline{\alpha}$, $\overline{\alpha}$ indicates the median $\hat{\alpha}$ across all mandates and the subscript " -1" indicates the alphas estimated on the previous three-year period. We split the funds into above- and below-median performance groups due to the small number of observations, particularly for the managers operating under specialist mandates. Identical procedures are followed for the market-timing betas and TM measures.

The estimated coefficients in (11) represent the following probabilities:

$$p\lim(\hat{\beta}_0) = Pr(\hat{\alpha} > \overline{\alpha} \mid \hat{\alpha}_{-1} \le \overline{\alpha}_{-1})$$

$$p\lim(\hat{\beta}_1) = Pr(\hat{\alpha} > \overline{\alpha} \mid \hat{\alpha}_{-1} > \overline{\alpha}_{-1}) - Pr(\hat{\alpha} > \overline{\alpha} \mid \hat{\alpha}_{-1} \le \overline{\alpha}_{-1}),$$

and so β_1 measures the probability of future above-median performance for a manager with a good track record (i.e. with above-median performance) compared with a manager that has a poor track record (i.e. performed below the median). A positive value of β_1 is indicative of performance persistence, while a negative value of β_1 suggests reversion toward the mean. Similarly,

$$p\lim(\hat{\beta}_0) + p\lim(\hat{\beta}_1) = Pr(\hat{\alpha} > \overline{\alpha} \mid \hat{\alpha}_{-1} > \overline{\alpha}_{-1}),$$

is a measure of fund managers' overall persistence. We would expect this to exceed one-half if performance persists.

Table 6 shows the results from this analysis. In each panel, the first column shows $\hat{\beta}_0 + \hat{\beta}_1$, while subsequent columns show the persistence estimate, $\hat{\beta}_1$, along with standard errors and t-statistics. Panel A shows that, for two out of three asset classes (namely UK equities and international equities), persistence is strongest for fund managers operating under a specialist mandate. For instance, 66.7% of specialist UK equity managers with above-median alphas during a three-year period generate above-median alphas during the following three years ($\hat{\beta}_0 + \hat{\beta}_1$). This far exceeds the expected value of 0.5 under the null of no persistence. The results are weaker for the market-timing measure, for which we fail to find evidence of persistence in any asset class for any type of mandate. However, for the TM measure, we do find much stronger evidence of persistence for specialist fund managers managing UK equities than for any other mandate/asset-class pairing. This again provides evidence explaining the switch to specialists over the sample period, since UK equities comprised the most important asset class for the UK pension fund industry during our sample period.

4 Performance, Risk, and Competition

4.1 Manager performance and competition

Do managers perform differently when they compete with other managers? Our dataset allows us to address this question in a unique manner, since we have data on the same manager--both when acting alone, and when competing against one or multiple other managers. For example, we have pre-expense UK equity returns for each fund manager across many different sponsors during the same time periods. Some sponsors employ a particular fund manager in a multi-manager setting within UK equities, while others employ the same fund manager as their sole UK equity manager. These data allow us to control for the unique skill of each manager using a manager fixed-effects framework. Differences in performance as a result of manager competition can then be addressed, by considering whether managers perform better or worse in a multi-manager setting.

To this end, we first conduct, for a given asset class (e.g., UK equities), the following experiment. For those time periods where a particular manager, i, acts both alone and in competition we can compute the following return differential:

$$\Delta R_{i,t} = \frac{1}{F_2}\sum_{f=1}^{F_2} r_{i,f,t}^{multi} - \frac{1}{F_1}\sum_{f=1}^{F_1} r_{i,f,t}^{single}, \tag{12}$$

where F_1 is the number of funds for which manager i is the sole manager, while F_2 is the number of funds where the manager competes. In this measure we do not subtract benchmark performance since returns are measured within the same asset class during the same period.

Table 7 reports results using this measure across different asset classes and mandate types. There appears to be no significant effect on average in any of the nine asset class-mandate type combinations and the estimated effects are modest in economic terms. However, the effect of competition is positive for six of nine cases and also when averaged across mandates and asset classes. Interestingly, the strongest effect of competition appears to come in UK bonds. Since this is a very homogenous asset class with less room for strategy differentiation than in, say, equities, competition effects should arguably be expected to be greater for this asset class. Comparing the results across mandates, the strongest results occur for multi-asset mandates.

The above experiment is very simple as it does not adjust for risk and differences in performance due to the size of the AUM. We next consider methods that incorporate such effects. Let $r_{i,f,t}$ be the excess return for manager i operating in a particular asset class for fund f at time t, and let $\mathbf{r}_{mt}$ be the vector of risk factors (as described in Section III). In a first step, we run the regression

$$r_{i,f,t} = \alpha_{i,f} + \boldsymbol{\beta}_{i,f}^{'}\mathbf{r}_{mt} + u_{i,f,t}.$$

This allows us to compute the risk-adjusted performance for manager i at fund f, $r_{i,f,t}^{adj} = \hat{\alpha}_{i,f} + \hat{u}_{i,f,t}$. We can also compute the average performance of manager i across all funds, f, managed, $\overline{\alpha}_i$, where $\overline{\alpha}_i = \frac{1}{N_i}\sum_{i=1}^{N_i}\hat{\alpha}_{i,f}$ and N_i equals the number of funds manager i works for over the course of his career, in a given asset class. In a second step, we run a pooled regression across all funds managed by all managers across all time periods, for a given asset class (e.g., UK equities):

$$r_{i,f,t}^{adj} - \overline{\alpha}_i = \beta\log(REL\_SIZE_{i,f,t}) + \gamma NMG_{i,f,t} + \varepsilon_{i,f,t}, \tag{13}$$

where $REL\_SIZE_{i,f,t}$ equals the total net assets (TNA) at the end of quarter t for manager i at fund f in a particular asset class (e.g., UK equities) divided by the median fund size in that asset class during that quarter (across all managers); and $NMG_{i,f,t}$ equals the total number of managers in the asset class at fund f

during quarter t.[28] This specification captures any scale economies at the fund level, controlling for the intrinsic skill of a particular manager (which we would expect to be common across all funds managed by the same manager) as measured by $\overline{\alpha}_i$. Note that we use relative fund size, as we would expect fund-level diseconomies-of-scale to be driven by fund size relative to the size of capital markets.[29]

Panel A of Table 8 shows the outcome of this analysis, separated by type of mandate (specialist, multi-asset, or balanced).[30] First, note that there is strong evidence of pre-fee diseconomies-of-scale, as the regression coefficient, β, is negative for seven of nine fund types.[31] In addition, the results of Panel A show that there is no evidence that a larger number of managers results in increased pre-fee performance, as indicated by the regression coefficient, γ.

However, our model may not be adequately specified for capturing all scale economies. Specifically, we might expect there to be scale economies at the fund management company (FMC) level, even though there are scale diseconomies at the pension fund level, similar to the findings of Chen et al (2004) among mutual funds. At the fund level, diseconomies may be due to market impact costs, while, at the FMC level, economies may be due to spreading fixed costs (e.g., security analysts) among greater numbers of funds.[32]

Accordingly, we employ another specification that uses the same first-stage regression as our above model, but uses a second-stage regression that captures the size of the FMC in a particular asset class (e.g., the aggregate of all UK equity funds managed by the fund manager):

$$r_{i,f,t}^{adj} = c + \beta \log(TOT\_SIZE_{i,t}) + \gamma NMG_{i,f,t} + \varepsilon_{i,f,t}, \qquad (14)$$

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[28]Note that we suppress the intercept, α, in this second stage, since all variation in $r_{i,f,t}^{adj} - \hat{\mu}_i$ should be related to $SIZE$ or NMG, or should be zero-mean noise.

[29]We do not have total capitalization of each market for each period, therefore, we use median fund size for a given period as a proxy.

[30]Note that we classify by the mandate of manager i, and not his competitors in an asset class--which might comprise managers with other mandates. For instance, manager i may be a specialist, in which case the manager would be included in the " Specialist" category of Panel A. However, manager k, a competitor of manager i at fund f (in UK equities) may be a balanced manager, in which case manager k would be included in the " Balanced" category. Thus, our model assumes cross-mandate competition within an asset class.

[31]This finding is consistent with our event study in the Hiring/Firing Section, which finds that large size is a strong predictor of a switch to multiple managers.

[32]Another possibility is that a particular manager uses a similar strategy across many funds that are managed in a given asset class. For instance, we would not expect the same fund manager to employ a significantly different strategy in managing UK equities for two different sponsors. Even if this fund manager offers different strategies within UK equities (e.g., growth vs. value), we would expect each of these strategies to be managed similarly by the fund manager.

where $TOT\_SIZE_{i,t} = \sum_{f=1}^{N_i} SIZE_{i,f,t}$, the aggregate assets (in a particular asset class) operated by manager i at the end of quarter t across all funds.[33]

The results for this specification are shown in Panel B of Table 8. Here, we find strong evidence of an economy-of-scale at the FMC level, since five out of nine coefficients, β, are positive and significant at the 99% confidence level. Apparently, large FMCs provide better performance, perhaps due to their large research teams and ability to recruit and retain top portfolio managers. Note, also that there is weak evidence of a positive competition effect among specialists, as the coefficient, γ, is positive for each asset class. However, there is no consistent competition effect of multiple managers under the multi-asset or balanced mandates.

The above two specifications assume that differential performance is linearly related to the number of managers within an asset class of a particular sponsor, $NMG_{i,f,t}$. In unreported tests, we find similar results when we use a dummy variable indicating more than one manager, and when we use separate dummy variables indicating the presence of two, three, or four managers within an asset class of a given sponsor.

Our results also show that competition leads to significantly better performance among specialists, but has mixed results among balanced and multi-asset managers. In economic terms, the competition effect is quite modest, however, even for specialists. For instance, the coefficient, γ, indicates that one additional competing manager is associated with an improvement of only 13 bps per quarter among UK bond managers.[34]

In further unreported tests, we ask how multiple managers affect the performance at the overall pension fund level. For instance, perhaps the addition of fund managers to one asset class presents a threat to managers in other asset classes. We address this by estimating the following model

$$r_{f,t} = \alpha_f + \beta \log(SIZE_{f,t}) + \gamma MLT_{f,t} + \varepsilon_{f,t}, \quad (15)$$

where $r_{f,t}$ is fund f's return during period t, $SIZE_{f,t}$ is fund f's size during period t, and $MLT_{f,t}$ is a dummy indicator that equals one if fund f has multiple

[33]Note that we do not subtract $\hat{\mu}_i = \frac{1}{N_i}\sum_{i=1}^{N_i}\hat{\alpha}_{i,f}$ from the regressand, since this would capture cross management-company size effects.

[34]However, it remains possible that our results reflect a selection bias. Specifically, perhaps a given fund manager ABC allocates more talent and effort to some pension funds, relative to others. If true, sponsors with poor performance would introduce competition to correct the underperforming funds managed by ABC, and that, as a result, ABC's performance may be similar under sole- and multiple-manager arrangements.

managers, while it is zero if fund f has only a single manager in a particular asset class. The results were largely insignificant as only one out of nine mandate-asset class combination (multi-managed managers, UK bonds) produced a significant coefficient.

To summarize, we find modest evidence of higher pre-fee performance with larger numbers of managers, which is likely to be offset by the higher fees associated with employing larger numbers of managers each having a smaller AUM. Also, we do find some evidence of pre-fee economies-of-scale at the FMC level, but, presumably, the FMC captures this surplus through fees. Our dataset does not allow an analysis of fees.

Why, then, do sponsors move to a multiple manager structure? We believe that there is a trade-off between competition (or specialization) and fees. Small pension funds wish to employ fewer managers to maintain scale-economies of fees. As the fund grows larger, the sponsor is able to employ a larger pool of managers to benefit (weakly) from competition or (especially) specialization and to avoid scale-diseconomies at the fund level. However, the sponsor very likely pays higher total fees with larger numbers of funds. We return to these issues in our discussion of the switch from single to multiple managers.

4.2 Manager risk and competition

The adoption of multiple managers can result in significant diversification losses, since each manager will not necessarily hold a portfolio that optimally diversifies with other managers. In response, as predicted by the model of van Binsbergen et al (2008), the sponsor may optimally reduce the risk budget of each fund manager to achieve the desired overall level of risk.

To explore whether pension fund sponsors adjust the risk of their funds under decentralization, we decompose fund risk according to the number of managers employed by the fund. For each fund, we compute the value-weighted average returns across all managers within a given asset class. We then perform a 3×3 double sort, in which we divide the funds into terciles according to their size (small, medium, large) and the number of fund managers (1, 2, 3 or more). We subdivide by fund size, since portfolio volatility is highly (negatively) correlated with fund size (since smaller funds may be less diversified than large funds).

For each period, we compute the cross-sectional sample variance in portfolio returns for each size-manager tercile. We then average this over time to get a summary measure of the time-series average cross-sectional return variance across funds included in each of nine size-number of manager cells. Hence our analysis is based on the following measure of the variance:

$$\bar{\sigma}^2_{size,\#man} = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{1}{N_t - 1}\sum_{i=1}^{N_t}\left(r_{it} - \bar{r}_t\right)^2\right), \quad (16)$$

where $\bar{r}_t$ is the (cross-sectional) average return within a given size-manager (within an asset class) tercile ($size$), N_t is the number of managers in a given size-manager tercile, and $T = 81$ is the total number of quarters in the dataset.[35]

Empirical results are shown in Table 9. They reveal a clear pattern relating fund size, the number of fund managers employed, and the portfolio risk for the total pension fund portfolio. Specifically, the larger the fund, and the greater the number of managers, the lower the dispersion of portfolio returns. These results are strongest for UK equities, but also hold for the largest UK bond and international equity funds.

As a second test, we compute the average time-series variance of returns for single- and multi-managed funds for the full sample, as well as four sub-samples. For each quarter, we group funds according to whether they are single- or multi-managed. For each fund, i, we compute its time-series variance of returns over the sample period, τ_i, for which we have quarterly return observations for that fund. Only funds with a minimum of 20 quarterly observations are included in the analysis, and funds that switch from being single-managed to becoming multi-managed (or vice versa) are categorized as separate samples, according to their status during a particular period, in the computation.[36] The average variance measure is

$$\bar{\sigma}^2_F = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{1}{\tau_i - 1}\sum_{t=1}^{\tau_i}\left(r_{it} - \bar{r}_i\right)^2\right) \quad (17)$$

where $F \in (S, M)$ represents the single- or multi-manager sample. The results are shown in Table 10. Clearly, multi-managed funds have, on average, a lower volatility than single-managed funds. Moreover, these findings are not just a result of multi-managed funds becoming more prevalent in the latter part of the sample, since the multi-managed funds have statistically significantly lower variance than the single-managed funds in all three sub-samples, including the last seven-year period from 1997-2004.

These results confirm Hypothesis 2, part *(ii)*, that an increasing number of managers being employed by a fund lowers the volatility of the fund's returns.

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[35]Suppose the underlying model has a single-factor structure, $r_{it} = r_{mt} + \sigma_i \varepsilon_{it}$, where ε_{it} is idiosyncratic (uncorrelated) risk and $\varepsilon_{it} : \ (0,1)$ and define $\sigma_i^2 = var(r_{it} - r_{mt})$. Then equation (16) effectively extracts $\hat{\sigma}^2 = (1/N)\sum_{i=1}^{N}\sigma_i^2$, the average idiosyncratic variance across funds.

[36]The quarter of the switch is omitted from this analysis.

Since multiple managers are more likely to manage different security types, or with different strategies, sponsors must be especially sophisticated in setting risk budgets so that the overall risk is controlled properly.

In the prior section, the reader should recall that we found weak evidence to support part *(i)* of Hypothesis 2 that performance is affected by the number of fund managers. These results together suggest that Sharpe ratios will be increasing as the number of managers rises, at least on a pre-fee basis. Interestingly, the reduced risk budget under decentralized management does not result in lower Sharpe Ratios, although we cannot observe the post-fee effect with our dataset. Risk is reduced, but performance does not decrease due to the competition (or specialization) effect of multiple managers.

Fund sponsors also face the risk associated with not knowing the true skill of the fund managers. An important question that arises from this is whether hiring multiple managers can help diversify this type of risk arising from not knowing manager alphas. To address this we estimated the alphas for both single and multi-managed funds using the earlier factor specifications for the three asset classes. Table 11 provides insights into the distribution of the estimated alphas along with the standard deviation of these alpha estimates across the single- and multi-managed funds. Consistent with Hypothesis 2, part (*iii*) that hiring multiple managers can reduce the alpha-risk, there is a clear tendency for alpha estimates to be far more widely dispersed for the single-managed funds than for the multi-managed funds across all three asset classes and across all mandate types. This suggests that alpha-diversification is an important reason why funds employ multiple managers.

4.3 The switch from balanced to specialist mandates

Table 12 reports the results of the return performance of the fund around the switch from a balanced to a specialist mandate for the three major asset classes and for the total portfolio. In particular, we consider the performance in the four quarters preceding the switch as well as the four quarters following the switch. For both UK bonds and UK equities, there is evidence that the mean return performance – measured relative to the benchmark – increases after a switch from a balanced to a specialist mandate, whereas the evidence is inconclusive for international equity. Moreover, for the total portfolio we also find statistically significant evidence of better performance after the switch, as the mean return performance increases from -0.67% per annum prior to the switch to 2.17% after the switch. These results indicate that, consistent with Hypothesis 3, part *(i)* there are some short-term benefits from switching from balanced to specialist mandates.

4.4 The switch from single to multiple managers

During the sample period, many funds switched from a single manager to multiple managers within an asset class, while a few funds made the opposite switch.[37] Given the growth in the number of asset managers, as well as the increased specialization of these managers, it should not be surprising that far more funds switched from single to multiple managers, relative to the converse. Panel A of Table 13 examines the performance during the periods before and after a switch to multiple fund managers within an asset class. Specifically, the table shows, for each asset class for a sponsor making a switch, mean benchmark-adjusted returns, during the four quarters prior to and following the switch quarter.[38] The results show some evidence of negative excess returns during the four quarters prior to a single-to-multiple manager switch in each asset class. Specifically, three of the four quarters from -4 to -1 exhibit negative excess returns in each asset class. Although this underperformance is not especially large, nevertheless fund sponsors severely penalize underperforming managers. Interestingly, performance is approximately zero following the switch, on average, in each asset class.

Panel B redefines a " switch" as one that occurs in *any* asset class of a given sponsor. We define the event as a switch in any asset class because it is possible that sponsors hire additional managers in one asset class (e.g., UK equities) hoping that their managers in other asset classes (e.g., UK bonds) interpret this as a warning that they might be subject to similar behavior in their own asset class. Here, we measure benchmark-adjusted returns, value-weighted across all asset classes of each sponsor. Average sponsor-level performance is then presented in the panel.[39] There does not appear to be strong cross-asset class competition effects, as the evidence of negative abnormal returns before a switch at the pension-fund level is weak. Thus, it appears that managers interpret competitive effects to be segmented, and not common across different asset classes.

The asset-class level findings in Panel A are consistent with sponsors anticipating a decrease in performance due to a growing asset base, with the corresponding diseconomies-of-scale, and moving to a multiple-manager mandate before performance degrades significantly. Thus, the secular movement from single- to multiple-managers appears to be driven by sponsors

[37]There are 150-200 switches in each asset class during our sample period.
[38]Since benchmark-adjusted returns are measured at the asset-class level, we value-weight the corresponding manager returns within that asset class. In addition, a sponsor may appear in more than one column of the table, if the sponsor switched from single to multiple managers in more than one asset class.
[39]For example, a sponsor who switches from one to two UK-equity managers would be included, even if the sponsor used a single manager in all other asset classes.

wishing to avoid underperformance rather than trying to improve mediocre performance.[40]

Table 14 further explores the reason for switching from single to multiple managers. Specifically, we run the following pooled logit regression for each asset class:

$$I_{f,t} = \alpha + \beta \log(REL\_SIZE_{f,t}) + \gamma PERF_{f,t} + \varepsilon_{f,t}$$

where $I_{f,t}$ is an indicator variable that takes the value 1 if fund f switches from a single manager to multiple managers during quarter t in a particular asset class, $REL\_SIZE_{f,t}$ is the size of fund f, relative to the average fund size (in that asset class) at the end of quarter t, and $PERF_{f,t}$ is the average return in excess of the benchmark for fund f over the four quarters previous to t. Note that β is positive for all asset classes (and significant for two of the three), confirming that diseconomies-of-scale are an important driver of the move from single to multiple managers. Note, also, that the switch is (weakly) driven by poor prior 4-quarter performance, confirming our above finding of weakly negative abnormal returns prior to the switch from single to multiple managers within an asset class. Overall, fund sponsors appear to react quickly to decreasing performance that is due to increasing fund size, before fund performance deteriorates substantially.

As a final test we examined the distribution of fund size at the quarter of a switch from a single manager to multiple managers (in an asset class). To control for the upward trend in asset class sizes over our period of study, we measure the quarterly size as the log of the fund size relative to the average fund size across all funds at the end of that quarter. The results are presented in Figure 3. They show that funds that switch from a single manager (in an asset class) to multiple managers are, on average, much larger than single-managed funds, but a little smaller than other two-manager funds. This again indicates that sponsors switch in response to anticipated scale effects (both economies and diseconomies, as discussed above). Within both single-managed and multi-managed funds there are fairly tight distributions of sizes, supporting the idea that there is a clientele effect of fund scale and multiple managers.

The results of this section are consistent with parts *(ii)* and *(iii)* of Hypothesis 3: switching from single to multiple managers appears to be driven mainly by diseconomies-of-scale at the asset-class level, and sponsors appear to properly anticipate and make the switch before there is significant deterioration in pre-fee performance caused by diminishing scale economies at the fund level.

[40]In unreported tests, we examine the pre-fee returns surrounding switches from multiple to single managers. Here, there was no statistically significant underperformance prior to the switch, and there was no superior performance after the switch. This indicates that the switch was prompted by a different explanation, such as a desire to reduce fund management costs (including monitoring costs), although the number of switches from multiple to single is too small to draw reliable conclusions.

5 Performance and Managerial Incentives

As mentioned in Section I, a key reason for employing multiple managers is that this can spur competition among managers and potentially lead to higher effort levels. For the strategy to be credible, it must be the case that investment managers either face a higher likelihood of being fired when they underperform or they have assets taken away from them (a " partial firing" of the manager).

To explore if these conditions are in place, we conduct three tests. First, we test whether underperformance pre-dates managers being fired which, if confirmed, gives managers a clear incentive to avoid underperformance. Second, we test whether poor performance led to a switch in the number of managers employed. In the third test, we search for a relationship between past performance -- measured relative to managers within the same asset class -- and future inflows of assets from the pension fund sponsor: a positive association would be suggestive of internal competition for funds and indicate that allocations depend on relative performance.

5.1 Hiring and firing decisions

Table 15 shows the mean return and the Jensen's alpha at the manager level around the hiring and firing dates. We can compute the mean returns (across manager-fund pairings) for a manager in the quarters preceding the hiring by a new fund by observing the manager's returns across the other funds he manages and this is reported in Panel A. Panel B shows the mean returns at the manager-fund level after the hire. In a similar fashion, Panel C repeats this calculation but now using firing as the event. Finally, panel D uses the returns on a manager's remaining portfolios after he has been fired by a particular client to track the post-firing return performance.

Panel C in the table shows that there were statistically significant negative Jensen alphas in all four quarters prior to the firing decision. For example in the fourth and third quarters before being fired, manager performance was -214 and -203 basis points respectively. This provides support for Hypothesis 4(i) that the probability of replacing a fund manager is negatively related to past performance. Since Panels A and B reveal that there is no tendency for abnormal performance during the immediate pre- and post-hiring periods, this suggests that managers have strong incentives to avoid strong underperformance. Interestingly, Panel D shows that there is no evidence that managers underperform for other clients after being fired, suggesting that poor performance is not intrinsic to the managers.

5.2 Past performance and allocation of funds

We have data on portfolio weights and returns and can thus extract net cash flows from the following approximate accounting identity:[41]

$$\Delta \log\left(w_{i,f,t+1}\right) = r_{i,f,t} - r_{f,t} + NCF_{i,f,t} - NCF_{f,t}, \quad (18)$$

where $w_{i,f,t+1}$ is the weight of fund manager i in fund f at the beginning of period $t+1$, $r_{i,f,t}$ is the return on manager *i*'s portfolio in fund f during period t, $r_{f,t}$ is the fund's return during period t, $NCF_{i,f,t}$ is the value-weighted net cash flow to manager i in fund f during period t and $NCF_{f,t}$ is the net cash flow into fund f during period t. Here net cash flows are measured in percentage points. Consistent with intuition, this equation shows that fund managers with above-average returns and above-average inflows of cash see their (relative) allocation increase.

We regress the net cash flows into manager i's portfolio -- measured relative to the value-weighted net cash flow into the fund as a whole -- on the manager's performance, again measured relative to the average, value-weighted returns of the fund as a whole:

$$NCF_{i,f,t} - NCF_{f,t} = \alpha_i + \beta_i CUMDIFFRx_{i,t-1} + \varepsilon_{i,t} \quad (19)$$

where $CUMDIFFRx_{i,t-1}$ measures the lagged cumulative *x*-period return difference between the performance of manager *i* and that of the fund as a whole, calculated across all managers. Positive and significant values of β_i indicate that higher past performance for a particular manager -- irrespective of asset class -- leads to a larger inflow of money towards that manager.

Table 16 shows the outcome from this analysis when we vary the period over which past performance is measured from 2 quarters (i.e., the most recent performance) to 4, 6 and 8 quarters. In panel A, dealing with the total portfolio, the sensitivity of cashflows to cumulative lagged returns (β_i) is positive and statistically significant for horizons between 2 and 8 quarters. The results suggest that a 1% outperformance over the previous four quarters leads to a 1% increase in the outperforming manager's relative flow of funds (i.e., 4×0.26). Hence, if the manager would normally get allocated, say, 40% of the new cash flows, a 1% outperformance leads the manager to instead get 40.4% of the new cash flows.

In unreported tests, we find that the flow-performance relation is strongest for balanced fund managers. This finding indicates that sponsors withdraw assets

[41] Assuming continuous cashflows through the quarter.

from balanced managers who underperform within a given asset class – i.e., they are more likely to " partially fire" a balanced manager in one asset class, while retaining that manager in others. With specialists, we would expect to see the manager terminated rather than having assets withdrawn, since specialists manage within fewer asset classes for the sponsor.

Panel B looks at the individual asset classes and relates net cash flows in an asset class to the cumulative past performance of the manager in that asset class

$$\Delta \log\left(w_{i,j,f,t+1}\right) = r_{i,j,f,t} - r_{j,f,t} + NCF_{i,j,f,t} - NCF_{j,f,t} \quad (20)$$

$$NCF_{i,j,f,t} - NCF_{j,f,t} = \alpha_{i,j} + \beta_{i,j} CUMDIFFRx_{i,j,t-1} + \varepsilon_{i,j,t}, \quad (21)$$

where j refers to the asset class. Panel B shows that UK equities have a positive sensitivity to past performance, although this sensitivity is less than for the total portfolio. For UK bonds, there is no significant relationship, while for international equities, we find a negative sign for the effect of differential return performance over the previous two quarters on the flow of funds to the outperforming manager.

Overall, these results provide some support for Hypothesis 4 *(ii)* that portfolio weights on fund managers are positively related to past performance, although the results in the individual asset classes are more mixed.

5.3 Manager Tenure and Entrenchment

Another important dimension along which a manager's incentives may vary cross-sectionally is related to the manager's tenure. This provides a proxy for any loyalty or bonding factor that may develop between the sponsor and manager and which protects the manager in bad times. As a consequence, agency costs may either increase over time – if managers become more entrenched over time – or may decrease over time – if the sponsor learns more about the manager and, as a result, can reduce costs from asymmetric information.

To see how tenure has progressed in our sample, Table 17 shows the evolution in managers' tenure over time, categorized by type of mandate and by asset class. For those funds that existed in 1984 we start the tenure clock at the beginning of our sample since the initial tenure prior to 1984 is unobserved.

For specialists, the average tenure edged up from about 2.5 years in 1994 to just over three years in 1999, only to decline to around 2.7 years in 2004. In contrast, tenure has been increasing over time for the multi-asset managers, rising from less than two years in 1994 to 3.5 years in 2004. By far the longest tenure, and the biggest increase in tenure over the sample, occurs for the balanced managers. For this group, we observe that the average tenure rose from five years in 1994 to six years in 1999 and close to eight years in 2004.

This evidence suggests that tenure varies far more across mandate types – with balanced mandates being associated with far longer tenure than specialist mandates – than across asset classes, although bond managers on average have slightly shorter tenure than equity managers.

Turning to how fund managers' performance is affected by tenure, for each fund-manager pairing, we constructed a measure of relative tenure, $REL\_TEN_{i,f,t}$ defined as the duration of the fund-manager pairing at time t divided by the average tenure at time t computed across all managers with the same mandate and asset class. Scaling by the average tenure of similar fund-manager pairings at time t accounts for the time-series trend found in the tenure numbers observed for the multi-asset and balanced mandates. Using this measure, and controlling again for the relative log size of the fund-manager pairing, we estimated the following model as a pooled regression

$$r_{i,f,t} = \alpha_{i,f} + \beta' r_{mt} + \gamma \log(REL\_SIZE_{i,f,t}) + \delta REL\_TEN_{i,f,t} + \varepsilon_{i,f,t}. \quad (22)$$

Table 18 shows the outcome of this analysis. We focus on the δ estimates which capture the effect of relative tenure on performance. Negative estimates of δ would indicate entrenchment effects as performance slides with longer tenure, while positive estimates are consistent with reduced agency costs as performance improves with tenure.

Among the specialist managers, there is only mild evidence of entrenchment for UK bonds. A very different picture emerges for the multi-asset and balanced mandates. Entrenchment appears to be very strong and systematic for managers in charge of multiple asset classes with effects that are particularly large (between 40 and 60 basis points per quarter) and statistically significant for the balanced equity managers. The only case where a multi-asset or balanced manager generates a positive δ-estimate, balanced UK bond managers, is associated with a smaller economic effect (10 basis points per quarter).

We conclude that agency costs appear to be strong and significant particularly for managers operating under a multi-asset or balanced mandate, while they are weaker for specialist managers. We hypothesize that this is related to the difficulty of replacing managers in charge of either the complete portfolio (balanced) or a very substantial part of it (multi-asset). Replacing such managers is likely to be far costlier than replacing a specialist manager who tends to manage a much smaller and less central part of the portfolio. Balanced (and multi-asset) managers are given the benefit of the doubt much more than specialist managers.

6 Conclusions

This paper used a proprietary dataset to study decentralization in investment management in the UK pension fund industry from 1984 to 2004. Over this time period, most pension fund sponsors shifted from employing balanced managers (those managing across all asset classes) to specialist managers (those specializing mostly within a single asset class), and from a single manager (either balanced or specialist) to competing multiple managers (balanced, specialist, or both) within each asset class. This secular shift from single balanced managers to multiple specialist and/or balanced managers carries significant decentralization costs: as modeled by van Binsbergen et al (2008), decentralization involves suboptimal risk-taking at the portfolio level, due to the problem of coordinating different managers through incentive contracts.

We studied whether this shift has been rational, i.e., whether fund sponsors have experienced increased performance to compensate for the suboptimal diversification. We first examined whether performance of specialist mandates is better than that of balanced mandates. We found that, after conditioning on fund manager mandates, specialist managers do display significant stock-selection skills, whereas balanced fund managers fail to display any significant market-timing skills. We further examined the effects on performance and risk of employing multiple managers. We found some evidence to support the conjecture that competition between multiple managers produces better performance, as well as that pension fund sponsors react to the coordination problem by controlling risk levels--the overall pension fund risk level is lower under decentralized investment management. We also found that the switch from balanced to specialist mandates, and the switch from single to multiple managers was preceded by poor performance. Finally, we examined the incentives for managers to perform well, and our results suggest that manager replacements, and the allocation of assets to managers, is at least partially based on the inferred skills of managers.

Overall, our findings help to explain both the shift from balanced to specialist managers over the sample period -- pension funds benefited from superior performance as a result of the shift -- and the shift from single to multiple managers -- pension funds benefited from risk reduction by employing multiple managers

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Appendix A: Analysis of Multi-Asset Managers

This Appendix investigates whether multi-asset managers are closer to specialist managers or to balanced managers.

Under one possible scenario, specialists were first used by large funds because they became disappointed with the performance of their balanced manager. Smaller funds could not afford seven specialists, so they used lower cost multi-asset managers. These would be specialists in related asset categories (such as UK and international equities, or UK and international bonds). If this is true, multi-asset managers are really specialists for smaller funds.

Another scenario is that balanced managers fought back against the rise of specialists by setting up mini-balanced managers called multi-asset managers. If this is true, there would be no particular link between fund size and the use of multi-asset managers and no particular link between asset categories offered by the multi-asset managers.

We investigate these possibilities in two ways. We first measure the number of asset classes multi-asset managers are generally active in and we then try to understand in what asset classes multi-asset managers are active. The same analysis is conducted for specialist and balanced managers.

The six columns of Table A contain the following information respectively:[42]

1. The number of observations, which is provides the number of "manager/fund/date" triples. We use this because the number of asset classes in a given "manager/fund/date" triple varies over time.

2. The average number of asset classes contained in the portfolios.[43]

3. The standard deviation of the number of asset classes contained in the portfolios.[44]

4. The percentage of portfolios active in both UK equities and UK bonds.

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[42]The data set used in our study is described in detail in section II of the main paper.
[43]To be precise, this is the cross-sectional and time-series average of the number of asset classes contained in the portfolios.
[44]This is the cross-sectional and time-series standard deviation of the number of asset classes contained in the portfolios.

5. The percentage of portfolios active in both UK equities and international equities.

6. The percentage of portfolios active in UK equities, UK bonds and international equities.

It is clear from the table that multi-asset managers are very close to being mini-balanced managers.

Table 1. Evolution in fund size, number of funds, managers and asset allocation.

Panel A: Fund size and asset allocation

Asset	Jan 1984		Jan 1994		Jan 2004	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
UK Equities	64.4	50.7	266.3	57.9	150.8	42.7
UK Bonds	23.0	18.1	9.7	2.1	59.6	16.9
Int. Equities	21.4	16.9	121.3	26.4	94.7	26.8
Int. Bonds	0.2	0.1	15.9	3.5	3.7	1.0
Index-Linked	1.8	1.4	10.8	2.4	32.1	9.1
Cash	2.8	2.2	21.8	4.7	5.4	1.5
Property	13.3	10.5	14.0	3.0	7.0	2.0
Total	126.9	100.0	459.7	100.0	353.3	100.0

Panel B: Number of funds and fund managers by asset class

Asset	Jan 1984		Jan 1994		Jan 2004		In Existence	
	Funds	Managers	Funds	Managers	Funds	Managers	Funds	Managers
UK Equities	955	113	1044	112	630	82	2385	280
UK Bonds	943	109	652	96	612	61	2319	247
Int. Equities	911	108	1019	118	627	89	2350	279
Int. Bonds	74	22	761	75	210	41	1603	181
Index-Linked	545	75	513	76	412	48	2044	205
Cash	779	108	816	113	463	75	2351	304
Property	718	93	543	86	232	43	1657	184

Note: This table reports descriptive statistics for the assets under management, the number of funds and the number of managers in our sample of UK pension funds. For each of the seven asset classes, Panel A shows the total size of funds under management in real billions of pounds sterling (using the 2004 consumer price index as the base-year deflator) along with the portfolio allocation to each asset class. Panel B reports the number of funds and the number of managers by asset class. Also shown is the total number of different funds and managers in existence at some point during our sample from 1984-2004.

Table 2. Distribution of Funds

Panel A: Distribution of funds by number of managers

	# of managers	Jan 1984 Mean Size	Jan 1984 Percentage	Jan 1994 Mean Size	Jan 1994 Percentage	Jan 2004 Mean Size	Jan 2004 Percentage
UK Equities	1	30.87	80.42%	72.06	72.99%	42.44	56.83%
	2	32.01	14.76%	62.25	19.83%	45.76	26.19%
	3	38.06	4.82%	129.13	7.18%	71.51	16.98%
UK Bonds	1	12.33	82.18%	8.66	87.27%	35.45	72.55%
	2	11.98	13.47%	7.80	11.35%	46.05	21.41%
	3	14.64	4.35%	24.01	1.38%	51.51	6.05%
Int. Equities	1	9.83	81.34%	29.19	75.37%	35.96	64.27%
	2	13.10	14.05%	27.03	17.76%	33.01	23.92%
	3	13.58	4.61%	56.69	6.87%	62.35	11.80%
Int. Bonds	1	2.49	98.65%	5.03	77.27%	6.13	79.52%
	2	1.77	1.35%	8.89	18.79%	13.42	17.62%
	3	-	-	26.96	3.94%	12.37	2.86%
Index-Linked	1	2.23	87.89%	9.31	88.30%	33.40	75.97%
	2	2.88	10.46%	19.98	11.11%	34.45	19.90%
	3	1.01	1.65%	21.11	0.58%	47.69	4.13%
Cash	1	1.84	82.67%	4.63	79.04%	2.03	68.25%
	2	1.22	13.35%	4.79	14.46%	3.13	21.17%
	3	2.73	3.98%	9.05	6.50%	4.72	10.58%
Property	1	16.03	86.21%	14.88	90.79%	26.09	88.36%
	2	5.43	11.56%	7.89	8.66%	13.62	10.34%
	3	6.38	2.23%	2.63	0.55%	12.78	1.29%

Panel B: Distribution of funds by mandate type

Mandate		Jan 1984 Funds	Jan 1984 Managers	Jan 1994 Funds	Jan 1994 Managers	Jan 2004 Funds	Jan 2004 Managers
UK Equities	Specialist	12	2.33	119	2.03	284	2.17
	Multi-Asset	2	2.00	173	1.36	384	1.67
	Balanced	952	1.26	821	1.36	83	1.46
UK Bonds	Specialist	10	1.80	46	1.35	203	1.56
	Multi-Asset	2	2.00	103	1.19	399	1.37
	Balanced	938	1.24	516	1.14	76	1.34
Int. Equities	Specialist	10	2.00	98	1.90	275	1.89
	Multi-Asset	2	2.00	157	1.31	365	1.57
	Balanced	907	1.25	815	1.34	81	1.36
Int. Bonds	Specialist	3	1.00	25	1.48	63	1.22
	Multi-Asset	0	0.00	71	1.15	90	1.22
	Balanced	71	1.01	676	1.29	64	1.36
Index-Linked	Specialist	6	1.33	30	1.37	139	1.47
	Multi-Asset	2	1.50	112	1.12	286	1.32
	Balanced	540	1.14	378	1.12	24	1.29
Cash	Specialist	26	1.92	129	2.09	236	1.80
	Multi-Asset	2	1.50	122	1.20	204	1.37
	Balanced	766	1.23	631	1.29	63	1.43
Property	Specialist	30	1.27	87	1.21	83	1.13
	Multi-Asset	1	1.00	66	1.12	98	1.19
	Balanced	692	1.17	402	1.10	53	1.06

Note: Panel A sorts the funds according to the number of managers they employ, i.e. a single manager, two managers, or three managers or more. For each of these categories we report the average size of the funds in real millions of pounds sterling (using the 2004 consumer price index as the base-year deflator). We also show the percentage of all funds in a given asset class that employ one, two or three or more managers. Panel B sorts the funds according to the manager's mandate type: specialist, multi-asset (more than one asset class, but fewer than all asset classes) and balanced (all asset classes). We report the number of funds as well as the average number of managers operating under each mandate type.

Table 3. Return performance by asset class.

Panel A: Mean Returns

Asset class	1%	5%	10%	25%	50%	75%	90%	95%	99%	mean	$mean_w$
UK Equities	-4.39%	1.45%	6.75%	10.96%	14.18%	17.81%	21.88%	24.49%	30.13%	14.15%	12.65%
UK Bonds	4.78%	6.37%	7.93%	9.42%	10.59%	11.57%	12.71%	13.39%	15.88%	10.43%	9.65%
International Equities	-6.11%	2.11%	5.27%	8.67%	11.22%	14.13%	17.29%	19.65%	23.95%	11.10%	9.85%

Panel B: Alpha Estimates

Asset class	1%	5%	10%	25%	50%	75%	90%	95%	99%	mean	$mean_w$
UK Equities	-6.31%	-3.30%	-2.32%	-1.00%	-0.01%	0.90%	2.09%	3.10%	5.47%	-0.07%	0.48%
UK Bonds	-2.56%	-1.05%	-0.55%	0.08%	0.63%	1.20%	1.78%	2.32%	3.90%	0.67%	0.74%
International Equities	-12.39%	-7.57%	-4.65%	-1.15%	0.60%	2.27%	4.25%	6.05%	13.22%	0.30%	0.67%

Panel C: Beta Estimates

Asset class	1%	5%	10%	25%	50%	75%	90%	95%	99%	mean	$mean_w$
UK Equities	0.82	0.91	0.94	0.98	1.01	1.05	1.09	1.12	1.23	1.02	0.99
UK Bonds	0.44	0.82	0.93	1.07	1.15	1.23	1.30	1.34	1.50	1.13	1.07
International Equities	0.46	0.71	0.81	0.89	0.94	1.01	1.11	1.20	1.45	0.95	0.95

Note: This table presents the raw return performance as well as the risk-adjusted return performance for the three main asset classes held by the pension funds, namely UK bonds, UK equities and international equities. All results are based on quarterly data over the period from 1984-2004. Panel A reports percentiles for the distribution of mean returns measured across funds. Panels B and C present alpha and beta estimates. In the case of the UK bonds, these are based on a two-factor model that uses the return on medium and long-term government bonds . For UK equities, we use a four-factor model that includes the return on a broad market portfolio, a size factor, a value factor and a momentum factor. Finally, for international equities we use a four-factor model based on return indices for North America and the EAFE area, augmented by a size and a small cap factor. The unweighted and weighted mean returns are reported in the last two columns. All results are measured in percentage terms and have been annualized

Table 4. Measures of security selection and market timing skills by types of mandate.

	UK Equities		UK Bonds		International Equities	
Specialist Mandates	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value
Jensen's Alpha	0.67%	0.014	1.17%	0.000	2.26%	0.002
Beta (Market Timing)	0.093	0.066	-0.206	0.598	-0.138	0.834
Treynor-Mazuy	1.31%	0.000	0.98%	0.000	1.55%	0.019
Multi-Asset Mandates	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value
Jensen's Alpha	0.46%	0.006	0.81%	0.002	1.91%	0.007
Beta (Market Timing)	-0.005	0.545	0.767	0.080	-0.331	0.998
Treynor-Mazuy	0.47%	0.003	0.55%	0.007	1.04%	0.065
Balanced Mandates	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value	Avg. Coefficient	P-Value
Jensen's Alpha	-0.24%	0.857	0.62%	0.057	0.48%	0.313
Beta (Market Timing)	0.091	0.000	-0.253	0.889	-0.563	0.999
Treynor-Mazuy	0.14%	0.276	0.65%	0.031	-1.85%	0.966

Note: This table reports evidence of security selection and market timing skills for three types of manager types, namely specialists, multi-asset managers (managing more than one asset class, but fewer than all asset classes) and balanced managers (managing all asset classes). For each mandate type we show the average estimates of Jensen's alpha from simple three- or four factor regressions extended to include the squared excess return on the associated market portfolio. Finally, we report the beta coefficient on the market timing term along with the Treynor-Mazuy performance measure. P-values are based on a non-parametric bootstrap that uses a one-sided test for the ability of funds to generate alphas, betas or Treynor-Mazuy measures in excess of the mean values estimated using the actual data sample.

Table 5. Mandate types, selectivity and timing skills based on the portfolio change measure

Panel A: Selectivity

Mandate	Average Selectivity	t-test	Positive Selectivity	Significantly Positive Selectivity
Specialist	0.63%	5.715991	60.26%	8.31%
Multi-Asset	0.07%	1.279539	51.11%	2.51%
Balanced	-0.21%	-5.75626	48.71%	2.88%

Panel B: Timing

Mandate	Average Timing	t-test	Positive Timing	Significantly Positive Timing
Specialist	0.027%	2.34	57.92%	15.37%
Multi-Asset	-0.030%	-1.67	45.31%	0.35%
Balanced	-0.019%	-2.05	42.11%	2.10%

Note: This table reports estimates of the selectivity (panel A) or timing (Panel B) skills based on the portfolio change measure proposed by Grinblatt and Titman (1992) which uses quarterly changes to the pension funds' portfolio weights and their returns to estimate the selectivity or timing skills. Results are reported separately for three types of managers, namely specialists, multi-asset managers (managing more than one asset class, but fewer than all asset classes) and balanced managers (managing all asset classes). The first two columns report the mean selectivity or timing measure, averaged across manager/fund pairings, and a t-test for its significance. The third and fourth columns report the percentage of managers with a positive selectivity or timing measure along with the proportion of the estimates that are statistically significant and positive.

Table 6. Persistence in performance and mandate type

	Panel A: Jensen's Alpha					Panel B: Beta (Market timing)					Panel C: Treynor-Mazuy				
	Specialist Mandates					**Specialist Mandates**					**Specialist Mandates**				
	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2
UK Equities	0.667	0.246	0.105	2.340	0.060	0.596	0.167	0.106	1.579	0.028	0.732	0.278	0.106	2.615	0.077
UK Bonds	0.882	0.282	0.180	1.566	0.108	0.722	0.278	0.204	1.361	0.074	0.810	-0.024	0.181	-0.131	0.001
Int. Equities	0.324	-0.143	0.104	-1.376	0.019	0.492	0.079	0.112	0.703	0.005	0.372	-0.098	0.103	-0.959	0.010
	Multi-Asset Mandates					**Multi-Asset Mandates**					**Multi-Asset Mandates**				
	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2
UK Equities	0.456	0.166	0.086	1.926	0.030	0.491	-0.088	0.090	-0.987	0.008	0.510	0.173	0.090	1.913	0.029
UK Bonds	0.805	0.224	0.110	2.045	0.060	0.689	0.133	0.120	1.115	0.018	0.783	0.129	0.113	1.140	0.020
Int. Equities	0.298	-0.049	0.088	-0.561	0.003	0.400	-0.069	0.093	-0.746	0.005	0.313	-0.088	0.089	-0.987	0.008
	Balanced Mandates					**Balanced Mandates**					**Balanced Mandates**				
	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2	$\hat{\beta}_0+\hat{\beta}_1$	$\hat{\beta}_1$	**S.E.** $\hat{\beta}_1$	**t-stat**	R^2
UK Equities	0.516	0.002	0.023	0.096	0.000	0.523	0.030	0.023	1.285	0.001	0.523	0.005	0.023	0.195	0.000
UK Bonds	0.493	0.008	0.036	0.226	0.000	0.504	0.045	0.035	1.268	0.002	0.492	0.071	0.035	1.998	0.005
Int. Equities	0.502	-0.037	0.025	-1.509	0.001	0.507	0.015	0.025	0.591	0.000	0.467	-0.084	0.025	-3.424	0.007

Note: This table reports the results from a regression of an indicator tracking above-median performance (estimated over a three-year period) for a particular fund-manager pairing on a constant and the fund-manager pairing's prior performance (estimated over the previous three-year period). The performance is based on the following equation:

$$r_{ipt} = \alpha_{ip} + \beta_{1ip} r_{mt} + \beta_{2ip} SMB_t + \beta_{3ip} HML_t + \beta_{4ip} MOM_t + \beta_{5ip} r_{mt}^2 + \epsilon_{ipt}.$$

We estimate the following: $I_{\{\alpha>\bar{\alpha}\}} = \beta_0 + \beta_1 I_{\{\alpha_{-1}>\bar{\alpha}_{-1}\}} + \epsilon$. A positive and significant estimate of β_1 indicates persistence in performance. Panel A tests for persistence in the fund's alpha. Panel B tests for persistence in the market timing coefficient; finally, panel C tests for persistence in the Treynor-Mazuy performance measure, i.e. $\alpha + \beta_5 \cdot \sigma_m^2$.

Table 7. Manager performance difference in single and multi-managed mandates

	$\Delta\overline{R}$	t-test	obs
	Specialist		
UK Equities	-0.0006042	-0.64	914
UK Bonds	0.0003654	0.57	322
Int. Equities	0.0002407	0.18	834
	Multi-Asset		
UK Equities	0.0002032	0.45	709
UK Bonds	0.0006028	1.61	576
Int. Equities	0.0006617	1.23	702
	Balanced		
UK Equities	-0.0000167	-0.06	3229
UK Bonds	0.0001016	0.47	2651
Int. Equities	-0.0003796	-1.14	3125

Note: This table reports the results of a matching procedure that compares managers concurrent performance in single and multi-managed funds. We restrict the analysis to those time-periods where manager "i" acts both alone and in competition and we compute

$$\Delta R_{i,t} = \frac{1}{F_2}\sum_{f=1}^{F_2} r_{i,f,t}^{multi} - \frac{1}{F_1}\sum_{f=1}^{F_1} r_{i,f,t}^{single}$$

where F_1 is the number of funds where manager "i" acts alone, F_2 is the number of funds where he acts in competition and $r_{i,.,t}$ are value-weighted returns. We then compute $\Delta\overline{R}$, which is the average of $\Delta R_{i,t}$ across managers and time-periods and we test if it is equal to zero. We report the results across mandates and asset classes.

Table 8. Size, number of managers and performance

Panel A: Scale Economies at Fund Level

			Specialist		
	β	t-test β	γ	t-test γ	Obs.
Uk Equities	0.0002648	1.81	0.0001358	0.98	11017
Uk Bonds	0.0001032	1.07	0.0000964	0.73	4066
Int. Equities	-0.0009035	-3.81	-0.0000473	-0.21	8731

			Multi-Asset		
	β	t-test β	γ	t-test γ	Obs.
Uk Equities	-0.0001081	-1.35	-0.0000974	-1.18	13338
Uk Bonds	-0.0000242	-0.42	-0.0000424	-0.67	10488
Int. Equities	-0.0001358	-0.83	-0.0001523	-0.88	12302

			Balanced		
	β	t-test β	γ	t-test γ	Obs.
Uk Equities	-0.0001768	-5.14	-0.0001818	-4.75	73045
Uk Bonds	-0.0000452	-1.61	-0.0000203	-0.55	56889
Int. Equities	-0.0001441	-2.00	-0.0000886	-1.09	69958

Panel B: Scale Economies at Manager Level

			Specialist		
	β	t-test β	γ	t-test γ	Obs.
UK Equities	0.00000	-0.03	0.00033	1.19	11017
UK Bonds	0.00050	7.08	0.00131	3.27	4066
Int. Equities	0.00071	3.40	0.00080	1.82	8731

			Multi-Asset		
	β	t-test β	γ	t-test γ	Obs.
UK Equities	0.00024	4.22	-0.00004	-0.23	13338
UK Bonds	0.00008	1.82	-0.00015	-1.08	10488
Int. Equities	-0.00026	-2.25	-0.00005	-0.12	12302

			Balanced		
	β	t-test β	γ	t-test γ	Obs.
UK Equities	0.00049	16.20	-0.00043	-5.82	73045
UK Bonds	-0.00013	-5.01	0.00012	1.69	56889
Int. Equities	0.00085	13.38	-0.00010	-0.63	69958

Note: This table presents the results from a two-step procedure capturing the effect of size and number of managers on fund performance. In the first step we compute risk-adjusted returns using a four-factor model for UK equities, a two-factor model for UK bonds and a four-factor model for international equities (refer to Table 3 for more details). In panel A, we present a measure of risk-adjusted returns that controls for managers' ability across funds and we regress this measure on the log fund-size relative to the average fund size and a variable indicating the number of managers active in each asset class, without including a constant. In Panel B, we regress risk-adjusted returns on a constant, the log size of the manager across all funds and the number of managers active in each asset class. The coefficient for the size variable is β, while the one for the number of managers is γ.

Table 9. Portfolio variance sorted by number of fund managers and size of funds

Total Portfolio

Managers	**Size tercile** 1	2	3
1	0.471	0.335	0.310
2	0.393	0.255	0.224
3 or more	0.240	0.221	0.189

UK Equities

Managers	**Size tercile** 1	2	3
1	0.344	0.270	0.208
2	0.318	0.188	0.161
3 or more	0.279	0.187	0.127

UK Bonds

Managers	**Size tercile** 1	2	3
1	0.184	0.107	0.119
2	0.128	0.133	0.083
3 or more	0.441	0.121	0.085

International Equities

Managers	**Size tercile** 1	2	3
1	0.853	0.615	0.622
2	0.847	0.422	0.379
3 or more	1.301	0.514	0.378

Note: This table shows the average return variance for funds sorted by the number of managers (one, two or three or more), and by size terciles. Each quarter, we sort the funds into nine categories according to the number of funds employed and the size of the fund's portfolio. We then compute the cross-sectional variance of fund returns for each category and finally calculate the time-series mean of this number. All variances have been multiplied by one thousand and are based on the full sample from 1984-2004.

Table 10. Return variances for multi- and single-managed funds

Panel A: Full Sample Results

	Mean of Variances of Returns	Funds	t-test
Single Managed funds	5.54	1473	4.18
Multi-Managed funds	5.01	655	

Panel B: Sub-Sample Results

t=1 to 27

	Mean of Variances of Returns	Funds	t-test
Single Managed funds	8.30	848	0.07
Multi-Managed funds	8.28	281	

t=28 to 54

	Mean of Variances of Returns	Funds	t-test
Single Managed funds	2.29	756	3.69
Multi-Managed funds	2.10	338	

t=55 to 81

	Mean of Variances of Returns	Funds	t-test
Single Managed funds	5.63	538	4.65
Multi-Managed funds	5.01	407	

Note: This table presents the average variance of returns for single- and multi-managed funds for the full sample (1984-2004) as well as for three sub-samples. Each quarter we group funds according to whether they are single- or multi-managed. Only funds with a minimum of 12 quarterly observations are included in the analysis. Funds that switch from being single-managed to becoming multi-managed (or vice versa) are categorized as separate funds. Average variances are multiplied by one thousand.

Table 11. Risk and Number of Managers

Specialist Mandates

		S.D. α	$\alpha < -4$	$-4 < \alpha < -2$	$-2 < \alpha < 0$	$0 < \alpha < 2$	$2 < \alpha < 4$	$4 < \alpha$	P-value
UK Equities	**Single-Managed**	4.14	3.78%	5.88%	27.31%	40.76%	11.76%	10.50%	0.0000
	Multi-Managed	3.33	0.00%	0.00%	26.92%	61.54%	7.69%	3.85%	
UK Bonds	**Single-Managed**	1.45	0.67%	2.01%	17.45%	59.73%	19.46%	0.67%	0.3242
	Multi-Managed	1.31	0.00%	0.00%	10.53%	57.89%	26.32%	5.26%	
Int. Equities	**Single-Managed**	6.66	5.14%	6.54%	16.82%	27.10%	19.63%	24.77%	0.0000
	Multi-Managed	3.46	4.48%	1.49%	13.43%	32.84%	23.88%	23.88%	

Multi-Asset Mandates

		S.D. α	$\alpha < -4$	$-4 < \alpha < -2$	$-2 < \alpha < 0$	$0 < \alpha < 2$	$2 < \alpha < 4$	$4 < \alpha$	P-value
UK Equities	**Single-Managed**	1.82	0.75%	3.51%	33.33%	47.87%	10.28%	4.26%	0.0002
	Multi-Managed	1.31	1.15%	4.60%	22.99%	65.52%	5.75%	0.00%	
UK Bonds	**Single-Managed**	1.48	0.28%	0.28%	19.94%	66.10%	11.40%	1.99%	0.0000
	Multi-Managed	0.93	0.00%	0.00%	20.00%	67.14%	12.86%	0.00%	
Int. Equities	**Single-Managed**	3.14	2.61%	5.22%	19.58%	30.55%	27.94%	14.10%	0.0000
	Multi-Managed	2.10	0.00%	1.30%	15.58%	45.45%	25.97%	11.69%	

Balanced Mandates

		S.D. α	$\alpha < -4$	$-4 < \alpha < -2$	$-2 < \alpha < 0$	$0 < \alpha < 2$	$2 < \alpha < 4$	$4 < \alpha$	P-value
UK Equities	**Single-Managed**	2.57	4.77%	11.48%	36.32%	35.38%	8.52%	3.54%	0.0000
	Multi-Managed	1.66	2.93%	5.61%	47.56%	40.24%	2.44%	1.22%	
UK Bonds	**Single-Managed**	1.37	0.37%	2.93%	24.74%	62.96%	8.42%	0.59%	0.0000
	Multi-Managed	1.04	0.29%	0.29%	14.29%	80.47%	4.08%	0.58%	
Int. Equities	**Single-Managed**	4.78	14.83%	7.82%	19.41%	28.71%	15.13%	14.10%	0.0000
	Multi-Managed	4.07	10.83%	9.57%	20.91%	28.21%	19.90%	10.58%	

Note: This table compares the distribution of α's for multi and single managed funds. The α's are obtained using a four-factor model for UK equities, a two-factor model for UK bonds and a four-factors model for international equities (refer to Table 3 for more details). Each column reports the proportion of funds with a given annualized α, while the last column reports the p-value for a variance test of the null of equal variance against the alternative that the variance of single-managed funds is greater than the one for multi-managed funds. The results are reported across different mandates and asset classes.

Table 12. Return Performance around switches from balanced to specialist mandates

Panel A: Results by Asset Class

Quarters Before/	UK Equities		UK Bonds		Int. Equities	
After Switch	Returns	t-stat	Returns	t-stat	Returns	t-stat
-4	-0.23%	-0.52	0.21%	0.49	2.87%	1.92
-3	-0.79%	-1.57	0.63%	1.37	2.00%	1.37
-2	-1.08%	-2.67	0.17%	0.33	0.62%	0.46
-1	0.59%	0.90	0.08%	0.15	2.08%	1.38
1	1.00%	1.73	0.61%	1.20	0.29%	0.20
2	0.81%	1.93	1.60%	3.51	2.24%	1.77
3	0.56%	1.06	0.84%	1.82	3.57%	2.48
4	-0.34%	-0.87	0.18%	0.36	-1.50%	-1.12
P-value	0.0060		0.0544		0.7664	

Panel B: Results for Total Portfolio

Quarters Before/	Total Portfolio	
After Switch	Returns	t-stat
-4	0.02%	0.04
-3	0.05%	0.14
-2	-0.52%	-1.46
-1	-0.22%	-0.65
1	0.62%	1.42
2	0.48%	1.37
3	0.83%	2.12
4	0.24%	0.58
P-value	0.0040	

Note: This table shows the mean returns in excess of the benchmark, and the associated t-statistics, around the quarters where a fund switches from balanced to specialist mandates. Returns are value-weighted and computed at the portfolio level, i.e. across all managers employed. In Panel A, the analysis is conducted for the three asset classes UK equities, UK bonds and international equities. In Panel B, the analysis is conducted at the total portfolio level. The last row of each panel reports the p-value for a difference in mean test for the null of equal average returns against the alternative that the performance in the year following the switch from a balanced to a specialist mandate is better than the one over the year before the switch. All numbers are in percent per annum and are based on the full sample from 1984-2004.

Table 13. Return Performance around switches in the employment of single versus multiple managers

Panel A: Results by Asset Class

Quarters Before/ After Switch	UK Equities Returns	UK Equities t-stat	UK Bonds Returns	UK Bonds t-stat	Int. Equities Returns	Int. Equities t-stat
-4	-0.57%	-1.18	-0.63%	-1.52	-1.55%	-1.10
-3	-0.59%	-1.10	-0.02%	-0.05	1.90%	1.44
-2	-1.24%	-2.59	-0.81%	-1.68	-0.65%	-0.48
-1	0.22%	0.33	1.18%	2.04	-1.74%	-1.25
1	0.28%	0.74	0.09%	0.21	-0.40%	-0.28
2	0.54%	1.78	0.20%	0.50	0.08%	0.06
3	-0.61%	-1.43	0.53%	1.27	-0.63%	-0.53
4	0.11%	0.24	-0.45%	-1.09	-0.24%	-0.17
P-value	0.0345		0.3329		0.4028	

Panel B: Results for Total Portfolio

Quarters Before/ After Switch	Total Portfolio Returns	Total Portfolio t-stat
-4	-0.69%	-1.42
-3	0.39%	0.83
-2	-0.28%	-0.58
-1	0.08%	0.13
1	-0.26%	-0.70
2	0.22%	0.65
3	-0.51%	-1.30
4	0.44%	0.81
P-value	0.4039	

Note: This table shows the mean returns in excess of the benchmark, and the associated t-statistics, around the quarters where a fund switches from employing a single to employing multiple managers. Returns are value-weighted and computed at the portfolio level, i.e. across all managers employed. In Panel A, the analysis is conducted for the three asset classes UK equities, UK bonds and international equities. In Panel B, the analysis is conducted at the total portfolio level. The last row of each panel reports the p-value for a difference in mean test for the null of equal average returns against the alternative that the performance in the year following the switch from single to multiple managers is better than the one over the year before the switch. All numbers are in percent per annum and are based on the full sample from 1984-2004.

Table 14. Number of Managers, Size and Performance

	β	**t-test(β)**	γ	**t-test(γ)**
UK Equities	0.08	1.57	-13.93	-1.58
UK Bonds	0.21	3.24	6.35	0.48
Int. Equities	0.11	1.94	-3.96	-1.30

Note: This table reports the results of a logit model of a fund's probability of switching from employing one to multiple managers in a given asset class as a function of the fund's size (β) and past performance (γ). Size is measured as the log fund size relative to the average fund size across all funds in existence at time t. Performance is measured as the average return in excess of the benchmark for each fund over the course of the previous year.

Table 15. Excess returns around hiring and firing dates.

Panel A: Pre-Hiring Performance

	Mean	Standard Deviation	Jensen's Alpha	T-statistic
Before Being Hired				
4 Quarters	0.27%	0.58%	0.22%	0.85
3 Quarters	0.47%	0.57%	0.41%	1.6
2 Quarters	0.30%	0.60%	0.25%	0.93
1 Quarter	0.08%	0.58%	0.04%	0.15

Panel B: Post-Hiring Performance

After Being Hired				
4 Quarters	-0.58%	1.25%	-0.32%	-0.62
3 Quarters	0.23%	0.75%	0.15%	0.44
2 Quarters	0.31%	0.93%	0.16%	0.39
1 Quarter	0.26%	0.83%	0.15%	0.4

Panel C: Pre-Firing Performance

Before Being Fired				
4 Quarters	-2.14%	0.95%	-2.08%	-4.8
3 Quarters	-2.03%	0.92%	-2.02%	-4.79
2 Quarters	-0.81%	0.95%	-0.86%	-1.99
1 Quarter	-1.00%	1.07%	-0.97%	-1.98

Panel D: Post-Firing Performance

After Being Fired				
4 Quarters	-0.07%	0.67%	-0.04%	-0.12
3 Quarters	-0.24%	0.75%	-0.04%	-0.57
2 Quarters	-0.12%	0.75%	-0.20%	-0.2
1 Quarter	0.12%	0.76%	0.14%	0.41

Note: This table shows the mean return and the Jensen's alpha at the manager level around the hiring and firing dates. Since in most cases, we observe the manager's returns across other funds, we can compute the mean returns (across manager/fund pairings) for a manager in the quarters preceding the hiring by a new client (fund). This is reported in Panel A. Panel B shows the mean returns at the manager-fund level after the hire. Panel C does the same thing, but now using firing as the event. Finally, panel D uses the returns on a manager's remaining portfolios after he has been fired by a particular client to track the post-firing return performance. The Jensen's alpha is calculated using a one-factor model (with the FTSE-All Share Index as the benchmark). All numbers are in percent per annum and are based on the full data sample from 1984-2004.

Table 16. Net cash flows and past cumulated return performance.

Panel A: Total Portfolio

	Beta	Standard Errors (Beta)	t-statistic	Observations
2 Quarters	0.088	0.039	2.253	30346
4 Quarters	0.268	0.090	2.970	26383
6 Quarters	0.255	0.123	2.075	23741
8 Quarters	0.354	0.153	2.309	21099

Panel B: Results by Asset-Class

UK Equities

2 Quarters	0.138	0.066	2.107	18957
4 Quarters	0.130	0.0321	4.031	16410
6 Quarters	0.085	0.027	3.161	14712
8 Quarters	0.099	0.0254	3.892	13014

UK Bonds

2 Quarters	0.057	0.379	0.151	5604
4 Quarters	-0.190	0.251	-0.757	4602
6 Quarters	0.120	0.237	0.506	3934
8 Quarters	0.025	0.235	0.108	3266

International Equities

2 Quarters	-0.134	0.062	-2.175	14684
4 Quarters	-0.005	0.033	-0.157	12674
6 Quarters	0.000	0.0301	0.012	11334
8 Quarters	0.021	0.030	0.700	9994

Note: This table shows the results from regressing the net cash flow that a manager of a particular asset class receives (relative to the overall flow into that asset class) on a constant and the manager's past differential return performance, again measured relative to the fund's overall, value-weighted return in the same asset class, cumulated over the previous 2, 4, 6 or 8 quarters. Along with the cash-flow, past-differential return sensitivity (measured by beta), we also present its statistical significance.

Table 17. Evolution of Managers' Tenure

Specialist

	Mar 1994	Mar 1999	Mar 2004
UK Equities	2.9	3.5	2.8
UK Bonds	2.2	3.2	2.6
Int. Equities	2.5	3.3	2.9

Multi-Asset

	Mar 1994	Mar 1999	Mar 2004
UK Equities	2.0	3.1	3.5
UK Bonds	1.6	2.6	3.2
Int. Equities	1.8	3.1	3.5

Balanced

	Mar 1994	Mar 1999	Mar 2004
UK Equities	5.2	6.7	8.4
UK Bonds	4.4	5.2	7.2
Int. Equities	5.2	6.6	8.2

Note: This table reports the average tenure of managers across mandates and asset classes. The average tenure is reported in years.

Table 18. Manager Tenure and Performance

Specialist Mandates

	γ	t-testγ	δ	t-testδ	Obs.
UK Equities	-0.003	-4.46	0.000	0.66	14022
UK Bonds	0.000	0.32	-0.001	-3.26	5521
Int. Equities	-0.007	-5.73	0.001	1.51	11281

Multi-Asset Mandates

	γ	t-testγ	δ	t-testδ	Obs.
UK Equities	-0.003	-7.11	0.000	-1.30	16742
UK Bonds	0.000	1.21	-0.001	-5.70	14185
Int. Equities	-0.004	-3.90	-0.001	-2.07	15625

Balanced Mandates

	γ	t-testγ	δ	t-testδ	Obs.
UK Equities	0.001	2.14	-0.004	-9.44	48551
UK Bonds	-0.002	-10.91	0.001	3.21	35889
Int. Equities	-0.001	-1.27	-0.006	-7.48	46752

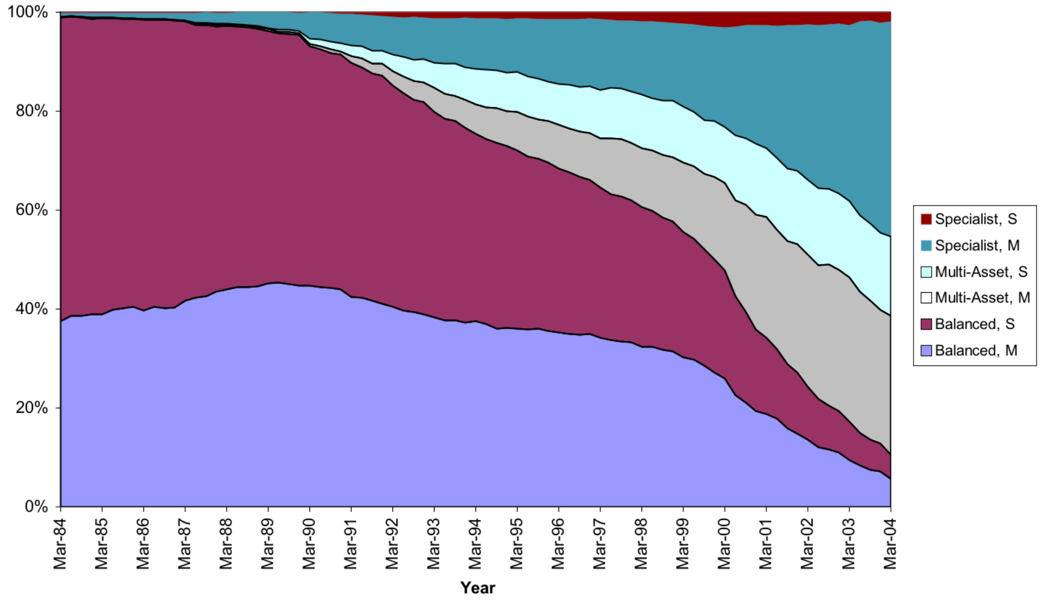
Note: This table reports estimates of the sensitivity of performance with respect to managers' tenure. The results are obtained by regressing returns on a four factor model for UK equities, a two-factor model for UK bonds and a four-factor model for international equities (refer to Table 3 for more details) as well as a relative size and a relative tenure variable. γ is the coefficient on the size variable while δ is the coefficient on the tenure variable. Relative tenure is measured as the tenure of a fund-manager pairing at a given point in time divided by the average fund-manager tenure at the same time computed across all fund-manager pairings in the same asset class and with the same mandate. The analysis is conducted separately across mandates and asset classes and is based on pooled time-series, cross-sectional regressions.

Table A. Mandates Description

	Obs.	Mean	S.D.	UKE &UKB	UKE & INT.E	UKE & UKB & INT.E
Specialist	33944	1.75	0.80	0.89%	21.13%	0.66%
Multi-Asset	18394	4.18	1.34	72.10%	82.73%	65.42%
Balanced	82115	4.89	1.21	78.99%	94.09%	76.25%

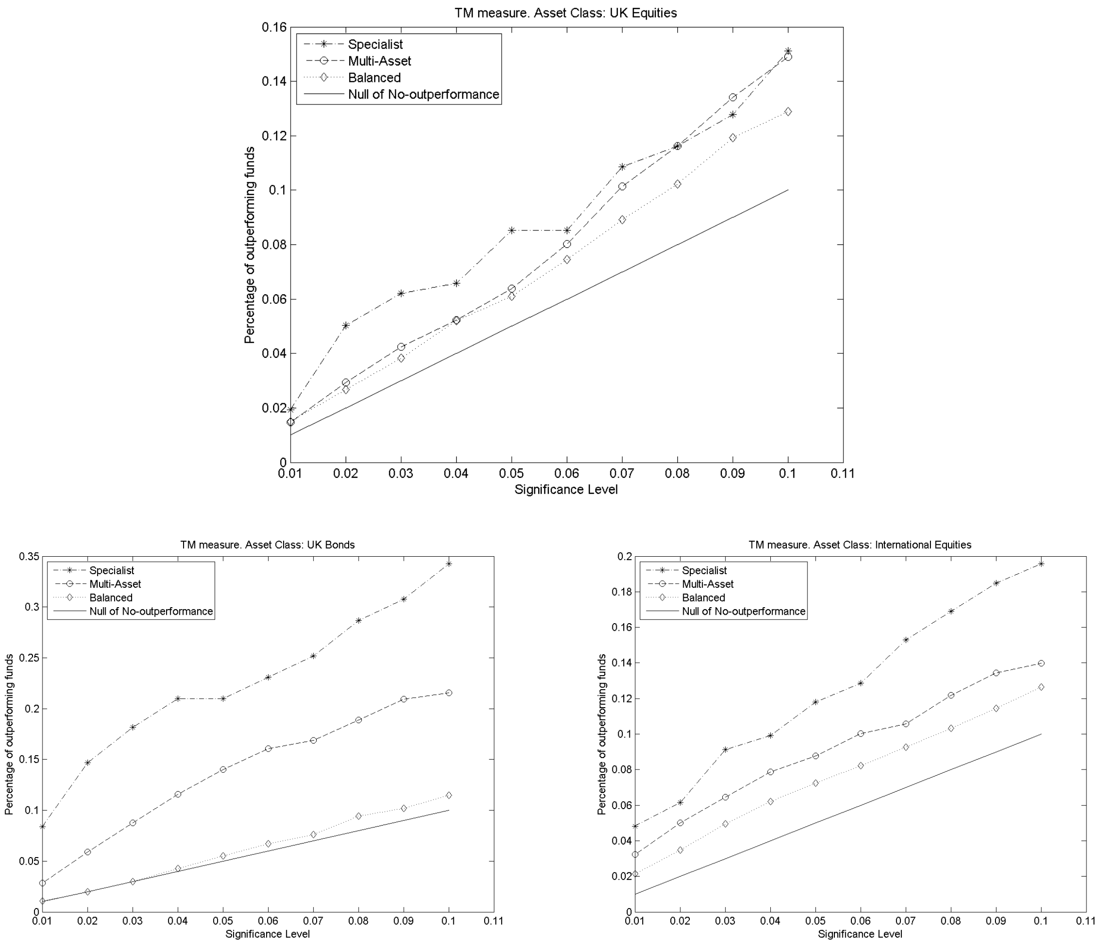
Note: This table describes Multi-Asset Managers on the basis of their asset classes holdings. Appendix A provides a detailed description of the analysis performed. UKE stands for UK equities, UKB for UK bonds and INT.E for international equities.

Figure 1: Distribution of Percentage of UK Equity Mandates by Single and Multiple Manager and Mandate Type



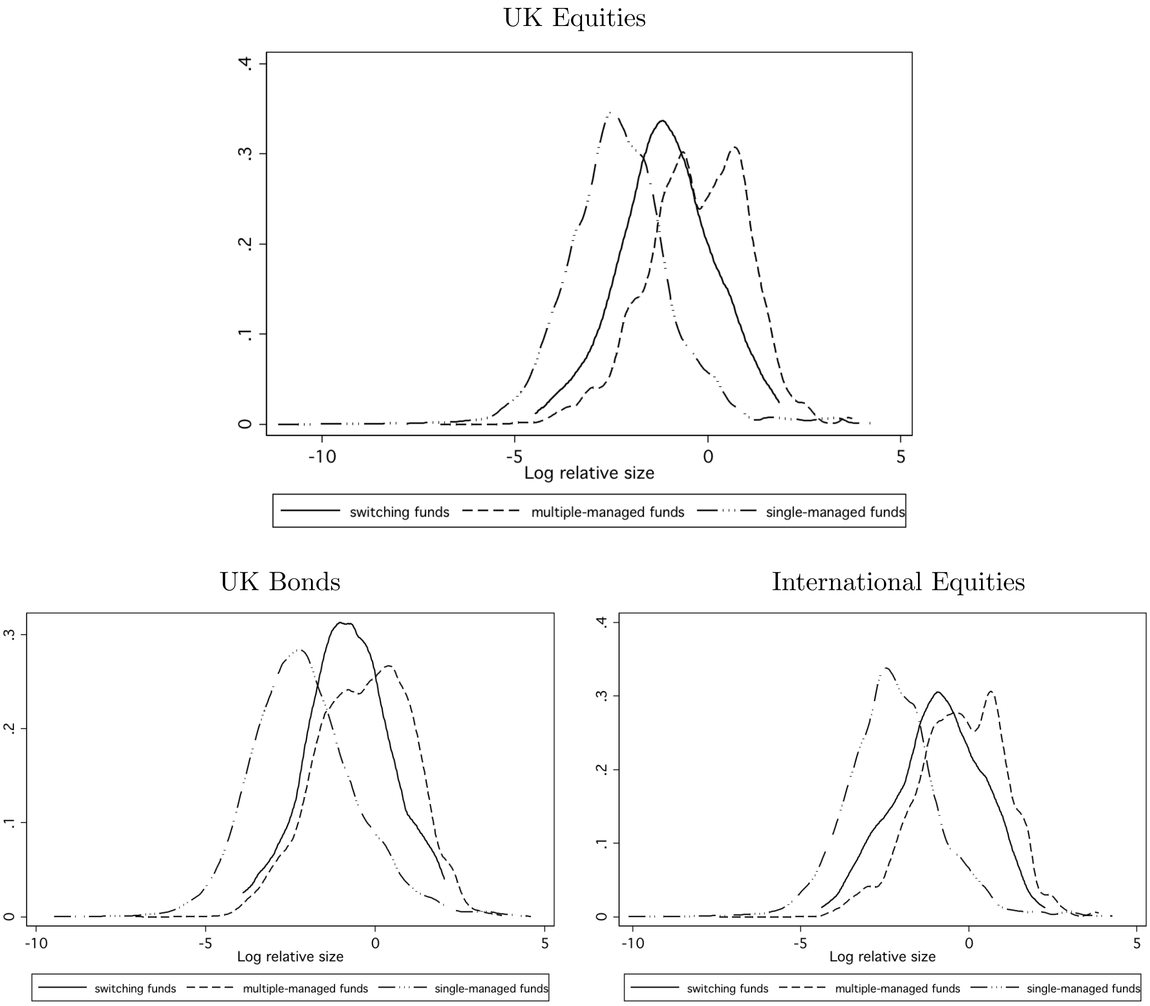
Note: This figure shows the evolution through time in the percentage of types of UK equity manager mandates, namely specialists, multi-asset managers (who manage more than one asset class, but fewer than all asset classes) and balanced managers (who manage across all asset classes), and whether these mandates were managed within the UK equity asset by a single or multiple fund managers.

Figure 2: Percentage of Outperforming Funds by Mandate Type



Note: This figure represents the outcome of a non-parametric bootstrap for the cross-sectional distribution of performance measures by three types of managers, namely specialists, multi-asset managers (who manage more than one asset class, but fewer than all asset classes) and balanced managers (who manage across all asset classes). For each mandate, we show the percentage of funds that generated a performance estimate greater than expected, as represented by the "Null of No-outperformance" line. We use the Treynor-Mazuy measure of performance as it controls for both market timing and security selection.

Figure 3: Distribution of relative fund-size for single and multiple-managed funds



Note: This figure presents kernel density estimates of the distribution of size for single-managed funds, multi-managed funds and funds that switch from employing one to multiple managers in the following quarter. Size is measured as the log fund size relative to the average fund size across all funds in existence at a given point in time. The analysis is conducted separately for the three asset classes UK equities, UK bonds and international equities.

Notes

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