NBER WORKING PAPER SERIES

ASSET MANAGERS: INSTITUTIONAL PERFORMANCE AND SMART BETAS

Joseph Gerakos
Juhani T. Linnainmaa
Adair Morse

Working Paper 22982
http://www.nber.org/papers/w22982

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 2016

We thank Jules van Binsbergen (discussant), Jeff Coles (discussant), Richard Evans (discussant), Ken French (discussant), Aneel Keswani (discussant), Jonathan Lewellen, Jesper Rangvid (discussant), Scott Richardson, Julio Riutort (discussant), Clemens Sialm (discussant), Annette Vissing-Jorgensen, workshop participants at Arizona State University, University of California at Berkeley, Emory University, University of Oregon, University of Colorado, University of Chicago, Temple University, Dartmouth College, University of Washington, Rice University, London Business School, London School of Economics, Notre Dame, University of California San Diego, the Wharton School, and conference participants at the FRIC'14: Conference on Financial Frictions, the 2014 Western Finance Association Conference, the 7th International Finance Conference at the Pontificia Universidad Catolica de Chile, the 2014 MSUFCU Conference on Financial Institutions and Investments, the 2015 UBC Winter Finance Conference, the 2015 FRBNY/NYU Financial Intermediation Conference, the NBER Conference on New Developments in Long-Term Asset Management, and the 5th Luxembourg Asset Management Summit for their comments. We thank the Fama-Miller Center at the University of Chicago Booth School of Business for financial support. Gerakos is affiliated with Citadel LLC. Linnainmaa is affiliated with Citadel LLC and Research Affiliates. Neither Citadel LLC nor Research Affiliates provided funding or data for this project. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

At least one co-author has disclosed a financial relationship of potential relevance for this research. Further information is available online at http://www.nber.org/papers/w22982.ack

Asset Managers: Institutional Performance and Smart Betas
Joseph Gerakos, Juhani T. Linnainmaa, and Adair Morse
NBER Working Paper No. 22982
December 2016
JEL No. G11,G23

ABSTRACT

Using a dataset of $17 trillion of assets under management, we document that actively-managed institutional accounts outperformed strategy benchmarks by 86 (42) basis points gross (net) during 2000–2012. In return, asset managers collected $162 billion in fees per year for managing 29% of worldwide capital. Estimates from a Sharpe (1992) model imply that their outperformance comes from factor exposures ("smart beta"). If institutions had instead implemented mean-variance portfolios of institutional mutual funds, they would not have earned higher Sharpe ratios. Recent growth of the ETF market implies that asset managers are losing advantages held during our sample period.

Joseph Gerakos
Tuck School of Business
Dartmouth College
Hanover, NH 03755
joseph.j.gerakos@tuck.dartmouth.edu

Juhani T. Linnainmaa
University of Southern California
Marshall School of Business
701 Exposition Blvd, Ste. 231
Los Angeles, CA 90089-1422
and NBER
juhani.linnainmaa@marshall.usc.edu

Adair Morse
University of California, Berkeley
545 Student Services Bldg, #1900
Berkeley, CA 94720
and NBER
morse@haas.berkeley.edu

1 Introduction

We document that over 2000–2012 delegated institutional holdings averaged $36 trillion, which represented 29% of worldwide investable capital. Institutions predominantly delegated this capital through active, strategy-specific investment vehicles set up by asset managers. Little is known about these investment vehicles or their performance because a lack of data has hindered research. By contrast, there is a large literature about the retail side of delegated management (i.e., retail mutual funds), which according to CityUK averaged $19 trillion over the sample period. Differences in disclosure requirements likely drive the contrast in research footprints. Retail mutual funds face mandatory disclosure under the U.S. 1940 Investment Company Act, while delegated institutional holdings are exempt.

Until recently, research on the institutional sector was at the level of institutions themselves, and not the capital that they delegate, because data about institutions are more accessible (Lakonishok, Shleifer, and Vishny 1992a). For example, Lewellen (2011) uses 13-F filings to study the performance of total institutional holdings (i.e., delegated capital and capital managed in-house) in U.S. equities and finds that institutions do not outperform benchmarks. Likewise, there is a substantial literature about the holdings and performance of specific types of institutions such as pensions and endowments. This literature finds mixed results about performance.[1] Because institutions both delegate capital and manage capital in-house, one cannot make inferences about the performance of asset managers based on the performance of institutions in general.

Several papers specifically study the institutional asset management industry. Goyal and Wahal (2008) and Jenkinson, Jones, and Martinez (2016) examine how institutions delegate

[1]The large literature studying performance of pension funds includes Ippolito and Turner (1987), Lakonishok, Shleifer, and Vishny (1992b), Coggin, Fabozzi, and Rahman (1993), Christopherson, Ferson, and Glassman (1998), Blake, Lehmann, and Timmerman (1999), Del Guercio and Tkac (2002), Ferson and Khang (2002), and Dyck and Pomorski (2012). Another literature studies endowments including Brown, Garlappi, and Tiu (2010), Lerner, Schoar, and Wang (2008), and Barber and Wang (2013).

capital.[2] Annaert, De Ceuster, and Van Hyfte (2005) and Bange, Khang, and Miller (2008) examine the asset allocations made by twenty-six asset managers into asset classes over time and find performance to benchmarks. Closest to out study, Busse, Goyal, and Wahal (2010) examine the performance of asset managers investing in U.S. public equities, and also fail to find performance over benchmarks.

We contribute to the literature by estimating the performance, size, and fees of this sector using a broader dataset of asset manager holdings and returns than has been previously available. We also provide evidence on what asset managers do to achieve performance. In asset manager language, we explore the importance of *smart beta* or *tactical factor* allocations. The words *smart* and *tactical* refer to tilting portfolios toward toward better-performing factors. This insight allows us to examine the performance of asset managers in terms of the Sharpe (1992) empirical model. Our estimates tie positive performance directly to smart beta investing. We document that institutional asset managers outperformed strategy benchmarks by 42 basis points net of $162 billion in annual fees and that smart beta investing entirely explained this outperformance.

We obtained data for the 2000–2012 period from a global consultant that advises pension funds, endowments, and other institutional investors on the allocation of capital to asset managers. As discussed by Goyal and Wahal (2008), most institutions use consultants in their delegation not only because of consultants' expertise in portfolio choice, but also because consultants serve as the gatekeepers of asset manager performance and holdings data that facilitate the shopping for and comparison of asset managers.

When an institution chooses an asset manager to delegate a strategy-level allocation, the asset manager either sets up an investment vehicle as a solo account or mixes the account with

[2]Jenkinson, Jones, and Martinez (2016) find that consultants' investment recommendations do not add value for institutions investing in U.S. actively managed equity funds. Similarly, Goyal and Wahal (2008) find that, when pension fund sponsors replace asset managers, their future returns are no different from the returns that they would have earned had they stayed with the fired asset managers. Whereas these studies examine variation in performance conditional on delegation, we examine the benefits of delegation.

a finite number of institutional clients seeking the same strategy exposure.[3] Asset managers then combine these investments into pooled holdings for all clients in each of the strategies for marketing and compliance reporting purposes. These "pools" are the unit of observation that consultants and their institutional clients use when evaluating asset managers. We refer to these pooled holdings as asset manager *funds* because the databases maintained by consultants resemble the mutual fund databases and because these funds are a natural unit to profile and study strategy-specific performance of asset managers.

Our data cover $18 trillion of annual assets on average over 2000–2012. The data include quarterly assets and client counts, monthly returns, and fee structures for 22,289 asset manager funds marketed by 3,272 asset manager firms. The median fund pools six clients and has $285 million in capital invested in a strategy. Our analysis focuses on four asset classes: U.S. fixed income (21% of delegated institutional assets), global fixed income (27%), U.S. public equity (21%) and global public equities (31%). These asset classes represent the lion's share of global invested capital. In these asset classes, we have close to the universe of institutional asset managers that were open to new investors during this period. We show that the database does not suffer from survivorship bias and is not biased toward better performing funds. Moreover, return reporting is GIPS compliant for most asset managers, further assuring data reliability.

With these data, we make five contributions to the literature. First, we augment the literature on the cost of financial intermediation. We estimate that asset managers charged the average delegated dollar a fee of 44 basis points, consistent with the prior literature that documents delegation costs of approximately 50–60 basis points for large institutions (Coles, Suay, and Woodbury 2000; Busse, Goyal, and Wahal 2010; Dyck, Lins, and Pomorski 2013; Jenkinson, Jones, and Martinez 2016). Our new contribution in this realm comes from the

[3] Institutional mutual funds are an exception in that they have large numbers of clients. They are interesting in their own right (Evans and Fahlenbrach 2012), but represent only $5 trillion of $48 trillion in total delegated institutional capital for 2012.

depth of our data globally and across asset classes to estimate aggregate fees. We find that institutions paid $162 billion per year in fees for delegated fixed income and public equities assets during 2000–2012, which was approximately twice the aggregate fees paid by retail mutual fund investors over the same period (French 2008; Bogle 2008).

For perspective on these magnitudes, consider 2012 as a snapshot. If we apply the estimates of Philippon (2015) and Greenwood and Scharfstein (2013) to total worldwide investable capital in 2012, the worldwide cost of securities intermediation was $726 billion. We can compare this top-down estimate with bottom-up calculations for costs incurred by different classes of investors. The U.S.-based estimates of French (2008) and Bogle (2008), applied globally, imply that the intermediation costs for retail delegation through mutual funds was approximately $100 billion for 2012. Further, Barber, Lee, Liu, and Odean (2009)'s estimates of retail investor trading costs from Taiwan can be scaled up to the global level and adjusted for differences in turnover, leading to an estimate of $313 billion in costs for non-delegated individual trading in 2012. We find that institutions paid $210 billion in fees in 2012 for delegated intermediation. These estimates leave another $100 billion to cover any asset classes omitted from these calculations as well as institutional non-delegated trading fees.[4]

Second, we document performance from the perspective of an institutional investor who delegates capital to an asset manager in order to gain exposure to a specific strategy (i.e., fulfill a "mandate"). As discussed by Goyal and Wahal (2008) and Jenkinson, Jones, and Martinez (2016), institutions typically construct their portfolios through a two-step process. Institutions first determine their strategy-level policy allocations by optimizing over strategy-level risk and return. Investment officers then fulfill the strategy policy allocations either "in house" or by issuing an investment mandate to an external manager. Because portfolio

[4]This dissection of intermediation costs emphasizes the importance of under-studied aspects of financial intermediation of institutional capital. We thank Brad Barber and Robin Greenwood for data and guidance with these back-of-the-envelope calculations.

risk is incorporated at a higher level, institutions appraise fund performance along two dimensions—net alpha and tracking error—both relative to the strategy benchmark in a single-factor model. We find that the average asset manager fund earns an annual strategy-level gross (net) alpha of 86 basis with a t of 3.35 (42 basis points with a t of 1.63).

This positive performance is consistent with institutions being sophisticated investors (Del Guercio and Tkac 2002), but contrasts with most studies that examine the performance of institutions (Lewellen 2011). Because the unit of observation in institution-level studies includes both delegated and non-delegated capital, an implication of our results is that non-delegated institutional capital likely underperforms delegated institutional capital. Furthermore, there are differences in asset classes covered. Most institution-level studies focus on the U.S. public equity asset class. In our results, U.S. public equities have the lowest positive alpha relative to strategy benchmarks. Thus, our results are consistent with Lewellen (2011) and Busse, Goyal, and Wahal (2010), who both find positive, but statistically insignificant gross alpha in U.S. public equity using coarser data.

Third, our detailed data allow us to infer, in the spirit of Barber, Huang, and Odean (2016) and Berk and Binsbergen (2016), how asset managers achieve positive net alphas. The marketing language used by asset managers speaks of smart betas or tactical factors.[5] We use the Sharpe (1992) to construct portfolios out of such tactical factors that best mimic each asset manager fund. We choose factors that nest the literature's factor models across different asset classes. To reflect practice, we limit factors to be tradable indexes and the weights to be long-only and to sum to one. When we estimate fund performance compared against this mimicking portfolio, we find no excess return over the mimicking portfolio. The fact that asset managers outperform strategy-level benchmarks but earn returns comparable to the fund-level mimicking portfolios implies that asset managers provide institutional clients

[5]See, for example, Blitz (2013), Towers Watson (2013), and Jacobs and Levy (2014). Moreover, the employees of asset managers often publish professional articles about smart beta. See, for example, Staal, Corsi, Shores, and Woida (2015), which is authored by employees of Blackrock.

with profitable systematic deviations from benchmarks.

The results from the Sharpe analysis raise the question as to whether delegation was worth \$162 billion per year. Could institutions have performed as well over the sample period by instead managing their assets in-house, assuming that they had the knowledge and ability to implement a factor portfolio? Following Berk and Binsbergen (2015), we consider the investment opportunity set of tradable indices that was available to institutions during the sample period. We find that if institutions had implemented dynamic, long-only mean-variance portfolios to obtain their within-asset class exposures, they would have obtained a similar Sharpe ratio as asset manager funds once we take into account trading and administrative costs. This finding suggests that asset managers earned their fees at the margin. Our estimates also imply that the introduction of liquid, low-cost factor ETFs is likely eroding the comparative advantage of asset manager funds.

Fourth, we contribute to the literature on active management.[6] We estimate tracking errors of 8.7% in models that use broad asset class benchmarks and 5.9% in models that use granular strategy-level benchmarks. These tracking errors are comparable to Petäjistö's (2013) estimates for active retail mutual funds. Hence, given the size of the asset manager fund market, our findings imply that the literature on active management overlooks almost half of actively managed capital.

Our fifth contribution speaks to the incidence of returns across investor classes. We document that the average asset manager fund earns an annual market-adjusted gross alpha of 131 basis points ($t = 3.21$) over the 2000–2012 period. In dollar terms, 131 basis points of gross alpha translates to \$469 billion per year, with \$307 billion accruing to institutions and \$162 billion to asset managers. Because asset managers may take more risk than the rest of the market, these results do not necessarily imply that the delegated assets of institutions earn positive risk-adjusted returns. However, a 131 basis point gross alpha together with

[6] See, for example, Jensen (1968), Malkiel (1995), Gruber (1996), Carhart (1997), Kosowski, Timmerman, Wermers, and White (2006), French (2008), and Fama and French (2010).

the adding-up constraint discussed by Sharpe (1991) implies a market-adjusted gross alpha of all other investors of −53 basis points. Assuming retail mutual funds earn gross alphas close to zero (Jensen 1968; Fama and French 2010), this implies a negative gross alpha either for non-delegated retail capital, which would be consistent with Cohen, Gompers, and Vuolteenaho (2002), or for non-delegated institutional capital, which would reconcile our work with Lewellen (2011).

2 Data and descriptive statistics

We obtained a database from a large global consulting firm (the "Consultant"). Some consultants build and maintain databases of asset manager funds. These databases look like mutual fund databases, containing quarterly assets under management and number of clients, current fee structures and strategy descriptions, and monthly performance of each asset manager fund (i.e., at the strategy-level). These databases are essential to the consultants' business model, enabling consultants to attract and service institutional clients who delegate capital. Asset managers voluntarily report data to consultants because, in essence, the consultants are the asset managers' primary clients. The majority of institutional investors use consultants to construct portfolios (Goyal and Wahal 2008).

We use the term "asset manager fund" to draw a parallel with mutual funds, although in this setting, the word "fund" is somewhat of a misnomer. Asset managers hold institutional capital in individual accounts or in accounts that pool small numbers of institutions. When asset managers report institutional holdings and performance, they add up all the clients with the same strategy focus into a single reporting vehicle (i.e., a "fund"). This fund is a reporting vehicle, not a direct investment vehicle per se, but it conveys the performance and holdings of the particular asset manager in the strategy in question just as mutual funds would do in marketing.

The pooled strategy-level fund is also the unit used by asset managers to comply with

GIPS (Global Investment Performance Standard) reporting standards. What is now the CFA Institute, initiated GIPS in 1987 to ensure minimum acceptable reporting standards for investment managers. In 2005, it became the global standard. Compliance is voluntary, but GIPS has been universally adopted by asset managers.

Because the Consultant's business model depends on data reliability, it employs a staff of over 100 researchers who perform regular audits of each asset manager and its funds. In the course of these audits, the Consultant's researchers consider the strategy placement of the fund and verify the accuracy of the performance and holdings data. When clients shop for asset manager funds, they can read these audits, compare the fund to benchmarks, and read the credentials of the people running the fund. Non-reporting asset managers receive less attention when the Consultant makes recommendations to its clients, and consultants and investors infer any lack of reporting as a negative signal of fund quality.

2.1 Aggregate assets under management

The first column of Table 1 reports our estimates of aggregate institutional assets under management for each year between 2000 and 2012. These estimates are based on the annual Pensions & Investments surveys, which we describe in the Appendix.[7] Total institutional assets increased from $22 trillion in 2000 to $47 trillion in 2012, representing approximately 700 asset manager firms throughout the period (column 2). The third column reports our estimates of worldwide investable assets, which we detail in the Appendix. Over the 2000–2012 sample period, worldwide investable assets rose from $79 trillion to $173 trillion. The next column shows that institutional assets held by asset managers remained relatively constant over the sample period at approximately 29% of worldwide investable assets.

Important for our study is the comparison of the coverage of the Consultant's database

[7]Each year, Pensions & Investments conducts several surveys of asset managers about their assets under management. These surveys are important to asset managers because they provide size rankings to potential clients. According to Pensions & Investments, nearly all medium and large asset managers participate.

with the Pensions & Investments data. The Consultant's total assets cover 28% of institutional assets under management in 2000, and rise to over 60% post-2006. In 2012, for example, institutional assets under management in the Consultant's database are $26 trillion, which represented 56.1% of total institutional assets according to Pensions & Investments.

Although our data cover $26 trillion in assets under management, this amount is less than 100% of worldwide delegated institutional assets. We therefore address the potential for sample bias in our data. It could be that we are simply missing asset managers, who choose not to report performance to this consultant. The Consultant's database covers 3,500 to 4,200 asset manager firms per year. When we hand match the names of the asset manager firms in the Consultant's database to those in the Pensions & Investments, 82.6% of the firms in Pensions & Investments are included in the Consultant's database. We examined the missing firms and found that nearly half of these firms are private wealth assets or the assets of smaller insurance company (but not the large insurer-asset managers). Another 16% of the missing firms specialize in private equity, real estate, or other alternatives, which represent asset classes that we do not consider. The remaining missing firms are retail banks mostly from Italy and Spain, and boutique asset managers from the U.S., which presumably cater to specific clients and thus do not advertise. We therefore feel comfortable that we have close to the population of large asset managers worldwide that serve institutional clients, except perhaps in southern Europe.

When we instead consider the possibility of selective reporting by the asset managers included in the Consultant's database, we consider three potential sources of bias. It could be (i) that asset managers always exclude certain clients' accounts, (ii) that asset managers selectively report assets under management at points in time when returns are good, or (iii) that they report assets under management but not the returns when performance is good. Based on discussions with the Consultant, we infer that issue (i) accounts for most of the missing fund-level data. In particular, the Consultant disclosed that missing from the database are specialized proprietary accounts. When choosing asset managers, institutional investors can only see funds that appear in the databases. Thus, although the data are incomplete, they nonetheless represent an institutional investor's information set for deciding among asset manager funds that are open for investment.[8]

Nonetheless, we do not know how these missing accounts perform. Our main concern is that manager choose to report based on fund performance. However, asset managers cannot selectively report based on performance and be in compliance with GIPS reporting procedures. This constraint especially binds starting in 2006, when GIPS was revised and became the global reporting standard for asset managers. Thus, we will split the sample at 2006 to ensure that our inferences hold in the recent period.

We also can directly test for bias in reporting following Blake, Lehmann, and Timmerman (1999). They state on page 436 that if "bias infected the funds included in our subsample, they should be more successful ex post than those in the overall universe." To implement their test, we create two variables to measure the extent that managers report to the Consultant's database. The first variable, *coverage*, is the percentage of total assets under management for which the manager reports data to the Consultant on strategy-level data to the Consultant. The second variable, *internal coverage*, is the percentage of total reported strategy-level assets for which the manager reports returns to the Consultant. We regress fund-level monthly returns on these two variables. We include interactions of strategy and month fixed effects to absorb strategy-level performance and cluster standard errors at the month-strategy level. If managers refrain from reporting strategies with worse performance, we would expect coverage to be negatively related to performance. For example, if a manager's coverage is 100%, then this manager should have a lower overall return than a manager who only reports better performing funds.

Table 2 presents results for these regressions with the first specification including *coverage* and second specification including both *coverage* and *internal coverage*. For both sets of

[8] Ang, Ayala, and Goetzmann (2014) make a similar point with respect to endowments making allocation decisions regarding alternative asset classes.

regressions, we find the opposite of what one would expect if managers selectively reported to the Consultant's database based on performance—managers who provide higher levels of coverage have slightly higher performance. The estimates presented in Table 2 suggest that our data do not suffer from survival or selection biases.

Two related concerns are survivorship and backfill biases. The Consultant's record-keeping, however, mitigates these concerns. Regarding backfill, the Consultant records a "creation date" for each asset manager fund, reflecting the date the asset manager fund was first entered into the system. At the initiation of coverage, the manager can provide historical returns for the fund. Such backfilled returns would be biased upward if better performing funds were more likely to survive and/or provide historical returns. In our analysis, we always analyze returns generated after the creation date. In the last column of Table 1, we show an annual average of 13% of the data are backfilled (and tossed), particularly in the early years. Survivorship bias may also occur if funds that closed were removed from the database. However, this is not the case—the Consultant leaves dead funds in the database.

2.2 Aggregate fees

The Consultant's database includes the fee structure for each asset manager fund. For example, one U.S. fixed income-long duration fund charges 40 basis points for investments up to $10 million, 30 basis points for investments up to $25 million, 25 basis points for investments up to $50 million, and 20 basis points for investments above $50 million. These parameters are static in the sense that the database records only the latest fee schedule from the asset manager. However, because these fees are in percent rather than dollars, the use of the static structure should only be problematic if fees over the last decade materially changed per unit of assets under management.

Figure 1 depicts three different estimates of aggregate fees. First, we calculate a *schedule middle point* estimate that assumes that the average dollar in each fund pays the median fee listed on the fund's fee schedule. This fee estimate could, however, be too high. Institutional investors could negotiate side deals that shift their placement in the fee schedule up. Thus, we second calculate a fee *schedule lower bound* estimate, which uses the lowest fee in the schedule for all capital invested in the fund. In the example above, we would apply the rate 20 basis points to all capital invested in the fund. The fee *schedule lower bound* estimate does not, however, account for the possibility that large investors pay less than 20 basis points. Such instances are likely limited to select clients. Nonetheless, we implement a more conservative estimate that we call the *implied realized fee*. Some funds in the Consultant's database report both net and gross returns. These funds therefore provide an estimate of effective fees. We annualize the monthly gross versus net return difference, take the value-weighted average, and then re-weight the asset classes so that the weight of each asset class matches that in the entire database.

Figure 1 plots annual estimates of aggregate fees received by asset managers for these three measures, aggregated to the total worldwide investable assets. We aggregate by taking the weighted average fees in the Consultant's data and then multiplying by the estimates of worldwide delegated institutional assets under management from Pensions & Investments. Based on this aggregation, we estimate that fees received by the top global asset managers range from $125 to $162 billion per year on average over the period.

2.3 Fund-level assets under management

The Consultant categorizes funds into eight broad asset classes: U.S. public equity, global public equity, U.S. fixed income, global fixed income, hedge funds, asset blends, cash, and other/alternatives. We drop other/alternatives, hedge funds, and asset blends because these funds represent heterogeneous investment strategies that make benchmarking challenging. We also drop the cash asset class because these short-term allocations play a different role in portfolios. Our database starts with 44,643 asset manager funds over the period 2000–2012.

After removing funds with no returns, cash funds, asset blend funds, other/alternatives funds, hedge funds, funds with backfilled returns, and funds that were inactive during the sample period, the sample consists of 15,893 funds across 3,318 asset manager firms. This sample encompasses 936,383 monthly return observations. Panel A of Table 3 reports descriptive statistics on the sample. The average total assets under management (AUM) in the sample is $9.1 trillion. In terms of age, the funds in the database are relatively established with the average fund being 12 years old. The largest asset classes are global and U.S. public equity with, on average, $2.7 trillion and $2.4 trillion in assets under management followed by U.S. fixed income ($2.2 trillion) and global fixed income ($1.8 trillion).

Panel B reports descriptive statistics at the asset manager fund level. For each month, we calculate the distributions and then take the average of the distributions. The average fund has $1.8 billion in assets under management, and the median fund has $411 million. The skew is due to large institutional mutual funds in the database. Hence, we focus on median statistics. The median fund has 6.5 clients and $55.3 million AUM per client. Many institutional investors have much smaller mandates. The 25th percentile mandate is just under $13 million.

We next present fund-level descriptive statistics for the four broad asset classes. The largest funds are U.S. and global fixed income, which have, on average, $2.6 billion and $2.2 billion in total AUM as of 2012, followed by global public equity ($1.7 billion) and U.S. public equity ($1.4 billion). Assets under management per client are also larger for fixed income funds than for equities. For example, the median per client investment in a U.S. fixed income fund is $74 million, compared to $30.6 million for U.S. public equity. Thus, fixed income investments are larger in fund size and mandates per client.

2.4 Fund-level fees

We next examine fee distributions by asset class and client size. Panel A of Table 4 reports that the mean value-weighted fee is 44 basis points. This corresponds with the *schedule middle point estimate* presented in Figure 1, which aggregates up to $162 billion if applied to all delegated institutional assets. The value-weighted mean fee is lowest for U.S. fixed income (28.7 basis points), followed by global fixed income (31.9 basis points), U.S. public equity (49.2 basis points) and global public equity (48.2). The global asset classes have more right-skew, accounting for the larger means.

A natural question arises of who pays these fees. The equal-weighted fee is 56 basis points. Funds with lower assets under management are more expensive, as one might expect if larger clients get price breaks. We do not observe individual client investments in each fund. We can, however, examine the distribution of fees conditional on the fund's average mandate size. Panel B of Table 4 presents these conditional distributions. Fees trend downward in assets per client. For example, when the assets per client are less than $10 million, the value-weighted mean fee ranges from 60.9 to 66.8 basis points, but is 37 basis points or less when the assets per client are greater than $1 billion.[9]

Our fee estimates are in line with those reported in both the press and academic research. For example, Zweig (2015) reports that CalPERS paid an average fee of 48 basis points in 2012. Coles, Suay, and Woodbury (2000) describe the fee price breaks for closed-end institutional funds. They find that a typical fund charges 50 basis points for the first $150 million, 45 basis points for the next $100 million, 40 basis points for the subsequent $100 million, and 35 basis points allocations above $350 million. Examining active U.S. equity institutional funds, Busse, Goyal, and Wahal (2010) find that fees are approximately 80 basis points for investments of $10 million and approximately 60 basis points for investments of $100 million.

[9] The very small mandates (less than $1 million) are likely to be in institutional mutual funds, which may explain why the average fees are slightly lower on the first row than on the second.

Beyond scale effects and the negotiating power held by large investors, asset managers may take into account other factors to determine an institution's willingness-to-pay, such as the ability of institutions to manage capital in-house, behavioral biases, or agency issues associated with delegation.[10] We do not capture such factors in our analysis.

3 Results

3.1 Alpha relative to the market

We start by comparing the performance of asset managers to the overall market. Panel A of Table 5 reports estimates of gross and net alphas from a market model that subtracts the returns on the broad asset class benchmarks.[11] We implement monthly value-weighted regressions of asset manager fund returns on broad asset class benchmark returns, constraining the market beta to be equal to one. Alphas in this specification represent simple value-weighted, monthly returns over the benchmark index. Tracking errors are defined as the standard deviation of the residual in a model that allows for a non-zero alpha. For exposition, we annualize alphas and tracking errors in all of our tables. We find that asset manager funds exhibit a market-adjusted gross alpha of 131 basis points annually, with a t of 3.21, and a net alpha of 88 basis points, with a t of 2.14.

Which asset classes account for the positive performance? The rows of Panel B report the net alphas and portfolio weights by year and asset class, and the far right column reports the time series of gross alphas. The bottom row reports how the asset classes each contribute to add up to the 131 basis points. The alpha contribution comes from global equity (50

[10]See, for example, Lakonishok, Shleifer, and Vishny (1992b), Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997), Gil-Bazo and Ruiz-Verdú (2009), and Gennaioli, Shleifer, and Vishny (2015).

[11]In our analysis, we use the following broad asset class benchmarks: Russell 3000 (U.S. public equity), MSCI World ex U.S. Index (global public equity), Barclays Capital U.S. Aggregate Index (U.S. fixed income), and Barclays Capital Multiverse ex US Index (global fixed income). Table A3 provides return statistics for the benchmarks and the Consultant's funds mapped to each asset class.

basis points), U.S. equity (40 basis points), U.S. fixed income (22 basis points), and global fixed income (17 basis points). The decomposition also indicates that positive alpha is partly driven by timing (i.e., having greater weights invested in asset classes that performed well during that period). We can quantify the timing contribution. If asset manager funds invested with the average weights across the asset classes (i.e., did not dynamically adjust the asset class portfolio weights), gross alpha would have been 102 basis points. Hence, 29 basis points of alpha is due to timing across asset classes.

Given that asset managers funds earn positive alpha in a sample that encompasses over 13% of the total worldwide investable assets, the adding-up constraint argument of Sharpe (1991) implies that the rest of the market earns negative gross alphas relative to the market. If we assume that there is no selection bias in our data relative to the aggregate delegated institutional capital in the Pensions & Investments surveys, we can extrapolate our estimates to approximately 29% of worldwide investable assets. The market clearing constraint suggests that if asset manager funds return a positive 131 basis points gross over the index, everyone else must return a gross 53 basis points *below* the index.[12]

We can convert this gross alpha into dollars. Maintaining the assumption that the Consultant's database is representative of the Pensions & Investments sample, asset manager funds collectively earn \$469 billion per year from the rest of the market. Of this amount, \$162 billion accrues to asset managers in fees and \$307 billion accrues to institutions. In terms of the dollar value added measure of Berk and Binsbergen (2015), the average asset manager fund generates \$181,811 in value-added per month, which is similar to the estimates of Berk and Binsbergen (2015) for retail equity mutual funds (\$140,000 per month). Our results together with the finding of Fama and French (2010) that retail mutual funds' gross alphas are close to zero suggest that asset managers earn positive alphas at the expense of

[12]The market clearing constraint is that the average investor holds the market, which implies that $w_{\text{asset managers}}\hat{\alpha}_{\text{asset managers}} + (1 - w_{\text{asset managers}})\hat{\alpha}_{\text{everyone else}} \equiv 0$. We use this condition to obtain the estimate of $\hat{\alpha}_{\text{everyone else}} = -53$ basis points.

non-delegated institutional and individual investors.

3.2 Performance

As discussed by Goyal and Wahal (2008) and Jenkinson, Jones, and Martinez (2016), institutions typically construct their portfolios through a two-step process. Institutions first determine their strategy-level policy allocations by optimizing over strategy-level risk and return. Investment officers then fulfill strategy policy allocations either "in house" or by issuing an investment mandate to an external manager. Because overall portfolio risk is typically incorporated in the first-step of determining strategy allocations, institutions generally appraise fund performance relative to only the strategy benchmark. Fund performance is commonly reported in two dimensions—net alpha and tracking error estimated in a strategy-level factor model.[13]

3.2.1 Asset class benchmarked performance

To place out strategy-level benchmark results (in the next subsection) in context, we first evaluate performance relative to broad asset class benchmarks. We regress monthly fund returns in excess of the one-month Treasury bill on the excess return of each benchmark. We estimate these regressions separately for funds' gross and net returns. Our prior was that institutions investing in asset manager funds likely have longer investment horizons than retail investors and are thus willing to hold more market exposure (i.e., betas higher than one in the traditional CAPM sense). Thus, we expected that the 131 basis points gross alpha from above would decline in a factor model of performance. The data did not support our prior. Table 6 reports that the overall (row 1) beta is less than one (0.93). Asset manager funds exhibit gross and net alphas of 189 basis points and 145 basis points. These estimates

[13]Our focus on a single factor is consistent with the findings of Barber, Huang, and Odean (2016) and Berk and Binsbergen (2016), who find that mutual fund flows respond to a single-factor model rather than, for example, to multi-factor models.

do not, however, reflect performance from the viewpoint of an institutional investor because the benchmark is not at the strategy level.

Nevertheless, we can compare these broad market results to those of Lewellen (2011) and Busse, Goyal, and Wahal (2010). Using aggregate institutional holdings of U.S. public equities taken from 13-F filings, Lewellen (2011) finds an insignificant gross alpha of 32 basis points (annualized) in a market model. For U.S. equity asset manager funds, Busse, Goyal, and Wahal (2010) estimate a gross alpha for U.S. equities of 64 basis points per year. Their estimate is not statistically significant, which may be driven by differences in sample period and their use of quarterly rather than monthly data. Lewellen's lower estimate may be due to the non-delegated holdings of institutions, that are not included in our sample or in that of Busse, Goyal, and Wahal (2010).

3.2.2 Strategy benchmarked performance

The Consultant's database classifies the asset manager funds into 170 granular strategy classes (e.g., Australian equities is a strategy class under the broad asset class of global public equity). In addition, the database includes a strategy-level benchmark for each fund. The Consultant sets the benchmarks based on the suggestion of the asset manager, auditing each strategy to ensure that the proposed benchmark is appropriate for the fund. We evaluate performance using the modal benchmark in the strategy class. If the benchmark chosen has less than 10% coverage of funds in the strategy, we instead use the benchmark covering the most assets under management in the strategy. We list the 170 strategies and their benchmarks in Table A5 of the Internet Appendix.

Panel A of Table 7 reports estimates of asset manager fund performance from the viewpoint of an institutional investor; namely, performance in a strategy-level single factor model. We find a gross alpha of 86 basis points (t = 3.35) and a net alpha of 42 basis points (t = 1.63). In this estimation, the precision of benchmarking improves materially, especially in the global asset classes. The model's explanatory power increases from 69.9% (Table 6) to 82.3% (Table 7) when we replace broad asset class benchmarks with strategy-level benchmarks. Tracking error falls to 5.6%, which is almost identical to the Del Guercio and Tkac (2002) estimate for pension funds and in line with Petäjistö's (2013) estimate for moderately active retail mutual funds.[14] Our beta estimate remains less than one, at 0.94. Thus, asset manager funds achieve performance with lower strategy-level risk, rather than by choosing lower risk benchmarks to make their performance look better. If managers strategically chose lower risk benchmarks, then the beta would likely be greater than one.

3.2.3 Robustness of strategy-level results to benchmarking and sample selection

Panel B presents results for alternative samples to evaluate the robustness of our results. The first row limits the sample to funds that enter the platform within a year after they are started. This restriction is potentially important because it restricts the analysis to funds with minimal amount of backfilling. Although we remove all backfilled data throughout this study, it is still possible that established and successful funds systematically differ from new funds. For this restricted sample, however, the alpha only marginally attenuates to an estimate of 0.80 ($t = 3.03$).

The second row of Panel B restricts the sample to post-2006. We use this cutoff for three reasons. First, the consultant's coverage, as a fraction of Pensions & Investments total AUM, is higher after this date. Second, this part of the sample captures all of the crisis period. Third, GIPS reporting standards were in force during this period. The gross alpha estimate remains at 0.67 ($t = 1.92$) for this sub-period. The bottom row of Panel B restricts the sample to asset managers who report performance for funds representing at least 85% of their total institutional assets under management (i.e., the variable "coverage" from Table 2

[14]Petäjistö (2013) reports an average tracking error of 7.1% for actively managed retail mutual funds. He also estimates tracking errors by fund type, finding a tracking error of 15.8% for concentrated mutual funds, 10.4% for factor bets, 8.4% for stock pickers, 5.9% for moderately active funds, and 3.5% for closet indexers.

is greater than 85%, which is the 75th percentile). We continue to find similar results for this restricted sample even though the average number of funds per month drops precipitously from 4,668 for the full sample to 437 for this restricted sample.

For benchmarking robustness, we compare the performance of asset manager funds with the performance of mutual funds. We use mutual fund data from CRSP's survivorship-bias free database. For each asset manager strategy, we use the CRSP classification codes to identify all mutual funds that follow the same strategy. We then compute the value-weighted return series of these mutual funds. Table 8 reports the differences between the value-weighted returns earned by asset manager funds and mutual funds on both gross and net basis.

The average asset manager fund's net return exceeds that of the average mutual fund by 110 basis points per year over the sample period. This difference is significant with a t of 2.43. This performance difference emanates from differences in both gross performance and fees. In the comparison of gross returns, the average dollar invested in asset manager funds outperforms the dollar invested in mutual funds by 50 basis points; the difference in fees makes up for the remaining 60 basis points. The last row reports the average size of the mutual fund comparison group. Across all asset classes, for example, we benchmark the average dollar invested in asset manager funds against 376 mutual funds in the typical month. The asset-class breakdown shows that the performance differences, on both gross and net basis, are particularly large in the fixed income asset classes. The net return difference is positive but insignificant in U.S. public equity, and negative and insignificant in global public equity.

These estimates are consistent with the research on actively managed mutual funds. Fama and French (2010) show that, collectively, actively managed U.S. equity funds resemble the market portfolio. A comparison of asset manager funds against the gross return earned by mutual funds is therefore close to our broad asset class comparison, except that the mutual fund "benchmark" is a noisier version of the broad asset class. The typical actively managed mutual fund is also expensive; the gross and net alpha estimates in Fama and French (2010, Table II) suggest that the average dollar invested in these funds pays 95 basis points in fees, which is far more than the average dollar invested in the asset manager funds.

To provide insight into how funds outperform benchmarks, Table 9 reports raw returns, standard deviations, and Sharpe ratios for the funds, the broad asset class benchmarks, and the strategy-level benchmarks. The statistics are value-weighted to reflect the investments of the asset manager funds. Focusing on the last row, we show that the strategy-level indices in equity and fixed income have a higher Sharpe ratio (0.26) over the period than the broad asset class indices (0.18). Asset manager funds look almost identical to strategy indices in terms of standard deviation (10.33 versus 10.37), but they achieve a higher return (5.23 versus 4.82). This pattern holds for each of the public equity and fixed income asset classes reported on the other rows of Table 9. These results together with those in Tables 7 and 8—which show that asset manager funds outperform strategy and mutual fund benchmarks—suggest that asset manager funds outperform their strategy benchmarks by taking risks *outside* those captured by the specific strategy.

3.3 Sharpe (1992) analysis

Given our performance results, we turn to the question of how asset managers generate positive net alphas relative to strategy benchmarks. To answer this question, we implement the Sharpe (1992) model that decomposes fund returns into loadings on tradable indices. This framework allows us to test whether *tactical* or *smart beta* exposures explain what asset managers do to achieve positive net alpha and whether, and at what indifference cost, institutions could have replicated asset manager returns by managing assets in-house.

3.3.1 Estimating mimicking portfolios for asset manager funds from tradable factors

We implement the Sharpe analysis as follows. We first gather a set of tradable factors (i.e., those with tradable indices) including the broad asset class benchmark, which varies by fund. We start with the 12 original factors of Sharpe (1992), but with modifications to reflect changes in market weights since the original paper (e.g., replacing Japanese market indices with that of emerging markets). We then augment the list to map to factors studied in the finance literature across asset classes. For U.S. equity, we include size and value factors, which have statistical power in predicting the cross-section of stock returns (Fama and French 1992) and explain the majority of variation in actively managed U.S. equity mutual fund returns (Fama and French 2010). For global equity, we include indices of European equities and emerging markets. For U.S. fixed income, we include indices to span differences both in riskiness and maturity, including indices of government fixed income of different maturities, corporation investment grade bonds, and mortgage-backed securities. These indexes are close to those that Blake, Elton, and Gruber (1993) use to measure the performance of U.S. bond mutual funds. The global fixed income factors capture returns on government and corporate bonds both in Europe and emerging markets. The following table lists the original factors used by Sharpe (1992) and those used in our analysis.

Asset class	Sharpe (1992)	Our implementation
U.S. public equity	Sharpe/BARRA Value Stock	**Russell 3000**
	Sharpe/BARRA Growth Stock	S&P 500/Citigroup Value
	Sharpe/BARRA Medium Capitalization Stock	S&P 500/Citigroup Growth
	Sharpe/BARRA Small Capitalization Stock	S&P 400 Midcap
		S&P 600 Small Cap
Global public equity	FTA Euro-Pacific ex Japan	**MSCI World ex U.S.**
	FTA Japan	S&P Europe BMI
		MSCI Emerging Markets Free Float
U.S. fixed income	Salomon Brothers' 90-day Treasury Bill	**Barclays Capital U.S. Aggregate**
	Lehman Brothers' Intermediate Government Bond	U.S. 3 month T-Bill
	Lehman Brothers' Long-term Government Bond	Barclays U.S. Intermediate Government
	Lehman Brothers' Corporate Bond	Barclays Capital U.S. Long Government
	Lehman Brothers' Mortgage-Backed Securities	Barclays Capital U.S. Corporate Investment Grade
		Barclays Capital U.S. Mortgage-Backed Securities
Global fixed income	Salomon Brothers' Non-U.S. Government Bond	**Barclays Capital Multiverse ex U.S.**
		Barclays Capital Euro Aggregate Government
		Barclays Capital Euro Aggregate Corporate
		JP Morgan EMBI Global Diversified Index

For each fund, we regress monthly returns against the 15 factors using data up to month $t-1$. We constrain the regression slopes to be non-negative and sum to one, following (Sharpe 1992). We then use the estimated loadings to construct a dynamic mimicking style portfolio for each fund. Because we constrain the loadings to sum to one for each fund, they can be interpreted as portfolio weights.[15] A benefit of the Sharpe methodology is that these non-negative weights yield clean inferences about fund exposures (Sharpe 1992). Panel A of Table 10 presents the factor weight estimates, where we have estimated the weights fund-by-fund and taken value-weighted averages by broad asset class. For example, the average weight on the Russell 3000 (the broad asset class benchmark) for U.S. public equity funds is 9.9%. The remaining rows present the deviations from the benchmark. For example, the average U.S. public equity fund holds a 28.8% weight in the S&P 500/Citigroup Value benchmark.

The second step of the Sharpe analysis assesses whether the factor loadings captured in

[15]We also estimated the regressions with the constraint that the coefficients sum to less than or equal to one. For this specification, the average weights sum to 0.99.

the mimicking style portfolio are the source of the positive asset manager fund performance. We estimate the factor loadings using rolling historical data to ensure that our second step performance measurement is out-of-sample.[16] For each fund-month, we calculate the fund's return in excess of the style portfolio. Panel B of Table 10 reports monthly value-weighted average excess returns over the mimicking style portfolio for each broad asset class and the associated t-statistics.

We find that gross returns are statistically indistinguishable from the mimicking portfolios, across all asset classes and for each broad asset class individually. The excess return estimate for all asset classes is -0.27 with a t of -0.77. Statistically and economically, the mimicking portfolio entirely accounts for the positive fund performance that we documented in Tables 6, 7, and 8. This result is consistent with our inference from the comparisons of funds and asset class benchmarks in Table 9—asset manager funds achieve outperformance by exchanging lower strategy-risk for higher other risks (tactical factor risk) that outperform benchmarks.

Does performance generated through factor exposures represent skill? This question relates to Berk and Binsbergen (2015), who consider the proper benchmarking of mutual funds. If internal management by the client cannot reproduce a tactical exposure in an asset class, then these authors suggest that we should attribute that exposure loading to a value-added activity that the fund provides its clients. Cochrane (2011) offers a similar interpretation:

> "I tried telling a hedge fund manager, "You don't have alpha. Your returns can be replicated with a value-growth, momentum, currency and term carry, and short-vol strategy." He said, "Exotic beta is my alpha. I understand those systematic factors and know how to trade them. My clients don't." He has a point. How many investors have even thought through their exposures to carry-trade or short-volatility. . . To an investor who has not heard of it and holds the market index, a new factor is alpha."

[16] In Table A4 of the Appendix, we present similar results when we estimate the Sharpe model using a jackknife procedure in which we use the full sample except for month t, or in which we exclude observations that are from six months before through six months after month t.

Cochrane (2011)

3.3.2 Do investors pay more for successful tactical betas?

If these factor exposures represent skill, then investors presumably are willing to pay for such performance. Therefore, we next examine whether fees in the cross section of asset manager funds correlate positively with the performance of the fund's style portfolio. Investors may also pay for "skill" that is not captured by the factor exposures (the gross fund return residual after subtracting out the return on the style portfolio). Table 11 presents regressions that estimate the relation between fees and these two return components. Panel A presents panel estimates, which include month-asset class fixed effects. This panel allows us to estimate the marginal effect of return components on fees within asset class-month. To ensure that the return components obtained from the Sharpe analysis are pre-determined regressors, we measure fees as of the end of the sample period—either in June 2012 or when the strategy disappears. Given that the fee observation is the same throughout the panel for each fund, we cluster the standard errors at the fund-level.

Panel A of Table 11 shows that fees positively and significantly correlate with the returns on the style portfolio and the residual component. The coefficient on the style portfolio for the all asset classes specification is 6.01 ($t = 5.51$). To put this magnitude in context, the mean of the dependent variable is 60.0 basis points of fees, similar to the equal-weighted average fees we report in Table 4. A one-standard deviation higher mimicking style portfolio return (4.07 basis points) associates with a fee that is higher by: 12 months $*$ 0.0601 $*$ 4.07 $=$ 2.94 basis points (i.e., a 4.9% higher fee relative to the baseline mean fee). We also find a positive significant coefficient for the residual return component. However, the marginal effect of this correlate is much lower. Using the same calculation, a one-standard deviation higher residual return (1.99 basis points) associates with fee being only 0.32 basis points higher. Noteworthy, however, is that the significance of the residual return component is being driven by fixed income asset classes. In global fixed income, for instance, a one standard deviation higher residual return associates with a 1.5% higher fee than the mean for that asset class.

As an alternative to the panel specification in Panel A, we estimate cross-sectional regressions with one observation per fund. We first estimate panel regressions of style returns and residual returns on month-asset class fixed effects. The independent variables in our collapsed specification are the time series averages of these style and residual returns, purged of the month-asset class effect. We find robust evidence that investors pay for tactical factor exposures. A one-standard deviation higher return on the style portfolio translates into fees that are higher by 2.42 basis points. The residual component only matters in global fixed income. In sum, our estimates suggest that asset manager funds charge fees, and investors pay fees primarily for performance generated through tactical factor exposures, especially for equity strategies.

3.3.3 "In-house" implementation of factor index loadings

The results from the Sharpe analysis raise the question of whether institutional investors could do as well as asset manager funds if they had instead implemented factor loading portfolios in-house. To address this question, we discard our asset manager data and construct rolling optimal portfolios using only historical data on tradable factor indices. We first use the standard algorithm, treating the factor indices as the assets, to generate mean variance (MV) efficient portfolios separately for each of the four asset classes. We implement this optimization using data up to month $t-1$, and then calculate the return on the optimal portfolio for month t. We aggregate across asset classes by applying asset managers' month $t-1$ asset class weights for month t returns.

We then implement two modifications to the mean-variance algorithm to generate more stable and simpler-to-implement optimal portfolios that avoid extreme short or long positions in factors.[17] The first simpler portfolio forces the covariance matrix to be diagonal to eliminate extreme loadings based on covariances and sets any negative estimated risk premiums to zero. The second alternative portfolio is a mean-variance portfolio with short-sale constraints imposed in the optimization.

Panel A of Table 12 presents the gross and net performance along with the implied Sharpe ratio for asset manager funds. Over the 2000–2012 period, asset manager funds earned 5.2% in gross returns with a standard deviation of 10.4% (Sharpe ratio = 0.3). Panel A then presents gross performance for the replicating portfolios. The standard MV portfolio exhibits a lower Sharpe ratio, 0.16, than asset manager funds. However, the two alternative MV portfolios have higher Sharpe ratios than the actual asset manager portfolios: MV analysis with a diagonal covariance matrix, 0.37, and MV analysis with short-sale constraint, 0.34.

In the rightmost column of Panel A of Table 12, we report the cost that would make an institution indifferent in Sharpe ratio terms between implementing the MV portfolio and delegating to asset managers. That is, the indifference cost solves for *cost* in:

$$\frac{r_{\text{gross replicating}} - r_f - \text{cost}}{\sigma_{\text{gross replicating}}} = \frac{r_{\text{net asset manager}} - r_f}{\sigma_{\text{net asset manager}}}. \tag{1}$$

Focusing on the diagonal MV portfolio, we find that institutions would be indifferent between delegating and managing assets in-house if the cost of managing assets in-house was 85.5 basis points. This 85.5 basis points must cover both administrative costs and trading fees. In terms of administrative costs, Dyck and Pomorski (2012) find that large pension funds incur approximately 12 basis points in non-trading costs to administer their portfolios.

To provide an estimate of the trading costs, we gather historical institutional mutual fund and ETF fee data from CRSP and Bloomberg covering the factors of the replication. We present the averages of the time series in Panel C of Table 12. Using these series, we

[17]For a discussion of the measurement error issues associated with the standard mean-variance solution, see DeMiguel, Garlappi, and Uppal (2009).

simulate the cost of implementing the replication for four different trading fee estimates: Quartile 1, Median, and Quartile 3 of the institutional mutual funds, sorted by cost, and the end-of-the-period ETFs. Panel B of Table 12 reports these results. Investing in the diagonal MV factor portfolio at the trading cost of the median institutional mutual fund would have cost 88.5 basis points in fees. Investing at the Quartile 1 fees would have cost 66.1 basis points. The indifference cost for the diagonal MV portfolio rule (85.5 basis points from Panel A) is similar to the sum of the administrative costs and the Quartile 1 fees (12 + 66.1 = 78.1 basis points). At this cost, an investor would be indifferent between managing assets in-house and delegating assets. At any mutual fund fees, the investor would likely prefer delegating.

Importantly, Panel B of Table 12 shows that even the Quartile 1 trading-cost estimate is high relative to the end-of-period ETF fees. Although many ETFs were not available over the full sample period (the ETF inception dates are included in Panel C), we consider a strategy that trades ETFs at their end of period fees. The first row of Panel B reports that at the end of period ETF fees, the portfolio would have cost only 24 basis points, thus tilting the preference away from delegating to asset managers toward investing in-house. The introduction of liquid, low cost ETFs is likely eroding the comparative advantage of asset managers.

This analysis is subject to several caveats. First, we assume that the necessary liquidity is available for the ETFs, index funds, and institutional mutual funds that an institution would use to replicate. Second, we assume that all institutions face the same trading costs. Third, we assume that institutions are sophisticated. Institutions must know which factors could be used to improve performance, and they have to know how to implement the required loadings in real time. These caveats favor delegation via asset managers. Put differently, less-sophisticated institutions or instittions who receive other (non-fee based) benefits from asset managers would likely choose delegation over in-house management.

4 Conclusion

We provide new facts about the investment vehicles into which institutions delegate assets. Over the period 2000-2012, institutional investors delegated an average of $36 trillion (29% of worldwide investable assets) to asset managers, paying an annual cost of $162 billion per year, or 44 basis points per dollar invested. In return, asset managers pooled a small number of institutions that want similar strategy exposures into actively-managed funds that outperform strategy benchmarks by 86 basis points gross, or 42 basis points net of fees. We trace this outperformance to systematic deviations from the asset-class benchmarks. The asset manager industry is therefore not just a passive pass-through entity that institutions use to implement strategy mandates.

A better understanding of delegation is relevant on several dimensions. For example, Adrian, Etula, and Muir (2014) show that intermediaries, rather than households, price assets. We provide evidence on the factors that lead institutions to delegate to intermediaries. Delegation is relevant to the ongoing debate about whether intermediation contributes to systemic risk (Jopson 2015). We characterize the delegation process and provide evidence on costs and benefits. There is room for more research on the determinants of asset flows and the implications of the sector's size.

Delegation is also relevant for understanding who pays for financial intermediation through fees and returns. We find that the average intermediated institutional dollar's return exceeded that of the market by 131 basis points between 2000 and 2012. This estimate implies that the average non-institutional or non-intermediated dollar—that is, investments made through retail mutual funds or directly by individuals or institutions—underperformed the market by 53 basis points *even before* fees. These estimates add to the debates on intermediary skill and the relative performance of active versus passive management, as well as for discussions of regulatory oversight of intermediation.

REFERENCES

Adrian, T., E. Etula, and T. Muir (2014). Financial intermediaries and the cross-section of asset returns. *Journal of Finance 69*(6), 2557–2596.

Ang, A., A. Ayala, and W. Goetzmann (2014). Investment beliefs of endowments. Working paper, Columbia University.

Annaert, J., M. De Ceuster, and W. Van Hyfte (2005). The value of asset allocation advice: Evidence from The Economist's quarterly portfolio poll. *Journal of Banking & Finance 29*(3), 661–680.

Bange, M. M., K. Khang, and T. W. Miller, Jr. (2008). Benchmarking the performance of recommended allocations to equities, bonds, and cash by international investment houses. *Journal of Empirical Finance 15*(3), 363–386.

Barber, B., X. Huang, and T. Odean (2016). Which risk factors matter to investors? Evidence from mutual fund flows. *Review of Financial Studies, forthcoming*.

Barber, B., Y.-T. Lee, Y.-J. Liu, and T. Odean (2009). Just how much do individual investors lose by trading? *Review of Financial Studies 22*(2), 609–632.

Barber, B. and G. Wang (2013). Do (some) university endowments earn alpha? *Financial Analysts Journal 69*(5), 26–44.

Berk, J. and J. Binsbergen (2015). Measuring skill in the mutual fund industry. *Journal of Financial Economics 118*(1), 1–20.

Berk, J. and J. Binsbergen (2016). Assessing asset pricing models using revealed preference. *Journal of Financial Economics 119*(1), 1–23.

Blake, C., E. Elton, and M. Gruber (1993). The performance of bond mutual funds. *Journal of Business 66*(3), 371–403.

Blake, D., B. Lehmann, and A. Timmerman (1999). Asset allocation dynamics and pension fund performance. *Journal of Business 72*(4), 429–461.

Blitz, D. (2013). How smart is 'smart beta'? *Journal of Indexes Europe March/April*.

Bogle, J. (2008). A question so important that it should be hard to think about anything else. *Journal of Portfolio Management 34*(2), 95–102.

Brown, K., L. Garlappi, and C. Tiu (2010). Asset allocation and portfolio performance: Evidence from university endowment funds. *Journal of Financial Markets 13*(2), 268–294.

Brown, K., W. Harlow, and L. Starks (1996). Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry. *Journal of Finance 51*(1), 85–110.

Busse, J., A. Goyal, and S. Wahal (2010). Performance and persistence in institutional investment management. *Journal of Finance 65*(2), 765–790.

Carhart, M. (1997). On persistence in mutual fund performance. *Journal of Finance 52*(1), 57–82.

Chevalier, J. and G. Ellison (1997). Risk taking by mutual funds as a response to incentives. *Journal of Political Economy 105*(6), 1167–1200.

Christopherson, J., W. Ferson, and D. Glassman (1998). Conditional manager alphas on economic information: Another look at the persistence of performance. *Review of Financial Studies 11*(1), 111–142.

Cochrane, J. (2011). Presidential address: Discount rates. *Journal of Finance 66*(4), 1047–1108.

Coggin, T. D., F. J. Fabozzi, and S. Rahman (1993). The investment performance of U.S. equity pension fund managers: An empirical investigation. *Journal of Finance 48*(3), 1039–1055.

Cohen, R. B., P. A. Gompers, and T. Vuolteenaho (2002). Who underreacts to cash-flow news? Evidence from trading between individuals and institutions. *Journal of Financial Economics 66*(2–3), 409–462.

Coles, J., J. Suay, and D. Woodbury (2000). Fund advisor compensation in closed-end funds. *Journal of Finance 55*(3), 1385–1414.

Del Guercio, D. and P. Tkac (2002). The determinants of the flow of funds of managed portfolios: Mutual funds vs. pension funds. *Journal of Financial and Quantitative Analysis 37*(4), 523–557.

DeMiguel, V., L. Garlappi, and R. Uppal (2009). Optimal versus naive diversification: How inefficient is the $1/N$ portfolio strategy? *Review of Financial Studies 22*(5), 1915–1953.

Dyck, A., K. Lins, and L. Pomorski (2013). Does active management pay? New international evidence. *Review of Asset Pricing Studies 3*(2), 200–228.

Dyck, A. and L. Pomorski (2012). Is bigger better? Size and performance in pension plan management. Working paper, University of Toronto.

Evans, R. and R. Fahlenbrach (2012). Institutional investors and mutual fund governance: Evidence from retail-institutional fund twins. *Review of Financial Studies 25*(12), 3530–3571.

Fama, E. and K. French (1992). The cross-section of expected stock returns. *Journal of Finance 47*(2), 427–465.

Fama, E. and K. French (2010). Luck versus skill in the cross-section of mutual fund returns. *Journal of Finance 65*(5), 1915–1947.

Ferson, W. and K. Khang (2002). Conditional performance measurement using portfolio weights: Evidence from pension funds. *Journal of Financial Economics 65*(2), 249–282.

French, K. (2008). Presidential address: The cost of active investing. *Journal of Finance 63*(4), 1537–1573.

Fung, W. and D. Hsieh (2004). Hedge fund benchmarks: A risk-based approach. *Financial Analysts Journal 60*(5), 65–80.

Gennaioli, N., A. Shleifer, and R. Vishny (2015). Money doctors. *Journal of Finance 70*(1), 91–114.

Gil-Bazo, J. and P. Ruiz-Verdú (2009). The relation between price and performance in the mutual fund industry. *Journal of Finance 64*(5), 2153–2183.

Goyal, A. and S. Wahal (2008). The selection and termination of investment management firms by plan sponsors. *Journal of Finance 63*(4), 1805–1847.

Greenwood, R. and D. Scharfstein (2013). The growth of finance. *Journal of Economic Perspectives 27*(2), 3–28.

Gruber, M. (1996). Another puzzle: The growth in actively managed mutual funds. *Journal of Finance 51*(3), 783–810.

Ippolito, R. and J. Turner (1987). Turnover, fees and pension plan performance. *Financial Analysts Journal 43*(6), 16–26.

Jacobs, B. and K. Levy (2014). Smart beta versus smart alpha. *Journal of Portfolio Management 40*(4), 4–7.

Jenkinson, T., H. Jones, and J. Martinez (2016). Picking winners? Investment consultants' recommendations of fund managers. *Journal of Finance 71*(5), 2333–2369.

Jensen, M. (1968). The performance of mutual funds in the period 1945–1964. *Journal of Finance 23*(2), 389–416.

Jopson, B. (2015, July 14). Big US fund managers fight off 'systemic' label. *Financial Times*.

Kosowski, R., A. Timmerman, R. Wermers, and H. White (2006). Can mutual fund "stars" really pick stocks? New evidence from a bootstrap analysis. *Journal of Finance 61*(6), 2551–2595.

Lakonishok, J., A. Shleifer, and R. Vishny (1992a). The impact of institutional trading on stock prices. *Journal of Financial Economics 32*(1), 23–43.

Lakonishok, J., A. Shleifer, and R. Vishny (1992b). The structure and performance of the money management industry. *Brookings Papers on Economic Activity. Microeconomics*, 339–379.

Lerner, J., A. Schoar, and J. Wang (2008). Secrets of the academy: The drivers of university endowment success. *Journal of Economic Perspectives 22*(3), 207–222.

Lewellen, J. (2011). Institutional investors and the limits of arbitrage. *Journal of Financial Economics 102*(1), 62–80.

Malkiel, B. (1995). Returns from investing in equity mutual funds 1971 to 1991. *Journal of Finance 50*(2), 549–572.

Markowitz, H. (1952). Portfolio selection. *Journal of Finance 7*(1), 77–91.

Petäjistö, A. (2013). Active share and mutual fund performance. *Financial Analysts Journal 69*(4), 73–93.

Philippon, T. (2015). Has the U.S. finance industry become less efficient? On the theory and measurement of financial intermediation. *American Economic Review 105*(4), 1408–1438.

Sharpe, W. (1991). The arithmetic of active management. *Financial Analysts Journal 47*(1), 7–9.

Sharpe, W. (1992). Asset allocation: Management style and performance measurement. *Journal of Portfolio Management 18*(2), 7–19.

Staal, A., M. Corsi, S. Shores, and C. Woida (2015). A factor approach to smart beta development in fixed income. *Journal of Index Investing 6*(1), 98–110.

Towers Watson (2013, July). Understanding smart beta.

Zweig, J. (2015, June 13). The intelligent investor: What you can learn from a pension giant. *The Wall Street Journal*, B1.

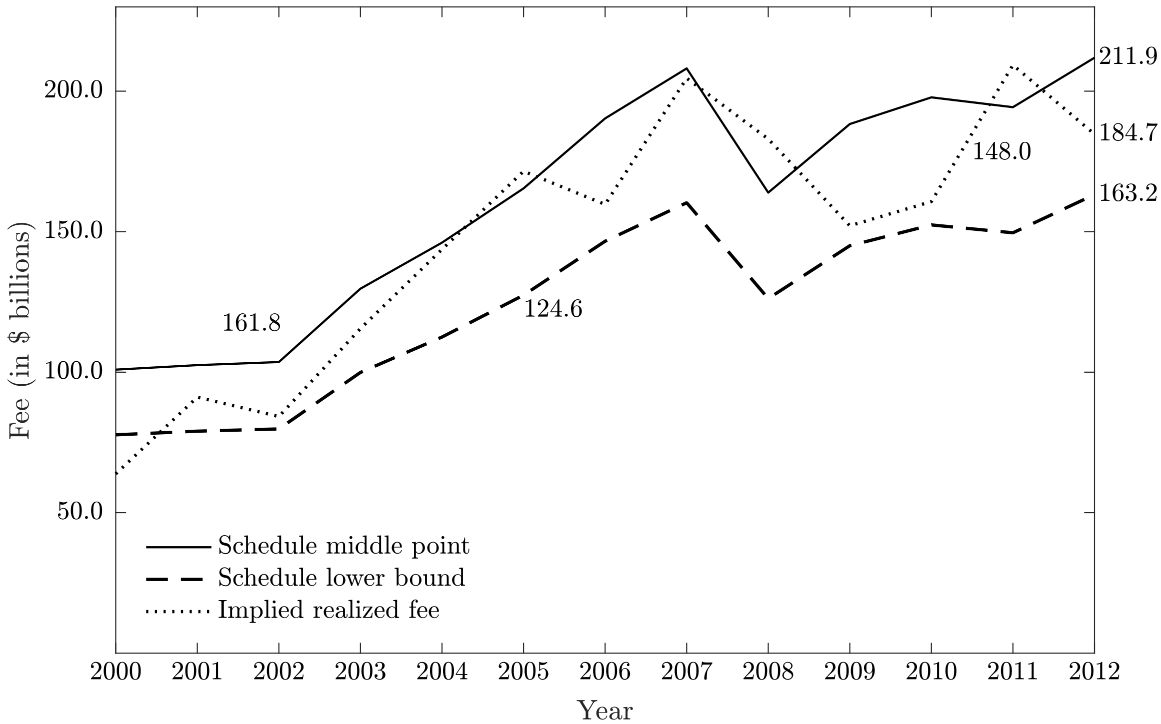

Figure 1: **Aggregate fees paid by institutions to asset managers.** This figure presents aggregate fee estimates based on information available in the Consultant's database. The estimates represent value-weighted average fees in the Consultant's database multiplied by total institutional assets under management. Line "Schedule middle point" assumes that the average dollar in each fund pays the median fee listed on that fund's fee schedule and "Schedule lower bound" uses the lowest fee from each fee schedule. "Implied realized fee" is estimated using data on funds that report returns both gross and net of fees. We annualize the monthly return difference, take the value-weighted average, and then re-weight asset classes so that each asset class's weight matches that in the full database. The numbers on y-axis to the right are the aggregate fee estimates for 2012. The numbers within the figure represent the average annual fees over the sample period for the three sets of estimates.

Table 1: Assets under management ($ in billions)

This table presents descriptive statistics for the Pensions & Investments surveys, our estimates of worldwide investable assets, and the Consultant's database. For descriptions of the Pensions & Investments surveys and our estimates of worldwide investable assets, see the Appendix. The Consultant's data cover the period 2000–2012.

	Pensions & Investments		Worldwide investable assets		Consultant's database				
					AUM			AUM with returns	
Year	AUM (in billions)	Number of managers	Total	% held by asset managers	Total	% of P&I	Number of managers	Raw	Without backfill
2000	22,170	718	78,884	28.1%	6,302	28.4%	3,428	5,286	3,102
2001	22,628	727	75,512	30.0%	6,574	29.1%	3,441	5,467	3,671
2002	22,897	723	76,603	29.9%	6,943	30.3%	3,600	6,014	4,155
2003	28,616	748	93,933	30.5%	9,612	33.6%	3,780	8,167	6,129
2004	32,370	715	108,514	29.8%	11,353	35.1%	3,902	10,065	7,950
2005	36,619	723	116,104	31.5%	12,922	35.3%	4,080	11,858	9,392
2006	42,142	720	134,293	31.4%	15,963	37.9%	4,227	14,894	12,246
2007	46,208	704	157,057	29.4%	27,778	60.1%	4,196	24,843	21,595
2008	36,306	671	134,650	27.0%	22,119	60.9%	4,283	18,491	16,116
2009	41,712	646	152,190	27.4%	25,340	60.7%	4,312	21,372	19,513
2010	43,798	633	164,610	26.6%	26,395	60.3%	4,248	23,174	21,607
2011	42,978	610	163,093	26.4%	25,877	60.2%	4,204	23,004	21,978
2012†	46,832	595	172,566	27.1%	26,265	56.1%	4,025	23,293	22,932
Average	35,790	687	125,231	28.9%	17,188	45.2%	3,979	15,071	13,107

† Year 2012 Consultant assets as of June 2012.

Table 2: Selection bias tests

This table examines the relation between performance and selective coverage in the Consultant's database. *Coverage* is the percentage of assets under management that the manager reports to the Consultant's database. *Internal coverage* is the percentage of assets under management for which the manager reports the returns on the underlying strategies. We report estimates from ordinary least squares panel regressions of percentage returns on the coverage measures. The unit of observation is a fund-month with $N = 1{,}226{,}824$. Standard errors are clustered by 32,165 month-by-strategy clusters. A coefficient estimate of 0.001 indicates that a percentage point increase in coverage is associated with a 0.1 basis point per month increase in returns.

Independent variable	Dependent variable: Net return		Dependent variable: Net return minus benchmark	
Specification 1: $r_{i,t} = a + b \times \text{coverage}_{i,t} + \varepsilon_{i,t}$				
Coverage (%)	0.00268 (1.35)	0.00077 (4.84)	0.00074 (2.97)	0.00077 (4.84)
Month × Strategy FEs	No	Yes	No	Yes
Adjusted R^2	0.03%	0.02%	0.01%	0.02%
Specification 2: $r_{i,t} = a + b_1 \times \text{coverage}_{i,t} + b_2 \times \text{internal coverage}_{i,t} + \varepsilon_{i,t}$				
Coverage (%)	0.00277 (1.46)	0.00078 (4.84)	0.00076 (3.10)	0.00078 (4.84)
Internal coverage (%)	0.00106 (0.59)	0.00038 (2.41)	0.00016 (0.64)	0.00038 (2.41)
Month × Strategy FEs	No	Yes	No	Yes
Adjusted R^2	0.04%	0.02%	0.01%	0.02%

Table 3: Summary of fund characteristics by asset class

This table presents descriptive statistics for the funds in the Consultant's database. Panel A reports the number of managers and funds, the average fund age, and the average AUM for all funds. In Panel B, we calculate each month the distributions of assets, client counts, and AUM per client for each fund and then report the time series averages of these distributions. Total assets and assets per client are in $ millions. The Consultant's data cover the period from January 2000 through June 2012.

Panel A: Number of managers and funds and average AUM

Asset class	Number of managers	Number of funds	Average fund age	Total AUM per year ($M)	% of total AUM
All	3,318	15,893	11.7	9,101,546	100%
U.S. public equity	1,232	4,956	6.1	2,396,141	26%
Global public equity	1,067	6,255	15.6	2,724,748	30%
U.S. fixed income	586	2,206	6.0	2,219,037	24%
Global fixed income	433	2,476	20.8	1,761,620	19%

Panel B: Distributions of assets, client counts, and AUM per client

			Percentiles		
Asset class	Mean	SD	25	50	75
All					
Assets	1,812.4	6,918.7	108.8	410.6	1,371.7
Clients	229.6	3,024.0	1.8	6.5	21.8
AUM per client	293.3	1,693.8	12.6	55.3	170.2
U.S. public equity					
Assets	1,358.4	4,158.4	83.4	339.1	1,103.4
Clients	122.3	800.0	2.5	7.8	28.0
AUM per client	175.9	491.1	6.3	30.6	125.0
Global public equity					
Assets	1,697.5	4,488.5	107.4	407.9	1.4
Clients	421.4	4,464.5	1.5	5.4	28.7
AUM per client	340.2	1,669.6	15.4	61.1	164.6
U.S. fixed income					
Assets	2,598.7	9,988.3	165.7	526.5	1,965.0
Clients	49.2	175.6	3.2	10.1	27.8
AUM per client	198.8	445.0	20.5	74.4	217.5
Global fixed income					
Assets	2,219.1	8,964.6	152.9	501.3	1,567.4
Clients	38.8	196.9	1.6	5.5	16.7
AUM per client	475.2	2,278.1	45.5	131.5	272.6

Table 4: Fees by asset class and client size

This table presents descriptive statistics for the fee data in the Consultant's database. Panel A reports the distributions of fund fees across all asset classes and by asset class. The fees reported in this table are the middle point fees reported on each fund's fee schedule. Panel B sorts funds based on the assets under management per client and reports the fee distributions for seven categories that range from less than one million dollars in assets per client to over one billion dollars in assets per client. The fees are computed using data on a total of 12,811 asset manager funds. The number of funds in the average month is 4,715.

Panel A: Distribution of fund fees (bps) by asset class

	Average			Percentiles		
Asset class	VW	EW	SD	25	50	75
All	44.0	55.8	33.6	31.0	53.4	74.3
U.S. public equity	49.2	63.1	37.7	47.2	63.5	80.0
Global pubic equity	58.2	68.1	45.8	50.6	64.0	80.6
U.S. fixed income	28.7	29.5	20.6	21.1	26.8	35.1
Global fixed income	31.9	36.1	24.6	22.9	29.5	44.1

Panel B: Distribution of fund fees (bps) by client size

	Average			Percentiles		
AUM per client	VW	EW	SD	25	50	75
$<$ $1 million	60.9	75.0	32.8	56.0	70.0	90.0
$1–$5	66.8	69.6	35.7	50.0	65.8	85.0
$5–$10	66.8	66.2	37.8	40.0	65.0	86.2
$10–$50	55.0	62.0	33.8	35.0	60.0	80.0
$50–$250	46.6	55.9	30.8	30.5	53.0	75.0
$250–$1000	37.1	51.4	30.8	27.5	48.1	69.0
$>$ $1000	32.2	50.8	36.1	25.0	45.0	66.7

Table 5: Fund returns

This table compares fund returns against broad asset-class benchmarks. Panel A reports market-adjusted returns, which are computed by subtracting from each fund's gross or net return the broad asset-class level benchmark return. These four benchmarks are listed in Table A3. Panel B presents the annual gross alphas and weights against the asset-class level benchmarks. We define for each fund i and month t a residual $e_{it} = r_{it} - r_{it}^B$, where r_{it}^B is the return on the broad asset class or strategy. We then estimate a value-weighted panel regression of these residuals against a constant, clustering the errors by month. The weights in this regression are proportional to each fund's assets under management and they are scaled to sum up to one within each month. Tracking error estimates are obtained from value-weighted regressions of e_{it}^2s on a constant. Alphas and tracking errors are annualized. Information ratio (IR) is the annualized net alpha divided by the tracking error. The Consultant's data cover the period from January 2000 through June 2012.

Panel A: Overall market-adjusted returns

Year	Gross returns $\hat{\alpha}$	Gross returns $t(\hat{\alpha})$	Gross returns Tracking error	Net returns $\hat{\alpha}$	Net returns $t(\hat{\alpha})$	Information ratio	Avg. number of funds
All	1.31	3.21	8.62%	0.88	2.14	0.10	4,668.2

Panel B: Market-adjusted returns and asset-class weights by year

	Annualized gross alphas				Annual portfolio weights				Total	
	Public equity		Fixed income		Public equity		Fixed income		gross	Avg. number
Year	U.S.	Global	U.S.	Global	U.S.	Global	U.S.	Global	alpha	of funds
2000	4.34	−4.49	−1.54	7.20	0.52	0.18	0.28	0.01	1.12	1,300.3
2001	2.90	−4.57	−0.36	6.57	0.46	0.21	0.32	0.02	0.38	1,825.6
2002	0.12	9.57	−1.43	−7.39	0.41	0.23	0.33	0.03	1.57	2,314.6
2003	1.53	7.52	3.08	−6.50	0.36	0.26	0.32	0.06	3.09	2,866.7
2004	1.55	3.49	1.53	−2.77	0.36	0.29	0.27	0.08	1.79	3,537.5
2005	2.18	−8.36	0.93	12.37	0.34	0.32	0.24	0.09	−0.60	3,956.3
2006	−1.12	4.11	0.92	−4.23	0.32	0.36	0.21	0.11	0.84	4,508.0
2007	0.36	2.72	−1.00	−6.22	0.31	0.38	0.20	0.12	0.21	5,119.4
2008	1.01	1.95	−7.28	−3.86	0.24	0.34	0.21	0.21	−1.40	6,777.5
2009	0.42	1.94	8.53	3.23	0.21	0.28	0.26	0.24	3.66	7,045.1
2010	0.55	5.00	2.50	2.17	0.20	0.28	0.24	0.29	2.72	7,309.0
2011	−2.02	1.16	0.87	5.69	0.20	0.28	0.24	0.28	1.71	7,645.2
2012	−2.23	1.18	4.61	4.17	0.20	0.25	0.26	0.28	2.26	7,732.5
Average	0.86	1.65	0.72	0.67	0.32	0.28	0.26	0.14	1.02	4,668.2

$$\text{Contribution of asset class } a = \sum_{t=2000}^{2012} \text{portfolio weight}_{at} \times \text{gross alpha}_{at} \Big/ \sum_{t=2000}^{2012} \text{portfolio weight}$$

Total	0.40	0.50	0.22	0.17					1.31	4,668.2

Table 6: Evaluating fund returns against broad market indexes

This table presents gross and net alphas from single-factor models that use the four broad asset class benchmarks listed in Table A3. We first estimate fund-by-fund regressions of net and gross returns against benchmarks and collect $e_{it} = \hat{\alpha}_i + \hat{\varepsilon}_{it}$. We then estimate value-weighted panel regressions of these residuals against a constant, clustering the standard errors by month. The weights in this regression are proportional to each fund's assets under management and they are scaled to sum up to one within each month. Betas and R^2s reported are obtained by estimating similar value-weighted regressions with the fund-specific betas and R^2s as the dependent variables. Tracking error estimates are obtained from value-weighted regressions of e_{it}^2s on a constant. Alphas and tracking errors are annualized. Information ratio (IR) is the annualized net alpha divided by the tracking error. The Consultant's data cover the period from January 2000 through June 2012.

	Gross returns					Net returns			Average
			Tracking						number
Asset class	$\hat{\alpha}$	$t(\hat{\alpha})$	error	$\hat{\beta}$	R^2	$\hat{\alpha}$	$t(\hat{\alpha})$	IR	of funds
All	1.89	3.92	7.92%	0.93	69.9%	1.45	3.01	0.18	4,668.2
U.S. public equity	0.92	1.83	8.02%	1.00	85.6%	0.43	0.85	0.05	1,788.0
Global public equity	1.73	1.34	9.36%	1.05	77.1%	1.15	0.89	0.12	1,549.9
U.S. fixed income	0.95	1.86	4.07%	0.97	64.3%	0.66	1.30	0.16	779.9
Global fixed income	4.30	4.90	6.58%	0.47	35.1%	3.98	4.54	0.60	550.4

Table 7: Evaluating fund returns against strategy-specific benchmarks

This table presents gross and net alphas from single-factor models that use the 170 strategies listed in Table A5. Panel A reports the estimates by asset class. Panel B reports estimates based on alternative samples for robustness. The first row in Panel B limits the sample to funds for which the manager entered no more than one year of historical data at the initiation of coverage. The second row presents results for the post-2006 data and the third row limits the sample to asset managers that report performance for funds that represent at least 85% of their total assets under management. We first estimate fund-by-fund regressions of net and gross returns against benchmarks and collect $e_{it} = \hat{\alpha}_i + \hat{\varepsilon}_{it}$. We then estimate value-weighted panel regressions of these residuals against a constant, clustering the standard errors by month. The weights in this regression are proportional to each fund's assets under management and they are scaled to sum up to one within each month. Betas and R^2s reported are obtained by estimating similar value-weighted regressions with the fund-specific betas and R^2s as the dependent variables. Tracking error estimates are obtained from value-weighted regressions of e_{it}^2s on a constant. Alphas and tracking errors are annualized. Information ratio (IR) is the annualized net alpha divided by the tracking error. The Consultant's data cover the period from January 2000 through June 2012.

Panel A: Single-factor model regressions against strategy benchmarks

	Gross returns					Net returns			Average
			Tracking						number
Asset class	$\hat{\alpha}$	$t(\hat{\alpha})$	error	$\hat{\beta}$	R^2	$\hat{\alpha}$	$t(\hat{\alpha})$	IR	of funds
All	0.86	3.35	5.62%	0.94	82.3%	0.42	1.63	0.07	4,668.2
U.S. public equity	0.39	0.97	6.25%	0.98	89.8%	−0.10	−0.25	−0.02	1,788.0
Global public equity	0.58	1.26	6.02%	0.96	90.3%	0.00	0.01	0.00	1,549.9
U.S. fixed income	1.36	6.59	2.93%	0.84	73.5%	1.07	5.19	0.36	779.9
Global fixed income	1.29	3.15	4.92%	0.95	69.2%	0.97	2.37	0.20	550.4

Panel B: Robustness

	Gross returns					Net returns			Average
			Tracking						number
Sample or specification	$\hat{\alpha}$	$t(\hat{\alpha})$	error	$\hat{\beta}$	R^2	$\hat{\alpha}$	$t(\hat{\alpha})$	IR	of funds
No more than one year of historical data	0.80	3.03	5.33%	0.93	83.2%	0.35	1.34	0.07	2,411.4
Only post-2006 data	0.67	1.92	5.36%	0.94	80.7%	0.23	0.67	0.04	6,503.1
Strategy coverage $\geq$ 85%	0.74	1.76	5.74%	0.94	85.4%	0.18	0.44	0.03	436.5

Table 8: Mutual fund-benchmarked gross and net returns

This table compares the performance of asset manager funds with the performance of mutual funds. For each asset manager fund, we use the CRSP classification codes to identify all mutual funds that follow the same strategy. We then compute the value-weighted return series of these mutual funds using the CRSP survivorship-bias free database. The table reports the differences between the value weighted gross and net returns earned by asset manager funds and mutual funds.

	Asset class				
		Public equity		Fixed income	
	All	U.S.	Global	U.S.	Global
Difference in net returns	1.10	0.75	−1.23	1.35	3.56
	(2.43)	(1.28)	(−1.16)	(1.92)	(2.85)
Difference in gross returns	0.50	0.22	−2.07	0.69	3.35
	(1.12)	(0.38)	(−1.96)	(0.98)	(2.68)
Avg. number of asset manager funds	3,001.3	2,073.3	2,309.9	929.3	930.1
Avg. number of mutual funds	376.4	844.0	100.6	187.5	333.0

Table 9: Average returns, standard deviations, and Sharpe ratios for asset manager funds, broad asset class benchmarks, and strategy-specific benchmarks

This table reports average returns, standard deviations, and Sharpe ratios for asset managers funds, the broad asset class benchmarks, and the strategy-specific benchmarks. The estimates are reported by asset class. The return on the strategy-specific benchmark is the value-weighted average of all the strategies within each asset class, with the weights proportional to asset manager funds' AUMs. The last row examines the performance of equity and fixed income asset classes.

	Asset managers			Asset-class benchmark			Strategy benchmark		
Asset class	Average return	SD	Sharpe ratio	Average return	SD	Sharpe ratio	Average return	SD	Sharpe ratio
U.S. public equity	4.46	16.69	0.14	3.62	16.68	0.09	4.23	16.55	0.12
Global public equity	4.01	16.87	0.11	2.31	15.57	0.01	3.66	17.30	0.09
U.S. fixed income	7.10	3.90	1.26	6.36	3.61	1.16	6.83	4.22	1.10
Global fixed income	7.03	4.85	1.00	6.41	8.50	0.50	6.02	4.61	0.83
1-month T-bill				2.17	0.63				
All	5.23	10.33	0.30	3.91	9.79	0.18	4.82	10.37	0.26

Table 10: Sharpe analysis

This table reports estimates from an analysis that compares fund returns with returns on mimicking portfolios constructed from 15 tactical factors. We implement this analysis using a modified version of Sharpe's (1992) approach. For each fund i-month t, we regress the strategy returns against 15 tactical factors using data up to month $t-1$. The first tactical factor is the strategy's broad asset class benchmark listed in Table A3. The remaining 14 tactical factors, which are listed in Panel A, are common across strategies. The regression slopes are constrained to be non-negative and to sum up to one. We use the resulting slope estimates to compute the return on strategy i's style portfolio in month t and define a residual $e_{it} = r_{it} - r_{it}^B$, where r_{it}^B is the return on the style portfolio. We then estimate a value-weighted panel regression of these residuals against a constant, clustering the errors by month. The weights in this regression are proportional to each fund's assets under management and they are scaled to sum up to one within each month. Panel A reports the average weights by asset class. Panel B reports gross and net alphas, tracking errors, and information ratios for the funds by asset class. The tracking error and Sharpe weight estimates are obtained from value-weighted regressions of e_{it}^2s and the first-stage weights on a constant. The Consultant's data cover the period from January 2000 through June 2012.

Panel A: Sharpe weights ($w_1 + \cdots + w_{15} = 100\%$)

		Asset Class			
Factors	All	U.S. public equity	Global public equity	U.S. fixed income	Global fixed income
Asset-class benchmark	18.7				
Russell 3000		9.9			
MSCI World ex U.S.			20.8		
Barclays Capital U.S. Aggregate				25.0	
Barclays Capital Multiverse ex U.S.					27.2
Equity: US					
S&P 500/Citigroup Value	10.8	28.8	3.9	0.7	0.8
S&P 500/Citigroup Growth	9.2	22.8	7.4	0.5	0.6
S&P 400 Midcap	3.9	10.9	1.9	0.6	0.4
S&P Small Cap	6.1	14.4	3.3	0.9	1.6
Equity: Global					
S&P Europe BMI	10.1	2.1	32.2	0.7	1.2
MSCI Emerging Market Free Float Adjusted Index	6.8	3.6	18.1	1.2	1.6
FI: US					
U.S. 3 Month T-Bill	5.8	1.8	1.8	8.3	18.0
Barclays Capital US Intermediate Govt	4.4	0.3	0.8	12.1	6.5
Barclays Capital US Long Govt	5.2	1.0	2.5	8.3	12.1
Barclays Capital US Corporate Investment Grade	8.5	0.6	1.8	22.7	9.6
Barclays Capital US Mortgage Backed Securities	4.8	0.7	1.2	14.4	2.8
FI: Global					
Barclays Capital Euro Aggregate Govt	1.5	1.0	1.5	0.2	4.6
Barclays Capital Euro Aggregate Corporate	1.3	1.1	1.4	0.4	1.9
JP Morgan EMBI Global Diversified	3.0	1.0	1.3	4.0	11.3
Total	100.0	100.0	100.0	100.0	100.0
Avg. number of funds	4,235.3	1,634.1	1,391.7	715.6	493.9

Panel B: Excess returns over the mimicking portfolio

Asset class	Gross returns: Excess return	Gross returns: t(Excess return)	Gross returns: Tracking error	Gross returns: R^2	Net returns: Excess return	Net returns: t(Excess return)	Net returns: IR	Average number of funds
All	−0.27	−0.77	5.76%	84.8%	−0.71	−2.00	−0.12	4,235.3
U.S. public equity	−0.67	−1.50	5.75%	89.9%	−1.16	−2.60	−0.20	1,634.1
Global public equity	−1.11	−1.50	7.23%	85.6%	−1.69	−2.29	−0.23	1,391.7
U.S. fixed income	0.46	1.24	2.98%	71.4%	0.17	0.45	0.06	715.6
Global fixed income	0.89	1.41	4.96%	60.9%	0.58	0.91	0.12	493.9

Table 11: Regressions of fees on style-portfolio and residual returns

This table presents regressions that measure the relation between before-fee performance and fees. The unit of observation is a month-fund pair. We report estimates from regressions of monthly fees ($\times 100$) on the return on the style portfolio and the residual return. These return-component estimates are from Table 10's Sharpe analysis. Panel A presents panel regressions with monthly returns. These regressions include month-asset class fixed effects and standard errors are clustered at the fund-level. Panel B presents cross sectional regressions with one observation per fund. We generate each fund's observation by first running panel regressions of style return and the residual return on month-asset class fixed effects. The residuals from these regressions represent abnormal performance after removing variation across asset classes and months. For each fund, we then take averages of these adjusted style and residual returns. The Consultant's data cover the period from January 2000 through June 2012.

Panel A: Panel regressions by asset class

Dependent variable:	Fees				
Sample set:	All asset manager fund-month observations				
In asset class:	All	Public equities		Fixed income	
		U.S.	Global	U.S.	Global
Style portfolio return	6.01	10.34	5.02	1.02	2.71
	(5.51)	(4.32)	(3.69)	(0.64)	(1.30)
Residual return	1.34	1.34	1.04	3.09	2.78
	(2.67)	(1.13)	(2.45)	(2.52)	(2.34)
Month-asset class FEs	Yes	Yes	Yes	Yes	Yes
N	619,703	232,894	202,734	104,747	79,328
Adjusted R^2	0.2%	0.3%	0.1%	0.1%	0.1%

Panel B: Cross-sectional regressions by asset class

Dependent variable:	Fees				
Sample set:	Asset manager fund				
In asset class:	All	Public equities		Fixed income	
		U.S.	Global	U.S.	Global
Style portfolio return	0.51	1.18	0.35	−0.05	0.29
	(2.83)	(3.03)	(1.39)	(−0.18)	(0.75)
Residual return	−0.02	0.07	−0.15	0.03	0.44
	(0.35)	(0.61)	(−1.14)	(0.48)	(1.64)
N	9,665	3,409	3,395	1,513	1,348
Adjusted R^2	0.6%	2.3%	0.3%	-0.1%	0.7%

Table 12: Replicating asset managers

This table reports Sharpe ratios of alternative portfolios constructed from tradeable indexes listed in Table 7. The first method uses the standard mean-variance optimization algorithm of Markowitz (1952). The second method first diagonalizes the covariance matrix and constrains the estimated risk premiums to be nonnegative. The third method imposes short-sale constraints. We estimate the means and covariances using all available historical data for each index up to month $t-1$. We construct the replicating portfolio separately within each asset class, and then use these weights together with the asset-class weights observed in the asset-manager data to compute the return on the replicating portfolio in month t. Panel A reports the Sharpe ratios of asset managers and these replicating portfolios. Column Indifference cost equates the Sharpe ratio of the replicating portfolio with the asset managers' Sharpe ratio. Panel B reports the cost of holding the replicating portfolio, constructed using the diagonal-covariance method, using four alternative assumptions about fees. The detailed fees are reported in Panel C. Expense ratios and fees are reported in basis points. Entries of "NA" denote that the data are not available.

Panel A: Sharpe ratios and indifference costs of replicating portfolios

	Average return	SD	Sharpe ratio	Indifference cost (bps)
Asset managers				
Gross return	5.23%	10.38%	0.295	
Net return	4.79%	10.38%	0.252	
Replicating portfolio, gross return				
Standard MV portfolio	4.42%	14.49%	0.155	−202.3
MV portfolio with diagonal covariance matrix	6.43%	11.55%	0.369	85.5
MV portfolio with short-sale constraints	6.16%	11.71%	0.341	53.6

Panel B: Cost (bps) of investing the replicating portfolio using the actual fees of the vehicle over the period

Vehicle	Fee
Institutional mutual funds	
Quartile 1	66.1
Median	88.5
Quartile 3	112.4
End-of-sample ETFs	24.0

Panel C: Fees used in the replicating portfolios

	ETFs			Institutional mutual funds			Fee
Benchmark	Expense ratio	Ticker	Start date	Q1	Median	Q3	used in replication
S&P 500/Citigroup Value	15	SPYV	9/29/00	70	91	112	91
S&P 500/Citigroup Growth	15	SPYG	9/29/00	80	97	122	97
S&P 400 Midcap	15	IVOO	9/9/10	70	95	115.5	95
S&P Small Cap	15	SLY	11/15/05	85	109	135	109
S&P Europe BMI	12	VGK	3/10/05	54.5	88	129	88
MSCI Emerging Market Free Float Adjusted	67	EEM	4/11/03	102	139	166	139
U.S. 3 Month T-Bill	14	BIL	5/30/07	16	26	45	26
Barclays Capital US Intermediate Govt	20	GVI	1/5/07	51	66	83	66
Barclays Capital US Long Govt	12	VGLT	11/24/09	20	43	67	43
Barclays Capital US Corporate Investment Grade	15	LQD	7/26/02	55	70	92	70
Barclays Capital US Mortgage Backed Securities	32	MBG	1/15/09	49	65	80	65
Barclays Capital Euro Aggregate Gov	15	GOVY	5/23/11	NA	NA	NA	15
Barclays Capital Euro Aggregate Corporate	20	IBCX	3/17/03	NA	NA	NA	20
JP Morgan EMBI Global Diversified	40	EMB	12/19/07	84	97	112	97

Appendix

In this Appendix, we describe the methodology that we use to estimate worldwide investable assets and total institutional assets held by asset managers.

Worldwide investable assets

We estimate total worldwide investable assets, which represent the sum of six broad investable asset classes: real estate, outstanding government bonds, outstanding bonds issued by banks and financial corporations, outstanding bonds issued by non-financial corporations, private equity, and public equity.

For real estate, we estimate the worldwide value of commercial real estate. To do so, we follow the methodology used by Prudential Real Estate Investors (PREI) in the report "A Bird's Eye View of Global Real Estate Markets: 2010 Update." Their methodology uses GDP per capita to capture country-level economic development and estimates the size of a country's commercial real estate market based on GDP. They select a time-varying threshold and assume that the value of commercial real estate above this threshold is 45% of total GDP. The threshold starts in 2000 at $20,000 in per capita GDP and then adjusts annually by the U.S. inflation rate. For countries with per capita GDP below the threshold in a given year, PREI calculates the value of the country's commercial real estate market as:

$$\text{Value of commercial real estate} = 45\% \times \text{GDP} \times (\text{GDP per capita / Threshold})^{1/3}.$$

To estimate the worldwide size of the government, financial, and corporate bond sectors, we use the Bank for International Settlements' debt securities statistics provided in Table 18 of the Bank's Quarterly Reviews. These statistics present total debt securities by both residence of issuer and classification of user (non-financial corporations, general government, and financial corporations).[1] We then aggregate the country-level data by year. For private equity, we use Preqin's "2014 Private Equity Performance Monitor Report," which provides annual estimates of assets under management held by private equity funds worldwide and these estimates include both cash held by funds ("dry powder") and unrealized portfolio values. For our estimates of the size of world's public equity markets, we use the World Bank's estimates of the market capitalization of listed companies.[2]

Table A1 presents annual estimates of worldwide investable assets by the six broad asset classes. Our estimate of worldwide investable assets for 2012 is $173 trillion. For comparison, if we extrapolate Philippon's (2015) estimates of U.S. investable assets, we obtain a similar estimate of $175 trillion in worldwide investable assets for 2012.

Total institutional assets held by asset managers

In our analysis, we supplement the Consultant's database with data from Pensions & Investments Magazine, which implements annual surveys of the asset management industry. In this subsection, we describe the Pensions & Investments surveys and how we use the surveys to construct our estimates of total institutional assets under management held worldwide by asset managers, which are presented in the first column of Panel A of Table 1.

We use two Pensions & Investments surveys. The first survey is the Pensions & Investments Towers Watson World 500, which is an annual survey of the assets under management (retail and

[1] The data are available at `https://www.bis.org/statistics/hanx18.csv`.

[2] The data are available at `http://data.worldbank.org/indicator/CM.MKT.LCAP.CD`.

institutional) held by the world's 500 largest money managers. The second survey is the Pensions & Investments Money Manager Directory, which provides more detailed data for U.S. based money managers including total assets under management, institutional assets under management, and broad asset allocations (equity, fixed income, cash, and other) for U.S. tax exempt institutional assets.

Table A2 provides descriptive statistics for these surveys and describes how we construct our estimate of total worldwide institutional assets held by asset managers. Column (1) presents annual total worldwide assets under management (retail and institutional assets) based on the Pensions & Investments Towers Watson World 500 survey and column (2) presents total assets under management (retail and institutional assets) for the U.S. based asset managers covered in the Pensions & Investments Money Manager Directory survey. The totals presented in these two columns include both retail and institutional assets. In column (3), we therefore present total institutional assets held by U.S. based asset managers. As shown in column (4), over the sample period, institutional assets held by U.S. based asset managers range from 63% to 69% of total assets.

To estimate the worldwide size of the institutional segment, we extrapolate based on the institutional asset percentages for the U.S. based asset managers. We first create a union of managers who show up on either the Pensions & Investments Towers Watson 500 survey or the Pensions & Investments Money Manager Directory survey.[3] Column (5) presents total assets under management (retail and institutional) for the managers in the union of the two surveys. These totals are very close to the totals based on the Towers Watson 500 survey, implying that the top 500 managers control the vast majority of assets. We next scale the total assets presented in column (5) by the percent institutional assets held by U.S. based managers presented in column (4). Column (6) presents these estimates of worldwide institutional assets under management. We present these estimates in the first column of Panel A of Table 1.

[3]Missing in this union are non-U.S. based asset managers who are smaller than the cutoff for the Pensions & Investments Towers Watson World 500. Given the close estimates of the top 500 with the intersection with U.S. based managers, this missing category does not appear large.

Table A1: Estimates of worldwide investable assets ($ in billions)

This table presents annual estimates of worldwide investable assets by asset class and in aggregate. We use the following sources to estimate the worldwide investable assets by asset class: real estate, Prudential Real Estate Investors; government bonds, the Bank for International Settlements; corporate bonds, the Bank for International Settlements; private equity, Preqin; public equity, the World Bank.

Year	Real estate	Govt. bonds	Financial bonds	Corporate bonds	Private equity	Public equity	Total
2000	13,249	13,578	14,613	4,788	716	31,940	78,884
2001	13,085	13,210	15,927	4,924	751	27,614	75,512
2002	13,625	15,361	18,386	5,216	767	23,248	76,603
2003	15,373	18,686	21,808	5,540	870	31,657	93,933
2004	17,312	21,750	25,091	5,727	963	37,671	108,514
2005	18,641	21,205	26,913	5,413	1,238	42,694	116,104
2006	20,100	22,600	31,426	5,801	1,704	52,663	134,293
2007	22,667	24,852	37,077	6,437	2,276	63,748	157,057
2008	24,770	28,055	38,298	6,757	2,279	34,491	134,650
2009	23,104	32,187	40,199	7,535	2,480	46,685	152,190
2010	25,251	36,686	38,434	8,102	2,776	53,361	164,610
2011	28,005	39,745	37,866	8,565	3,036	45,876	163,093
2012	28,481	41,181	37,799	9,380	3,273	52,452	172,566

Table A2: Total institutional assets held by asset managers ($ in millions)

This table presents how we estimate total institutional assets held by asset managers. To do so, we use two Pensions & Investments surveys: Towers Watson and the Money Manager Directory. Towers Watson provides the total assets under management (retail and institutional) held by the world's 500 largest asset managers, which are presented in the first column. The Money Manager Directory provides total assets under management (retail and institutional) and institutional assets under management for U.S. asset managers, which are presented in the second and third columns. We create a union of these two surveys and then use the ratio institutional to total assets for U.S. asset managers to extrapolate total worldwide institutional assets held by asset managers, which is presented in the last column.

	Towers Watson	Money Manager Directory			Union	
	Total AUM	Total AUM	Institutional AUM	Institutional %	Total AUM	Institutional AUM
2000	34,590,284	20,192,354	12,805,136	63%	34,959,252	22,169,678
2001	34,683,588	20,896,204	13,481,972	65%	35,072,352	22,628,247
2002	35,002,040	20,371,588	13,192,112	65%	35,357,876	22,896,843
2003	42,461,288	24,965,260	16,622,492	67%	42,978,752	28,616,324
2004	48,183,548	28,726,436	19,072,168	66%	48,754,880	32,369,531
2005	52,964,400	31,701,564	21,643,876	68%	53,635,800	36,619,222
2006	62,902,888	37,344,564	24,708,774	66%	63,693,416	42,142,311
2007	68,731,120	41,645,204	27,621,568	66%	69,667,872	46,207,863
2008	52,581,856	31,414,800	21,459,676	68%	53,147,692	36,305,571
2009	61,149,820	37,957,556	25,607,218	67%	61,829,884	41,712,151
2010	63,811,204	43,089,043	29,233,620	68%	64,556,904	43,798,420
2011	62,170,700	42,591,797	29,157,459	68%	62,780,420	42,978,170
2012	67,223,072	46,757,542	32,237,746	69%	67,925,128	46,832,082

Table A3: Broad asset classes in the Consultant's database and their benchmarks

This table presents the annual average returns and standard deviation of returns for both the asset manager funds in the four broad asset classes and the benchmarks used in Table 5 to evaluate funds performance.

	Consultant's database		Benchmark		
Asset class	Average return	SD	Name	Return	SD
U.S. public equity	4.46	16.69	Russell 3000	3.29	16.66
Global public equity	4.01	16.87	MSCI World ex U.S.	2.03	15.55
U.S. fixed income	7.10	3.90	Barclays Capital U.S. Aggregate	6.29	3.60
Global fixed income	7.03	4.85	Barclays Capital Multiverse ex U.S.	6.36	8.61

Table A4: Sharpe analysis: Alternative specifications

This table reports estimates from an analysis that compares fund returns with returns on mimicking portfolios constructed from 15 tactical factors. In Table 10, we construct the style portfolio by using data for all months except month t. Panel A in this table constructs the style portfolio using data that exclude six months both before and after month t. Panel B constructs the style portfolio using data only up to month $t-1$. We report gross and net alphas, tracking errors, and information ratios for the funds by asset class.

Panel A: Exclude month-t return observation (jackknife)

	Gross returns				Net returns			Average
	Excess	t(Excess	Tracking		Excess	t(Excess		number
Asset class	return	return)	error	R^2	return	return)	IR	of funds
All	−0.28	−0.86	6.25%	83.4%	−0.72	−2.19	−0.12	4,598.9
U.S. public equity	−0.66	−1.66	6.63%	87.6%	−1.15	−2.90	−0.17	1,765.3
Global public equity	−1.28	−1.78	7.41%	84.9%	−1.86	−2.59	−0.25	1,524.8
U.S. fixed income	0.55	1.67	2.93%	72.7%	0.26	0.79	0.09	767.7
Global fixed income	1.01	1.73	4.83%	63.0%	0.69	1.18	0.14	541.1

Panel B: Exclude return observations in window $[t-6, t+6]$

	Gross returns				Net returns			Average
	Excess	t(Excess	Tracking		Excess	t(Excess		number
Asset class	return	return)	error	R^2	return	return)	IR	of funds
All	−0.31	−0.97	6.43%	82.4%	−0.75	−2.35	−0.12	4,419.3
U.S. public equity	−0.70	−1.83	6.89%	86.5%	−1.20	−3.11	−0.17	1,711.9
Global public equity	−1.36	−1.86	7.51%	84.5%	−1.94	−2.65	−0.26	1,451.5
U.S. fixed income	0.59	1.75	2.94%	72.2%	0.30	0.89	0.10	743.9
Global fixed income	1.12	1.87	4.91%	62.5%	0.81	1.34	0.16	512.0

Internet Appendix

This Appendix includes a table that lists the investment strategies included in the Consultant's database along with the number of funds in each strategy, the average return of the funds in the strategy, the strategy's benchmark, and the average return on the strategy's benchmark.

Table A5: Strategies in the Consultant's database and their benchmarks

Strategy name	Number of funds	Average return	Benchmark	Average return
U.S. public equities				
All Cap Core	145	3.478	Russell 3000	3.624
All Cap Growth	90	1.750	Russell 3000 Growth	1.326
All Cap Index Based	18	3.071	Russell 3000	3.624
All Cap Value	88	7.841	Russell 3000 Value	5.799
Canada Core	145	9.141	S&P/TSX 60	9.319
Canada Growth Biased	57	9.209	MSCI Canada Growth	9.241
Canada Income Oriented	38	9.226	S&P/TSX Income Trust	16.536
Canada International Equity Targeted Volatility	2	12.153	MSCI AC World Minimum Volatility CAD	9.924
Canada Passive Equity	32	10.248	S&P/TSX Composite	8.953
Canada Small Cap Equity	79	11.045	MSCI Canada Small Cap	8.668
Canada Socially Responsible	16	8.390	Jantzi Social	8.381
Canada Total Equity	85	7.267	S&P/TSX Composite	7.614
Canada Value Biased	74	10.200	MSCI Canada Value	8.902
Large Cap Core	738	2.693	S&P 500	3.003
Large Cap Growth	575	0.674	S&P 500/Citigroup Growth	1.851
Large Cap Index Based	199	3.691	S&P 500	3.003
Large Cap Value	573	5.741	S&P 500/Citigroup Value	4.225
Other	215	3.097	Russell 3000	3.624
Mid Cap Core	114	7.753	Russell Midcap	8.308
Mid Cap Growth	172	4.332	Russell Midcap Growth	4.810
Mid Cap Index Based	34	9.146	Russell Midcap	8.308
Mid Cap Value	142	8.806	Russell Midcap Value	10.336
Small Cap Core	220	7.815	S&P 600 Small Cap	9.919
Small Cap Growth	295	4.812	S&P SmallCap 600/Citigroup Growth	8.836
Small Cap Index Based	46	7.647	S&P U.S. SmallCap	4.847
Small Cap Micro	75	8.872	Russell Microcap	7.482
Small Cap Value	292	10.701	S&P SmallCap 600/Citigroup Value	10.798
SMID Cap Core	82	8.881	S&P 400 MidCap (50%) S&P 600 Small Cap (50%)	9.651
SMID Cap Growth	123	2.879	S&P MidCap 400/Citigroup Growth (50%) S&P SmallCap 600/Citigroup Growth (50%)	8.370
SMID Cap Value	102	10.491	Russell Midcap Value	10.336
Socially Responsible	88	3.006	Jantzi Social	5.683
Global public equity				
Asia ASEAN Equity	47	9.305	MSCI South East Asia	16.632
Asia ex Japan Equity	151	9.288	MSCI AC Asia (Free) ex Japan	8.460
Asia Greater China Equity	67	14.940	MSCI Golden Dragon	14.415
Asia Pacific Basin Equity Passive	19	13.812	MSCI AC Asia Pacific (Free)	7.101
Asia/Pacific Small Cap Equity	20	14.427	MSCI AC Asia Pacific ex Japan Smallcap	10.506
Asian Emerging Markets Equity	26	14.630	MSCI EM ASIA	13.117
Australia Equity	323	6.319	S&P Australia BMI	7.517
Australia Equity (Socially Responsible)	23	7.673	Jantzi Social	8.714
Australia Passive Equity	22	7.639	S&P Australia BMI	8.368
Australia Small Company Equity	71	10.992	S&P/ASX Emerging Companies	9.153
BRIC Equity	57	18.493	MSCI BRIC	18.952
China Equity (offshore)	38	18.339	MSCI China (USD)	21.955
Eastern European Equity	47	13.001	MSCI EM Eastern Europe	12.704
EMEA Equity	36	15.095	MSCI EM Eastern Europe	11.393
Emerging Markets Equity	305	10.425	MSCI EM Net	13.491
Emerging Markets Equity Other	59	11.189	MSCI EM Net	13.491
Equity Sectors Consumer Goods	13	7.250	MSCI World	0.239
Equity Sectors Other	17	8.440	MSCI AC WORLD	6.396
Europe Eurozone Equity	171	2.866	MSCI EMU	2.293
Europe ex UK Equity	157	5.536	MSCI Europe ex UK	4.376
Europe ex UK Equity - Passive	15	6.506	MSCI Europe ex UK	6.066
Europe inc UK Equity	382	3.237	S&P Europe BMI	5.115
Europe inc UK Equity - Passive	12	7.484	S&P Europe BMI	7.188
Europe Nordic Equity	33	-0.295	MSCI Nordic	-0.363
Europe Norway Equity	45	1.865	MSCI Norway	7.139
Europe Small Cap Equity	101	5.104	MSCI Europe Small Cap	7.271
Europe Sweden Equity	31	5.119	MSCI Sweden	5.748
Flexible Equity	54	0.682	MSCI World	3.124
German Equity	20	3.301	DAX	3.392

Strategy name	Number of funds	Average return	Benchmark	Average return
Global Equity - Core	631	2.162	MSCI World	3.124
Global Equity - Growth	152	0.799	MSCI World Growth	1.511
Global Equity - Passive	76	0.485	MSCI World	4.620
Global Equity - Value	204	5.472	MSCI World Value	4.642
Global Small Cap Equity	57	4.298	MSCI World Small Cap Index	7.241
Gold & Precious Metals	15	26.160	S&P GSCI Precious Metals Total Return	18.662
Health/Biotech	23	7.069	S&P Healthcare Equip. Sel	11.058
HK ORSO	58	4.342	Hang Seng TR Index	14.895
Hong Kong Equity	34	16.241	FTSE MPF Hong Kong	13.880
Indian Equity	54	18.632	MSCI India	19.357
International Equity Global Equity Sustainability	7	13.433	MSCI EM	1.307
International Equity Global Equity Sustainability	167	4.177	MSCI World ESG	-0.790
International Equity Global Equity Sustainability	4	3.273	MSCI World ESG	13.184
International Equity Targeted Volatility	20	4.019	MSCI World Minimum Volatility	5.128
International Equity World ex Japan Equity	116	2.163	MSCI World	5.078
Japan Equity	417	-2.203	MSCI Japan	-0.776
Japan Passive Equity	28	1.558	MSCI Japan	4.033
Japan Small Cap Equity	55	3.918	MSCI Kokusai All Cap	0.506
Korea Equity	23	7.165	MSCI Korea	10.515
Latin American Equity	40	14.914	MSCI Latin America	17.001
Mixed UK/Non-UK Equity	27	7.111	FTSE All Share	3.412
Natural Resources	45	13.364	S&P Global Natural Resources SK	-8.928
New Zealand Equity	46	8.466	NZX 50 (40 prior to 1 Oct 2003)	7.223
Other	75	3.733	MSCI World	3.124
Pacific Basin ex Japan Equity	149	9.582	MSCI Pacific ex Japan	10.736
Pacific Basin inc Japan Equity	85	3.406	MSCI Pacific	2.106
Singapore Equity	17	9.995	MSCI Singapore	10.676
Swiss Equity	67	7.061	MSCI Switzerland	6.886
Technology	24	0.602	MSCI AC World: Sector: Information Technology	-1.176
UK All Cap	309	4.248	MSCI UK	3.971
UK Passive Equity	44	5.292	MSCI UK	4.610
UK Small Cap	50	8.059	Hoare Govett Smaller Companies	7.954
UK Socially Responsible	15	4.235	MSCI World ESG	-0.790
World ex US/EAFE Equity - Core	341	2.759	MSCI EAFE	3.425
World ex US/EAFE Equity - Growth	142	1.873	MSCI EAFE Growth	1.629
World ex US/EAFE Equity - Passive	52	3.384	MSCI EAFE	3.425
World ex US/EAFE Equity - Value	146	6.757	MSCI EAFE Value	5.183
World ex US/EAFE Small Cap Equity	78	7.134	MSCI EAFE Small Cap	7.925
U.S. fixed income				
Bank/Leveraged Loans	58	5.876	S&P/LSTA US Leveraged Loan 100 Index Price	0.257
Canada Short-Term	13	4.514	DEX Short Term	4.586
Canada Core Plus	34	6.301	DEX Long Term	8.111
Canada Credit	23	7.371	DEX Universe Corporate	6.739
Canada Long-Term	32	8.323	DEX Long Term	8.474
Canada Other	65	8.411	DEX Long Term	8.837
Canada Passive	33	7.362	DEX Universe Bond	6.254
Canada Universe	152	6.626	DEX Universe Bond	6.584
Convertible	47	3.746	Barclays Capital US High Yield Composite	7.982
Core Investment Grade	399	6.330	Barclays Capital US Corporate Inv Grade	7.045
Core Opportunistic	158	6.793	Barclays Capital US Aggregate	6.362
Credit	65	6.734	Barclays Capital US Universal	6.495
Credit - Long Duration	34	7.881	Barclays Capital US Long Credit	7.322
Fixed Income Private Debt	12	12.101	Preqin Buyout	12.907
Government	66	7.050	Barclays Capital US Govt/Credit	6.466
High Yield	174	7.053	Barclays Capital US High Yield Composite	7.982
Index Based	98	6.526	Barclays Capital US TIPS	8.002
Intermediate	242	6.001	Barclays Capital US Intermediate Aggregate	5.954
Liability Driven Investment	29	7.895	Barclays Capital US Corporate Inv Grade	7.489
Long Duration	81	9.947	Barclays Capital US Long Credit	8.910
Mortgage Backed	96	8.377	Barclays Capital US Mortgage Backed Securities	6.199
Municipal	113	5.109	SPDR Nuveen Barclays Capital Municipal Bond Fund ETF	2.106
Other	111	6.030	Barclays Capital US Aggregate	6.362
Socially Responsible	9	6.387	Barclays Capital US Universal	6.343
TIPS/Inflation Linked Bonds	65	7.853	Barclays Capital US TIPS	7.363

Strategy name	Number of funds	Average return	Benchmark	Average return
Global fixed income				
Asia ex Japan Bonds	24	3.967	Barclays Capital Non-Japan Asia USD Credit	7.125
Asia Singapore Bond	22	3.579	Singapore iBoxx ABF Bond Index	3.978
Asian Bonds	55	6.821	JP Morgan Asia Credit Index JACI	7.646
Australia Credit	18	6.440	UBS Credit	6.366
Australia Diversified	26	7.146	UBS Composite Bond	6.339
Australia Enhanced Index	14	6.404	UBS Composite Bond	6.339
Australia Fixed Income	72	6.329	UBS Composite Bond	6.325
Australia Inflation Linked Bonds	21	6.797	UBS Inflation	7.131
Australia Passive	11	6.319	UBS Composite Bond	6.310
Australia Short Duration - High Income	48	6.236	BofAML Global High Yield	11.314
Denmark Fixed Income	13	6.291	OMRX Bond	5.485
Emerging Markets Debt	144	12.038	JP Morgan EMBI Global Diversified	10.939
Emerging Markets Debt - Corporate	24	22.167	BofA Merrill Lynch Emerging Markets Corporate	16.161
Emerging Markets Debt - Local Currency	70	11.115	JPMorgan Government Bond Index - Emerging Markets	11.576
Europe Sweden Fixed Income	10	7.016	OMRX Bond	5.242
Eurozone Bank Loans	11	-6.005	S&P European Leveraged Loan Index	3.716
Eurozone Govt	97	7.610	Barclays Capital Euro Aggregate Gov	5.019
Eurozone Govt & Non-Govt	133	4.525	Barclays Capital Euro Aggregate Credit	4.941
Eurozone High Yield	48	4.653	BofAML Euro High Yield Index	7.368
Eurozone Inflation-Linked Bonds	22	3.045	Barclays Capital Euro inflation linked bond indices	3.316
Eurozone Non-Govt	113	4.577	Barclays Capital Euro Aggregate Corporate	5.045
Eurozone Other	24	2.732	Barclays Capital Euro Aggregate Credit	4.321
Eurozone Passive	25	4.651	Barclays Capital Euro Aggregate Credit	4.270
Global Broad Market/Aggregate	165	5.997	Barclays Capital Global Aggregate	6.416
Global Convertibles	54	3.715	UBS Global Convertible Index	7.503
Global Credit	84	6.273	Barclays Capital Global Aggregate	5.650
Global High Yield	71	8.234	BofAML Global High Yield	9.092
Global Inflation-Linked Bonds	45	5.887	Barclays Global Inflation Linked Index	6.185
Global Passive	34	7.442	Barclays Capital Global Aggregate	6.806
Global Sovereign	187	7.115	JP Morgan GBI Global	6.750
Hong Kong Dollar Bond	18	3.547	HSBC Hong Kong Bond	4.533
International Fixed Other	12	7.822	Barclays Capital Global Aggregate	6.033
International Multi-asset Fixed Other	8	8.564	Barclays Capital Global Aggregate	5.268
Japan Fixed Income	101	0.542	Nikko BPI Composite	1.458
New Zealand Fixed Income	15	7.140	UBS Composite Bond	6.535
Other	37	3.633	Barclays Capital Global Aggregate	6.416
Swiss Fixed Income	44	3.531	Swiss Bond Index Total Return	2.519
UK Core Plus	69	6.899	BofAML Non Gilts AAA Rated	6.006
UK Europe Other	1	9.200	BofAML Non Gilts 10+ Year	12.144
UK Govt & Non-Govt	62	6.868	BofAML Non Gilts AAA Rated	6.094
UK Index Linked Gilts	48	7.027	FTSE Gilts ILG All Stocks	6.947
UK Non-Govt	81	6.690	BofAML Non Gilts All Stocks	6.161
UK Passive Fixed Income	39	7.471	BofAML Non Gilts	5.603
UK Govt	71	6.408	FTSE Gilts All Stocks	6.241
Unconstrained Bond	46	7.712	Barclays Capital Global Aggregate	5.510
World ex Japan	83	4.119	Barclays Capital Global Aggregate	6.492
World ex US	51	7.673	Barclays Capital Global ex US	6.648