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DECENTRALIZATION IN PENSION FUND MANAGEMENT

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The past few decades have seen a major shift from centralized to decentralized investment management by pension fund sponsors, despite the increased coordination problems that this brings. Using a unique, proprietary dataset of pension sponsors and managers, we identify two secular decentralization trends: sponsors switched (i) from generalist (balanced) to specialist managers across asset classes and (ii) from single to multiple competing managers within each asset class. We study the effect of decentralization on the risk and performance of pension funds, and find evidence supporting some predictions of recent theory on this subject. Specifically, the switch from balanced to specialist managers is motivated by the superior performance of specialists, and the switch from single to multiple managers is driven by sponsors properly anticipating diseconomies of scale within an asset class (as funds grow larger) and adding managers with different strategies before performance deteriorates. Indeed, we find that sponsors benefit from alpha diversification when employing multiple fund managers. Interestingly, competition between multiple specialist managers also improves performance, after controlling for size of assets and fund management company-level skill effects. We also study changes in risk-taking when moving to decentralized management. Here, we find that sponsors appear to anticipate the difficulty in coordinating multiple managers by reducing their overall risk budget following decentralization, which helps to compensate for the suboptimal diversification that results. In summary, our results shed light on the complex array of factors that affect the decision of pension funds to delegate investment choice.

1 Decentralized investment management: The historical trend

The pension fund industry has witnessed a well-documented shift from centralized to decentralized investment management over the last few decades of the twentieth century. Lakonishok *et al.* (1992) studied the US money management industry, and observed that, up to the early 1980s,

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pension fund sponsors typically employed a single fund manager to manage their asset portfolio; these pension fund managers operated under balanced mandates that invested in both equity and fixed-income securities, with very few specialists. In contrast, their sample of pension funds from 1983 to 1990 included mainly specialist managers, and they suggested that performance evaluation had become difficult with the advent of specialist managers. They argued that a specialist manager may try to convince the sponsor that they had outperformed their style benchmark even though they may have underperformed the market. Indeed, the celebrated Brinson *et al.* (1986) paper on performance attribution was motivated by the need to delineate responsibility for portfolio performance in the presence of multiple asset managers, which by 1985 had become the common organizational form in the US pension industry.

The practice of using multiple managers, referred to as decentralized investment management by Sharpe (1981), may at first appear surprising, since there is the potential for suboptimal portfolio diversification, leading to a "diversification loss," with individual managers having no incentive to account for the correlation of their own portfolio returns with the returns of other managers employed by the pension fund sponsor. This "coordination problem" has recently been analyzed in van Binsbergen *et al.* (2008, hereafter denoted BBK). 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 to investment advisors or consultants.

A number of potential benefits from employing multiple managers counteract these disadvantages from decentralization, especially as funds grow larger. For example, pension funds can diversify (across managers) the strategies used to generate alpha to exploit the skills of specialist active managers with superior knowledge of a particular asset class (Sharpe, 1981; van Binsbergen *et al.*, 2008). They might also employ multiple managers to induce yardstick competition, and benefit from the resulting higher effort levels exerted by these managers (Shleifer, 1985). The employment of multiple managers can also help to diversify uncertainty about manager skills (Kapur and Timmermann, 2005). Such benefits from using multiple managers can be particularly important for a sponsor with a large fund, given the significant diseconomies of scale in pre-fee returns in asset management (Chen *et al.*, 2004).

In the UK, a similar switch in pension fund mandates also occurred, but at a later date. In a major study of the UK's pension fund management industry, Blake *et al.* (2013) examine the factors behind this shift from centralized to decentralized investment management that was implemented by UK pension funds over the period 1984–2004 using a unique, proprietary dataset (known as CAPS) provided by the performance management service BNY Mellon Asset Servicing. This work identifies two secular decentralization trends in the pension fund management industry over this 20-year period: corporate sponsors of occupational pension plans switched (i) from employing generalist (balanced) to specialist fund managers to manage their pension fund assets across asset classes and (ii) from employing single to multiple competing fund managers within each asset class. The study analyzes the economic drivers of these decentralization decisions, as well as examining their effect on the risk and performance of pension funds, and finds evidence consistent with some theories of decentralized investment management.

Following the decision to outsource the investment management of a pension fund, plan sponsors must decide on the optimal investment delegation arrangement.[1] In general, sponsors can choose either centralized or decentralized fund management, and 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. The sponsor always chooses the strategic asset allocation (SAA). But the balanced manager can make both market timing (e.g., "tactical asset allocation") and security selection decisions. The specialist manager is allowed to make security selection decisions within a subclass of assets, and only limited market timing decisions. The multi-asset manager can invest in more than a single asset category, but in less than the full range available to the balanced manager; the multi-asset manager can also engage in more sophisticated market timing strategies than the specialist manager.

Second, the sponsor might decentralize by using multiple balanced managers (rather than a single balanced manager), each of whom invests across all asset classes, or by using multiple specialist managers (rather than a single specialist manager) within a given asset class. For instance, a sponsor might split the management of domestic equities so that one manager oversees growth stocks, while the other oversees value stocks, or so that one manager uses a fundamental-based strategy, while the other uses a quantitative strategy. Therefore, it is crucial to analyze the results of decentralization for a sponsor within each asset class as well as across asset classes to assess the performance and risk effects of decentralization.

2 Data

Our dataset consists of monthly and quarterly returns on the investment portfolios of 2,385 UK pension funds from March 1984 to March 2004. The investment portfolios are divided into seven asset classes: UK equities, UK bonds, overseas equities, overseas bonds, property, cash, and index-linked bonds. In addition, for each unique fund-quarter, the coded identity of the manager or managers who are responsible for the fund, the type of investment mandate under which they operate, and the size of the investment portfolio under management are provided. The investment mandates are classified as balanced, multi-asset, or specialist. These pension funds were typically occupational defined benefit (principally final salary) pension funds that had their performance monitored by CAPS at some stage during this period. The assets of these pension funds were managed by up to 364 different fund management companies (FMCs).[2]

Figure 1[3] shows the evolution in the proportion of UK equity mandates in our sample that follows a balanced, multi-asset, or specialist strategy, also decomposed into single- and multiple-managed mandates. The figure illustrates the secular move by UK pension funds away from balanced managers 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 which time 63% of mandates were multi-asset and 25% were specialist. From being an industry dominated almost exclusively by balanced mandates in 1984, UK pension funds developed into more of a hybrid industry with several different types of mandates playing an important role 20 years later. Figure 1 also shows the trend toward multiple-managed

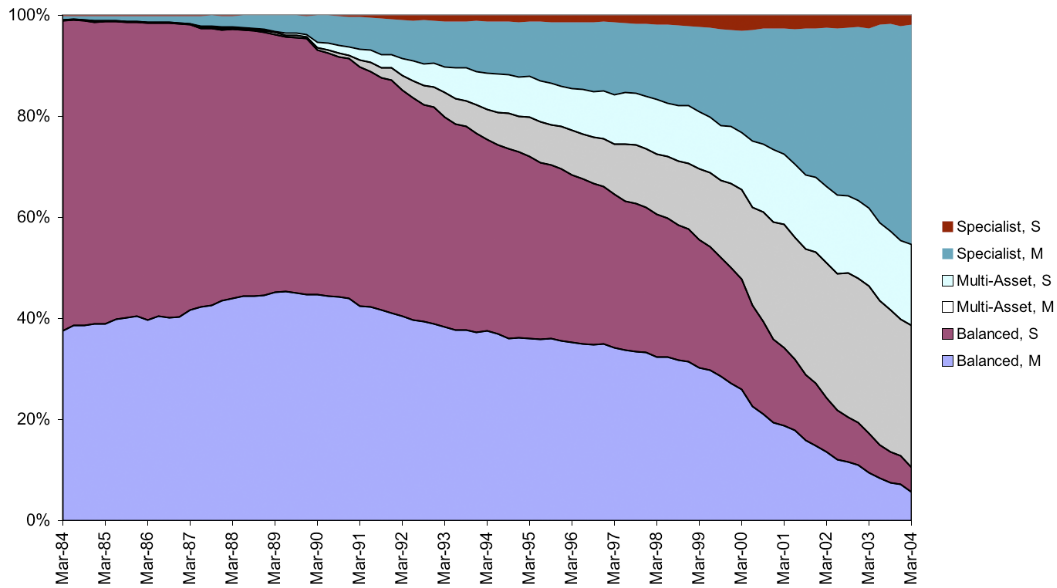

Figure 1 Distribution of UK equity mandates by mandate type and by number of managers: 1984–2004.
Note: This figure shows the evolution through time in the percentages of types of UK equity manager mandates, namely specialists, multi-asset managers (who manage more than one asset class, but fewer than all asset classes), and balanced managers (who manage across all asset classes), and whether these mandates were managed within the UK equity asset class by a single (S) or by multiple (M) fund managers.

asset classes within each of the three different mandates. Although the use of multiple balanced mandates within a pension fund has decreased over time, it has increased as a proportion of all balanced mandates. The proportion of multiple manager mandates has similarly increased among multi-asset and specialist managers.

3 Decentralization pathways

In this section, we examine the two principal pathways along which the centralization/decentralization decision might proceed.

The first pathway along which a pension fund's chief investment officer (CIO) might decentralize is by switching from a single balanced manager across all asset classes to a specialist manager within each asset class. For instance, the CIO may decide that manager A is best suited to manage UK equities, while manager B is best suited to manage UK and international bonds.

Sharpe (1981) argues that specialists might invest in acquiring superior private information on securities within a particular asset class, giving them better performance than generalists. Therefore, if the movement toward specialist managers is rational, specialists should deliver better performance (as per Sharpe, 1981) than balanced managers that is more than sufficient to compensate for the diversification loss (as per BBK). To provide deeper insights into the economic motivation for a pension fund CIO switching between balanced, multi-asset, and specialist mandates, Panel A of Table 1[4] presents transition matrices that contain summary statistics across all manager change events within the UK equity asset class.

Specifically, the panel shows all events where a single manager within a given asset class is replaced by another single manager. It is important to recognize that some of these transitions retain the same level of decentralization (or lack

Table 1 Transition matrices for mandate and number of managers.

		Specialist	Multi-asset	Balanced
Panel A. Single-to-single manager switches				
Specialist	Num	9	NA	NA
	Size	0.40	NA	NA
	Δ Fees	0.02%	NA	NA
	Δ Returns	1.95%	NA	NA
Multi-asset	Num	5	36	1
	Size	0.46	0.42	0.01
	Δ Fees	0.14%**	0.02%	0.06%
	Δ Returns	4.18%	0.38%	−8.10%
Balanced	Num	12	42	206
	Size	0.14	0.19	0.67
	Δ Fees	0.15%***	0.03%***	0.03%***
	Δ Returns	4.34%***	0.92%**	1.69%***
Panel B. Single-to-multiple manager switches				
Specialist	Num	42	10	5
	Size	1.66	1.40	0.92
	Δ Fees	0.03%	0.00%	−0.03%
	Δ Returns	1.31%*	3.60%	−1.56%
Multi-asset	Num	18	31	6
	Size	1.42	1.02	1.56
	Δ Fees	0.08%**	0.05%**	0.00%
	Δ Returns	1.34%	−0.05%	2.21%
Balanced	Num	30	14	218
	Size	1.32	0.67	1.01
	Δ Fees	0.09%***	0.06%**	0.02%***
	Δ Returns	1.53%**	2.19%*	0.63%**

This table reports two transition matrices for funds that switched their mandates over the period 1984 to 2004. The rows of each matrix report the mandates the funds switch from, and the columns report the mandates they switch to. Each cell of the transition matrices contains the number of funds that completed the switch, "Num"; their relative size compared to all the other funds during the same quarter, "Size"; the change in fees associated with the switch, "Δ Fees"; and the four-quarter pre-fee average returns differential associated with the switch, "Δ Returns." The significance of the change in fees and returns is computed using bootstrapped p-values and the asterisks represent the significance levels (* = 10%, ** = 5%, *** = 1%). Panel A reports the results for the funds that do not combine the change in mandate with a change in the number of managers, while Panel B reports the results for the funds that combine the change in mandate with an increase in the number of managers but do not replace the incumbent manager. NA stands for "Not Available" and is associated with switches that never occur in the dataset.

thereof) within the pension fund. For instance, the replacement of a single balanced manager with another single balanced manager retains a fully centralized structure, while the replacement of a single specialist with another specialist retains the same level of centralization within that asset class (and the same level of decentralization across asset classes).

The most common single-manager replacement (206 cases) occurs when a balanced manager is replaced by another balanced manager, across all asset classes, thereby retaining fully centralized asset management. A very uncommon event (only 12 occurrences) is the replacement of a single balanced manager with a single specialist manager, a move to fully decentralized management under a new set of mandates. There are no shifts from a single specialist to a single balanced manager (i.e., from fully decentralized to fully centralized management) in our dataset, suggesting that decentralization, when optimally undertaken, is intended to be irreversible, since the benefits for the plan sponsor are anticipated to be permanent.

The cells also show, for UK equities, the average relative size (in terms of assets under management or AUM) of those funds making manager switches in a given quarter, relative to the UK equity allocation of all other pension funds during the same quarter (where "1.0" indicates that the fund making a manager replacement has UK equity assets of the average size at that date). It is clear that all funds making single-manager-to-single-manager switches are much smaller than the average fund, as indicated by the size indicator being below unity in all cells—these small funds cannot move to a multiple-manager mandate due to the high fees involved.

Changes in fee levels and in realized pre-fee returns, computed relative to the asset class benchmarks, are also shown in the cells beneath the size information. Same-mandate switches (specialist to specialist or balanced to balanced) result in improved pre-fee returns, at only a slightly increased fee level. For instance, a switch from one balanced manager to another results in a (statistically significant) pre-fee return increase of 169 basis points (bps) from the year prior to the year following a manager replacement, with an average fee increase of only 2 bps per year. Since there is no change in mandate type (and hence the same level of manager centralization or decentralization), this significantly improved performance indicates that sponsors appear to delay replacing managers with lagging performance due to the uncertainty in the performance of the new manager (and perhaps to the career risk faced by the CIO when executing such a switch).[5]

The second pathway along which the CIO might decentralize is to move from a single manager to multiple managers within each asset class. For instance, a pension fund can choose a number of balanced managers, each managing across all asset categories. Similarly, a fund that wishes to employ a specialist strategy might hire one or more specialist managers within each asset class. Either decision represents a switch from centralized to decentralized management within asset classes.

Why might pension fund sponsors consider employing multiple managers? Since Chen *et al.* (2004) report evidence of strong scale diseconomies in fund management (before fees) and Berk and Green (2004) demonstrate that such performance diseconomies result from growth in AUM for successful funds, we would expect CIOs to be especially keen to switch to multiple managers when their funds have grown too large for a single manager to maintain an acceptable level of performance. Further, if the CIO is uncertain about the manager's true skill level, he might want to employ a number of managers to diversify alpha risk. Indeed, Sharpe (1981) 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. Kapur and Timmermann (2005) show that, if fund managers have specialist skills that are not perfectly known by the sponsor, then a risk-averse sponsor (in our setting, represented by the CIO) will employ multiple managers to diversify the risk of employing a low skilled fund manager. If this effect is important, we would expect to find a tighter distribution of alphas among multiple-managed funds than among single-managed funds. Also, we would expect the CIO to be especially concerned about alpha risk as a fund grows larger, due to the higher penalty from underperformance.

Hiring multiple managers could also induce an internal yardstick competition (Shleifer, 1985), allowing the CIO to assess managers' comparative performance and overcome the problems of shirking and hidden actions (see also Holmstrom, 1982). Mookherjee (1984) shows that, with multiple agents, relative performance evaluation when agents' outputs are correlated enables the principal (in this case, the CIO) to obtain first-best outcomes.

Nevertheless, hiring multiple managers introduces a coordination problem—this time within an asset class—in addition to the cross-asset-class coordination problem discussed earlier. BBK argue that the CIO will contract with each fund manager in a way that induces the manager to optimally choose a lower risk portfolio than would be chosen without the coordination problem. However, if the CIO expects the new manager to have greater skill than the incumbent, the CIO will allocate a greater risk budget to each new manager, although the total risk budget (across all managers) can still be lower than in the case in which there is no coordination problem due to imperfect correlations in the managers' returns.

To explore these issues, Panel B of Table 1 presents a transition matrix that illustrates the economics of single to multiple UK equity manager decentralization switches. The majority of these switches maintain the same mandate type (for instance, single specialist to multiple specialist). Furthermore, a substantial fraction (61%) of the switches occur within the balanced mandate.

An examination of the relative size of funds changing from single to multiple managers within an asset class offers additional insights. These funds are much larger than those switching from one single manager to another, as shown by comparing the corresponding cells in Panels A and B of Table 1. Also, funds switching from single to multiple specialists are substantially larger than funds switching from single to multiple balanced managers, which indicates that an optimal strategy for funds facing severe scale diseconomies is to employ multiple specialist managers.

What is the economic motivation behind the different changes? Single-to-single replacements (Panel A) generally result in higher improvements in returns than single-to-multiple switches (Panel B). This finding suggests that single-to-single manager changes are motivated by an attempt to find a more-skilled manager, while single-to-multiple manager changes are made to avoid anticipated increased scale diseconomies as a pension fund's assets grow larger.

The smaller improvement in performance associated with single-to-multiple manager switches suggests that the CIO moves more quickly to make this type of switch than the single-to-single manager switch. We also find a tighter distribution of manager skills in larger funds and this could additionally contribute to the smaller improvement. There are a number of potential explanations for these findings. First, although there may be some residual uncertainty about the true skill level of the incumbent manager, initially there is likely to be a great deal of uncertainty about the skills of any newly appointed manager. The CIO may be reluctant to fire a long-standing manager who might have had a spell of bad luck and replace him with a manager whose performance could be worse. With a single-to-multiple manager change, the incumbent can be retained while learning more about the skill level of the new manager. Second, a CIO will learn from experience where the scale diseconomies in asset management begin to bite for his particular fund, so he will be able to predict more precisely when a single manager's skills will likely begin to tail off as a function of the size of the manager's AUM.

4 Evidence on the performance of balanced, multi-asset, and specialist mandates

Building on the analysis in the previous section, we now attempt to identify some of the causal factors explaining the different pathways to decentralization.

The first dimension of the decentralization decision is whether to employ a single balanced manager across all asset classes, or to employ a specialist manager within each asset class. If the movement toward specialist managers is rational, then specialist managers should deliver better pre-fee performance than balanced managers to compensate for the diversification loss as well as the higher fees charged by specialists. On the other hand, balanced fund managers market themselves as providers of strategic asset allocation services across the full range of assets available, and are in a position to take advantage of market timing and security selection opportunities across all asset classes. We would, therefore, expect that the measured performance (before fees) of fund managers will depend on mandate type: (i) specialist fund managers will exhibit better security-selection skills; (ii) balanced fund managers will exhibit better market-timing skills; (iii) given that there is a diversification loss with the use of specialists and because of their higher fees, the total performance of specialist managers will exceed that of balanced managers to compensate; and (iv) the performance of multi-asset managers will be greater than balanced, but less than specialist managers' performance. In order to test these predictions, we assess the performance of fund managers by mandate-type: specialist fund managers should exhibit security-selection skills, while balanced fund managers should possess market-timing skills.

Our analysis concentrates on the three main asset classes held by UK pension funds over the data period, namely UK equities, UK bonds and international equities. To test for security selection and market timing skills in UK equities, we estimate a five-factor model by fund manager i at pension fund f during quarter t:

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

where r_{ift} is the pre-fee excess return (over a T-bill rate), r_{mt} is the period—t 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.[6] Under the null hypothesis of no selectivity skills, α_{if} (Jensen's alpha) should be equal to zero. We can test for selectivity skills across, for example, all specialist equity mandates, by testing for the significance of the average alpha, $\bar{\alpha}$, across F funds and M specialist equity fund managers in the sample. To conduct inference about the statistical significance of this mean alpha estimate, we use the residual-resampling bootstrap procedure prescribed by Kosowski *et al.* (2006).

To separate selectivity from timing skills, Equation (1) includes a quadratic term on the excess return on the market. Following Grinblatt and Titman (1994), the Treynor–Mazuy (1966) total performance measure (TM) for each pension fund manager is defined as:

$$TM_{if} = \alpha_{if} + \beta_{5if} Var(r_m), \tag{2}$$

where $Var(r_m)$ is the variance of the excess returns on the market and its coefficient β_{5if} is the market timing beta. For domestic bonds, we estimate a four-factor model consisting of the excess returns on the FTSE-A All-Gilts ($GOVB$) and UK government consol (i.e., perpetual) bonds ($CONS$) portfolios, again measured relative to the UK T-bill rate, and their squared values ($GOVB^2$ and $CONS^2$). For international equities, we use a six-factor model comprising sterling-denominated excess returns on the North American (NA) and Europe Australasia Far Eastern Ex UK ($EAFEX$) stock market portfolios and their squared values (NA^2 and $EAFEX^2$), plus global SMB and HML factors.[7] We separate the global equity return into North American and EAFE components because of evidence in Timmermann and Blake (2005) which shows that UK pension fund weights on North America differed significantly from their corresponding market capitalization weights over the sample period studied here.

Tables 2 and 3[8] show the results of the security selection and market timing measures of pre-fee performance for each mandate type, with bootstrapped p-values for two sub-samples of the dataset, from March 1984 to March 1994, and from April 1994 to March 2004. Specialist managers outperform balanced managers in all three asset classes based on Jensen's alphas, and for the total performance measures, for both sub-periods of the full dataset. Specifically, for UK equities, the average pre-fee selectivity alpha for specialist mandates was an insignificant 31 bps per year in the sub-sample period 1984–1994, but this increased to a significant 79 bps over the period 1994–2004. The performance of specialist mandates in international equities was particularly impressive in both sub-samples: 3.39% and 1.97%, respectively. The results for the multi-asset mandates typically lie between the specialist and balanced mandates: multi-asset mandates also display significant selectivity skills, particularly in international equities, where they exhibit pre-fee alphas of 4.48% and 1.53% per year. These results confirm that specialist fund managers display significant security selection abilities, and their pre-fee total performance exceeds that of balanced managers. The total performance of specialist and multi-asset managers is generally higher in the second sub-sample than the first. However, the total performance of balanced managers is not statistically different from zero in both periods. Although there is some evidence that in UK equities in the period 1984–1994 balanced managers did appear to display a small amount market timing skills, with a coefficient of 0.12 and a zero p-value. However, we do not find systematic evidence that balanced mandates are associated with positive returns from market timing. The same holds for specialist and multi-asset mandates. There is little evidence that fund managers, whatever their mandate type, possess any genuine market timing skills, consistent with extant research on both mutual fund and pension fund managers.

Previous studies of pension fund performance, including Beebower and Bergstrom (1977), Brinson *et al.* (1986), Ippolito and Turner (1987), Lakonishok *et al.* (1992), Coggin *et al.* (1993), Christopherson *et al.* (1998), and Bauer *et al.* (2007) for the US, and Blake *et al.* (1999) for the UK, have typically found little evidence of either security selection or market timing skills by pension fund managers. However, these studies did not allow for the differing objectives of pension

Table 2 Pre-fee measures of security selection and market timing skills by mandate type: First subsample (March 1984–March 1994).

		UK equities		UK bonds		International equities	
		Avg. coefficient	*p*-value	Avg. coefficient	*p*-value	Avg. coefficient	*p*-value
Specialist mandates	Jensen's alpha	0.31%	0.223	0.71%	0.045	3.39%	0.026
	Market timing beta	0.253%	0.029	0.070%	0.460	−0.939%	1.000
	TM total performance	1.04%	0.003	0.62%	0.067	−1.22%	0.780
Multi-asset mandates	Jensen's alpha	0.13	0.395	−0.76%	0.889	4.48%	0.013
	Market timing beta	−0.112%	0.816	−0.310%	0.575	−1.241%	1.000
	TM total performance	−0.17%	0.659	−0.33%	0.716	−1.58%	0.852
Balanced mandates	Jensen's alpha	−0.43%	0.901	0.75%	0.106	0.85%	0.236
	Market timing beta	0.120%	0.000	0.534%	0.032	−0.676%	1.000
	TM total performance	0.06%	0.411	0.94%	0.036	−2.71%	0.976

This table reports evidence of security selection and market-timing skills for three types of manager, 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 the factor models described in Section 4 of this paper. Finally, we report the beta coefficient on the market-timing term along with the Treynor–Mazuy (TM) total performance measure. *p*-values are based on a nonparametric bootstrap that uses a one-sided test for the ability of funds to generate alphas, betas, or TM measures in excess of the mean values estimated using the actual data sample. Jensen's alphas and the TM measures are reported in percent per annum.

Table 3 Pre-fee measures of security selection and market-timing skills by mandate type: Second subsample (April 1994–March 2004).

		UK equities		UK bonds		International equities	
		Avg. coefficient	*p*-value	Avg. coefficient	*p*-value	Avg. coefficient	*p*-value
Specialist mandates	Jensen's alpha	0.79%	0.012	1.27%	0.000	1.97%	0.005
	Market timing beta	0.007%	0.461	−0.409%	0.664	0.248%	0.082
	TM total performance	0.92%	0.004	1.00%	0.001	2.16%	0.001
Multi-asset mandates	Jensen's alpha	0.50%	0.005	0.90%	0.000	1.53%	0.016
	Market timing beta	0.007%	0.423	0.745%	0.097	−0.089%	0.791
	TM total performance	0.48%	0.005	0.60%	0.004	1.12%	0.044
Balanced mandates	Jensen's alpha	0.55%	0.026	0.51%	0.000	0.90%	0.238
	Market timing beta	−0.121%	0.950	−2.046%	1.000	−0.115%	0.624
	TM total performance	0.38%	0.083	0.09%	0.306	−0.30%	0.581

This table reports evidence of security selection and market-timing skills for three types of manager, 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 the factor models described in Section 4 of this paper. Finally, we report the beta coefficient on the market-timing term along with the Treynor–Mazuy (TM) total performance measure. *p*-values are based on a nonparametric bootstrap that uses a one-sided test for the ability of funds to generate alphas, betas, or TM measures in excess of the mean values estimated using the actual data sample. Jensen's alphas and the TM measures are reported in percent per annum.

fund managers, and whether they were operating under balanced or specialist mandates. We have shown that it is important for balanced managers to be assessed for market timing skills, and for specialists to be assessed for selectivity skills.

Of course, sponsors of pension plans are interested in the performance of a fund manager, net of management fees. However, the CAPS dataset does not include information on manager-specific management fees, which are typically negotiated on a case-by-case basis between each pension fund and the FMC and are not publicly disclosed. Instead, we simulate a set of fund manager fees for each pension fund mandate using a comparable dataset from Defaqto of the same fund management company's fees for retail products. These retail fees are then rescaled using a survey dataset on institutional fees from Mercer (2006).

Table 4[9] reports the distribution of these annual fees by mandate and asset class based on our simulations. It can be seen from the mean of these distributions that specialist fees for international equities at 41 bps are significantly higher than all the other sets of fees, significantly reducing the benefit to pension funds of the high pre-fee performance of specialist mandates in international equities that we noted in Tables 2 and 3. The fees for balanced mandates, on the whole, are lower than for specialist and multi-asset mandates. One notable feature is that the fees for specialist bond mandates are much lower than for multi-asset and balanced bond mandates, which suggests that these latter two mandates include some cross-subsidization across asset classes (e.g., their bond class fees may partly subsidize their equity class operations).

4.1 The dynamics of manager switching

The second dimension of the decentralization decision is whether to employ a single or multiple managers within an asset class. Table 5[10] explores the dynamics of the switch from single to multiple managers. The table reports the results of a logit regression of a fund's probability of switching from single to multiple managers in a given asset class as a function of the fund's size (δ) and past performance (γ).[11] Size is measured as log fund size relative to the average fund size across all funds in existence at time t (in that asset class). Past performance is measured by the average annual return in excess of the benchmark for fund f over the four quarters prior to t.

Increasing fund size is a strong predictor of the switch from single to multiple managers in the three main classes, but especially in UK bonds. Poor past performance also increases the probability of switching from single to multiple managers in each asset class. Note, that δ is positive for all asset classes (and mostly statistically significant), confirming that diseconomies of scale are an important driver of the move from single to multiple managers. A UK equity fund that is 10 times the average size has an 18% higher chance of switching than the average fund, while the corresponding numbers are 48% and 25% for UK bonds and international equities, respectively. Note, also, that the switch from single to multiple managers, in aggregate (Panel A), is (weakly) driven by poor previous four-quarter performance (γ), although this result is not consistent across mandates or asset classes. In fact, it is positive and statistically significant for specialist mandates in UK equities, implying that positive past performance from a single specialist mandate encourages pension fund sponsors to choose multiple specialist managers, especially in UK equities.

So switching from single to multiple managers appears to be driven mainly by diseconomies of scale at the fund level, and sponsors appear to properly anticipate and make the switch before there is significant deterioration

Table 4 Annual fees by mandate and asset class (%).

Asset class	1%	5%	10%	25%	50%	75%	90%	95%	99%	Mean%	Mean$_w$%
Panel A: Specialist mandates											
UK equities	0.00	0.05	0.13	0.20	0.33	0.42	0.52	0.55	0.59	0.32	0.21
UK bonds	0.00	0.00	0.01	0.07	0.13	0.20	0.27	0.29	0.34	0.14	0.07
International equities	0.15	0.18	0.27	0.41	0.52	0.58	0.62	0.63	0.67	0.48	0.41
Panel B: Multi-asset mandates											
UK equities	0.08	0.21	0.24	0.30	0.36	0.41	0.44	0.45	0.45	0.35	0.28
UK bonds	0.10	0.24	0.28	0.33	0.35	0.41	0.41	0.41	0.41	0.35	0.30
International equities	0.09	0.21	0.25	0.31	0.35	0.39	0.41	0.41	0.41	0.34	0.27
Panel C: Balanced mandates											
UK equities	0.03	0.11	0.16	0.26	0.35	0.38	0.41	0.42	0.45	0.31	0.21
UK bonds	0.03	0.12	0.22	0.31	0.35	0.39	0.41	0.41	0.41	0.33	0.26
International equities	0.03	0.12	0.21	0.30	0.35	0.38	0.41	0.41	0.41	0.32	0.24

This table presents the annualized estimated fees across specialist, multi-asset, and balanced mandates for the three main asset classes held by the pension funds, namely UK equities, UK bonds, and international equities. All results are based on quarterly data over the period from 1984 to 2004. Panel A reports results for specialist mandates. Panels B and C present results for multi-asset and balanced mandates, respectively. The columns "mean" and "mean$_w$" report simple and value-weighted average fees.

in pre-fee performance caused by diminishing scale-economies at the fund level.

4.2 *The coordination of fund managers: Competition and manager performance*

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 more other managers in the same asset class. For example, we have pre-fee 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 multiple-manager setting within UK equities, while others employ the same fund manager as their sole UK equity manager. Our data allow us to control for the unique skill of each manager using a manager fixed-effects modeling framework. Differences in performance as a result of manager competition can then be addressed, by considering whether managers perform better or worse in a multiple-manager setting.

To this end, we conduct, for a given asset class (e.g., UK equities), the following experiment. In the first stage, we run the regression in Equation (1), and compute the risk-adjusted performance for manager i at fund f, denoted $r_{ift}^{adj} = \widehat{\alpha}_{if} + \widehat{\varepsilon}_{ift}$. We can also compute the average risk-adjusted performance of manager i, $\bar{\alpha}_i$, across all funds managed, f, where $\bar{\alpha}_i = \frac{1}{F_i}\sum_{i=1}^{F_i} \hat{\alpha}_{if}$ and F_i equals the number of funds that manager i is managing in a given asset class. In the second stage, we run a pooled regression across all funds managed by all managers across all time periods, for the given asset class:

$$r_{ift}^{adj} - \bar{\alpha}_i = \delta \log(REL\_SIZE_{ift}) + \gamma NMAN_{ft} + \nu_{ift}, \qquad (3)$$

Table 5 The probability of switching from single to multiple managers: The effect of fund size and past performance.

		δ	t-test (δ)	γ	t-test (γ)
Panel A: Aggregate results					
	UK equities	0.08	2.26	−8.24	−1.21
	UK bonds	0.21	5.95	−12.90	−1.46
	Int. equities	0.13	3.50	−4.52	−1.46
Panel B: Results by mandate types					
Specialist Mandates	UK equities	0.16	1.99	19.61	3.58
	UK bonds	0.59	3.74	−17.21	−0.54
	Int. equities	0.09	1.21	−2.15	−0.38
Multi-asset mandates	UK equities	0.42	2.58	−19.39	−0.84
	UK bonds	0.45	3.11	−45.00	−1.69
	Int. equities	0.48	2.96	−11.29	−0.87
Balanced mandates	UK equities	0.15	3.17	−4.74	−0.55
	UK bonds	0.20	4.94	5.63	0.50
	Int. equities	0.20	4.28	−3.82	−1.03

This table reports results of a logit model of a fund's probability of switching from single to multiple managers in a given asset class as a function of the fund's size (δ) and past performance (γ). Size is measured as log fund size relative to the average fund size across all funds in existence at time t. Performance is measured as the average annual return in excess of the benchmark for each fund over the course of the previous year. Time-fixed effects are used. Panel A reports aggregate results while Panel B reports the results for specialist, multi-asset, and balanced mandates.

where REL_SIZE_{ift} equals the total net assets at the end of quarter t for manager i at fund f in a particular asset class (e.g., UK equities) divided by the average fund size in that asset class during that quarter (across all managers), and $NMAN_{ft}$ equals the total number of managers in the asset class at fund f during quarter t. This specification captures any diseconomies of scale 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 $\bar{\alpha}_i$. Again, we use relative fund size (*REL_SIZE*), as we would expect fund-level diseconomies of scale, principally caused by market impact effects, to be driven by fund size relative to the size of capital markets.

Table 6[12] presents the results from this two-stage procedure capturing the effect of fund size and number of managers on fund performance, separated by mandate type (specialist, multi-asset, or balanced). Panel A shows that there is evidence of pre-fee diseconomies of scale at the fund level as the regression coefficient, δ, is negative for seven of nine fund types. However, the effect is economically small; for instance, a fund and balanced manager pairing in UK equities that is 10 times the size of another such pairing exhibits an estimated relative alpha decrease of only about 16 bps per year. Second, the results of Panel A suggest there is no evidence that a larger number of managers result in increased pre-fee performance, as indicated by the largely negative values of the regression coefficient, γ.

Table 6 Pre-fee performance, fund size, and the number of managers.

		δ	t-test (δ)	γ	t-test (γ)	Obs.
Panel A: Scale economies at fund level						
Specialist	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	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	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	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	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	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

This table presents results from a two-stage procedure capturing the effect of fund size and number of managers on fund performance. First, we compute risk-adjusted returns using the factor models described in Section 4 of this paper. In Panel A, we present a measure of risk-adjusted returns that controls for managers' skills across funds and we regress this measure on 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 a variable indicating the number of managers active in each asset class. The coefficient for the size variable is δ, while the coefficient for the number of managers is γ.

However, the model in Equation (3) might not be capturing FMC scale economies. Specifically, we might expect there to be scale economies at the 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 FMC level, economies might be due to spreading fixed costs (e.g., a large research team of security analysts) among a greater number of funds; furthermore, large FMCs are able to recruit and retain the best—and correspondingly most expensive—fund managers. Accordingly, we employ another specification that uses the same first-stage regression as the 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):

$$r_{ift}^{adj} = c + \delta \log(TOT\_SIZE_{it}) + \gamma NMAN_{ft} + \nu_{ift}, \qquad (4)$$

where $TOT\_SIZE_{it} = \sum_{f=1}^{F_i} SIZE_{ift}$ measures the aggregate assets (in a particular asset class) operated by manager i at the end of quarter t across all funds. In Panel B of Table 6, we find statistically significant evidence of economies of scale at the FMC level, since five out of nine coefficients, δ, are positive and significant at the 1% significance level. This suggests that large FMCs do provide better performance. We also find evidence of a positive competition effect among specialists, as the coefficient γ is positive and economically large for each asset class (and is highly significant in the case of UK bonds, where a fund moving from one to two managers experiences an increase in risk-adjusted return of 52 bps per year). However, there is no consistent positive competition effect among multiple managers operating under either multi-asset or balanced mandates, again indicating that skills, even under competition, are only prevalent among specialist managers.

4.3 *The coordination of fund managers: Competition and manager risk*

The appointment of multiple managers can result in significant diversification losses, so the sponsor should optimally reduce the risk budget of each fund manager to achieve the desired overall level of risk, as predicted by the theoretical model of BBK. To explore whether pension fund sponsors adjust the risk of their funds when they increase the number of fund managers employed, 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, *NMAN* (1, 2, 3, or more). We subdivide by fund size, since portfolio return volatility is highly negatively correlated

Table 7 Portfolio variance sorted by number of fund managers and by fund size.

Total portfolio				UK equities			
	Size tercile				Size tercile		
Managers	Small	Medium	Large	Managers	Small	Medium	Large
1	0.471	0.335	0.310	1	0.344	0.270	0.208
2	0.393	0.255	0.224	2	0.318	0.188	0.161
3 or more	0.240	0.221	0.189	3 or more	0.279	0.187	0.127
UK bonds				**International equities**			
	Size tercile				Size tercile		
Managers	Small	Medium	Large	Managers	Small	Medium	Large
1	0.184	0.107	0.119	1	0.853	0.615	0.622
2	0.128	0.133	0.083	2	0.847	0.422	0.379
3 or more	0.441	0.121	0.085	3 or more	1.301	0.514	0.378

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 (small, medium, and large). 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 are annualized before being multiplied by 1000 and are based on the full sample from 1984 to 2004.

with fund size (since smaller funds are generally 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 these nine terciles. Hence, our analysis is based on the following measure of the variance (within an asset class):

$$\overline{\sigma}^2_{SIZE,NMAN} = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{1}{NMAN_t - 1}\sum_{i=1}^{NMAN_t}(r_{it} - \overline{r}_t)^2\right), \tag{5}$$

where $\overline{r}_t$ is the (cross-sectional) average return within a given size/manager tercile, $NMAN_t$ is the number of managers in the same size/manager tercile, and $T = 81$ is the total number of quarters in the dataset.

The results from this exercise are shown in Table 7.[13] They reveal a clear pattern relating fund size, the number of fund managers employed, and the portfolio risk for the overall pension fund sponsor's portfolio. Specifically, the larger the fund, and the greater the number of managers, the lower the dispersion of portfolio returns. The results are strongest for the total portfolio and 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 multiple-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 multiple-managed. For each fund, i, we then 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

Table 8 Return variances for single- and multiple-managed funds.

		Mean of variances of returns	Funds	t-test
Panel A: Full-sample results				
	Single-managed funds	5.54	1473	4.18
	Multiple-managed funds	5.01	655	
Panel B: Sub sample results				
1984–1990	Single-managed funds	8.30	848	0.07
	Multiple-managed funds	8.28	281	
1990–1997	Single-managed funds	2.29	756	3.70
	Multiple-managed funds	2.10	338	
1997–2004	Single-managed funds	5.63	538	4.65
	Multiple-managed funds	5.01	407	

This table presents the average variance of returns for single- and multiple-managed funds for the full sample (1984–2004) as well as for three subsamples. Each quarter, we group funds according to whether they are single- or multiple-managed. Only funds with a minimum of 12 quarterly observations are included in the analysis. Funds that switch from being single-managed to becoming multiple-managed (or vice versa) are categorized as separate funds. Average variances are annualized before being multiplied by 1000.

Table 9 Risk and the number of managers.

		S.D. (α)	$\alpha < -4$	$-4 < \alpha < -2$	$-2 < \alpha < 0$	$0 < \alpha < 2$	$2 < \alpha < 4$	$4 < \alpha$	p-value	I.R.
Panel A. Specialist mandates										
UK equities	Single-managed	4.14	3.78	5.88	27.31	40.76	11.76	10.50	0.0000	0.25
	Multiple-managed	3.33	0.00	0.00	26.92	61.54	7.69	3.85		0.42
UK bonds	Single-managed	1.45	0.67	2.01	17.45	59.73	19.46	0.67	0.3242	0.67
	Multiple-managed	1.31	0.00	0.00	10.53	57.89	26.32	5.26		1.14
Int. equities	Single-managed	6.66	5.14	6.54	16.82	27.10	19.63	24.77	0.0000	0.54
	Multiple-managed	3.46	4.48	1.49	13.43	32.84	23.88	23.88		0.70
Panel B. Multi-asset mandates										
UK equities	Single-managed	1.82	0.75	3.51	33.33	47.87	10.28	4.26	0.0002	0.30
	Multiple-managed	1.31	1.15	4.60	22.99	65.52	5.75	0.00		0.38
UK bonds	Single-managed	1.48	0.28	0.28	19.94	66.10	11.40	1.99	0.0000	0.64
	Multiple-managed	0.93	0.00	0.00	20.00	67.14	12.86	0.00		0.83
Int. equities	Single-managed	3.14	2.61	5.22	19.58	30.55	27.94	14.10	0.0000	0.51
	Multiple-managed	2.10	0.00	1.30	15.58	45.45	25.97	11.69		0.77
Panel C. Balanced mandates										
UK equities	Single-managed	2.57	4.77	11.48	36.32	35.38	8.52	3.54	0.0000	−0.08
	Multiple-managed	1.66	2.93	5.61	47.56	40.24	2.44	1.22		−0.13
UK bonds	Single-managed	1.37	0.37	2.93	24.74	62.96	8.42	0.59	0.0000	0.33
	Multiple-managed	1.04	0.29	0.29	14.29	80.47	4.08	0.58		0.56
Int. equities	Single-managed	4.78	14.83	7.82	19.41	28.71	15.13	14.10	0.0000	0.03
	Multiple-managed	4.07	10.83	9.57	20.91	28.21	19.90	10.58		0.10

This table compares the distribution of annualized alpha estimates for single- and multiple-managed funds. The alphas are obtained using the factor models for each asset class described in Section 4 of this paper. Each column reports the proportion of funds within a given annualized alpha range. S.D. (α) is the standard deviation of the annualized alphas. The penultimate column reports the p-value for a variance test of the null of equal variances against the alternative that the variance of single-managed funds is greater than that for multiple-managed funds. The final column presents the information ratio (I.R.), which is defined as the ratio of alpha to the standard deviation of alpha.

single-managed to becoming multiple-managed (or vice versa) are categorized as separate samples, according to their status during a particular period, in the computation. The average variance measure is:

$$\overline{\sigma}_f^2 = \frac{1}{F_f}\sum_{i=1}^{F_f}\left(\frac{1}{\tau_i - 1}\sum_{t=1}^{\tau_i}(r_{it} - \overline{r}_i)^2\right),$$

where $f \in (SINGLE, MULTI)$ represents the single- or multiple-manager sample and F_f is the number of funds in the corresponding sample. The results are shown in Table 8.[14] Clearly, multiple-managed funds have, on average, a lower volatility than single-managed funds. Moreover, these findings are not just a result of multiple-managed funds becoming more prevalent in the latter part of the sample, since the multiple-managed funds have statistically significantly lower variance than the single-managed funds in two of three sub-samples.

These results suggest that an increasing number of managers being employed by a fund lowers the volatility of the fund's returns. Since multiple managers are more likely to manage different security types, or employ different strategies, sponsors appear to be especially sophisticated in setting reduced risk budgets so that the overall risk is controlled properly. We have already found weak evidence that performance is positively influenced by the number of fund managers. Thus, while we find that the reduced risk budget under decentralized management does indeed lead to a reduction in risk, there is no corresponding decrease in performance because the competition and/or specialization effects from having multiple managers more than compensate. Both effects help reduce the impact of diseconomies of scale which would otherwise tend to worsen performance as funds grow larger.

Fund sponsors also face the risk associated with not knowing the true skill of fund managers. An important question that arises from this is whether hiring multiple managers can help diversify the risk relating to manager alphas. To address this, we estimate the alphas for both single- and multiple-managed funds using the factor specifications for the three asset classes. Table 9[15] provides insights into the distribution of the estimated alphas along with the standard deviations of these alpha estimates across the single- and multiple-managed funds. The results show that hiring multiple managers can reduce alpha risk: there is a clear tendency for alpha estimates to be far more widely dispersed for single-managed funds than for multiple-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.

5 Conclusions

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, via alpha diversification, and from avoiding fund-level diseconomies of scale by employing multiple managers. In short, our findings suggest that the move by UK pension funds from employing a single balanced fund manager to employing multiple fund managers with specialist mandates is due to the following factors. First, specialist managers appear to outperform balanced managers, even after allowing for the higher costs of specialist mandates. Second, pension fund sponsors appear to be sensitive to fund manager performance, and switch to multiple specialist managers in an attempt to improve performance. Third, pension fund sponsors recognize the potential diseconomies of scale that may arise as pension fund assets grow, and employ multiple fund managers to reduce these scale diseconomies. Fourth, pension fund sponsors recognize the coordination difficulties in employing multiple managers and optimally reduce the risk budget of each fund manager to obtain the desired overall level of risk. Fifth, in the presence of unknown fund manager skill, pension fund sponsors employ multiple managers to minimize the risk of employing a poorly performing manager. We interpret these shifts as largely being rational by pension fund sponsors, despite the greater coordination problems and diversification loss associated with increased decentralization.

Our findings carry important implications for both pension fund sponsors and fund managers (and for other institutional investors). Our findings suggest that as a pension fund increases its assets under management, there are different ranges of asset size at which economies and diseconomies of scale set in, at the level of both the pension fund and the investment manager.

When a pension fund is small, it will not be able to afford expensive segregated management and will settle for a standard pooled investment fund with the commensurate level of fees. As the pension fund grows, beyond some asset size, it can afford to employ a segregated balanced investment manager and can begin to negotiate on fees. However, as the pension fund grows even larger, the trading activities associated with its large size will begin to have a negative market impact effect on the core asset classes (equities and bonds) in which it invests, and diseconomies of scale begin to bite. But as the pension fund grows even larger, it can afford to employ specialist managers and diversify into a wider range of alternative specialist asset classes (such as private equity, hedge funds, infrastructure, and commodities) in which economies of scale can again be exploited. Further growth in assets means the pension fund can afford to employ multiple specialist managers in each asset class and hence diversify across manager risk. It can also afford to employ a skilled CIO, employ in-house research and, possibly, in-house investment management which allows it to respond more rapidly to news.

Similarly, when a fund management company is small, it has limited research capabilities and cannot afford to hire the most talented managers. As the FMC grows, it can afford to engage in more sophisticated research and employ better managers—economies of scale can be exploited. But there are diminishing returns to research and successful managers can become a victim of their own success. Most successful managers merely scale up their existing investments as new funds flow in, with inevitable consequences for reduced performance. Ultimately, "size is an anchor to performance", so it is critical to know when the trigger points at which diseconomies of scale begin to bite in both the pension fund and the fund manager. The same will hold for other institutional investors.

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Notes

[1] 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 (or fiduciaries) 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 have a duty to take into account the views of the sponsor. We do not have information on the governance structure of different pension plans (such as information on the trustees). Therefore, for simplicity, we refer to the sponsor or the sponsor's appointed chief investment officer as being the decision-maker, even though, legally, this role is held by the trustees.

[2] March 2004 approximately marks a structural break in pension fund investment behavior in the UK. After this date, defined benefit pension funds were required to match assets and liabilities more effectively to reduce their levy to a new mandatory Pension Protection Fund established by the 2004 Pensions Act. As a result of these more onerous requirements (in addition to other market-related circumstances), most UK private sector defined benefit pension plans closed to new members and employers opened defined contribution pension plans instead.

[3] Taken from Blake *et al.* (2013, Figure I).

[4] Taken from Blake *et al.* (2013, Table IV).

[5] Had sponsors not delayed replacing managers with lagging performance, the cumulative underperformance of the manager who is fired (relative to the new manager) would not have been so large.

[6] CAPS use the total return on the FTSE All-Share Index as the benchmark for UK equities. We take the excess return of this index over the UK Treasury bill rate. SMB_t, HML_t and MOM_t are UK versions of these factors reported in Gregory *et al.* (2013).

[7] 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).

[8] Taken from Blake *et al.* (2013, Table I.A.IV and Table I.A.V.).

[9] Taken from Blake *et al.* (2013, Table I.A.III).

[10] Taken from Blake, *et al.* (2013, Table I.A.XI).

[11] In the regression, the dependent variable is an indicator variable that takes the value unity, if fund f switches from a single manager to multiple managers during quarter t in a particular asset class.

[12] Taken from Blake *et al.* (2013, Table I.A.XII).

[13] Repeated from Blake *et al.* (2013, Table VI, Panel A).

[14] Repeated from Blake *et al.* (2013, Table VI, Panel B).

[15] Repeated from Blake *et al.* (2013, Table VII).

References

Bauer, R., Frehen, R., Lum, H. and Otten, R. (2007). *The Performance of US Pension Funds: New Insights into the Agency Costs Debate*, Limburg Institute of Financial Economics Working Paper.

Beebower, G. L. and Bergstrom, G. L. (1977). "A Performance Analysis of Pension and Profit-Sharing Portfolios: 1966–1975," *Financial Analysts Journal* **33**, 31–42.

Berk, J. B. and Green, R. C. (2004). "Mutual Fund Flows and Performance in Rational Markets," *Journal of Political Economy* **112**, 1269–1295.

Blake, D., Lehmann, B. and Timmermann, A. (1999). "Asset Allocation Dynamics and Pension Fund Performance," *Journal of Business*, **72**, 429–461.

Blake, D. (2003). *Pension Schemes and Pension Funds in the United Kingdom*, Oxford University Press: Oxford.

Blake, D., Rossi, A., Timmermann, A., Tonks, I. and Wermers, R. (2013). "Decentralized Investment Management: Evidence from the Pension Fund Industry," *Journal of Finance* **68**(3), 1133–1178.

Brinson, G. P., Hood, R. and Beebower, G. L. (1986). "Determinants of Portfolio Performance," *Financial Analysts Journal* **42**(4), 39–44.

Carhart, M. (1997). "On Persistence in Mutual Fund Performance," *Journal of Finance* **52**, 57–82.

Chen, J., Hong, H., Huang, M. and Kubik, J. (2004). "Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization," *American Economic Review* **94**, 1276–1302.

Christopherson, J. A., Ferson, W. E. and Glassman, D. A. (1998). "Conditioning Manager Alphas on Economic Information: Another Look at the Persistence of Performance," *Review of Financial Studies* **11**, 111–142.

Coggin, T. D., Fabozzi, F. J. and Rahman, S. (1993). "The Investment Performance of US Equity Pension Fund Managers: An Empirical Investigation," *Journal of Finance* **48**, 1039–1055.

Fama, E. and French, K. (1993). "Common Risk Factors in the Returns on Bonds and Stocks," *Journal of Financial Economics* **33**, 3–53.

Gregory, A., Tharayan, R. and Christidis, A. (2013). "Constructing and Testing Alternative Versions of the Fama–French and Carhart Models in the UK," *Journal of Business Finance & Accounting* **40**(1), 172–214.

Grinblatt, M. and Titman, S. (1994). "A Study of Monthly Mutual Fund Returns and Performance Evaluation Techniques," *Journal of Financial and Quantitative Analysis* **29**, 419–444.

Holmstrom, B. (1982). "Moral Hazard in Teams," *Bell Journal of Economics* **13**(2), 324–340.

Ippolito, R. A. and Turner, J. A. (1987). "Turnover, Fees and Pension Plan Performance," *Financial Analysts Journal* **43**(6), 16–26.

Kapur, S. and Timmermann, A. (2005). "Relative Performance Evaluation Contracts and Asset Market Equilibrium," *Economic Journal* **115**, 1077–1102.

Kosowski, R., Timmermann, A., Wermers, R. and White, H. (2006). "Can Mutual Fund "Stars" Really Pick Stocks? New Evidence from a Bootstrap Analysis," *Journal of Finance* **61**, 2551–2595.

Lakonishok, J. A., Shleifer, A. and Vishny, R. W. (1992). "The Structure and Performance of the Money Management Industry," *Brookings Papers on Economic Activity* 339–391.

Mercer (2006). *Global Investment Management Fee Survey*, Mercer Human Resource Consulting: London.

Mookherjee, D. (1984). "Optimal Incentive Schemes with Many Agents," *Review of Economic Studies* **51**, 433–446.

Sharpe, W. F. (1981). "Decentralized Investment Management," *Journal of Finance* **36**, 217–234.

Shleifer, A. (1985). "A Theory of Yardstick Competition," *RAND Journal of Economics* **16**, 319–327.

Timmermann, A. and Blake, D. (2005). "International Asset Allocation with Time-Varying Investment Opportunities," *Journal of Business* **78**(1 part 2), 71–98.

Treynor, J. and Mazuy, K. (1966). "Can Mutual Funds Outguess the Market?," *Harvard Business Review* **44**, 131–136.

van Binsbergen, J. H., Brandt, M. W. and Koijen, R. S. J. (2008). "Optimal Decentralized Investment Management," *Journal of Finance*, **63**, 1849–1894.

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