Leading the Way? External Lead Managers and Institutional Equity Fund Performance in Korea*

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Abstract

The outsourced CIO system is gaining in popularity among institutional investors, whereby manager selection and monitoring are delegated to external lead managers. Using a unique proprietary dataset on Korean public agency sponsors, we compare the performance of domestic equity fund managers selected directly by the sponsors against those by the delegated lead managers. In contrast to previous studies on intermediated investment management, managers selected by the external lead managers significantly outperform their directly-selected counterparts for most performance measures. Such performance appears to stem from the lead managers' ability to detach themselves from various internal organizational issues inherent within public institutional sponsors.

JEL Classification: G11, G20, G23.

Keywords: Delegated portfolio management, institutional investors, intermediated investment management, outsourced CIO, investment pool.

1. Introduction

"Leadership is the art of getting someone else to do something you want done because he wants to do it." — President Dwight Eisenhower

According to a recent study by Towers Watson (2016), 19 major pension markets in the world account for over $35 trillion in pension assets. With further demand from governments, public and private corporations, and non-profit endowments for purposes unrelated to pension, the market for institutional asset management has become huge and contributed significantly toward the growth of the entire money management industry (Stoughton, Wu and Zechner, 2011). As a result, whether managers act in the interest of institutional clients has become a question of principal importance. It is thus no surprise that the literature on delegated portfolio management provides an extensive discussion over how to design delegation contracts that would alleviate possible agency problems.[1]

However, a vast majority of this literature assumes the relationship between the investor and the manager to be bilateral with a single layer of delegation. Indeed, one major maintained assumption within a dominant majority of the literature is that the investor delegates to the manager for some exogenous reason, and that it constitutes a full, direct transfer of portfolio management. Except for a small number of recent studies (e.g., Stoughton, Wu and Zechner, 2011; Chen, Hong, Jiang and Kubik, 2013), it pays little regard to the fact that multiple layers of delegation may exist between the investor and the manager ultimately in charge of the day-to-day asset management.

[1] Prominent early studies include Bhattacharya and Pfleiderer (1985), Stoughton (1993), Admati and Pfleiderer (1997), and Ou-Yang (2003), while more recent studies on optimal contracting under delegated portfolio management include Li and Tiwari (2009), Dybvig, Farnsworth and Carpenter (2010), Kyle, Ou-Yang and Wei (2011), and He and Xiong (2013). For a theoretical survey of the early literature, refer to Stracca (2006).

Another strand of the literature focuses on the decision to delegate being an endogenous choice in itself. Indeed, whether to engage in in-house management of assets or outsourcing is a long-standing question in the literature on the boundaries of the firm, beginning with a seminal paper by Coase (1937).[2] Yet, even within such literature with rich history, a dominant majority of studies fail to incorporate the possibility that outsourcing to an external agent in the market may involve multiple layers of contracts and delegation.

However, for the institutional clients that lack resources to engage in in-house management of their assets, there are obvious gaps in the academic literature. For them, the practical decisions that they face are often not over *whether* to delegate. Yet, they cannot take the delegation structure as simply given either; they face numerous decisions over the specifics of the structure itself. Should they select managers directly without any external advice? Should they make use of outside investment consultants and advisers for the manager selection process? Should they delegate the decisions altogether to a third party? Unfortunately, the existing studies that assumes the principal-agent setting as given or focuses solely on the choice between in-house vs. outsourced management cannot provide adequate answers.

The gap between the academic and practical worlds has become even wider in recent years as the popularity of outsourced CIO (OCIO) system, whereby an institutional client offers external lead managers discretionary powers in terms of manager selection and monitoring, has increased substantially among pensions and endowments. In fact, total assets managed by OCIO providers on behalf of the institutional clients has surpassed $1.3 trillion according to a report in 2016 by Charles Skorina & Co. Thus, questions above regarding the specifics of the delegation structure have important ramifications for

[2] See Alchian and Demsetz (1972), Williamson (1975), Klein, Crawford and Alchian (1978), Grossman and Hart (1986), Hart and Moore (1990), Holmstrom and Milgrom (1991, 1994), and Holmstrom (1999).

this fast-growing segment of the industry,[3] yet they have attracted relatively little academic interest until now, arguably due to a distinct lack of data availability for the OCIO market in the U.S. and other developed countries.

This paper fills the gap in the literature through an empirical analysis of Korean domestic equity funds that serve public agency institutional clients. We focus on Korean asset management industry as it provides us with an ideal setting to explore performance implications of different delegation structures in terms of manager selection and monitoring. Specifically, we compare the performance of fund managers selected directly by the institutional clients against those selected by external lead managers. While a recent study by Jenkinson, Jones and Martinez (2016) explores the value added of investment consultants and advisors, they focus solely on the advisory functions, and thus ours is the first to consider the performance implications of external managers with full discretion in manager selection. Our rich proprietary dataset allows for a clean test owing to its wide coverage and interesting variations in outsourcing arrangements among Korean public agency sponsors, enabling us to provide insights on the research questions raised earlier.

Public agency sponsors in Korea have two main ways of outsourcing portfolio management for the delegated portions of their assets.[4] A small number of large public agency sponsors select external managers directly through their own internal process. However, others are encouraged by the government join one or both of the two Investment Pools for Public Funds (IPPFs). These options are neither mutually

[3] A related report by the Chief Investment Officer magazine estimates full discretionary OCIO assets have increased by 860% between 2007 and 2015.

[4] In line with the global trend, three large public funds have recently opted for the OCIO system whereby they would delegate the manager selection process to a designated lead manager with fiduciary duties, but as these developments have only materialized from 2015 onward, we do not consider this structural change for the remainder of this paper.

exclusive nor mandatory, and some sponsors utilize both channels.

The design of Korean IPPFs is not dissimilar to the local government investment pool (LGIP) system operated by various U.S. states and municipalities, but with one crucial difference; whereas many LGIPs in the U.S. are either internally managed or maintain a mixture of internal and external management, Korean IPPFs operate strictly on a fund-of-funds basis, with external lead managers prohibited from managing assets directly. Instead, the key role of these lead manager is to select a group of end-level managers that would then engage in day-to-day management of the IPPF assets. As with LGIPs in the U.S., these end-level managers do not directly manage the assets of any one particular public agency sponsor; their mandate is set by the lead manager for their designated portion of the investment pool. The lead manager then earns management fees directly from public agency sponsors, generally in terms of a percentage of the assets under management.

In short, when public agency sponsors in Korea outsource their portfolio management, they can do so by themselves or delegate the outsourcing decision altogether to an external lead manager via IPPF. Drawing upon the terminology of Stoughton, Wu and Zechner (2011), the latter is referred to as an example of "intermediated investment management." As this additional layer of delegation raises more agency problems as well as potential misalignment or conflict of interests, performance implications of such delegation arrangements is expected to be unfavorable for the investors.

Indeed, a growing body of literature on intermediated investment management has consistently found evidence in accordance with this view, both for retail and institutional clients. For retail funds, Bergstresser, Chalmers and Tufano (2009) find that broker-sold mutual funds underperform their direct-sold peers even before the distribution fees are taken into account. Del Guercio and Reuter (2014) engage in a further analysis of direct- and broker-sold funds to find that the well-known underperformance of actively managed funds relative to passive index funds is confined to the broker-sold and not to the direct-

sold segments. Similarly, Chen, Hong, Jiang and Kubik (2013) finds that retail funds managed in-house by fund families post superior performance in comparison with those managed by outsourced sub-advisory firms.

For institutional clients, Andonov, Eichholtz and Kok (2015) find clear evidence of pension plan sponsors suffering from substantial under-performance as the layers of delegation increase, albeit with their research scope limited to real estate. Crucially, the paper most relevant to ours is a recent study on investment consultants for pension plan clients by Jenkinson, Jones and Martinez (2016). They advise clients in various functions, from asset allocation and asset-liability management to manager selection and evaluation.[5] Yet, their recommended funds are found to either underperform or are indistinguishable from their non-recommended counterparts.

Thus, the existing evidence on the performance implications of advisers, brokers and consultants has been almost unanimously unfavorable. In fact, a number of hypotheses have been advanced to explain how the consultants maintain their popularity among institutional clients even in the face of such underperformance. For example, it is argued that resorting to these consultants shifts public scrutiny away from the sponsors' hiring and firing decisions (Goyal and Wahal, 2008). Another plausible reason is the consultants' ability to build trust with clients that "do not know much about finance, are too nervous or anxious to make risky investments on their own (Gennaioli, Shleifer and Vishny, 2015, p. 92)" and change their overall risk preferences.

However, this does not always have to be the case. An additional layer of delegation can still be consistent with superior performance, even in the face of agency problems, if the delegated party possesses

[5] These consultants also offer OCIO services, similar to the role of the lead managers considered in our study. However, manager-level data for the assets managed under the OCIO scheme has hitherto not been utilized, which makes the analysis of our dataset all the more important.

better expertise or if the delegating party has problems of its own. If so, their use can still be optimal—even without resorting to more complex arguments for their popularity advanced so far—as long as external managers deliver on their promises. After all, it is difficult to reconcile the sheer growth of the market for OCIO providers with the overwhelmingly unfavorable evidence of intermediated management hitherto found in the literature.

Using comprehensive fund-level, i.e., end-manager-level, data of Korean domestic equity funds with public institutional clients between 2010 and 2015, we indeed find this to be the case; external managers selected by the IPPFs significantly outperform those selected directly by the public fund sponsors, even after additional management fees charged by the IPPF lead managers are taken into account. Their superior performance is evident across all major performance evaluation measures, including net benchmark-adjusted return, as well as Fama-French (1992) three-factor and Carhart (1997) four-factor alphas. The difference is also significant and plausible in terms of its economic magnitude, with the difference in monthly returns or alphas between 0.2 and 0.4% per month. Our evidence thus suggests external lead managers do indeed deliver on manager selection skills.

Crucially, our data is free of survivorship bias and has excellent coverage; it spans all manager-level equity funds selected by the two IPPFs in operation as well as all but one major public agency sponsors who select external managers directly. Moreover, our results seem unlikely to be driven by various alternative hypotheses. First, we consider the possibility that the external funds selected by the IPPF lead managers may be different in their inherent characteristics to those selected directly by the sponsors. Thus, we engage in propensity score matching (PSM), assigning for every IPPF-selected fund a directly-selected fund similar in characteristics. We find that, in most cases, PSM actually increases both economic and statistical significance of performance differential between the two. Further robustness checks using different matching procedures render our results unchanged.

Second, the result is not driven by the self-selection of capable public agency sponsors forming an "alliance" through the IPPFs. If anything, the establishment of the IPPF system had the primary aim of enhancing the performance of small, poor-performing funds. While large funds with long history of asset management were left largely to their own discretion, small funds were actively encouraged to join. Thus, if there is to be any selection bias, the direction of the bias would actually run contrary to our main finding.

Third, it may be argued that this result is driven purely by the economies of scale arising from joining a large investment pool and not through the use of external lead managers. Once again, this seems unlikely to be the answer, because the net assets of the two IPPFs are broadly comparable to those of public agency sponsors within our sample that select external managers directly. If anything, net assets under management of some of the latter funds are larger. Thus, comparing IPPFs to public agency sponsor sponsors is a fair comparison at least in terms of overall fund size.

To the best of our knowledge, our study is the first to document tangible performance benefits of the use of financial intermediaries in manager selection process for institutional investors. Even when we broaden our attention to the larger literature on retail mutual funds, only one recent study by Cici, Kempf and Sorhage (2017) find real benefits of such intermediaries, and even here, broker-sold funds deliver more returns primarily because they provide better tax management advice. In this respect, our study is the first to offer evidence on direct performance-driven benefits of utilizing external lead manager in the manager selection process.

We also attempt to provide possible explanations for this performance differential. The anecdotal evidence suggests the use of external lead managers alleviates the internal organizational issues within public agency sponsors. Employees in public agency sponsors face strong incentive to engage in short-termism due to frequent shifting of posts. For many, portfolio management does not form a main part of their career, and they thus have a clear objective to avoid an "accident" during their short tenure. This also

encourages internal sponsors to select managers that are easier to justify to the trustee committee, i.e., those with favorable observable characteristics.

We find evidence that supports this conjecture in our sample; for example, managers selected by the sponsors are more likely to be from large asset management firms and stay close to the benchmark. This is not a problem confined to Korean sponsors; Del Guercio and Tkac (2002) similarly document a strong preference among U.S. pension plan sponsors for funds that stay close to the designated benchmark as they are easier to justify to the trustee committee ex post. Given that these sponsors serve many stakeholders and thus attract intense public scrutiny, such problems are inevitable to an extent and difficult to address merely through internal efforts.

In contrast, employees in the lead management firm tend to have a longer job tenure, with a clear focus on portfolio management as their main job description. The firm itself also has a much longer evaluation horizon compared to the sponsors; external lead managers are evaluated over four-year period in Korea, compared to high-pressured annual evaluation that most large public agency sponsors must undergo. Moreover, as the lead managers are not directly answerable to trustee committee on a day-to-day level, they enjoy greater flexibility to chase alpha over a longer horizon by choosing managers with more desirable "soft" characteristics. The fact that these firms have invariably better access to manager- and market-related information due to the economies of scale arising from their pre-established systems and databases serving retail and other clients also hand them an advantage in terms of information acquisition, allowing them to allocate more money to active management and outperform, consistent with the predictions of Garleanu and Pedersen (2016).

In this respect, our result needs not be viewed as running counter to the findings of Jenkinson, Jones and Martinez (2016). While major investment consultants do exert substantial influence over their fund recommendations, it is still the case that the decisions are ultimately made by the plan sponsors as long as

the role of these consultants is limited to advisory functions.[6] If so, even though following their advice somewhat eases outside scrutiny, corporate treasurer making the manager selection decisions ultimately remains exposed to the same evaluation pressures. Only by engaging in a full transfer of control, responsibility, and accountability for the decisions can the chronic agency issues within institutional sponsors be addressed, i.e., by creating yet another layer of delegation, a surprising finding given the prevailing view on the intermediated investment management.

The rest of this paper is organized as follows. In Section 2, we outline the background on how public agency sponsors in Korea outsource their asset management. We then explain our data as well as research methodology in Section 3. In Section 4, we present our main results and perform basic robustness checks for PSM procedure. In Section 5, we engage in further empirical analyses to rule out various alternative hypotheses and discuss where the superior performance of IPPF funds is likely to have emanated from. Section 6 concludes the paper.

2. Background: Portfolio Management Among Korean Public Agency Sponsors

There are around 65 public agency sponsors in Korea, which are either pension funds or trust funds of various public agencies with diverse purposes such as radioactive waste management, industrial accident insurance, and credit guarantees for small to medium enterprises. Among them, National Pension Fund (NPS) is by far the largest, with reserves amounting to over $450 billion. However, due to its disproportionate size and influence within the Korean market, NPS is excluded from the sample in our paper. The Korean government also classifies any fund with reserves over KRW 1 trillion ($850 million)

[6] By limiting their analysis to funds *recommended* by the investment consultants, Jenkinson, Jones and Martinez (2016) do not answer how these consultants perform in their OCIO roles.

as a large fund, and among them, there are six with reserves over KRW 5 trillion ($4.2 billion). Five out of these funds, with assets under management between $4.5 billion and $27 billion, have outsourced a significant proportion of their reserves to equity investment, all with internal manager selection procedure (until the second half of 2015).[7] Two of them further engage in in-house management for the remaining portion of their equity investment.

A large number of smaller public agency sponsors, however, have little internal resources for equity investment. Moreover, even when outsourcing, these funds often find it challenging to engage in manager selection by themselves. To enhance performance, the government introduced the IPPF system in 2001, with a fund-of-funds structure that enables a multi-manager investment on these sponsors' behalf. At its inception, there was only one lead manager in charge of the entire pool, but since 2013, one additional lead manager has been selected, with the original lead manager operating around three-quarters of the assets and the other the remaining quarter. Whereas IPPF started with under $2 billion in assets, this number has significantly grown, and by the end of 2016, the two lead managers' combined assets are valued at $18 billion. Therefore, the size of investment pools is broadly comparable to the five large funds that engage in direct selection of equity fund managers during our sample period. Other than these five funds, virtually no public agency sponsor engages in equity investment outside of IPPF, particularly in the face of increased public scrutiny.

Both lead managers are major asset management firms in Korea. This is not dissimilar to arrangements in the U.S.; according to a report by the Pensions & Investments newspaper in 2015, the top 10 OCIO providers consists of six asset management firms and four investment consultant firms. Unlike investment consultants, however, asset management firms also have managers of their own. Thus, to minimize

[7] The remaining sixth fund invests only in bonds and is thus excluded from our analysis.

potential conflicts of interest, lead managers are outright prohibited from selecting any of their in-house fund managers for the purpose of IPPF management.

FIGURE 1 HERE

Each lead manager offers a number of funds-of-funds for various asset classes (money market fund, government bond, long-duration fixed income, active equity etc.), as outlined in Figure 1. IPPF-participating public agency sponsors then invest in these funds-of-funds according to their own asset allocation plan. In certain cases, a public agency sponsor may demand specific additional restrictions on investment in a particular asset class, making it difficult for their assets to be pooled together with others'. In this instance, the lead manager may create specific fund-of-funds tailored to its individual needs.

Each fund-of-funds consists of multiple end-level fund managers selected solely at the discretion of the lead manager, who is also in charge of all fiduciary duties including the design of end-level managers' benchmarks, mandates, policies, and fee structure, as well as ex post monitoring and performance evaluation. At the time of writing, each lead manager enters into a four-year contract with the government and has a longer evaluation horizon than the five large funds in our sample, each of whom has to be subject to a thorough annual evaluation by the Ministry of Strategy and Finance along with possible additional due diligence checks in case of poor performance.[8]

While investment pools and OCIO provisions are also common in the U.S., with the market for OCIO providers rapidly growing both in assets and client numbers, analysis on this segment of the industry has not been forthcoming. It is even more difficult to compare the performance of these managers against those selected directly by the sponsors. In contrast, we obtain manager-level data for both IPPFs as well

[8] The Korean government maintains all public agency sponsor with assets larger than KRW 1 trillion ($ 850 million) to be evaluated on a yearly basis, whereas smaller funds may be evaluated over a two-year horizon.

as all major sponsors engaging in straightforward outsourcing of equity investment (except for the NPS). Our dataset thus allows for a clean analysis. Furthermore, with the size of the IPPFs broadly comparable to those of the large funds engaging in direct manager selection, our comparison of delegation structure between IPPF-participating and non-participating sponsors is reasonably free of potentially concerns regarding the economies of scale. Thus, our data offers a unique testing bed to explore the performance implications of different outsourcing arrangements.

3. Data and Methodology

3.1. Data

3.1.1. Data Construction

We analyze the performance of equity funds selected directly by public agency sponsors or IPPF lead managers between 2011 and 2015, with data at monthly frequency. The data is proprietary, obtained directly from the public agency sponsors and IPPFs.[9] It spans all funds selected by either the public agency sponsor (which we refer to as non-IPPF funds hereafter) or lead manager (IPPF funds) with at least one day in operation between 2010 and 2015. The rigor of the dataset has been checked meticulously by the staff at respective institutions and it is completely free of survivorship bias. As the fund holdings data has to be maintained and checked straight from the inception, it is also free of any backfill bias. The dataset contains details on each manager-level fund's returns, net assets, net flows, benchmarks, fees, and other pertinent information. Among these, we limit our focus to actively managed funds given the scope of our

[9] We thank the Korean Ministry of Strategy and Finance as well as the public agency sponsors and IPPF lead managers for providing access to this data.

research question. Between January 2010 and December 2015, there are 67 IPPF funds (totaling 1,437 fund-month observations) and 195 non-IPPF funds (4,189 fund-month observations).

However, to estimate multi-factor models or tracking error without inducing look ahead bias, we utilize the previous twelve months of a fund's data to compute the factor loadings and standard deviation.[10] Thus, the data for 2010 is used solely for this purpose. We further exclude any fund with net assets under KRW 1 billion (or $0.85 million). Our final sample therefore consists of 37 IPPF funds (totaling 694 fund-month observations) and 117 non-IPPF funds (2,183 fund-month observations) in operation between January 2011 and December 2015. While this number may seem small in comparison to the U.S. fund market, applying similar screens to active equity retail mutual funds in Korea for the same period leaves only around 600 funds. Thus, the data coverage is not small compared to the size of the Korean mutual fund industry as a whole. More information is provided in Panel A of Table 1.

TABLE 1 HERE

For the purpose of multi-factor analysis, market return is defined as the monthly return on KOSPI index. However, since the Korean market for government bonds is not as mature and liquid as the U.S. Treasuries market, it has been a common practice for studies on the Korean equity market to use the interest rate on the 91-day certificates of deposit (CD) released by the Bank of Korea as the risk-free rate, to which we adhere. Factor returns are calculated analogous to Fama and French (1992) or Carhart (1997).

We also obtain the data on total net assets under management of all asset management firms to whom the end-level managers in our sample belong, provided by the Korea Financial Investment Association.

[10] As a robustness check, we employ an alternative window for the purpose of factor loading calculation, namely an increasing window up to previous 36 months with 12 months as a minimum, as in Hou, Karolyi and Kho (2011). In untabulated analysis, we confirm that results remain qualitatively unchanged.

Both public and private placement funds are used for the calculation of net assets. Panel B of Table 1 provide summary statistics on the number of funds and asset management firms in our sample for each year, distinguishing between IPPF and non-IPPF funds.

Unlike retail funds, however, most funds in our sample do not publish their stated styles in their mandate. Thus, we define their styles ex post in the following manner. For each calendar year, we estimate each fund's average SMB and HML loadings using the Fama-French three-factor model.[11] Then, we sort these funds on their average SMB loading to produce two equal subsamples, "big" and "small." We also sort on their average HML loading, with the top 30% and the bottom 30% of our sample classified as "growth" and "value," while the remaining 40% as "neutral." Under this classification, a fund would belong to one of $2\times3 = 6$ styles for any given year.

3.1.2. Performance Measures and Controls

We use eight performance measures in our empirical analysis: (i) excess return over benchmark, (ii) excess return over the risk-free rate, (iii) CAPM alpha, (iv) three-factor alpha, (v) four-factor alpha, (vi) tracking error, (vii) Sharpe ratio, and (viii) information ratio.

Fund alphas are constructed in the standard manner. For each month t, we calculate the factor exposures of each fund using the previous 12-month window leading up to month $t-1$. Then, at t, multiplying factor exposure estimates with realized factor returns produces the realized normal return. This allows us to calculate the realized abnormal returns for each month, i.e., fund alphas. For each fund i, this is succinctly summarized in the equations below:

[11] We require a minimum of four factor loading estimates in a calendar year for a fund to be included in style sorting.

$$\alpha_{i,t}^{CAPM} = r_{i,t} - \hat{\beta}_{MKT,i,t-1} MKT_t \quad (1)$$

$$\alpha_{i,t}^{FF3} = r_{i,t} - \hat{\beta}_{MKT,i,t-1} MKT_t - \hat{\beta}_{SMB,i,t-1} SMB_t - \hat{\beta}_{HML,i,t-1} HML_t \quad (2)$$

$$\alpha_{i,t}^{Carhart} = r_{i,t} - \hat{\beta}_{MKT,i,t-1} MKT_{i,t} - \hat{\beta}_{SMB,i,t-1} SMB_{i,t} - \hat{\beta}_{HML,i,t-1} HML_{i,t} - \hat{\beta}_{UMD,i,t-1} UMD_t \quad (3)$$

As a measure of how actively a fund is managed, its tracking error, namely the standard deviation of a fund's excess returns over benchmark over the previous 12-month window, is computed each month. Using this, we also calculate the information ratio, namely the ratio of excess return over benchmark and tracking error. Sharpe ratio is calculated analogously.

Other control variables are as follows. Fund size is defined as the log of a fund's total net asset for a given month. Similarly, management firm size is the log of the asset management firm's total net asset under management to whom the end-level fund manager belongs. Expense ratio of a fund is its total fee divided by the total net asset value of the fund. We also have information on the net fund flow for each month, used as a control in some of our subsequent analysis. Detailed definition of each of these variables and performance measures are available in Panel A of Table 1.

3.2. Estimation Methodology

In addition to a simple comparison of various performance measures between IPPF and non-IPPF funds, we engage in propensity score matching (PSM) to control for the possibility that the fund managers selected directly by the public agency sponsors and those by the IPPF lead managers are inherently different in their characteristics. This is likely to be the case if the end-objectives of the public agency sponsors not participating in the IPPF are different from IPPF participants, or if they hold different

preferences regarding particular styles or other fund characteristics (such as fund tenure or size).

For the PSM estimation, we use the following two-stage procedure. In the first stage, we use the logit model to estimate the possibility of a given fund at the end-manager level being selected by the IPPF lead manager each month.[12] In other words, treatment group consists of IPPF funds and control group is non-IPPF funds. The following control variables are used for the first stage logit estimation: fund size, management firm size, fund flow, expense ratio, and Fama-French three-factor loadings estimated up to the previous month-end. In the second stage, we use propensity scores estimated from logit estimation to match each IPPF fund with the closest non-IPPF fund. For the baseline analysis, we use the one-to-one nearest neighbor matching based on propensity score without caliper length restriction. However, as the results are often sensitive to the selection of the matching procedure, we engage in robustness checks using caliper length restriction, one-to-three matching, and Gaussian kernel matching.[13]

4. Main Result

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics, both for the full sample as well as separately for the subsamples of IPPF and non-IPPF funds. It is immediately apparent that managers selected by the IPPF lead managers exhibit substantially superior performance—both gross and net of fees—in comparison with those selected directly by the sponsors, with the difference statistically significant at the 1% level in all but one performance measure. In particular, the estimated mean differences in fund alphas are very

[12] Exact matching on calendar month is imposed to prevent an IPPF fund-month being matched to a non-IPPF fund in different calendar month.

[13] Results using local linear matching are similar to Gaussian kernel matching and thus not reported.

similar in magnitude regardless of factor model at around 0.25% per month. A similar pattern emerges for the risk-adjusted performance measures such as Sharpe ratio and information ratio, although the latter has a larger magnitude.

TABLE 2 HERE

There are other noteworthy differences between IPPF and non-IPPF funds. Managers selected by the IPPF lead managers have larger tracking error, with the difference from non-IPPF counterparts significant at the 1% level, in line with Del Guercio and Tkac (2002). Given that IPPF funds post higher information ratio than their non-IPPF counterparts, it appears this "closet indexer" behavior of the non-IPPF funds has negative consequences on fund performance. IPPF funds are also smaller in size, with the average size of IPPF funds at around USD 14 million and non-IPPF funds at around USD 23.5 million. Along with the superior performance of IPPF funds, this is broadly in line with the existing evidence of diseconomies of scale in fund management (e.g., Berk and Green, 2004; Blake, Rossi, Timmermann, Tonks and Wermers, 2013). IPPF lead managers are also more likely to select funds from a smaller asset management firm; this indicates the sponsors' preferences toward managers from large, established asset management firm, given their direct accountability to trustee committees. Interestingly, despite an additional layer of delegation, IPPF funds have marginally lower expense ratio, even after the lead managers' fees are taken into account. IPPF and non-IPPF funds also appear to have significantly different three- and four-factor exposures, implying some difference in their preferred styles.

In Table A.1 in the Appendix, we also report the Pearson correlation matrix for our variables of interest. One notable feature is that a fund's realized volatility over the past 12 months has negative correlations with most performance measures, a finding in concurrence with Jordan and Riley (2015), while a fund's previous-12-month return has positive correlations with these measures, which suggests some persistence in fund performance.

Above all, descriptive statistics presented above indicate that there are substantial differences in size, activeness, expenses, styles, and other fund characteristics between IPPF and non-IPPF funds. Thus, a simple comparison of the performance measures would not suffice in uncovering the effect of the use of external lead managers in manager selection given the inherent differences in various fund characteristics between the two subsamples. Thus, for the remainder of the empirical analysis, we compare the performance of IPPF funds to matched non-IPPF funds identified through a range of propensity score matching procedures.

4.2. Propensity Score Matching: Main Result

In Table 3, we present the first-stage result of our PSM analysis, namely the logit regression that estimates the probability of a fund being selected by the IPPF lead manager. Unreported results indicate that probit regressions lead to similar results.

TABLE 3 HERE

IPPF lead managers are more likely to select small-sized funds with low management fees and a manager from a smaller asset management firm. Moreover, funds selected by IPPF lead managers have more positive exposure to the *SMB* factor, indicating that these funds tend to invest more in smaller stocks on average.

We then engage in one-to-one and one-to-three nearest neighbor matching without caliper length restriction. Panel A of Table 4 reports the results for one-to-one matching, while Panel B does so for one-to-three matching. In untabulated analysis, we confirm that, when one-to-one matching is used, the differences-in-mean between IPPF and matched non-IPPF funds for all but one control (fund size) turns insignificant, suggesting that the matching procedure mostly manages to take into account of inherent

differences in fund characteristics. For one-to-three matching, differences-in-mean between IPPF and matched non-IPPF funds remain significant for a majority of controls. This is not surprising given the difficulties associated with finding three close controls for every IPPF fund-month observation in a relatively small sample.

TABLE 4 HERE

In any case, however, both panels in Table 4 indicate that the performance differential between IPPF and non-IPPF funds remain robust even after accounting for the inherent differences in fund characteristics. In Panel A, point estimates for the differences-in-mean between IPPF and non-IPPF funds for all performance measures, both gross and net of management fees, remain broadly similar to those without matching in Table 2. Mean difference in excess return over benchmark continues to be around 0.35% per month, while fund alphas are between 0.2 and 0.3% per month and remain significant at the 1% level, with more prominent statistical significance in a majority of cases. The fact that the alphas of IPPF funds are always significantly higher regardless of the factor model used suggests that the performance differential appears not to be market- or style-driven.

When one-to-three matching is employed in Panel B, qualitative results remain unchanged, both in terms of economic and statistical significance. Once again, the differences in the performance of IPPF and matched non-IPPF funds remain significantly positive at the 1% level for all but one case (which is significant at the 5% level). Despite the fact that one-to-three matching without caliper length restriction often results in a "bad match," i.e., an IPPF fund being matched to a non-IPPF fund with a large difference in fund characteristics, the differences in performance measures between IPPF and non-IPPF funds remain highly robust, with little change in point estimates and statistical significance.

We pool together the IPPF and matched non-IPPF funds and engage in regression analysis, with various performance measures as dependent variable. This further controls for the effect of fund characteristics

on performance. Our main variable of interest is the IPPF dummy that takes value of 1 if and only if a fund was selected by the IPPF lead manager and 0 if it is a matched non-IPPF fund. Controls are the same as those used in the first-stage matching procedure plus each fund's realized volatility estimated over the previous 12-month window.[14] Whenever the four-factor alpha is the dependent variable, we use the funds' four-factor exposures instead of Fama-French three-factor exposures as controls. We use heteroscedasticity- and autocorrelation-consistent standard errors of Newey and West (1987). Table 5 presents our results.

TABLE 5 HERE

Across all five performance measures, the IPPF dummy turns out to be significantly positive at the 1% level except for one case where significance is obtained at the 5% level, highlighting the positive performance implications of the use of lead managers. In addition to the IPPF dummy, fund size has a positive contribution toward performance within our IPPF and matched non-IPPF sample. This does not necessarily contradict our earlier discussion on diseconomies of scale; rather, it may be that the large non-IPPF funds suffering most from these problems have simply been dropped during the matching procedure. Furthermore, as in Jordan and Riley (2015), we document a negative relationship between past fund volatility and fund performance.

4.3. Propensity Score Matching: Robustness

One of the inherent problems in PSM is that results are often sensitive to the matching procedure. Given that our baseline case of one-to-one nearest neighbor matching fails to eliminate the inherent differences

[14] In an untabulated analysis, we also include the fund's realized volatility as an additional control for the first stage matching. It has little explanatory power at the first stage and our qualitative results for the performance differential remain unchanged.

in fund size between IPPF and non-IPPF funds, it is worth asking whether some "bad matches" may be driving the performance differential between the two.

As a result, we employ two alternative matching techniques. First, to ensure that the matched non-IPPF fund is reasonably close to the IPPF counterpart in terms of observed characteristics, we impose caliper length restrictions. We impose two cut-offs, namely 0.1 and 0.25 pooled standard deviations of propensity score. The lower the cut-off point, the more stringent the requirement for a "close match." Table 6 re-estimates Panel A of Table 4 for these two cases.[15]

TABLE 6 HERE

In both instances, the point estimates for the differences-in-mean are similar to those obtained in Table 4, with excess return over benchmark between 0.3 and 0.4% per month and alphas between 0.2 and 0.3% per month depending on the factor model. Once again, these estimates are statistically significant at the 1% level in all but one case (significant at the 5% level). Crucially, imposing a stricter restriction, i.e., 0.1 pooled standard deviations, actually increases the point estimates for the mean differences, which makes it less likely that our results are by-products of the differences in inherent fund-level characteristics between IPPF and non-IPPF funds.

Using the caliper length restriction at 0.25 pooled standard deviations, we also engage in one-to-three matching and re-estimate the regression results in Table 5.[16] Table 7 presents our results.

TABLE 7 HERE

Once again, the IPPF dummy turns out to be statistically significant across all performance measures: for a majority of cases, the estimates are significantly positive at the 1% level, and the remaining few are

[15] In untabulated analysis, we confirm that the post-matching difference in control variables between IPPF and matched non-IPPF funds become markedly less prominent once caliper length restrictions are placed.

[16] We confirm the regression results for the case of caliper length restriction at 0.1 pooled standard deviation remain qualitatively unchanged.

always significant at the 10% level. The signs and significance of other control variables such as fund size and past realized volatility are also in line with Table 5.

Instead of nearest neighbor matching, we also consider whether our results remain robust when Gaussian kernel method is imposed. Table 8 presents our results when the bandwidth is set at 0.05. Once again, both the economic and statistical significance of various performance measures remain identical to the cases with nearest neighbor matching in Tables 4 or 6. In unreported analysis, we confirm that the results remain unchanged for bandwidths of 0.01 and 0.1 respectively.[17] Thus, the positive performance implications of IPPF lead managers appear to be extremely robust to various changes in the matching technique.

TABLE 8 HERE

5. Discussion

5.1. Fund Performance by Size, Style, and Activeness

In order to explore the performance characteristics of IPPF and non-IPPF funds in more detail, we engage in further portfolio analyses. First, using the fund size, i.e., assets under management, at each month-end for the entire sample, we assign each find into one of four quartile portfolios based on fund size.[18] We then compare the performance of these size-based portfolios in Table 9.

TABLE 9 HERE

For IPPF funds, an inverse U-shaped pattern emerges for most performance measures; whereas the

[17] Given that Gaussian kernel matching involves constructing a hypothetical match, i.e., a weighted-average of every non-IPPF fund available, for each IPPF fund, regression analysis cannot be performed.

[18] As IPPF and non-IPPF fund subsamples differ in their composition of funds by various characteristics, imposing the same portfolio break-point for both subsamples mean that neither subsamples end up with equal-sized portfolios.

smallest quartile posts weakest performance, the third quartile performs the best when we look at the excess return over benchmark or fund alphas. However, for Sharpe ratio or information ratio, the largest quartile performs the best, closely followed by the third quartile. Thus, overall, it appears that funds with large assets under management fare better within our subsample of IPPF funds. Among non-IPPF funds, we also observe a weak improvement in performance as size increases, with the performance differential between the largest and smallest quartile portfolios statistically significant in most instances. However, their economic magnitudes are not as sizeable as in IPPF funds. As a result, superior performance of IPPF funds relative to non-IPPF ones stems primarily from large-sized ones; Panel C reveals that the statistical significance of performance differential between IPPF and non-IPPF funds are the strongest for the top two quartiles of fund size, with the third quartile exhibiting the strongest statistical significance across various performance measures. A possible interpretation is that the lead managers are better at monitoring and handling potential diseconomies that arises in larger funds, thereby enhancing its performance.

TABLE 10 HERE

In Table 10, we repeat the analysis above for monthly-rebalanced 2×3 portfolios sorted on the size and book-to-market exposures of each fund estimated every month using the returns for the previous 12 months. The median value of the *SMB* at each month-end is the cut-off, and the sorting for value exposure is based on each fund's estimated *HML* using the standard definition: top 30%, middle 40%, and bottom 30%. For IPPF funds, strong performance is observed especially among funds in large-value, small-neutral, and small-value portfolios. For non-IPPF funds, a different picture emerges; while growth-oriented funds are able to match the performance of IPPF funds, fund performance is much weaker among those that exhibit strong exposure to value premium. When we compare the portfolio performance in Panel C, small-neutral portfolio yields the strongest performance difference between IPPF and non-IPPF portfolios in terms of statistical significance, with small-value and large-value portfolios also exhibiting

statistical significance in performance differential for a number of measures. The evidence here suggests that managers selected by IPPF lead managers are better at handling small- and value-oriented funds, arguably requiring more attention and monitoring compared to attention-grabbing large-cap growth stocks.

TABLE 11 HERE

Lastly, in Table 11, we repeat the analysis in Table 9, but this time with monthly portfolio sorting based on the fund's tracking error estimated over the previous 12 months. Once again, we form quartile portfolios from the most passive to the most active. For both IPPF and non-IPPF funds, a clear U-shaped pattern is observed, with superior performance of portfolios with either the smallest or largest tracking errors. However, when we compare the relative performance of the two groups by tracking error in Panel C, strong performance of IPPF funds relative to non-IPPF funds seem to primarily emanate from top two quartiles, i.e., funds with large tracking errors.

Thus, overall, IPPF funds fare better than their non-IPPF counterparts when the funds require more careful selection and management, namely: (i) large-sized funds potentially subject to various diseconomies of scale, (ii) small- and value-oriented funds, and (iii) actively-managed funds with large tracking errors. In other words, although the use of lead managers means an additional layer of delegation, our evidence is consistent with a positive value added particularly in areas where superior understanding of and expertise in portfolio management matter more.

5.2. Alternative Explanations

A number of alternative explanations may be posited to account for the performance differential between IPPF and non-IPPF funds. While we have addressed some in the introduction, such as the similar size of IPPFs and direct-selected public agency sponsors being comparable, we discuss the plausibility of the

remaining issues in this section.

First, the superior performance may be attributable to unique characteristics of a particular lead manager. In a small market, an asset management firm may develop a "monopolistic" position and hoard employees with superior talent. However, no asset management firm enjoys such position in Korea. Moreover, the two IPPF lead managers within our sample exhibit substantial heterogeneity; one has a more established presence within the OCIO market but having short overall firm history, and the other a relative newcomer but with a much longer firm history. In untabulated analysis, we separately analyze their respective performance; we find that both lead managers exhibit superior performance over the sponsors with statistical significance for almost all performance measures.[19] Given that the market for OCIO managers in the U.S. is also dominated by a handful of large firms such as Russell Investments, SEI and Towers Watson, we do not believe the small number of lead managers in our sample to be a major issue.

Second, among the five major non-participating sponsors, two opt for a mixture of in-house and delegated management while the other three delegate the entirety of their equity asset management. If so, it is possible that the two public agency sponsors with in-house management team may decide to hold onto more profitable opportunities within their in-house portfolios and delegate challenging "lemons" to external managers. Thus, we repeat the baseline PSM analysis in Table 12, but this time for two separate subsamples. First, we match the IPPF funds with non-IPPF funds selected by public agency sponsors with in-house management. Then, we repeat the same matching procedure against a subsample of non-IPPF funds selected by those without an in-house team.

TABLE 12 HERE

In Panel A, we find that the superior performance of IPPF funds largely disappear against non-IPPF funds selected by sponsors with in-house management. While the information ratio of IPPF funds is

[19] While we do not publish the results directly given their sensitive nature, they are available upon request.

significantly higher at the 1% level, non-IPPF funds outperform at the 5% level when we focus on the excess return over risk-free rate. On the other hand, the outperformance of IPPFs is more apparent when compared to public agency sponsors not engaging in-house management, as Panel B reveals, with substantially increased economic magnitudes; the mean difference in excess return over benchmark rises to around 0.5% per month, while the estimated mean difference in fund alphas are at around 0.35% per month.

The main reason for this is that the two sponsors with in-house management teams delegate actively-managed portions to external managers and engage in passive management in-house. In other words, whether a particular investment is a "lemon" is not a factor for consideration. Instead, the evidence found in Table 12 can be accounted for by the fact that sponsors with more experience and expertise—sufficient to manage an in-house team—are able to match the performance of IPPF lead managers; in contrast, the positive performance implications of these lead managers are more evident for sponsors with limited expertise in portfolio management.

Third, given the rapid growth of the IPPFs over the past decade, it may be argued that the influx of new assets into these funds may create additional demand for Korean equity assets, buoying the equity market prices and culminating in superior performance. While this cannot be categorically ruled out, we are skeptical of this hypothesis. First, even though the two IPPFs have grown in size, their presence in the Korean equity market amounts to around less than 0.1% of the total market capitalization. Thus, the inflows into the IPPFs alone are capable of generating excess returns or alphas of similar magnitudes to what we have witnessed throughout this paper. In addition, for most regression specifications, fund flow has very little influence on performance. Put together, it is unlikely that the superior performance of IPPFs are merely a by-product of increased demand created by an accumulation of pension and other public-purpose assets.

Fourth, as Berk and van Binsbergen (2015) point out, the return measure used throughout our empirical analysis may be inadequate, particularly given that the IPPF funds tend to be smaller in size; as they argue, a "manager who adds a gross alpha of 1% on a $10 billion fund adds more value than a manager who adds a gross alpha of 10% on a $1 million fund (p. 2)." Given the optimization problem of managers, it may be that return measures used in Section 4 are overstating the value added of end-level managers selected by IPPF lead managers. To address this issue, in Table 13, we estimate the value added of managers, either in terms of excess value added over benchmark or factor benchmark returns (CAPM, three- or four-factor models), both for our baseline PSM as well as PSM with caliper length restrictions. We find that our result holds intact regardless of whether manager skill is measured in terms of returns or value added. Depending on the matching specifications, IPPF funds add around 80 to 120 million won (roughly around $70,000 to $100,000 at the time of writing) on average every month in terms of value added in excess of benchmark compared to their non-IPPF peers, a plausible figure of significant economic magnitude once annualized. The reason for this is that, for most measures, IPPF funds post positive performance while the reverse is true of non-IPPF funds. Since non-IPPF funds tend to be larger in fund size, measuring performance in terms of value added attaches even more importance to the negative performance of non-IPPF funds.

TABLE 13 HERE

5.3. Managerial Implications: Where Does Performance Come From?

While our empirical results so far indicate superior performance of managers selected by the lead managers, one question remains unanswered: how does the shift in organizational structure from direct manager selection to external delegation help sponsors enhance performance? To answer this, we engage in a more qualitatively-minded approach, holding extended interviews and surveys of relevant parties. The interviewees provide a consistent picture of diverse challenges that the sponsors face in manager selection,

and how the changes in organizational structure brought upon by the use of external lead managers help address these issues.

First, portfolio management, in many instances, is not the primary function for many sponsors in our sample. Moreover, given the need to satisfy a diverse group of stakeholders, the goals of these sponsors are multi-faceted, often resulting in a wide-reaching organizational structure with a large number of divisions and wide-ranging job descriptions. Crucially, to enhance the procedural justice perceived by their employees over assignments to lucrative posts, these funds invariably engage in frequent job rotations. As a result, our survey finds that those in charge of portfolio management at non-participating sponsors have a median of 7.0 years of career in finance and related fields, noticeably less than the corresponding figure of 10.3 years for their counterparts in the IPPF lead management firms. Under this environment, employees within these sponsors find it difficult to develop their expertise or adopt a long-term view; instead, their primary concern is to avoid blame during their short tenure. This also gives rise to short-termism; instead of evaluating whether the managers have stayed true to their stated strategy and engage in a proper Bayesian updating, there are obvious incentives to fire underperforming managers at the earliest available opportunity. While both the IPPF and non-IPPF sponsors post high attrition rates, extensive interviews reveal that, whereas the IPPF lead managers are reluctant to fire managers as long as they stay true to their initial investment policy, non-IPPF sponsors are more willing to fire managers on the basis of more direct performance measures.

Second, the sponsors' desire to avoid public criticism also raises a number of issues. To avoid any perception of conflicts of interest, manager selection is often carried out by non-standing ad-hoc committees consisting mainly of impartial academics. Such arrangement, however, inhibits long-term organizational learning and systematic approach to manager selection, not to mention that useful signals about manager quality shared among the practitioners may not be accessible.

Third, another related issue is over-reliance on firm reputation during manager selection. The descriptive statistics in our sample have already shown that non-IPPF funds tend to select managers from larger, more established asset management firms than IPPF funds. This is not a coincidence, as the observable characteristics of management firms—not the managers themselves—such as the firm size and history are often given significant weight in manager selection criteria. Once again, this stems from the sponsors' desire to choose managers from reliable firms with proven record as their selection is easier to justify to the committee. In a similar vein, sponsors place more weight on other "hard" observable information, often overlooking "soft" qualitative factors. Not unlike the mortgage market in the U.S. prior to the recent crisis (e.g., Rajan, Seru and Vig, 2015), there is a greater emphasis on the quantifiable measures such as qualifications and certificates.

In theory, if a public agency sponsor can address these questions through an appropriate change in its internal structure and incentives, resorting to the use of external lead managers may not be necessary. In reality, it is more difficult. Close public scrutiny over its day-to-day management, along with the need to maintain internal employee relations, makes it difficult for the fund to engage in a complete overhaul of the aforementioned arrangements. If so, delegating the selection and monitoring process to an external body, while increasing the layers of delegation within the overall structure, can be a viable solution.

First, job rotations within lead management firms are much less frequent, with a clear focus on portfolio management. Given a clear objective and longer tenure, employees can adopt a long-term perspective in manager selection, alleviating many of the problems arising from short-term, ad-hoc nature of the selection process. The fact that lead management firms themselves are evaluated on a much longer four-year horizon in Korea further helps counter short-termism.

Second, employees can make use of the firms' existing infrastructure in analyzing quantitative and qualitative characteristics of potential managers. If so, they can utilize both "hard" and "soft" information,

allowing them to discern manager ability with more accuracy.[20] Such infrastructure also helps employees deal with mundane, bureaucratic issues in a more standardized manner, allowing them to concentrate more on their core functions. This also allows IPPF lead managers to react to various market situations and operating issues in a more timely and immediate manner. While public agency sponsors may also establish such a system in theory, costs often far outweigh benefits. In this respect, lead management firm holds inherent scale economies from having already established the requisite infrastructure to serve its existing clients.

6. Conclusion

In contrast to the existing literature on intermediated investment management that invariably find negative performance implications of additional layers of delegation in portfolio management, we document superior performance of equity managers selected by the IPPF external lead managers compared to those selected directly by the public agency sponsors within the context of Korean asset management industry for institutional clients. Both the economic and statistical significance of such performance differential remain strong after controlling for inherent fund characteristics through PSM, and the results are robust to a wide range of checks and additional analysis intended to rule out various alternative explanations. In particular, the performance differential of managers selected by external lead managers and by sponsors themselves is particularly evident in funds that require more attention and monitoring, such as large-sized funds or funds with large tracking errors.

We contend that our results are different from those that examine the performance implications of

[20] In Table A.2. in the Appendix, we present a comparison of a representative IPPF-participating public agency sponsor's manager selection criteria before its participation in the IPPF (with the criteria drafted by the sponsor itself) and those employed by the IPPF lead manager following its participation.

investment advisers and consultants, because the full transfer of control for manager selection and monitoring to OCIO lead managers is the key ingredient that alleviates internal organizational problems inherent within institutional sponsors. In other words, when the internal structure itself is susceptible to short-termism and over-cautiousness in the face of public scrutiny and criticism, taking the portfolio management decisions away from one's own hands through an additional layer of delegation can be performance-enhancing. If so, delegating to an external lead manager with a clear focus on portfolio management and a long-term perspective may be a "second best" approach to performance enhancement for sponsors with practical difficulties in overhauling internal issues. In this respect, the explosive growth of the market for OCIOs in recent years needs not be viewed as a conundrum; when one's hands are tied, it may make sense for others to lead the way.

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Figure 1. Delegation structure of Korean IPPFs

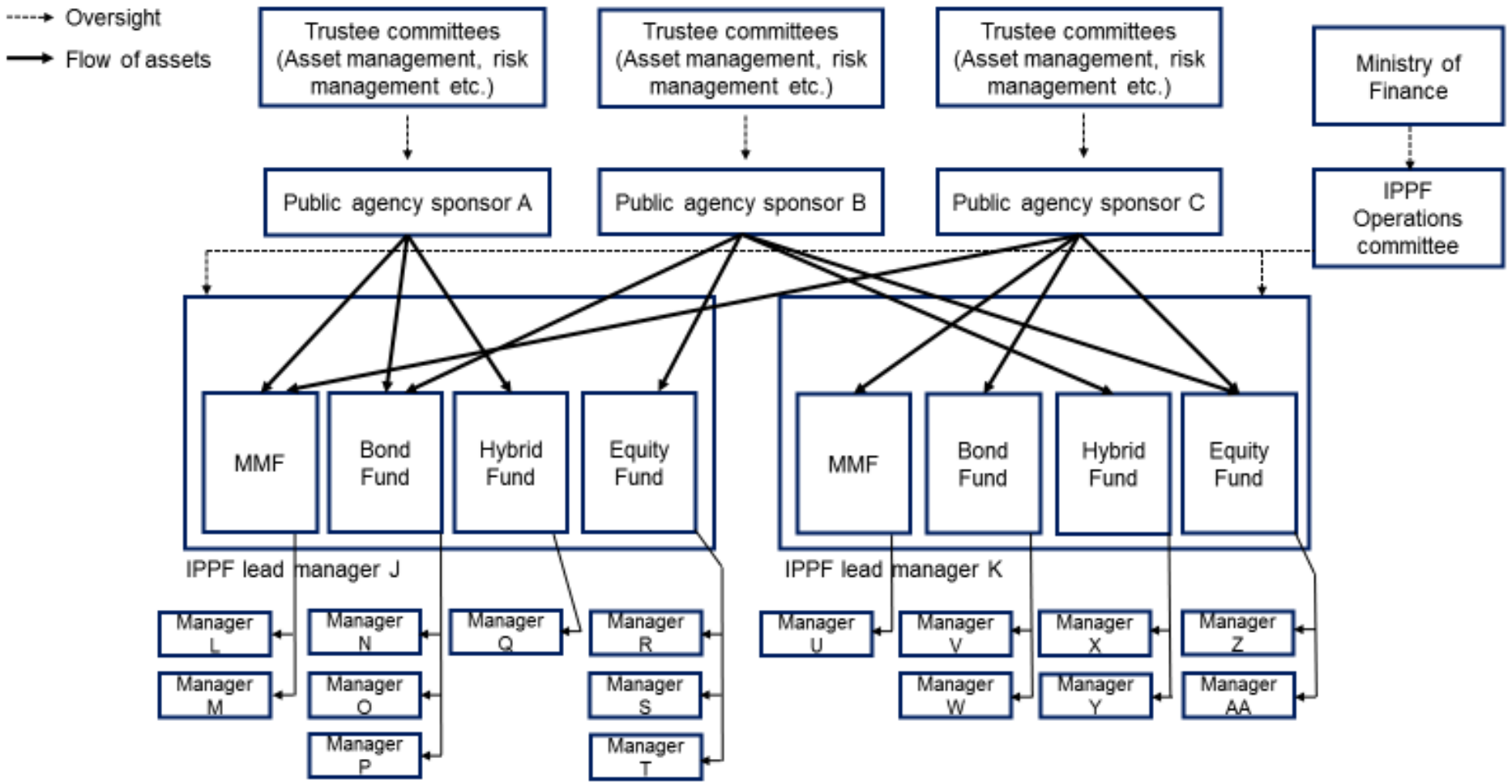

Table 1. Basic Information about the Sample

Panel A of this table reports the number of fund-month observations comprising our sample. Panel B of this table then reports the number of funds and asset management firms comprising our IPPF and non-IPPF funds. Because we impose exact matching on calendar month, the number of fund-month observations for the IPPF funds is smaller when one-to-three matching is employed, as it is not possible to find 3 matches for some IPPF fund-month observations.

Panel A. Number of Observations

	IPPFs	Non-IPPFs	Total
Initial Sample	1437	4189	5626
(Number of Funds)	(67)	(195)	(262)
Final Full Sample	694	2183	2877
(Number of Funds)	(37)	(117)	(154)
1:1 Matched Sample	694	694	1388
(Number of Funds)	(37)	(89)	(126)
1:3 Matched Sample	563	1689	2252
(Number of Funds)	(36)	(110)	(147)

Panel B. Number of Funds and Management Firms Used by Calendar Year

	Total		Average	
No. of Funds	IPPFs (Total)	Non-IPPFs (Total)	IPPFs (Mean)	Non-IPPFs (Mean)
2011	19	46	19.0	15.3
2012	23	48	23.0	16.0
2013	23	59	11.5	19.7
2014	33	100	16.5	25.0
2015	38	129	19.0	32.3
No. of Management Firms Used	IPPFs (Total)	Non-IPPFs (Total)	IPPFs (Mean)	Non-IPPFs (Mean)
2011	8	18	8.0	8.7
2012	12	19	12.0	9.7
2013	13	23	7.5	12.0
2014	12	27	9.0	14.0
2015	13	25	9.5	14.3

Table 2. Variable Definition and Descriptive Statistics

Panel A of this table provides a detailed definition of each variable. Unless otherwise stated, all variables are constructed using the data provided by the public agency sponsors and IPPF lead management firms. Panel B then provides descriptive statistics separately for IPPF and non-IPPF funds as well as the subsample difference-in-mean and the corresponding t-statistics. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. Variable Definition

Variable	Details	Source(s)
Excess return over benchmark (Excess BM)	Monthly fund return net of its benchmark return, either net or gross of management fees.	Proprietary dataset
Excess return over the risk-free rate (Excess RF)	Monthly fund return net of the risk-free rate, with the latter defined as the return on 91-day certificate of deposits (CD).	Proprietary dataset, Bank of Korea
CAPM_Alpha	Monthly fund alpha, defined as a calendar month's abnormal return estimated using the CAPM model using the previous 12 months' return data, with the market return defined as the return on KOSPI 200 index.	Proprietary dataset, FnGuide
FF3_Alpha	Monthly fund alpha estimated using the Fama-French (1992) three-factor model computed in the analogous manner to CAPM alpha.	Proprietary dataset, FnGuide
Carhart_Alpha	Monthly fund alpha estimated using the Carhart (1997) four-factor model computed in the analogous manner to CAPM alpha.	Proprietary dataset, FnGuide
Tracking error (TRACKING ERROR)	A fund's tracking error, with each month's tracking error defined as the standard deviation of its excess return over benchmark for the past 12 months	Proprietary dataset
Sharpe Ratio (SR)	A fund's Sharpe Ratio, defined as its average pre-12-month monthly excess return over the risk-free rate over its standard deviation in the previous 12-month window	Proprietary dataset, FnGuide
Information Ratio (IR)	A fund's Information Ratio, defined its average pre-12-month monthly excess return over benchmark over its standard deviation in the previous 12-month window	Proprietary dataset
Previous 1-year volatility (1YR_VOL)	A fund's previous 1-year volatility at each month, defined as the standard deviation of its monthly returns over the previous 12-month window	Proprietary dataset
Previous 1-year return (1YR_RET)	A fund's previous 1-year return.	Proprietary dataset
Fund size	Log of a fund's total net asset at each month-end	Proprietary dataset
FF3_MKT	A fund's exposure to the market factor using the three-factor model, updated each month using the previous 12 months' data	FnGuide
FF3_SMB	A fund's exposure to the size factor using the three-factor model, computed analogously	FnGuide
FF3_HML	A fund's exposure to the book-to-market factor using the three-factor model, computed analogously	FnGuide
Carhart_MKT	A fund's exposure to the market factor using the four-factor model	FnGuide
Carhart_SMB	A fund's exposure to the size factor using the four-factor model	FnGuide
Carhart_HML	A fund's exposure to the book-to-market factor using the four-factor model	FnGuide
Carhart_UMD	A fund's exposure to the momentum factor using the four-factor model	FnGuide
Management firm size	Log of the total net asset under management of the fund manager's asset management firm	Korea Financial Investment Association
Expense Ratio (ER)	A fund's total expenses divided by its total net asset	Proprietary dataset
Fund Flow	Fund flow at each month, calculated in the identical manner to Sirri and Tufano (1998)	Proprietary dataset

Panel B. Descriptive Statistics

Variable	IPPF						Non-IPPF						Difference-in-Mean (IPPF – Non-IPPF)	
	Min	Median	Mean	Max	St. Dev.	No. of obs.	Min	Median	Mean	Max	St. Dev.	No. of obs.	Difference	*t*-statistic
Excess BM (Net of Fees)	-4.852	0.184	0.218	6.553	1.758	694	-8.620	-0.081	-0.137	5.930	1.480	2182	0.355***	4.804
Excess BM (Gross of Fees)	-4.834	0.203	0.237	6.571	1.758	694	-8.560	-0.063	-0.116	5.967	1.479	2182	0.352***	4.772
Excess RF	-15.015	-0.022	-0.192	10.109	3.723	694	-15.231	-0.138	-0.360	12.021	3.686	2182	0.167	1.033
CAPM_Alpha	-3.568	0.097	0.115	5.091	1.285	694	-7.502	-0.120	-0.106	8.822	1.493	2182	0.221***	3.789
FF3_Alpha	-3.644	0.030	0.051	5.138	1.150	694	-7.947	-0.123	-0.179	9.073	1.432	2182	0.230***	4.308
Carhart_Alpha	-4.041	0.005	0.023	4.805	0.974	694	-6.804	-0.151	-0.250	7.238	1.197	2182	0.273***	6.066
Tracking Error	0.463	1.387	1.465	2.899	0.516	694	0.097	1.250	1.346	5.009	0.625	2182	0.119***	5.030
Sharpe Ratio	-0.476	0.045	0.093	0.872	0.228	694	-0.602	-0.010	0.010	0.862	0.227	2182	0.082***	8.272
Information Ratio	-0.989	0.201	0.215	1.044	0.338	694	-0.917	0.000	-0.006	0.916	0.275	2182	0.221***	15.626
1YR_VOL	1.556	3.095	3.524	7.496	1.424	694	0.578	3.113	3.614	7.462	1.456	2182	-0.089	-1.431
1YR_RET	-19.899	3.863	5.629	43.526	11.166	694	-24.874	1.280	3.094	47.519	12.005	2182	2.536***	5.115
Fund Size	21.132	23.806	23.552	25.485	1.034	694	22.264	24.202	24.063	26.403	0.862	2182	-0.511***	-11.784
FF3_MKT	0.341	0.920	0.895	1.230	0.162	694	-0.222	0.931	0.905	1.238	0.171	2182	-0.010	-1.423
FF3_SMB	-0.376	0.025	0.035	0.493	0.108	694	-0.479	0.007	0.021	1.086	0.162	2182	0.013**	2.478
FF3_HML	-0.799	0.046	0.044	0.777	0.196	694	-1.143	0.057	0.060	1.555	0.206	2182	-0.017*	-1.916
Carhart_MKT	0.436	0.953	0.924	1.278	0.158	694	0.001	0.943	0.929	1.406	0.166	2182	-0.005	-0.688
Carhart_SMB	-0.491	-0.027	-0.029	0.324	0.119	694	-0.699	-0.025	-0.014	0.621	0.142	2182	-0.015***	-2.669
Carhart_HML	-0.715	0.011	0.019	0.704	0.195	694	-1.010	0.034	0.037	1.578	0.200	2182	-0.018**	-2.126
Carhart_UMD	-0.233	0.124	0.127	0.585	0.135	694	-0.391	0.096	0.130	1.147	0.186	2182	-0.003	-0.518
Management Firm Size	26.995	31.585	31.596	34.253	1.232	694	25.820	31.632	31.797	35.585	1.713	2182	-0.201***	-3.385
Expense Ratio	0.127	0.220	0.223	0.887	0.041	694	0.004	0.205	0.247	0.506	0.126	2182	-0.024***	-7.726
Fund Flow	-92.505	-0.013	2.247	670.100	36.320	694	-54.066	-0.017	0.718	185.968	10.747	2182	1.529	1.094

Table 3. Logit Regression for Propensity Score Matching

This table reports the results of the first-stage logit regression for the purpose of propensity score matching (PSM). The dependent variable is a binary indicator that takes the value of 1 if the fund is selected by one of the IPPF lead managers and 0 otherwise. In addition to the controls, exact matching is imposed for each calendar month. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

	Coefficient	*z*-value
Intercept	23.588***	12.325
Fund Size	-0.774***	-13.289
Management Firm Size	-0.158***	-4.425
Fund_Flow	0.004*	1.720
Exp Ratio	-3.024***	-6.305
FF3_MKT	-0.530	-1.632
FF3_SMB	1.858***	5.046
FF3_HML	-0.580**	-2.150
Time Fixed Effect	YES	
Pseudo-R^2	0.099	

Table 4. Baseline PSM Results (Nearest Matching, No Caliper Restriction)

This table presents the results of tests of difference between IPPF funds and matched non-IPPF funds, with one-to-one and one-to-three matching performed using the nearest neighbor method without any caliper restriction. Difference-in-mean and difference-in-median tests (Wilcoxon-Mann-Whitney rank signed tests) are performed. All returns and volatility estimates are in percent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. One-to-One Matching

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	0.218	0.184	694	-0.138	-0.080	694	0.356***	4.834	0.265***	4.212
Excess BM(Gross)	0.237	0.203	694	-0.119	-0.055	694	0.355***	4.829	0.258***	4.208
Excess RF	-0.192	-0.022	694	-0.389	-0.153	694	0.197***	2.844	0.131***	2.634
CAPM_Alpha	0.115	0.097	694	-0.096	-0.122	694	0.210***	3.325	0.218***	3.222
FF3_Alpha	0.051	0.030	694	-0.206	-0.176	694	0.257***	4.693	0.206***	4.885
Carhart_Alpha	0.023	0.005	694	-0.269	-0.171	694	0.292***	5.885	0.175***	5.672
Tracking error	1.465	1.387	694	1.393	1.327	694	0.072**	2.520	0.059***	2.627
Sharpe ratio	0.093	0.045	694	0.009	-0.017	694	0.083***	10.848	0.062***	9.643
Information ratio	0.215	0.201	694	-0.033	-0.035	694	0.248***	16.915	0.236***	14.302

Panel B. One-to-Three Matching

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	0.143	0.146	563	-0.161	-0.134	1689	0.304***	4.488	0.280***	4.196
Excess BM(Gross)	0.161	0.165	563	-0.141	-0.119	1689	0.302***	4.458	0.284***	4.157
Excess RF	-0.065	0.023	563	-0.234	-0.175	1689	0.169***	2.932	0.198**	2.181
CAPM_Alpha	0.069	0.030	563	-0.107	-0.136	1689	0.176***	3.230	0.166***	2.742
FF3_Alpha	-0.011	-0.031	563	-0.189	-0.197	1689	0.178***	3.717	0.166***	3.477
Carhart_Alpha	-0.020	-0.039	563	-0.255	-0.208	1689	0.234***	5.508	0.169***	5.146
Tracking error	1.472	1.398	563	1.370	1.312	1689	0.102***	4.134	0.086***	3.173
Sharpe ratio	0.081	0.032	563	0.008	-0.017	1689	0.074***	10.375	0.049***	7.402
Information ratio	0.203	0.192	563	-0.008	0.000	1689	0.211***	14.464	0.192***	12.249

Table 5. Baseline Matched Sample Regression

This tables reports the regression of various performance measures on the IPPF dummy and other fund characteristics, for IPPF fund-month and matched non-IPPF fund-month observations identified through the two procedures in Table 4. All standard errors in parentheses are adjusted by Newey-West (1987) heteroscedasticity- and autocorrelation-consistent standard errors with three lags. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

	One-to-One Matched Sample					One-to-Three Matched Sample				
	Dependent Variable					Dependent Variable				
	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha
Intercept	-0.258	-7.416***	-1.489	-1.254	-3.242**	1.258	-6.459***	-0.877	-0.266	-1.298
	[1.614]	[1.643]	[1.512]	[1.392]	[1.348]	[1.147]	[1.297]	[1.144]	[1.032]	[0.856]
IPPF	0.343***	0.196***	0.218***	0.253***	0.280***	0.252***	0.144**	0.158***	0.196***	0.251***
	[0.074]	[0.068]	[0.064]	[0.058]	[0.054]	[0.073]	[0.065]	[0.060]	[0.053]	[0.047]
Management Firm Size	-0.005	0.020	0.001	-0.022	-0.020	-0.014	0.000	-0.004	-0.034*	-0.030*
	[0.033]	[0.034]	[0.032]	[0.030]	[0.028]	[0.021]	[0.023]	[0.022]	[0.020]	[0.017]
Fund Size	0.052	0.071*	0.069**	0.093***	0.148***	0.010	0.057*	0.062**	0.073***	0.094***
	[0.040]	[0.038]	[0.035]	[0.034]	[0.031]	[0.033]	[0.033]	[0.030]	[0.027]	[0.022]
Exp Ratio	0.192	0.599	0.304	0.315	0.517	-0.001	0.481*	0.268	0.317	0.467**
	[0.542]	[0.568]	[0.517]	[0.451]	[0.425]	[0.257]	[0.280]	[0.248]	[0.229]	[0.213]
Lagged fund flow	0.000	0.000	0.000	0.001	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
1YR_VOL	-0.463***	-0.431***	-0.288**	-0.168	0.009	-0.457***	-0.428***	-0.390***	-0.220**	-0.049
	[0.159]	[0.157]	[0.128]	[0.116]	[0.110]	[0.097]	[0.133]	[0.098]	[0.089]	[0.074]
FF3_MKT	1.103**	0.802*	0.707	0.031		1.111***	0.948**	0.983***	0.269	
	[0.480]	[0.466]	[0.435]	[0.362]		[0.273]	[0.377]	[0.321]	[0.285]	
FF3_SMB	1.623***	2.098***	1.563***	-0.245		0.705**	1.027***	0.791***	-1.124***	
	[0.412]	[0.407]	[0.372]	[0.322]		[0.288]	[0.337]	[0.305]	[0.243]	
FF3_HML	-0.004	-0.228	-0.200	-0.173		-0.167	-0.592***	-0.493**	-0.703***	
	[0.308]	[0.296]	[0.281]	[0.232]		[0.216]	[0.220]	[0.211]	[0.189]	
Carhart_MKT					-0.371					-0.320
					[0.343]					[0.252]
Carhart_SMB					-0.865***					-0.923***
					[0.326]					[0.227]
Carhart_HML					-0.163					-0.594***
					[0.221]					[0.181]
Carhart_UMD					-0.757***					-1.123***
					[0.265]					[0.161]
Time Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R^2	0.421	0.893	0.340	0.367	0.309	0.32	0.875	0.312	0.342	0.302
No. of Obs.	1388	1388	1388	1388	1388	2252	2252	2252	2252	2252

Table 6. PSM Robustness Check (Caliper Restriction)

This table presents the results of tests of difference between IPPF funds and matched non-IPPF funds, with one-to-one matching using the nearest neighbor method but also with a caliper restriction, either at (i) 0.25 pooled standard deviations or (ii) 0.1 pooled standard deviations of the propensity scores. Difference-in-mean and difference-in-median tests (Wilcoxon-Mann-Whitney rank signed tests) are performed. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. Caliper Restriction at 0.25 Pooled Standard Deviations

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	0.207	0.170	554	-0.110	-0.082	554	0.317***	3.770	0.252***	3.955
Excess BM(Gross)	0.226	0.191	554	-0.091	-0.061	554	0.317***	3.774	0.252***	3.963
Excess RF	-0.155	-0.118	554	-0.347	-0.288	554	0.192**	2.479	0.170**	2.437
CAPM_Alpha	0.108	0.097	554	-0.094	-0.115	554	0.202***	2.823	0.212***	3.079
FF3_Alpha	0.049	0.022	554	-0.184	-0.180	554	0.234***	3.474	0.202***	3.797
Carhart_Alpha	0.033	0.025	554	-0.241	-0.163	554	0.275***	4.744	0.188***	4.496
Tracking error	1.517	1.455	554	1.339	1.235	554	0.179***	5.589	0.221***	5.836
Sharpe ratio	0.117	0.066	554	0.013	-0.013	554	0.104***	12.863	0.078***	11.098
Information ratio	0.266	0.265	554	-0.028	-0.013	554	0.295***	18.079	0.278***	14.742

Panel B. Caliper Restriction at 0.1 Pooled Standard Deviations

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statisitc	Difference	*z*-score
Excess BM(Net)	0.217	0.194	477	-0.160	-0.113	477	0.377***	4.310	0.307***	3.996
Excess BM(Gross)	0.236	0.212	477	-0.141	-0.099	477	0.377***	4.310	0.311***	3.990
Excess RF	-0.179	-0.075	477	-0.445	-0.291	477	0.265***	3.262	0.216***	2.958
CAPM_Alpha	0.126	0.116	477	-0.131	-0.121	477	0.257***	3.438	0.238***	3.270
FF3_Alpha	0.052	0.012	477	-0.202	-0.186	477	0.254***	3.609	0.197***	3.505
Carhart_Alpha	0.073	0.072	477	-0.230	-0.172	477	0.304***	5.067	0.244***	4.700
Tracking error	1.541	1.469	477	1.345	1.230	477	0.196***	5.609	0.239***	5.709
Sharpe ratio	0.111	0.066	477	0.004	-0.008	477	0.107***	11.543	0.073***	10.047
Information ratio	0.273	0.269	477	-0.017	-0.022	477	0.290***	16.304	0.291***	13.394

Table 7. Matched Sample Regression (With Caliper Restriction at 0.25 Pooled Standard Deviations)

This tables reports the regression of various performance measures on the IPPF dummy and other fund characteristics, for IPPF fund-month and matched non-IPPF fund-month observations identified through one-to-one and one-to-three nearest neighbor matching, but with caliper restriction at 0.25 pooled standard deviations. All standard errors in parentheses are adjusted by Newey-West (1987) heteroscedasticity- and autocorrelation-consistent standard errors with three lags. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

	One-to-One Matched Sample					One-to-Three Matched Sample				
	Dependent Variable					Dependent Variable				
	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha
Intercept	-2.540	-10.028***	-4.032*	-2.024	-3.637**	0.466	-6.495***	-0.818	-0.632	-0.793
	[2.174]	[2.233]	[2.069]	[2.024]	[1.765]	[2.237]	[2.490]	[2.226]	[2.011]	[1.749]
IPPF	0.294***	0.162**	0.178**	0.231***	0.248***	0.346***	0.147*	0.174**	0.263***	0.268***
	[0.081]	[0.074]	[0.070]	[0.064]	[0.058]	[0.092]	[0.085]	[0.080]	[0.073]	[0.064]
Management Firm Size	-0.012	0.004	-0.013	-0.043	-0.048*	-0.022	-0.015	-0.032	-0.065**	-0.055**
	[0.035]	[0.036]	[0.034]	[0.033]	[0.029]	[0.032]	[0.035]	[0.032]	[0.028]	[0.025]
Fund Size	0.158**	0.195***	0.197***	0.148***	0.187***	0.015	0.044	0.062	0.079	0.074
	[0.066]	[0.064]	[0.059]	[0.054]	[0.048]	[0.065]	[0.068]	[0.062]	[0.058]	[0.051]
Exp Ratio	-0.315	0.454	0.238	0.203	0.609	0.731	0.916*	0.718	0.667	0.583
	[0.774]	[0.766]	[0.684]	[0.619]	[0.602]	[0.487]	[0.531]	[0.487]	[0.469]	[0.419]
Lagged fund flow	-0.001	0.000	0.000	0.000	-0.001	-0.001	0.000	0.000	0.000	0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
1YR_VOL	-0.118	-0.182	-0.179	-0.014	0.229*	-0.345**	-0.287*	-0.253*	0.066	0.019
	[0.130]	[0.258]	[0.217]	[0.217]	[0.124]	[0.139]	[0.171]	[0.144]	[0.127]	[0.098]
FF3_MKT	-0.499	-0.221	0.099	-0.550		1.082**	0.603	0.895**	-0.160	
	[0.466]	[0.860]	[0.699]	[0.706]		[0.423]	[0.509]	[0.429]	[0.399]	
FF3_SMB	0.768	1.006**	0.603	-0.919**		0.259	0.590	0.264	-1.783***	
	[0.476]	[0.485]	[0.451]	[0.435]		[0.385]	[0.420]	[0.416]	[0.368]	
FF3_HML	-0.124	-0.202	0.009	-0.119		0.027	-0.591*	-0.394	-0.583**	
	[0.355]	[0.361]	[0.331]	[0.290]		[0.252]	[0.318]	[0.312]	[0.295]	
Carhart_MKT					-1.083***					-0.129
					[0.388]					[0.347]
Carhart_SMB					-1.200***					-1.984***
					[0.389]					[0.367]
Carhart_HML					-0.191					-0.384
					[0.225]					[0.297]
Carhart_UMD					-0.690**					-1.098***
					[0.289]					[0.245]
Time Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R^2	0.409	0.887	0.331	0.37	0.319	0.312	0.866	0.291	0.337	0.305
No. of Obs.	1108	1108	1108	1108	1108	1228	1228	1228	1228	1228

Table 8. PSM Robustness Check (Gaussian Kernel Method)

This table presents the results of tests of difference between IPPF funds and matched non-IPPF funds, with Gaussian kernel method at bandwidth 0.05. Unreported analyses confirm that using bandwidths 0.01 and 0.1 lead to similar results. Difference-in-mean and difference-in-median tests (Wilcoxon-Mann-Whitney rank signed tests) are performed. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

	Difference (IPPF – non-IPPF)			
	Mean		Median	
Variable	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	0.300***	4.864	0.231***	4.955
Excess BM(Gross)	0.299***	4.849	0.237***	4.941
Excess RF	0.156***	2.990	0.287***	2.685
CAPM_Alpha	0.177***	3.715	0.114***	3.763
FF3_Alpha	0.227***	5.405	0.165***	5.596
Carhart_Alpha	0.272***	7.430	0.207***	7.112
Tracking error	0.086***	4.217	0.010***	3.192
Sharpe ratio	0.082***	13.260	0.055***	10.691
Information ratio	0.244***	18.939	0.224***	15.674

Table 9. Portfolio Approach (By Fund Size)

This table yields the results of portfolio analysis based on fund size. At each month-end, we sort our full sample of funds into four quartile portfolios based on fund size and form equal-weighted or value-weighted portfolios (using each fund's month-end net assets as the weight) separately for the IPPF and non-IPPF funds, i.e., portfolio rebalancing occurs at each calendar month-end. Panel A reports our results for the IPPFs, Panel B for the non-IPPFs, and Panel C for the IPPF – non-IPPF difference. Newey-West (1987) heteroscedasticity- and autocorrelation-consistent standard errors with three lags are used. *t*-statistics are in the parentheses. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. IPPFs

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Fund Size (Equal-weighted)	Small	0.004	-0.320	-0.080	-0.082	-0.163	1.235	0.021	0.003	22.105
	Q2	0.178	-0.163	0.045	-0.020	-0.085	1.384	0.109	0.057	23.493
	Q3	0.411	0.082	0.370	0.315	0.264	1.398	0.259	0.121	24.046
	Big	0.274	-0.046	0.165	0.093	0.068	1.481	0.317	0.155	24.623
	Big-small difference	0.270**	0.275**	0.245**	0.175*	0.230**	0.247***	0.296***	0.152***	2.518***
	t-statistic	[2.207]	[2.222]	[2.050]	[1.693]	[2.483]	[5.986]	[12.572]	[11.052]	[35.228]
Fund Size (Value-weighted)	Small	0.001	-0.321	-0.077	-0.082	-0.171	1.257	0.013	-0.001	22.230
	Q2	0.153	-0.174	0.042	-0.023	-0.093	1.383	0.115	0.058	23.548
	Q3	0.428	0.098	0.385	0.333	0.278	1.409	0.264	0.125	24.065
	Big	0.308	-0.014	0.198	0.122	0.095	1.494	0.329	0.163	24.660
	Big-small difference	0.307**	0.307**	0.275**	0.203*	0.267***	0.237***	0.315***	0.163***	2.430***
	t-statistic	[2.413]	[2.362]	[2.209]	[1.894]	[2.794]	[5.643]	[12.216]	[10.352]	[31.091]

Panel B. Non-IPPFs

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Fund Size (Equal-weighted)	Small	-0.138	-0.412	-0.157	-0.196	-0.282	1.250	-0.052	-0.012	23.201
	Q2	-0.029	-0.296	-0.061	-0.119	-0.215	1.316	0.075	0.044	23.822
	Q3	-0.148	-0.375	-0.105	-0.262	-0.376	1.433	-0.037	0.017	24.318
	Big	-0.036	-0.226	0.009	-0.026	-0.108	1.301	0.044	0.045	25.158
	Big-small difference	0.101	0.186**	0.166**	0.169**	0.175***	0.051**	0.096***	0.057***	1.957***
	t-statistic	[1.346]	[2.413]	[2.202]	[2.392]	[2.857]	[1.997]	[6.010]	[6.519]	[61.443]
Fund Size (Value-weighted)	Small	-0.125	-0.395	-0.139	-0.188	-0.264	1.255	-0.043	-0.009	23.254
	Q2	-0.056	-0.324	-0.082	-0.154	-0.238	1.299	0.071	0.043	23.865
	Q3	-0.139	-0.362	-0.094	-0.253	-0.374	1.443	-0.037	0.017	24.342
	Big	-0.049	-0.216	0.021	0.018	-0.048	1.227	0.055	0.044	25.425
	Big-small difference	0.075	0.178***	0.160**	0.206***	0.216***	-0.027	0.098***	0.053***	2.171***
	t-statistic	[1.021]	[2.629]	[2.448]	[3.211]	[3.790]	[-1.054]	[5.687]	[7.595]	[57.989]

Table 9. Portfolio Approach (By Fund Size, Continued)

Panel C. IPPF – Non-IPPF Comparison

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Fund Size (Equal-weighted)	Small	0.142	0.092	0.078	0.114	0.120	-0.015	0.073	0.015	-1.095***
		[0.764]	[0.136]	[0.507]	[0.790]	[0.937]	[-0.285]	[1.653]	[0.394]	[-14.381]
	Q2	0.208	0.133	0.106	0.100	0.130	0.067	0.034	0.014	-0.329***
		[0.935]	[0.198]	[0.603]	[0.590]	[0.913]	[0.945]	[0.727]	[0.364]	[-4.561]
	Q3	0.559**	0.457	0.475**	0.577***	0.640***	-0.035	0.295***	0.104***	-0.271***
		[2.541]	[0.652]	[2.583]	[3.294]	[4.417]	[-0.564]	[6.747]	[2.826]	[-5.823]
	Big	0.311	0.181	0.156	0.119	0.175	0.180***	0.273***	0.110***	-0.535***
		[1.459]	[0.272]	[0.927]	[0.731]	[1.369]	[2.819]	[6.416]	[3.079]	[-12.643]
Fund Size (Value-weighted)	Small	0.126	0.073	0.063	0.106	0.092	0.002	0.057	0.008	-1.024***
		[0.659]	[0.108]	[0.394]	[0.707]	[0.699]	[0.034]	[1.328]	[0.223]	[-11.882]
	Q2	0.209	0.150	0.124	0.131	0.145	0.084	0.044	0.015	-0.317***
		[0.911]	[0.221]	[0.692]	[0.759]	[0.999]	[1.209]	[0.961]	[0.402]	[-4.529]
	Q3	0.567**	0.460	0.478**	0.587***	0.652***	-0.034	0.301***	0.108***	-0.277***
		[2.555]	[0.656]	[2.535]	[3.250]	[4.367]	[-0.549]	[6.811]	[2.923]	[-6.140]
	Big	0.357*	0.202	0.178	0.104	0.143	0.267***	0.274***	0.119***	-0.765***
		[1.706]	[0.304]	[1.114]	[0.679]	[1.141]	[4.254]	[6.257]	[3.303]	[-16.475]

Table 10. Portfolio Approach (By Style)

This table yields the results of portfolio analysis based on fund style. At each month-end, we sort our full sample into either (i) big or (ii) small funds depending on its exposure to the Fama-French *SMB* factor, and (i) value, (ii) neutral, and (iii) growth depending on the exposure to the *HML* factor. Then, each fund is sorted into one of $2\times3=6$ style portfolios. Then, we form equal-weighted or value-weighted style portfolios (using each fund's month-end net assets as the weight) separately for the IPPF and non-IPPF funds, i.e., portfolio rebalancing occurs at each calendar month-end. Panel A reports our results for the IPPFs, Panel B for the non-IPPFs, and Panel C for the IPPF – non-IPPF difference. Newey-West (1987) heteroscedasticity- and autocorrelation-consistent standard errors with three lags are used. *t*-statistics are in the parentheses. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. IPPFs

Sorted by	Style	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Style (Equal-weighted)	Big - Growth	-0.037	-0.249	-0.078	-0.004	-0.168	1.278	0.068	0.022	23.543
	Big - Neutral	-0.197	-0.496	-0.240	-0.259	-0.331	1.329	0.067	0.042	23.713
	Big - Value	0.398	-0.101	0.122	0.188	0.205	1.405	0.324	0.067	23.237
	Small - Growth	0.139	-0.067	0.074	-0.020	-0.032	1.462	0.170	0.095	23.565
	Small - Neutral	0.415	0.092	0.315	0.198	0.130	1.484	0.255	0.117	23.832
	Small - Value	0.452	-0.010	0.256	0.043	0.011	1.540	0.305	0.149	23.457
Style (Value-weighted)	Big - Growth	-0.054	-0.261	-0.088	-0.030	-0.188	1.284	0.088	0.027	23.977
	Big - Neutral	-0.178	-0.470	-0.220	-0.235	-0.312	1.328	0.100	0.048	24.057
	Big - Value	0.570	0.071	0.266	0.310	0.322	1.435	0.370	0.106	23.572
	Small - Growth	0.122	-0.082	0.059	-0.057	-0.066	1.522	0.184	0.107	24.071
	Small - Neutral	0.479	0.154	0.367	0.273	0.208	1.552	0.307	0.142	24.257
	Small - Value	0.500	0.023	0.288	0.038	0.010	1.610	0.362	0.177	23.942

Panel B. Non- IPPFs

Sorted by	Style	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Style (Equal-weighted)	Big - Growth	-0.021	-0.238	-0.028	0.143	-0.019	1.143	-0.031	0.000	24.207
	Big - Neutral	-0.130	-0.358	-0.093	-0.065	-0.152	1.067	0.081	0.042	24.014
	Big - Value	-0.214	-0.426	-0.189	-0.209	-0.369	1.632	-0.001	0.005	24.140
	Small - Growth	0.106	-0.210	0.162	0.034	0.057	1.329	0.020	0.088	24.541
	Small - Neutral	-0.056	-0.268	-0.059	-0.204	-0.257	1.203	-0.021	0.008	24.068
	Small - Value	-0.054	-0.279	-0.047	-0.332	-0.391	1.671	0.086	0.078	24.446
Style (Value-weighted)	Big - Growth	-0.024	-0.174	0.035	0.193	0.061	1.049	0.027	0.010	24.926
	Big - Neutral	-0.130	-0.321	-0.058	-0.030	-0.093	1.051	0.096	0.043	24.582
	Big - Value	-0.230	-0.422	-0.186	-0.183	-0.354	1.714	0.010	0.003	24.646
	Small - Growth	0.111	-0.178	0.195	0.053	0.102	1.374	0.039	0.104	24.830
	Small - Neutral	-0.062	-0.262	-0.047	-0.211	-0.258	1.206	-0.014	0.017	24.560
	Small - Value	-0.075	-0.264	-0.022	-0.285	-0.342	1.598	0.103	0.085	24.805

Table 10. Portfolio Approach (By Style, Continued)

Panel C. IPPF – Non-IPPF Comparison

Sorted by	Style	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Style (Equal-weighted)	Big - Growth	-0.017	-0.011	-0.050	-0.147	-0.148	0.134*	0.099*	0.022	-0.664***
		[-0.065]	[-0.015]	[-0.227]	[-0.786]	[-0.977]	[1.976]	[1.912]	[0.560]	[-5.809]
	Big - Neutral	-0.067	-0.138	-0.146	-0.194	-0.179	0.262***	-0.014	0.000	-0.301**
		[-0.295]	[-0.162]	[-0.802]	[-1.126]	[-1.207]	[3.840]	[-0.247]	[-0.003]	[-2.566]
	Big – Value	0.612	0.325	0.311	0.397	0.575***	-0.227	0.325***	0.062	-0.903***
		[1.562]	[0.507]	[1.088]	[1.612]	[2.790]	[-1.649]	[7.081]	[1.394]	[-15.427]
	Small - Growth	0.034	0.143	-0.088	-0.054	-0.089	0.132	0.150***	0.007	-0.976***
		[0.107]	[0.181]	[-0.335]	[-0.214]	[-0.457]	[1.445]	[2.835]	[0.172]	[-7.640]
	Small - Neutral	0.471**	0.360	0.374**	0.402**	0.387***	0.281***	0.277***	0.109***	-0.237*
		[2.088]	[0.514]	[2.032]	[2.162]	[2.664]	[4.52]	[5.733]	[2.815]	[-1.915]
	Small - Value	0.507	0.268	0.302	0.375	0.402*	-0.131	0.220***	0.070	-0.989***
		[1.633]	[0.402]	[1.102]	[1.470]	[1.751]	[-1.54]	[4.059]	[1.63]	[-12.814]
Style (Value-weighted)	Big - Growth	-0.030	-0.087	-0.123	-0.223	-0.249	0.236***	0.061	0.017	-0.949***
		[-0.124]	[-0.118]	[-0.584]	[-1.207]	[-1.570]	[3.671]	[1.216]	[0.426]	[-9.606]
	Big - Neutral	-0.048	-0.149	-0.161	-0.205	-0.219	0.277***	0.003	0.005	-0.524***
		[-0.211]	[-0.175]	[-0.871]	[-1.170]	[-1.441]	[4.100]	[0.063]	[0.102]	[-5.874]
	Big – Value	0.800*	0.493	0.452	0.493*	0.676***	-0.279*	0.361***	0.102**	-1.074***
		[1.812]	[0.760]	[1.405]	[1.766]	[2.892]	[-1.841]	[7.704]	[2.249]	[-8.854]
	Small - Growth	0.011	0.096	-0.137	-0.110	-0.167	0.148	0.146**	0.003	-0.759***
		[0.032]	[0.123]	[-0.484]	[-0.404]	[-0.822]	[1.353]	[2.657]	[0.084]	[-7.571]
	Small - Neutral	0.541**	0.416	0.413**	0.484**	0.465***	0.345***	0.322***	0.125***	-0.303**
		[2.244]	[0.582]	[2.049]	[2.421]	[2.908]	[4.710]	[6.706]	[3.197]	[-2.555]
	Small - Value	0.575*	0.287	0.311	0.323	0.353	0.012	0.259***	0.092**	-0.863***
		[1.750]	[0.422]	[1.116]	[1.274]	[1.524]	[0.142]	[4.140]	[2.013]	[-7.162]

Table 11. Portfolio Approach (By Tracking Error)

This table yields the results of portfolio analysis based on fund size. At each month-end, we sort our full sample of funds into four quartile portfolios based on fund size and form equal-weighted or value-weighted portfolios (using each fund's month-end net assets as the weight) separately for the IPPF and non-IPPF funds, i.e., portfolio rebalancing occurs at each calendar month-end. Panel A reports our results for the IPPFs, Panel B for the non-IPPFs, and Panel C for the IPPF – non-IPPF difference. Newey-West (1987) heteroscedasticity- and autocorrelation-consistent standard errors with three lags are used. *t*-statistics are in the parentheses. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. IPPFs

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Tracking Error (Equal-weighted)	Small	0.206	-0.122	0.100	0.085	0.055	0.970	0.147	0.036	23.283
	Q2	0.113	-0.218	-0.036	-0.021	-0.097	1.240	0.119	0.030	23.433
	Q3	0.093	-0.242	0.012	-0.017	-0.141	1.431	0.104	0.054	23.343
	Large	0.317	-0.007	0.228	0.102	0.065	1.829	0.278	0.181	24.018
	Large-small difference	0.111	0.115	0.128	0.017	0.010	0.859***	0.132***	0.145***	0.736***
	t-statistic	[0.708]	[0.750]	[0.825]	[0.124]	[0.084]	[33.474]	[4.348]	[7.163]	[7.025]
Tracking Error (Value-weighted)	Small	0.231	-0.084	0.129	0.142	0.091	0.939	0.203	0.045	24.037
	Q2	0.070	-0.262	-0.079	-0.062	-0.103	1.252	0.152	0.046	23.731
	Q3	0.185	-0.150	0.095	0.029	-0.102	1.436	0.141	0.071	23.711
	Large	0.373	0.049	0.290	0.138	0.118	1.861	0.311	0.199	24.267
	Large-small difference	0.141	0.133	0.161	-0.004	0.028	0.922***	0.108***	0.153***	0.230**
	t-statistic	[0.867]	[0.827]	[1.022]	[-0.026]	[0.222]	[30.029]	[3.383]	[7.112]	[2.562]

Panel B. Non-IPPFs

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Tracking Error (Equal-weighted)	Small	-0.024	-0.281	-0.023	-0.023	-0.064	0.775	0.031	0.019	24.168
	Q2	-0.069	-0.320	-0.058	-0.089	-0.166	1.088	-0.017	0.007	24.088
	Q3	-0.195	-0.475	-0.225	-0.314	-0.421	1.415	-0.052	0.006	24.092
	Large	-0.072	-0.249	-0.017	-0.173	-0.327	2.003	0.059	0.060	24.162
	Large-small difference	-0.049	0.032	0.007	-0.150	-0.263*	1.228***	0.028	0.040***	-0.006
	t-statistic	[-0.273]	[0.157]	[0.034]	[-0.793]	[-1.855]	[23.606]	[1.589]	[3.448]	[-0.156]
Tracking Error (Value-weighted)	Small	-0.042	-0.239	0.010	0.030	-0.002	0.767	0.062	0.026	24.860
	Q2	-0.047	-0.257	-0.007	-0.012	-0.086	1.093	0.011	0.014	24.753
	Q3	-0.196	-0.446	-0.201	-0.325	-0.406	1.400	-0.068	0.008	24.630
	Large	-0.042	-0.177	0.068	-0.111	-0.254	2.013	0.084	0.078	24.554
	Large-small difference	-0.000	0.061	0.057	-0.142	-0.252*	1.246***	0.022	0.052***	-0.305***
	t-statistic	[-0.001]	[0.267]	[0.265]	[-0.656]	[-1.683]	[22.292]	[0.958]	[3.212]	[-4.722]

Table 11. Portfolio Approach (By Tracking Error, Continued)

Panel C. IPPF – Non-IPPF Comparison

Sorted By	Quartiles	Excess BM	Excess RF	CAPM_Alpha	FF3_Alpha	Carhart_Alpha	TE	IR	SR	Fund size
Tracking Error (Equal-weighted)	Small	0.229	0.159	0.123	0.108	0.119	0.195***	0.115**	0.017	-0.886***
		[1.572]	[0.237]	[1.207]	[1.090]	[1.315]	[4.858]	[2.516]	[0.494]	[-9.796]
	Q2	0.182	0.102	0.022	0.068	0.070	0.151***	0.137***	0.023	-0.655***
		[1.024]	[0.154]	[0.158]	[0.540]	[0.626]	[3.198]	[3.439]	[0.633]	[-5.262]
	Q3	0.288	0.233	0.237	0.297*	0.280**	0.016	0.157***	0.048	-0.749***
		[1.234]	[0.344]	[1.308]	[1.770]	[2.026]	[0.271]	[3.196]	[1.269]	[-6.779]
	Large	0.389	0.242	0.245	0.275	0.392*	-0.175**	0.219***	0.121***	-0.144**
		[1.325]	[0.351]	[0.909]	[1.039]	[1.876]	[-2.202]	[4.470]	[2.933]	[-2.384]
Tracking Error (Value-weighted)	Small	0.274*	0.154	0.118	0.111	0.093	0.172***	0.141***	0.019	-0.823***
		[1.851]	[0.228]	[1.112]	[1.039]	[0.932]	[4.177]	[3.257]	[0.534]	[-9.053]
	Q2	0.117	-0.005	-0.072	-0.050	-0.017	0.159***	0.141***	0.032	-1.022***
		[0.626]	[-0.008]	[-0.495]	[-0.389]	[-0.146]	[3.315]	[3.338]	[0.887]	[-7.324]
	Q3	0.381	0.297	0.296	0.354**	0.304**	0.035	0.209***	0.063*	-0.918***
		[1.603]	[0.436]	[1.625]	[2.084]	[2.106]	[0.574]	[4.113]	[1.658]	[-7.61]
	Large	0.415	0.226	0.222	0.249	0.373*	-0.152*	0.227***	0.121***	-0.287***
		[1.347]	[0.322]	[0.79]	[0.915]	[1.786]	[-1.859]	[4.581]	[2.935]	[-4.941]

Table 12. Non-IPPF Sponsors With and Without In-House Equity Management Team

This table re-estimates the baseline PSM tests of difference in Table 4, albeit separately for non-IPPF sponsors with and without in-house equity management team. Difference-in-mean and difference-in-median tests (Wilcoxon-Mann-Whitney rank signed tests) are performed. All returns and volatility estimates are in per cent. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. Non-IPPF sponsors with in-house equity management

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	-0.033	0.034	180	0.000	-0.012	180	-0.033	-0.235	0.046	0.501
Excess BM(Gross)	-0.014	0.054	180	0.032	0.019	180	-0.046	-0.331	0.035	0.604
Excess RF	-0.398	-0.294	180	-0.071	-0.102	180	-0.327**	-2.199	-0.192**	-2.257
CAPM_Alpha	-0.072	-0.053	180	0.172	0.084	180	-0.243*	-1.842	-0.137*	-1.784
FF3_Alpha	-0.043	0.002	180	-0.079	-0.020	180	0.037	0.317	0.022	0.929
Carhart_Alpha	-0.063	-0.059	180	-0.198	-0.111	180	0.136	1.287	0.051	1.553
Tracking error	1.431	1.343	180	1.464	1.336	180	-0.033	-0.550	0.008	0.056
Sharpe ratio	0.082	0.023	180	0.093	0.033	180	-0.011	-0.760	-0.010	-1.516
Information ratio	0.189	0.134	180	0.079	0.071	180	0.109***	4.156	0.062***	3.550

Panel B. Non-IPPF sponsors without in-house equity management

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Excess BM(Net)	0.306	0.234	514	-0.186	-0.142	514	0.492***	5.740	0.376***	5.140
Excess BM(Gross)	0.324	0.252	514	-0.171	-0.139	514	0.496***	5.793	0.391***	5.195
Excess RF	-0.121	0.051	514	-0.501	-0.172	514	0.380***	5.006	0.224***	4.438
CAPM_Alpha	0.180	0.167	514	-0.189	-0.224	514	0.369***	5.233	0.391***	4.840
FF3_Alpha	0.084	0.061	514	-0.250	-0.244	514	0.334***	5.426	0.305***	5.135
Carhart_Alpha	0.053	0.046	514	-0.294	-0.192	514	0.347***	6.218	0.238***	5.686
Tracking error	1.477	1.439	514	1.369	1.320	514	0.109***	3.392	0.118***	3.008
Sharpe ratio	0.096	0.053	514	-0.020	-0.029	514	0.116***	13.432	0.082***	11.917
Information ratio	0.224	0.224	514	-0.073	-0.061	514	0.296***	17.423	0.285***	14.222

Table 13. Measuring IPPF vs. Non-IPPF Manager Skill in Terms of Value Added

This table re-estimates the baseline PSM and caliper-restricted PSM tests of difference in Tables 4 and 6, albeit with performance measured in terms of value added rather than percentage returns. All monthly value added are expressed in terms of constant 2011 millions of won (not dollars). Difference-in-mean and difference-in-median tests (Wilcoxon-Mann-Whitney rank signed tests) are performed. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

Panel A. Baseline One-To-One PSM

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Value Added (Excess BM)	16.646	47.562	694	-12.284	-61.605	694	109.166***	3.706	28.93***	3.471
Value Added (Excess RF)	-1.939	-81.076	694	-36.674	-146.027	694	64.951	1.614	34.735*	1.705
Value Added (CAPM)	8.290	31.072	694	-15.029	-42.925	694	73.997***	2.916	23.319***	2.654
Value Added (FF3)	2.588	17.874	694	-32.151	-63.155	694	81.029***	3.469	34.74***	3.982
Value Added (Carhart)	1.049	12.300	694	-29.740	-64.747	694	77.047***	4.079	30.788***	4.539

Panel B. One-to-One PSM with Caliper Restriction (0.25 Pooled Standard Deviations)

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Value Added (Excess BM)	29.149	53.128	554	-19.946	-28.941	554	82.069***	2.858	49.095***	3.633
Value Added (Excess RF)	-18.195	-98.885	554	-47.718	-153.191	554	54.306*	1.725	29.523**	2.436
Value Added (CAPM)	18.389	35.288	554	-21.942	-25.652	554	60.941**	2.392	40.331***	2.986
Value Added (FF3)	2.673	20.439	554	-37.288	-54.529	554	74.968***	3.127	39.962***	3.760
Value Added (Carhart)	5.762	15.656	554	-32.301	-68.208	554	83.864***	3.877	38.063***	4.609

Panel C. One-to-One PSM with Caliper Restriction (0.1 Pooled Standard Deviations)

	IPPF			**Non-IPPF**			**Difference (IPPF – non-IPPF)**			
							Mean		Median	
Variable	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.	Difference	*t*-statistic	Difference	*z*-score
Value Added (Excess BM)	45.413	54.384	477	-21.565	-70.793	477	125.177***	3.298	66.978***	3.545
Value Added (Excess RF)	-7.889	-108.687	477	-50.294	-202.275	477	93.588**	2.136	42.405**	2.137
Value Added (CAPM)	28.374	39.448	477	-32.619	-60.195	477	99.643***	3.156	60.993***	3.097
Value Added (FF3)	1.560	17.175	477	-37.274	-71.167	477	88.342***	2.821	38.834***	3.008
Value Added (Carhart)	13.210	23.181	477	-34.286	-62.357	477	85.539***	3.889	47.496***	4.350

Table A.1. Correlation Matrix

This table reports the correlation matrix of our variables of interest. * denotes significance at the 10% level, ** at the 5% level, *** at the 1% level respectively.

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Excess BM(Gross)	1											
(2)	Excess RF	0.27***	1										
(3)	CAPM_Alpha	0.85***	0.40***	1									
(4)	FF3_Alpha	0.78***	0.36***	0.89***	1								
(5)	Carhart_Alpha	0.61***	0.34***	0.73***	0.82***	1							
(6)	TE	-0.04*	-0.03	-0.06**	-0.11***	-0.13***	1						
(7)	SR	0.25***	0.22***	0.28***	0.27***	0.19***	0.17***	1					
(8)	IR	0.30***	0.06***	0.26***	0.27***	0.25***	0.14***	0.65***	1				
(9)	1YR_VOL	-0.13***	-0.09***	-0.10***	-0.10***	-0.16***	0.25***	0.02	-0.08***	1			
(10)	1YR_RET	0.23***	0.26***	0.28***	0.26***	0.16***	0.15***	0.88***	0.59***	0.00	1		
(11)	Fund size	0.01	0.02	0.02	0.02	0.03	0.03	0.14***	0.13***	0.10***	0.14***	1	
(12)	FF3_MKT	-0.07***	-0.02	-0.02	-0.04*	-0.04*	-0.38***	-0.22***	-0.14***	0.34***	-0.21***	0.12***	1
(13)	FF3_SMB	0.02	0.08***	0.06**	-0.13***	-0.07***	0.31***	0.06***	-0.03	-0.05*	0.02	0.05**	-0.13***
(14)	FF3_HML	-0.01	-0.09***	-0.09***	-0.07***	-0.09***	0.27***	0.02	0.08***	0.18***	0.05*	-0.03	-0.20***
(15)	Carhart_MKT	-0.10***	-0.02	-0.06***	-0.09***	-0.06***	-0.24***	-0.23***	-0.16***	0.30***	-0.22***	0.16***	0.90***
(16)	Carhart_SMB	0.04*	0.08***	0.08***	-0.04*	-0.10***	0.05*	-0.07***	-0.15***	0.14***	-0.14***	0.00	0.10***
(17)	Carhart_HML	0.02	-0.09***	-0.06**	-0.03	-0.10***	0.21***	-0.03	0.04*	0.16***	-0.03	-0.05**	-0.19***
(18)	Carhart_UMD	-0.01	-0.01	-0.02	-0.06***	-0.11***	0.64***	0.29***	0.19***	0.21***	0.33***	0.09***	-0.30***
(19)	Management firm size	-0.03*	-0.03**	-0.03	-0.07***	0.00	0.10***	-0.21***	-0.11***	-0.31***	-0.25***	-0.01	-0.21***
(20)	Expense Ratio	-0.03*	0.02	-0.01	-0.01	-0.02	0.02	0.14***	0.05*	0.29***	0.15***	0.11***	0.11***
(21)	Fund Flow	0.09***	0.02	0.07***	0.05**	0.03	-0.01	0.07***	0.09***	0.01	0.06***	0.11***	0.03

Table A.1. Correlation Matrix (Continued)

		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(13)	FF3_SMB	1								
(14)	FF3_HML	-0.02	1							
(15)	Carhart_MKT	0.05*	-0.18***	1						
(16)	Carhart_SMB	0.64***	0.05**	0.05**	1					
(17)	Carhart_HML	-0.08***	0.93***	-0.21***	0.12***	1				
(18)	Carhart_UMD	0.26***	0.11***	-0.06**	-0.22***	-0.01	1			
(19)	Management firm size	0.16***	-0.08***	-0.12***	-0.09***	-0.10***	0.11***	1		
(20)	Exp_Ratio	0.02	0.06***	0.09***	0.05*	0.02	0.09***	-0.26***	1	
(21)	Fund_Flow	0.01	-0.02	0.02	0.01	-0.01	0.00	-0.03	-0.10***	1

Table A.2. Changes in Manager Selection Criteria Around IPPF Participation

In this table, we compare the (i) manager selection criteria of a representative IPPF-participating public agency sponsor when engaging in direct manager selection prior to its participation in the IPPF) and (ii) the manager selection criteria employed by one of the IPPF lead managers.

Before IPPF	After IPPF
Quantitative factors	
1) Financial Stability of Asset Management Firm Total Equity / Paid-in Capital ROE Net Income over the Past 3 Years Leverage Ratio Assets Under Management	Removed
2) Organization and Personnel No. of Fund Managers Average Manager Tenure Assets Under Management Per Manager	Removed
3) Return Performance BM Excess Return Information Ratio	1) Return Performance Up-Follow Ratio Hit Ratio 1 Hit Ratio 2 2) Style Stability Style-Adjusted Alpha R-Squared 3) Risk Adjusted Return Information Ratio Sortino Ratio M-Squared 4) Return Volatility Standard Deviation Tracking Error Downside Standard Deviation Maximum Loss Over Past 6 Months Down-Follow Ratio
Qualitative factors	
1) Operating System and Strategy	1) Operating Strategy Momentum Strategy (Stocks) / Duration Strategy (Bonds) Sector Allocation (Stocks) / Curve Position (Bonds) Security Selection
2) Risk Management	2) Risk Management Risk Management of Systematic and Idiosyncratic risk Compliance System
3) Fund Manager	3) Fund manager Style Persistence Alpha Creation Ability 4) Market Forecast Capability Domestic and Global Economy Investment Demand and Supply Investment Environment