Are Mutual Fund Managers Paid For Investment Skill?

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Abstract

A voluminous literature has studied mutual fund performance, drawn inference about skill, studied managerial risk-taking incentives, and investigated how investors direct new money flows in response to performance. This literature has been handicapped by a lack of information on how mutual fund managers are compensated. We hand collect a unique dataset on the compensation from tax records for Swedish mutual fund managers. We investigate the relationship between manager pay on the one hand and fund performance and fund size on the other hand. We find a weak relationship between pay and performance, but a strong relationship between pay and size, measured as fee revenue. The non-performance related components of size drive the link with pay. Only at the top of the performance distribution do we find a meaningful link between performance and pay, suggesting performance-based pay components often are absent or are asymmetric and often expire out-of-the-money. Profitable fund companies pay higher wages and have wages that are more sensitive to performance and less sensitive to revenue. By tying compensation to fee revenue, owners align managerial incentives with their own. The weak pay-performance sensitivity is rational in a world where investor flows respond weakly to outperformance.

JEL: G00, G23, J24, J31, J33, J44

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1 Introduction

Mutual fund research has long taken a prominent role in finance, not only because a large and growing number of investors delegate their investments in risky asset to advisers, but also because they offer a unique laboratory in which to test theories of incentive provision, performance evaluation, and information acquisition. Indeed, few areas of the financial sector have better quality data on prices (fund returns) and quantities (portfolio holdings and investor fund flows) to test such theories. Except, one major piece of evidence has been missing: data on manager compensation. In its absence, empirical analysis has focused on the relationship between mutual fund investors and funds. It has analyzed how investors pay for the services of the fund–the management fee is typically a fraction of assets under management– and how sensitive investor flows are to fund performance. But fund advisors delegate the actual management of the funds to employees, fund managers.

Little is known about the nature of the compensation contract between owners and managers and even less is known about the actual compensation managers earn. The implicit assumption in the literature hitherto has been that there are essentially no frictions in this second layer of delegation. This paper collects a unique data set on mutual fund manager compensation to shed light on the determinants of fund manager compensation. The goal is a better understanding of the frictions between fund advisors and the fund managers they employ. These frictions are important for investors delegating their assets to such funds.

We start from Morningstar data on the universe of mutual funds sold in Sweden and the names and tenure of the individuals managing these funds. We are able to link manager names to their tax records. The tax records provide annual labor income (which from the perspective of the Swedish tax law includes bonus payments) and other forms of compensation, but also gives access to their demographics, education, and financial income. For each manager and year, we connect compensation to the assets under management in all funds (co-)managed and to the return on that manager's portfolio of funds.

We document a strong relationship between the labor income of the manager and the size of the funds under management. The fee revenue generated from the funds managed by a given manager is a natural measure of size since it directly connects the individual to the income stream she generates for the fund family. We find an elasticity of compensation to revenues of 0.15. A one percent increase in revenues generated by this manager increases her compensation by 0.15%. A one standard deviation increase in the cross-section of revenue translates to a 27% increase in pay. Thus, similar to contracts between investors and the fund advisor, contract between fund advisors and the fund managers they employ are tied to assets under management. At a first glance it seems to suggest an alignment of incentives between fund manager and fund owners. However, there is far from complete pass through of fund revenues to managerial compensation. The 0.15 point estimate implies that a 1% increase in revenue lowers the manager's *share* of revenue by 0.85%.

Our second main result is that the relationship between pay and performance is weak, on average. We define the abnormal return on a fund as the gross (before fees) return in excess of the benchmark as stated in the fund's prospectus. The manager's abnormal return is the weighted average abnormal return on the funds she manages. A one percentage point increase in that abnormal return increases pay by 0.35%. For the average manager, that non-trivial gain in performance results in a mere $372 in additional annual compensation. A one standard deviation increase in abnormal return performance increases compensation by 2.9%, ten times less than a standard-deviation increase in revenue. Including manager fixed effects greatly diminishes the pay-for-performance elasticity and renders it no longer different form zero. Likewise, in a horse race between revenue and abnormal return, the elasticity of pay to revenue is unchanged while the elasticity to performance is no longer different from zero. This result is robust across investment categories and holds for a variety of other measures of performance employed in the literature such as value added, CAPM alphas, and multi-factor alphas.

The elasticity of compensation to revenue may indirectly reflect managerial performance. Positive abnormal returns in the current year increase assets under management, and may increase pay as a result. However, we find no support for this indirect performance channel. Alternatively, high abnormal returns in the previous year may lead investors to reward the manager with inflows (e.g., Sirri and Tufano, 1998). The resulting growth in the asset base again could raise pay. We find no evidence for this channel either, calling into serious question the benefits to managers from performance related flows. Rather, managers seem to get rewarded mostly for revenues already established at the end of the previous year, for new investor flows unrelated to superior performance, and for running additional funds or changing to funds with higher expense ratios. While the last two components could reflect the owner's decision to promote a manager, such a promotion does not appear to be linked to superior past return performance.

While the average effect of incremental performance on pay is small, we do find evidence for non-linearities in performance pay. Splitting managers into abnormal return quartiles, relative to their peers in the same investment category, we find that managers in the top quartile make 9% more than managers in the bottom quartile. This pay for outstanding performance effect survives the inclusion of revenue quartile indicator variables. In other words, pay responds to outstanding performance even for managers that run the largest funds. The non-linearities in the pay-for-performance relationship underscore the importance of using actual income data. Just knowing that a manager has a contract which provides for pay for performance does not allow us to understand how close to in-the-money such a provision is and ultimately how much incentives it provides. Evaluating managerial skill requires an understanding of the precise incentives she faces. The non-linearity in managers' compensation, in contrast to the linear contract typically signed between investors and the fund advisor, underscores the two tiered nature of the corresponding agency relation. An issue that has mostly been ignored in the literature.

Mutual fund companies manage multiple funds. This raises the possibility that manager pay depends not only on the revenue and performance of the funds she is responsible for but also on the revenue and performance generated by other funds in the same fund family. Our analysis uncovers that indeed overall firm profits are an important determinant of individual managers' compensation. In a horse race, we find that the elasticity of manager compensation to firm revenue (0.138) exceeds that of manager revenue (0.069), while the effects of manager and firm abnormal return are indistinguishable from zero. Firms with higher profits pay more. Profitability lowers the sensitivity of compensation to revenues and increases that to performance. Intra fund family incentive frictions will impact managers allocation decisions. A careful evaluation of managerial skill should account for such externalities.

Finally, we study a broader concept of managerial compensation by including the manager's dividend income. Dividend income is much more sensitive to performance than labor income, and increases the sensitivity of total income to performance from an insignificant 0.11 to a statistically significant 0.50. The magnitude remains economically small. The sensitivity of total income to revenue is similar to that of labor income. A subset of managers are members of the Board of Directors of the mutual fund company. Those managers' total income is more sensitive to revenue as well as to performance, but the latter coefficient is imprecisely estimated. Overall, we conclude that fund managers' pay is more closely tied to the fee revenues they are responsible for than to their ability to generate superior returns, and that their compensation depends significantly on the overall profitability of the fund family they work for.

The newly gained evidence can help direct and better tailor research striving to infer fund manager skill, and should be valuable for theories of mutual fund management and labor economics more broadly.

The remainder of the paper is organized as follows. Section 2 discusses the related literature. Section 3 describes our data. Section four contains the main results. Section 5 concludes. The appendix contains further detail on the data, variable construction, and some auxiliary results.

2 Related Literature

A large branch of the empirical mutual fund literature studies the contract between investors and fund advisors. The predominant contract is a percentage fee that is either fixed (the majority of contracts), or fixed up to a given level, with net asset above that level receiving lower marginal rates.[1] Only a small fraction of funds have a performance fee component; in the U.S., Elton, Gruber, and Blake (2003) document that fraction to be around 10% of funds. When present, it is typically symmetric.[2] Coles, Suay, and Woodbury (2000) and Deli (2002) examine how cross-sectional variation in advisory rates is determined by fund characteristics. Warner and Wu (2011) focus on fee changes, finding that while fee increases are associated with superior past market-adjusted performance, decreases instead reflect economies of scale associated with asset growth at the fund-level and the family level.

In contrast, little is known about fund managers' contracts (Basak and Pavlova, 2013). In a recent working paper, Ma, Tang, and Gomez (2016) documents that fund managers's in the U.S. do

[1] Concavity with respect to assets under management is lower for smaller funds and funds that are part of smaller fund families (Deli (2002)). For closed-end funds the most prevalent (55% of funds) compensation scheme is linear in NAV. In addition, a substantial fraction (43%) use a piecewise linear schedule with a compensation rate that decreases with NAV, with a negligible fraction having performance based compensation (Coles, Suay, and Woodbury (2000)).

[2] In the U.S. the 1970 amendment to the Investment Advisors Act of 1940 restricts advisors performance fees to be symmetric with respect to the benchmark against performance is measured.

typically receive performance-based incentive contracts (79% of funds), while fund advisor contracts do not typically depend explicitly on fund performance (19%). The information is extracted from U.S. funds' Statement of Additional Information (SAI). The text in the SAI mentions whether managerial compensation contains a bonus based on performance, whether their is a fund family-wide bonus pool for managers, and a few other details. However, apart for general statements regarding the existence of some of the components used in compensation no information is provided on exactly how they get determined, nor on the quantitative contribution of different compensation components. The paper shows that pay-for-performance contracts result in higher future fund performance. We bring actual wage data to the discussion, which allows us to quantify the strength of performance-based pay. We find a weak relationship between pay and performance, suggesting a small performance-related bonus component or one that typically expires out of the money.

Our results on assessing the use of performance fees speaks to a large theoretical literature that studies which contracts should emerge under delegation. Earlier work focused on highlighting the sub-optimality of linear performance fees, due to their inability at alleviating the under-investment problem emerging from the feedback effect of risk incentives on effort incentives (Stoughton, 1993; Admati and Pfleiderer, 1997). Although, within a standard dynamic moral hazard setting, with state dependent contracts, Ou-Yang (2003) finds it is optimal to include symmetric benchmark-adjusted compensation.

Later work has rationalized benchmarking, and has shown that convex performance fees may emerge as the optimal compensation structure. Li and Tiwari (2009) highlight that once one accounts for the interaction between effort and risk taking incentives, it is optimal to include a bonus incentive fee in the contract.[3] Cuoco and Kaniel (2011) show that when contracts are set competitively, convex performance contracts can emerge as the Pareto-dominatant outcome in a dynamic equilibrium model with endogenous asset prices. This in part stems from the fact that investors do not internalize that their decisions on how much capital to allocate to funds impacts the equilibrium delegation contract. Buffa, Vayanos, and Wooley (2014) show that when agency frictions between investors and managers are more severe, managers compensation is more sensitive to performance, and performance is tied more closely to a benchmark. When managerial ability is unknown managers are retained only if

[3] Axelson and Bond (2015) study effort provision in financial sector jobs that entail the risk of large losses to investors. They emphasize the dynamic provision of effort over the career.

returns on their portfolio are sufficiently above the benchmark return. Retained managers have a high performance-based compensation component (Heinkel and Stoughton, 1994). This literature is qualitative in nature, and the fact that we detect the presence of asymmetric performance contracts is encouraging support. However, the modest magnitude is instructive for theory going forward, as models evolve toward predicting quantities as well.

Relative bargaining power also influences the optimal contract. When surplus accrues to the investor, linear performance fees dominate, but when managers are able to extract part or all of the surplus then convex performance fees are the typical outcome expected (Das and Sundaram (2002)). Our evidence on what fraction of rents accrue to the fund manager and how managers' compensation is related to firm profits provides a first important step to discerning how surplus is split between fund advisors and the fund managers, and what part of this split stems from the convex performance component. It also highlights an important question for future research: what is the added value of managers versus the advisory firms they work for.

Our evidence is also instructive for the literature that strives to infer managerial skill. Koijen (2014) structurally estimates the cross-section of managerial ability, incentives, and risk preferences from a dynamic investment model. Manager compensation is assumed to contain a fixed salary and a bonus component which depends on fund returns and fund flows. For the median fund, variable compensation is estimated to be one-third of overall compensation. Earlier work by Basak, Pavlova, and Shapiro (2007) similarly explores asset allocation and risk shifting incentives of managers, while Cuoco and Kaniel (2011) and Basak and Pavlova (2013) explore equilibrium asset pricing implications. Kacperczyk, Van Nieuwerburgh, and Veldkamp (2014, 2015) study how fund managers' incentives to acquire aggregate or stock-specific information vary over the business cycle. Our paper brings new empirical evidence on compensation data to guide these models. Also, these papers typically evaluate managers' performance at the fund level, ignoring fund family incentive externalities. Gaspar, Massa, and Matos (2006) show fund families strategically shift performance between funds, for example, by allocating attractive IPO shares to certain funds or cross-trading within the family. We show that managerial pay and the sensitivity of pay to performance both depend on fund family variables such as revenue and profits. Accounting for these incentive externalities can lead to more efficient inference algorithms.[4]

DelGuercio and Reuter (2014) justify the prevalence of delegation despite the negative average net return from actively-managed mutual funds by appealing to investor heterogeneity.[5] Retail investors who prefer to invest through brokers end up in under-performing funds presumably because of agency conflicts between investors and brokers. We find direct evidence of weaker incentive-based pay for managers in the mutual fund arms of the four large Swedish retail banks.

Our work is related to seminal work by Berk and van Binsbergen. Berk and van Binsbergen (2015) argue for measuring mutual fund manager skill based on the value a manager extracts from capital markets. They show that this measure is positive on average and that a top group of managers displays persistence in this measure. Berk and van Binsbergen (2016) show that investors reward funds with high value added with more investment flows. Investors seem to be using the Capital Asset Pricing Model when deciding on such fund flows. Most closely related to our work, Berk, van Binsbergen, and Liu (2017) show that fund owners have insight into the talent of their managers and reward the best ones with larger funds to manage. We study value added as an alternative performance measure, and bring evidence from compensation data to shed new light on the relationship between managerial skill and its relationship with fund flows.

Our study relates to the literature on compensation of highly skilled individuals. Gabaix and Landier (2008) argue that the most talented CEOs match with the largest firms. Philippon and Reshef (2012) study the salaries of financial sector workers relative to other skill-intensive industries. Célérier and Vallée (2017) study wage data of French elite university graduates and find that the returns to talent and find them to be much greater in the finance industry. Böhm, Metzger, and Strömberg (2015) uses Swedish data on cognitive and non-cognitive skills and finds no evidence that the amount of talent in the financial sector has increased or improved. We estimate the Gabaix and Landier (2008) model on Swedish mutual fund managers, and find that compared to U.S. CEOs, they have a lower elasticity of managerial impact on revenues and a a considerably thinner-tailed talent distribution.

[4]Some decisions are made exclusively at the family level, such as which funds to advertise (Gallaher, Kaniel, and Starks, 2006), incubation strategies (Evans, 2010), and of course decisions on determination of number and type of funds.

[5]See also Pástor and Stambaugh (2012) and Savov (2010).

Only two other studies we are aware of use mutual fund manager income data. Bodnaruk and Simonov (2015) collect similar data to us for Sweden; their sample is about half as large as ours. They focus on a different question than ours, namely whether mutual fund managers' personal portfolio allocations evidence investment acumen. Income plays no role in their study other than to define a peer group for the fund managers. They find that mutual fund managers do not outperform their peer group, do not diversify their risks better, and do not exhibit lower behavioral biases. Their work is consistent with this group not being particularly highly skilled.[6] In contemporaneous work, Ben Naim and Sokolinski (2017) study income data of Israeli mutual fund managers. They confront this data with a model that extends Gennaioli, Shleifer, and Vishny (2015). Mutual fund managers contribute familiarity which attracts fund flows and increases the pay-performance sensitivity.

3 Data and Measurement

Our data set has three hierarchical levels: fund companies, which we also refer to as firms, mutual funds, and fund managers. This section describes how we measure returns, revenues, and compensation at these various levels of aggregation.

We start from the universe of open-ended mutual funds for the period January 1990 until December 2015 that are available for sale in Sweden or in the Nordic countries. The data source is Morningstar Direct. The sample includes both active and no longer active funds. These funds have inception dates between 1975 and 2014. We eliminate all funds that have "Region of Sale" equal to "Global Cross-border" or "European cross-border" because those are funds that do not have local operations in Sweden. The sample contains 1,744 funds that belong to 182 fund companies, identified by Morningstar's variable "Firm Name". Some fund companies are subsidiaries of a larger unit, the fund complex. To identify fund complexes, we use Morningstar's variable "Branding Name." Often, the various fund companies in a fund complex operate in different Nordic companies.[7] The 182 fund companies form 126 complexes.

[6] Bodnaruk and Simonov (2016) uses survey data to study loss aversion among Swedish mutual fund managers.

[7] For instance, the Swedish bank Handelsbanken operates as "Handelsbanken Rahastoyhtiö Oy" in Finland, as "Handelsbanken Kapitalforvaltning AS" in Norway, and as "Handelsbanken Fonder AB" in Sweden. We keep track of these three separate fund companies since they are separate legal entities. In the Swedish accounting database Serrano, we can obtain accounting variables for the Swedish fund company.

Morningstar Direct provides the manager history for each fund. The history contains the first and last name of each manager with a start date and end date. This generates 10,123 non-missing fund manager-year observations for 1,600 funds.[8]

What makes our data set unique is that we match by hand the managers to their social security numbers, using publicly available sources. This is what allows the match to the tax records which contain the manager income data. We describe the matching procedure in detail in Appendix A.1. For 670 fund managers names we do not find a (reliable) match with a social security number. Many of these names are Finnish, Danish, or Norwegian and likely stem from the inclusion of Nordic cross-border funds. These fund managers are not Swedish tax payers and do not have a Swedish social security number. For common manager names, we obtain several candidate social security numbers. Based on age and industry, we are often able to identify the correct individual. In some cases, too many candidates remain and we drop such many-to-one matches. Our final sample contains 2,878 fund manager-year observations pertaining to 941 funds and 529 fund managers.

3.1 Fund Level

Definitions We denote by R_{it}^{gross} mutual fund i's gross return in month t. The net return R_{it}^{net} is the gross return minus the total expense ratio, denoted by TER_{it}. R_{it}^{B} is the fund's benchmark return. This can be either the return on the benchmark stated in the prospectus or the return from a factor model. We denote by R_{it}^{abn} the abnormal return, defined as the return of the fund over the benchmark return before expenses. The fund earns fee revenue (REV_{it}) equal to the product of assets under management at the end of last month times the total expense ratio in place in the current month. The value added (V_{it}) is defined as in Berk and van Binsbergen (2015) as the product of the assets under management (AUM) of the fund at the end of last month (AUM_{it-1}) times the difference between the gross return and the benchmark return. Net value-added takes out fund revenue from (gross) value

[8] Given that this field has a fixed character length, the seventh person's name is often truncated beyond recognition. On a few occasions, but rarely, does this happen to the sixth name. At one point in time, there can be more than one manager managing the fund. Morningstar does not indicate any hierarchy between the managers who manage a fund at the same time. Some of the spells are blank or indicate "team management." We lose less than 300 spells due to blanks and team management.

added.

$$R_{it}^{gross} = R_{it}^{net} + TER_{it} \tag{1}$$

$$R_{it}^{abn} = R_{it}^{gross} - R_{it}^{B}, \tag{2}$$

$$REV_{it} = AUM_{it-1} TER_{it} \tag{3}$$

$$V_{it} = AUM_{it-1}\left(R_{it}^{gross} - R_{it}^{B}\right) = \underbrace{AUM_{it-1}(R_{it}^{net} - R_{it}^{B})}_{\equiv NV_{it}} + REV_{it} \tag{4}$$

Investment Categories Following the literature, we eliminate money market mutual funds as well as index funds, identified as such by Morningstar or by the word "index" in their name. We also eliminate the four government pension funds that invest public pension money. We believe they are fundamentally different from privately owned mutual funds. The remaining funds belong to one of five categories based on the Morningstar "GlobalBroadCategoryGroup" variable: Equity, Allocation (mix of stocks and bonds), Fixed Income, Alternatives, and a Rest category which combines commodity funds, miscellaneous funds, and funds where the category variable is missing. The Alternatives category contains Currency, Long/short Equity, Market neutral, Multi-alternative, and Other Alternative funds. This category mainly consists of hedge funds which in Sweden are allowed to market themselves directly towards the general public. Many of the Equities and Fixed Income funds specialize in specific investment regions or in specific industries.[9] Most of the Miscellaneous funds in the Rest category are either Capital Protected or Guaranteed, a common type of structured product in Europe.

AUM and TER We retrieve annual time series of assets under management (AUM) from Morningstar. Several funds have multiple share classes. AUM is available per share class. We aggregate those share classes into a single fund (identified by Morningstar's variable "FundId"). We convert AUM values in other currencies than SEK into SEK when necessary. Similarly, we obtain total expense ratios (TER) per share class and aggregate them across share classes using AUM weights. We complement the annual AUM and TER time series from Morningstar Direct with two additional sources, Bloomberg

[9]The most common equity categories are: Other Europe Equity (specializing in Swedish, Norwegian, Finnish, all Nordic stocks, or Russian stocks), Global Equity, Europe Equity, and Emerging Markets Equity. Among fixed-income funds, the most common are Other Europe Fixed Income (specializing in Swedish bonds), Other Fixed Income, and Euro Fixed Income.

and some hand collected data obtained from AMF Fonder.[10] Our final data set has 941 funds and 5,540 fund-year observations. The aggregate AUM among these funds increases from 2.6 billion SEK in 1994 to 1,773.1 billion SEK in 2015. All SEK amounts are expressed in 2012 real SEK. The average SEK/USD exchange rate over the 1994-2015 period is 7.5.

Summary statistics for the funds employed in our main regression analysis are reported in Table 1.[11] The average fund has AUM of 2,300 million SEK, or about $351 million. There is a wide cross-sectional fund size distribution. Ten percent of funds are smaller than 63 million SEK, the median is 700 million SEK, and 10% of funds manager more than 6,700 million SEK. The average TER is 1.36%. Investors pay as little as 0.5% (10th percentile) and as much as 2.2% (90th percentile) in fees. Multiplying the sum of monthly AUM within the year with the annual TER, we obtain a measure of annual fund revenue, REV. REV has a right-skewed distribution, whereas the log of REV is fairly symmetrically distributed, with mean and median of 15.9.

Performance We obtain monthly net fund returns from Morningstar. To calculate gross monthly returns, we add TER/12. All returns are converted into SEK. Excess returns are calculated by subtracting the 1-month STIBOR (Stockholm Interbank Offered Rate) rate. We calculate annual log returns by summing log monthly returns. The average fund has a log excess annual return of 5.1%; the median is 6.9%. The interquartile range is large, ranging from -2.2% to 18.0%.

As our main measure of performance, we use the gross abnormal return or "alpha" relative to the stated benchmark return in logs, $\log(1 + R_i^{abn})$, in the year prior to the labor income year. To the extent that there is a component of compensation directly tied to the manager's abnormal return, that component likely reflects performance in the previous calendar year. This is a simple measure of gross alpha. Gross return rather than net returns are what matter in the relationship between owners and managers. In order to construct it, we require a benchmark for each fund in our sample.

Morningstar reports a Primary Prospectus Benchmark for 74% of our funds. Some funds have

[10] AUM values that are missing in the middle of a fund's AUM time series are imputed using the fund's return and average net flow rate during the missing period. Missing AUM data points at beginning or end of the time series are not imputed. 69% of our AUM data points are from Morningstar Direct, 2% are from Bloomberg, 2% from hand collection, and 27% are from imputations. appendix A.2 provides the details of the imputation procedure.

[11] More precisely, a fund-year observation is included in this table if at least one manager in our sample manages that fund in that year.

linear combinations of indices as their benchmark. There are more than 300 different benchmark indices present in our sample. We find monthly return information for most of them on Morningstar, Bloomberg, and Datastream. For funds with no assigned benchmark or irretrievable benchmark, we assign a benchmark by hand.[12] We express all benchmark returns in SEK. The median annual log abnormal return is 0.5%. The distribution has a large 8.4% standard deviation. The interquartile range is -2.9% to 4.1%. Net abnormal returns (after expenses, not reported) are slightly negative on average, consistent with the evidence for the U.S.

We explore four alternative measures of abnormal returns. They are the CAPM alpha, the Fama-French 3-factor alpha, the Global Five Factor alpha, and gross value added. For Equity, Alternative, and Allocation categories we use the Swedish stock market index return (SIXPRX) in excess of the 1-month STIBOR rate as the CAPM market factor. For Fixed Income and Other categories we use the Swedish government bond index return (OMRX) in excess of the 1-month STIBOR rate as the CAPM market factor.[13] The three-factor Fama-French model has the stock market factor, the size factor (SMB), and the value factor (HML), constructed from all Swedish stocks. We also consider a global five-factor model. For Equity, Alternative, and Allocation categories, the five factors are five excess returns on different international equity baskets.[14] For Fixed Income and Other categories, the five factors are five international bond factor excess returns.[15] Gross value added, defined in (4), uses the stated benchmark and is expressed in millions of SEK. The last four rows of panel B of Table 1 show the distribution of these alternative performance measures across funds. The average gross CAPM alpha is exactly zero and has an even wider dispersion than the main abnormal return measure. Average 3- and 5-factor alphas are also close to zero with similar dispersion. Median gross value added is 1.3 million SEK. It is negative for slightly less than half the fund-year observations, and has a right

[12]In those cases, we use the Morningstar variable "Category", assigning the most common benchmark for that category to the remaining funds. When the benchmark is a linear combination of indices, and we lack return information some of the component indices, we assign an alternative only to that component, keeping the other components and the index weighting.

[13]Betas are estimated using the full sample. The regression includes a constant. We require at least 24 months of data to estimate the beta. Results using rolling beta estimates are similar.

[14]Specifically, (i) the Swedish stock market index return (SIXPRX) in excess of the 1-month STIBOR rate, (ii) the global equity index (MSCI) in excess of the 1-month U.S. T-bill rate, (iii) the North American equity index (MSCI) in excess of the 1-month U.S. T-bill rate, (iv) the European equity index (MSCI) in excess of 1-month EURIBOR rate, and (v) the Asia ex-Japan equity index (MSCI) in excess of BOJ basic discount rate.

[15]Specifically, (i) the Swedish government bond index return (OMRX) in excess of the 1-month STIBOR rate, (ii) the global bond aggregate index (Barclays) in excess of the 1-month U.S. T-bill rate, (iii) the U.S. bond aggregate index (Barclays) in excess of 1-month U.S. T-bill rate, (iv) the euro bond aggregate index (Barclays) in excess of 1-month EURIBOR rate, and (v) the Asian Pacific bond aggregate index (Barclays) in excess of BOJ discount rate.

tail of 143 million SEK at the 90th percentile.

3.2 Manager Level

Definitions We define the same concepts at the level of the manager. Two complications arise. More than one manager can be managing a fund (management team). Conversely, one manager can be managing multiple funds. To deal with such cases, we divide the fund's AUM equally among all managers who manage the fund, and we weight by their respective AUM the multiple funds a given manager runs. Manager m's assets under management (AUM_{mt}), total expense ratio (TER_{mt}), fee revenues (REV_{mt}), net and gross excess returns (R^k_{mt}), gross abnormal return (R^{abn}_{mt}), value added (V_{mt}), and net value added (NV_{mt}) are defined as follows:

$$AUM_{mt} = \sum_{i \in \Omega_{mt}} \frac{AUM_{it}}{N_{it}} \tag{5}$$

$$TER_{mt} = \frac{1}{AUM_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{AUM_{it-1}}{N_{it-1}} TER_{it} \tag{6}$$

$$REV_{mt} = AUM_{m,t-1} TER_{mt} \tag{7}$$

$$R^k_{mt} = \frac{1}{AUM_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{AUM_{it-1}}{N_{it-1}} R^k_{it}, \qquad k = \{net,\ gross\} \tag{8}$$

$$R^{abn}_{mt} = \frac{1}{AUM_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{AUM_{it-1}}{N_{it-1}} R^{abn}_{it} \tag{9}$$

$$V_{mt} = \sum_{i \in \Omega_{mt-1}} \frac{V_{it}}{N_{it-1}} \tag{10}$$

$$NV_{mt} = \sum_{i \in \Omega_{mt-1}} \frac{NV_{it}}{N_{it-1}} \tag{11}$$

where Ω_{mt} is the set of all funds managed by manager m at time t and N_{it} is the number of manager manages fund i at time t.[16] The manager-level objects are measured at the monthly level and then aggregated to the annual level. Monthly fee revenues are added up within the year. Monthly log

[16]Equation (9) uses last period's AUM to compute a manager's abnormal returns. This ignores the fact that the set of funds a manager manages in month t may not be the same as in month $t-1$ and also that the number of managers running a given fund may change between $t-1$ and t. Using time-t weights may cause the opposite problem. Our approach follows Berk, van Binsbergen, and Liu (2017).

returns are added to generate log annual returns.

Manager Characteristics Table 2 reports summary statistics for the final sample of manager-year observations. Panel A considers various manager characteristics. The average and median age is 42 years. Their average years of experience managing mutual funds is 5.9 with a standard deviation of 4.7 years. They have 15 years of formal education on average, which reflects having obtained a college degree. The manager at the 10th percentile has only completed high-school whereas the top-25% have completed at least one additional one-year degree. We calculate the fraction of manager m's funds that are co-managed ($Coman$), the average number of teams manager m is on in a given year ($Teams$), and the average team size excluding the manager herself for the funds managed by manager m ($TeamSize$). The median manager co-manages 11% of her AUM, is on 0.92 teams, and has 0.13 team mates. There is non-trivial dispersion in all of these variables. Managers mostly manage funds within a single investment category: the average number of investment categories in manager m's portfolio of funds ($NumCat$),in a given year, is typically 1, with less than 20% managing assets in more than one category.

Pay Our main outcome variable is the labor income (L_{mt}) of a mutual fund manager m in year t. Labor income is defined as regular salary and benefits plus business income, before taxes. Including business income is useful for cases where the manager is running a fund for a fund family as a self-employed consultant. From the perspective of Swedish tax legislation any bonus pay from the employer is considered as labor income and included in our measure. We drop labor income observations below 5000 SEK annually. Panel B reports income measures in thousands of Swedish kronor (SEK). The median fund manager earns 1.2 million SEK in labor income. Ten percent of managers earn more than 2.75 million SEK and five percent earn more than 3.5 million SEK. The 10th percentile is 520,000 SEK. In other words, we have a large amount of labor income inequality among mutual fund managers in our sample.

As a second measure of pay, we add dividend income ($D_{m,t}$) to labor income to obtain total income ($Y_{m,t}$). The advantage of including dividend income is that we obtain a more comprehensive measure of pay. Some mutual fund managers may be compensated with stock or may have personal companies that are shareholders in the mutual fund family. That personal company then pays dividends to the individual. These payments reflect, at least in part, the efforts and talents of the manager. Payments through dividends may also be a more tax efficient way of providing compensation. There are two disadvantages. We only have data on total dividend income, so that dividend income includes dividends from all other equity positions the manager has, including many that have no relationship to his/her employment. Second, the timing of the dividend payments form the personal company to the individual is arbitrary and may break the link between performance in year $t-1$ and total pay in year t.

The median fund manager has very little dividend income. But the distribution is extremely right-skewed. Dividend income is 0.5 million at the 90th percentile and 0.8 million on average. The standard deviation is 8.8 million. In other words, we have some extremely-high earning individuals in our data set, even by U.S. standards. Total income averages 2.4 million SEK or $320,000, while median total income is 1.35 million SEK or $180,000.

AUM, TER, and REV Panel C of Table 2 reports AUM, TER, and REV at the manager level. The median fund manager is in charge of 1.38 billion of AUM or about $184 million. The mean is 3.9 billion SEK, indicating skewness. Ten percent of our sample manages more than 10 billion SEK in AUM. Total expense ratios at the manager level are similar than the numbers discussed at the fund level. The median manager is associated with 16.4 million SEK of fee revenue, the average manager with 47 million SEK. Ten percent of managers have less than 1.4 million in revenue while ten percent control more than 132 million. Manager revenue will be our main measure of size. In logs, it is symmetrically distributed around 16.6 with a large standard deviation of 1.8.

One statistic that is interesting is what fraction of fee revenue the manager generates goes towards her compensation. The last row of panel C reports the ratio of manager labor income to manager revenue. The median is 7.6% with an interquartile range of 2.5% to 24.2%.

Performance Panel D reports performance at the manager level. If a manager manages multiple funds and/or co-manages funds, we weight the performance of the various funds she is involved with, as discussed above. There is considerable variation in gross returns, from -22% at the 10th to +31% at the 90th percentile. The mean and median are naturally similar to the fund returns measured at the fund-level. The median gross abnormal return is 0.9% and the mean is 1.3%. The CAPM, 3-factor, and 5-factor alphas are similar, and all measures of abnormal return display large dispersion.

3.3 Firm Level

Each fund company or firm offers multiple funds and employs many managers. Panel C of Table 1 aggregates up from the fund to the firm level. Our sample contains about 920 unique firm-year observations. The average AUM at the firm level is 25 billion SEK, the median is 4 billion. The average TER at the firm level remains around 1.4%. Firm revenue averages 280 million SEK. From the Serrano accounting data base, we obtain net firm profits. Median firm profits are 11 million SEK, mean profits 59 million SEK. We define $Profit^{+}$ as the positive part of profits. It is only defined for firm-year observations with positive profits. The average firm has 11 funds and 7.6 managers in a given year in our data set, while 10 percent of firm-year observations have more than 30 funds and more than 20 fund managers.

Since our analysis will be at the manager level, panel E of Table 2 aggregates up across all the managers in a firm. If two managers work for the same firm in a given year they count as two observations for the purposes of panel E. Calculated as such, the average AUM at the firm level is 103 billion SEK and the median is 23 billion. Firm revenue averages 1,105 million SEK. These numbers are much larger than in panel C of Table 1, reflecting the fact that our sample contains more managers at large firms. Log firm revenue is symmetrically distributed with mean of 19.1 and standard deviation of 2.4. Mean profits are 157 million.

4 Results

This section investigates the empirical determinants of labor income in the cross-section of mutual fund managers.

4.1 Sensitivity of Pay to Size and to Performance

Little is known about the employment contracts of mutual fund managers. Indeed, we do not know whether the contract formally stipulates a link between pay and fund revenue, fund performance, or other fund family-level performance indicators. More importantly, we do not know the form of those relationships nor their strength. Third, we do not know what measures of fund performance owners of mutual fund families use to compensate their employee-managers. All these are open and interesting empirical questions.

In our first and main set of results, we ask whether managerial pay depends on that manager's performance, the size of the fund(s) managed, or on both. If it depends on both, we are interested in the relative magnitude of the effects. As our main measure of size we use the fee revenue of the funds managed by a given manager. Fee revenue is easily measurable, and therefore contractible, and it is a measure of the revenue or sales directly associated with the activities of that manager. We measure revenue as the assets under management times total expense ratio, calculated for each month, and then added up across months in the year in which labor income is measured. Our results are robust to using assets under management as an alternative size measure.

Our main empirical specification is:

$$\log\left(L_{m,t}\right) = \alpha_m + \alpha_t + \beta \log\left(REV_{m,t}\right) + \gamma \log\left(1 + R^{abn}_{m,t-1}\right) + \delta X_{m,t-1} + \varepsilon_{m,t} \tag{12}$$

where α_m is a manager fixed effect, α_t a year fixed effect, and $X_{m,t-1}$ are control variables to be defined below. The controls are lagged by one year relative to the size and performance measures. The additional lag helps to interpret the coefficients of size and performance as the total effect of size and performance.[17] We explore both specifications without manager fixed effects (a common constant) and with manager fixed effects. Standard errors are clustered at the manager level.

Later we explore sensitivity of our results to alternative definitions of size and performance, to alternative functional forms of that relationship, and to including additional lags of revenue and abnormal return.

[17] Results are similar when controls are measured at the same year of the size and performance measures.

Sensitivity of Pay to Revenue In column (1) of Table 3, we only include a constant and log revenue. We find an elasticity of pay to size of 0.148, which is measured precisely (standard error of 0.017). A one percent increase in the revenues from the funds a manager operates increases her pay by about 0.15 percent. This specification rejects the null hypothesis of a compensation that contains only a fixed salary, independent of fund size. Log revenue accounts for a substantial 14.5% of the cross-sectional and time series variation in pay.

On the one hand, this result suggests that the owners and the managers of mutual funds have incentives that are at least somewhat aligned, in that both of their payoffs increase in fund revenue. It also shows that the manager-specific fund revenue matters for compensation.

On the other hand, large variation in fund revenue is associated with only modestly higher manager pay. A doubling of revenue from funds under management (increase by 100% or 1 log unit) increases pay by 15%. Fund managers capture only a small share of the additional fund revenues. To illustrate this point, consider a simple example that uses rounding and a SEK/USD exchange rate of 7.5. Average manager-level revenue is about $6.2 million, 1.4% of $453 million AUM. Average managerial pay is about $210,000, which represents 3.3% of the revenue the manager's funds generate. A doubling of AUM from $453 to $906 million translates in a revenue increase from $6.2 to $12.4 million. The manager captures only $31,200 of this $6.2 million revenue increase or 0.5%; the other 99.5% goes to the owners of the fund family. After the increase, managerial pay represents only 1.9% of revenue.

In column (2), we add control variables $X_{m,t-1}$. These are measured annually and include: the manager's experience in years worked as a fund manager ($Exper$), experience squared ($Exper^2$), age of the manager (Age), age squared (Age^2), years of education (Edu), the fraction of manager m's funds that are co-managed ($Coman$), the average number of teams manager m is on in a given year ($Teams$), the average team size excluding the manager herself for the funds managed by manager m ($TeamSize$), the average number of categories manager m runs ($NumCat$), and investment category fixed effects. The equity funds category is the omitted category. The control variables enter with the expected sign, and several are statistically significant. One year of additional experience as a fund manager increases pay by 2.9%. The returns to experience appear to be concave, but not significantly so. Older managers make more, even after controlling for experience. The returns to age are strongly concave. A 45-year old manager makes 7.6% more than a 40-year old manager, taking into account both linear and quadratic terms. An extra year of education increases pay by 1.2%. This effect is not significantly different from zero probably because we have too little variation in education in our sample. A manager who co-manages all her funds has 18.8% lower pay than a manager who manages all funds by herself, all else equal. A manager who belongs to more teams makes less, with each additional team subtracting 2.8% from pay. Larger teams are associated with higher pay, with each additional team member increasing pay by 10.7%, presumably because larger funds are run by larger teams on average. Finally, a manager who manages money in more than one investment category makes an extra 8.6% per additional category, but this effect is imprecisely estimated. The controls increase the R^2 of this regression to 24.3%, a gain of 9.8% points. However, taking into account these control variables, the sensitivity of pay to revenue does not change by much compared to column (1). The elasticity point estimate is 0.137 and remains precisely estimated.

In column (3) we include manager fixed effects. The sensitivity of pay to revenue is now identified off time series variation for a given manager. Years in which the manager's funds generate more fee revenue are years of higher managerial pay. The elasticity estimate drops modestly to 0.128 and remains precisely estimated. In a world with perfect positive assortative matching, observable skill, and a time-invariant notion of skill, the largest funds would be managed by the most talented (highest-skill) fund managers; see for example Berk and Green (2004). A specification with manager fixed effects would fully soak up the cross-sectional variation in pay implied by sorting on constant skill. Comparing the point estimates on size in columns (2) and (3), we conclude that most of the variation in pay related to fund revenue is not driven by cross-sectional variation in constant skill levels. This evidence points to the importance of either time-varying skill (Kacperczyk, Van Nieuwerburgh, and Veldkamp, 2014, 2015), imperfect information/learning about skill by the owners of the fund families, or imperfect matching between skill and fund size. For example, if the fund family revises upwards its belief of a manager's skill, it may put that manager in charge of a larger fund with more fee revenue. Such a promotion could drive the increase in pay. The positive association could also be driven by strong performance in the past year, which increases AUM and revenue measured at the end of December, either directly by the fund family allocating more asset to the manager to manage or indirectly through attracting new money flows from investors. Strong performance in the past year could also lead to an increase in expense ratios. The next section studies a decomposition of manager revenue in to explore these channels.

The top row of Figure 1 shows the relationship between log fund revenue (one the horizontal axis) and log pay (on the vertical axis). Each of the 20 points represents 5% of the observations. The best-fitting line through the points is also shown; its slope is the elasticity of pay to size. The left picture corresponds to column (1) of Table 3, the middle picture shows the slope after including the controls and corresponds to column (2), while the right panel controls for manager fixed effects in addition. The graphs makes clear that a linear-in-logs specification for revenue and pay fits the data very well.[18] The middle panels in Figure 1 replace log revenue by log of assets under management. This alternative size measure of size displays a very similar linear-in-logs relationship to managerial pay. Given the similarity, we proceed with revenue as our preferred measure of size, since it directly captures the resources that flow to the firm as a result of the effort of the manager.

Sensitivity of Pay to Performance A second natural null hypothesis is that a component of managerial pay is directly tied to the return performance of the manager. In column (4) of Table 3 we estimate log pay as a constant and a linear function of performance. Performance is the abnormal return, the manager's gross return over the stated benchmark, and expressed in logs. We find a baseline pay-for-performance semi-elasticity of 0.349. The point estimate is significant at the 10% level. A 1% point increase in the log annual abnormal return of a manager increases pay by 0.35%. This is a very small effect. Log pay increases from 13.59 when the net abnormal returns is zero to 13.5935 (13.59+0.01*0.35) when the annual abnormal return is 1%. At 7.5 SEK per USD, a non-trivial increase of 1% point in abnormal return represents an annual pay increase of $372. Variation in abnormal returns explains only 2.4% of variation in pay.

Column (5) adds the control variables. The performance sensitivity coefficient increases in magnitude to 0.357 as well as in significance (5% level). There is some evidence that managerial pay is linked to the abnormal returns, after controlling for experience, age, education, etc. This specification rejects a model where pay is independent of fund performance. But the economic magnitude of the pay-for-performance sensitivity remains economically small. Even though performance-based pay may be prevalent, as suggested by Ma, Tang, and Gomez (2016), the importance of the performance-based component of compensation appears modest at best. One possibility is that contracts do include an

[18]In unreported results, we have explored specifications that specify labor income levels and linear and linear-quadratic functions of revenue. Those specifications do not fit the data as well as the log-log specification.

option-like performance bonus component, but theses largely end up out-of-the-money.

Column (6) adds manager fixed effects. The semi-elasticity drops to 0.147 and loses significance. Whatever pay-for-performance sensitivity (PPS) we find is largely driven by cross-sectional variation rather than time series variation for a given manager. Talented managers tend to earn higher returns and earn higher labor income. Once this constant talent is captured by the manager fixed effect, the PPS loses significance.

The bottom row of Figure 1 shows the relationship between performance (log gross abnormal return on the horizontal axis) and log pay (on the vertical axis). The slope of the best-fitting line through the points is the semi-elasticity of pay to performance. The left picture corresponds to column (4) of Table 3, the middle picture shows the slope after including the controls and corresponds to column (5), while the right panel controls for manager fixed effects in addition (column 6). The graphs make clear that a linear-in-logs specification for abnormal return and pay does not fit the data that well.[19] We explore different non-linear specifications below.

A Horse Race Between Size and Performance Column (7) of Table 3 models log pay as a function of a constant, log revenue, and the log abnormal return. The sensitivity of pay to revenue barely changes from column (1) when return performance is added, and neither does the regression R^2. The PPS, in contrast, loses its statistical significance and more than half of its magnitude estimated in column (4). Some of the effect of lagged performance in column (4) may have captured the relationship between pay and fee revenue, rather than a direct reward for out-performance. In column (8), we add control variables. The effect of revenue remains unchanged from column (2). Performance again loses statistical significance and two-thirds of its magnitude compared to column (5). Finally, in column (9) we add manager fixed effects. The sensitivity of pay to revenue is unchanged by the inclusion of abnormal returns but the reverse is not true: while already insignificant in column (8) the magnitude shrinks to half. In sum, there is strong evidence for a link between pay and fee revenue (size), but only weak evidence for a link between pay and performance (abnormal return over the benchmark).

[19] A similarly poor fit exists with abnormal returns on the x-axis, instead of log abnormal returns.

Interpreting Economic Magnitudes To further gauge the economic magnitudes of the effect, we standardize log revenue and the log abnormal return by subtracting out the cross-sectional mean and dividing by the cross-sectional standard deviation. Because fixed income and equity mutual funds may have very different return standard deviations or fund size distributions, we standardize log revenue and log abnormal return investment category by category. In each category, we pool the observations from all years.[20] We then re-estimate the same nine specifications but with the standardized revenue and standardized performance measures. In the interest of space, we report only the main coefficients of interest. They are found in the bottom panel of Table 3. A one standard deviation increase in log revenue is associated with a 27.1% increase in pay. This represents a 0.4 standard deviation change in log labor income. The effect moderates to a 24.6% increase once controls are included, and to 19.3% once manager fixed effects are also added. All coefficients are significant at the 1% level and the effect of a 1 standard deviation increase in revenue is economically meaningful. In contrast, a one standard deviation increase in the log abnormal return is associated with a 2.9% increase in pay. This sensitivity is ten times smaller than that of revenue. It falls to 2.5% with controls and to zero when manager fixed effects are added. When both standardized revenue and performance are included side-by-side, the effect of revenue dominates quantitatively and drives out the effect of performance.

4.2 Decomposing Revenue

In this section, we investigate the relationship between pay and fee revenue in more detail. Specifically, we want to address the possibility that pay is sensitive to fee revenue because revenue contains performance-related components that are associated with pay. For example, the Berk and Green (2004) model predicts that investors allocate more fund flows to managers that outperform.

To explore this possibility, we first decompose revenue into a component known at the end of the previous year and a growth component. This decomposition is additive in logs:

$$\log\left(REV_{mt}\right) = \log\left(REV_{mt-1}\right) + \log\left(\frac{REV_{mt}}{REV_{mt-1}}\right).$$

Column (2) of Table 4 shows this decomposition. Column (1) of Table 4 repeats the main specification

[20] We do not have enough observations to calculate standard deviations for each year separately. However, we demean all returns so that in each category the cross-sectional mean is zero in each year.

from Table 3, column (8), for convenience. Column (2) shows that lagged revenue, as of the end of last year, has a slightly stronger effect on pay (0.139) than current revenue (0.137), although the two are statistically indistinguishable from each other. The elasticity of pay to the increase in revenue is smaller at 0.088, but remains highly significant. Pay responds to both past revenue and its change, but with a stronger response to the former than the latter.

The growth in revenue must either come from growth in assets under management or from growth in the total expense ratio. This decomposition is additive in logs:

$$\log\left(\frac{REV_{mt}}{REV_{mt-1}}\right) = \log\left(\frac{TER_{mt}}{TER_{mt-1}}\right) + \log\left(\frac{AUM_{mt}}{AUM_{mt-1}}\right).$$

TER growth is measured at the manager-level. It changes either because the TER of the funds managed changes or because the set of funds a manager (co-)manages changes over time. And the funds in that set may have different (constant) expense ratios. Empirically, at the median of the managerial revenue growth distribution, growth in TER accounts for only one percent of growth in revenue. This reflects the fact that the median manager does not change the set of funds managed and that TER ratios are quite stable over time. However, at the 75th percentile of revenue growth, growth in TER accounts for 52% of revenue growth. Such large contribution is due to a changing set of funds under management. Column (3) of Table 4 shows that both components of the growth in revenue matter for pay. In fact, we find a higher elasticity of pay to TER growth (0.142) than to AUM growth (0.076), but both enter strongly significantly.

The relationship between manager TER growth and manager compensation may reflect compensation for skill. There are two layers to this. First, funds run by skilled managers may set higher fees.[21] Second, more skilled managers may be promoted to higher TER funds, maybe because such funds are more complex and require a more talented manager to run them. To explore this possibility, we study whether abnormal manager returns predict TER growth. We find they do not. The point estimate is negative, statistically insignificant, and the explanatory power is minimal.[22]

[21] Berk and Green (2004) think of fund fees as choice variables that increase in managerial skill. Warner and Wu (2011) provide empirical support for this in that fund TER occasionally increases following good performance. Since time series variation in fund TER is a minor contributor to manager-level TER growth in our data, the quantitative bite from this channel is limited.

[22] Specifically, a regression of log TER growth on lagged log abnormal returns results in a point estimate of -0.099 (t-stat of -1.53) and an adjusted R^2 of 0.00099. Adding year and category fixed effects and the usual control variables

The growth in AUM, in turn, has multiple sources. Consider the law of motion for the assets under management of one mutual fund i:

$$\frac{AUM_{it}}{AUM_{it-1}} - 1 = R^B_{it} + R^{abn}_{it} + \underbrace{FlowPerf_{it-1} + RestFlow_{it}}_{Flow}. \tag{13}$$

The first component captures the mechanical increase in AUM due to the change in the benchmark return. The second term captures the growth in the asset base due to gross abnormal returns. The third term captures AUM growth driven by the well-known flow-performance relationship. Investors reward funds with good performance in $t-1$ with new money flows. The second and third terms are the performance-related terms, one is related to performance in t and one to performance in $t-1$. The fourth term captures the remaining component of the flows. These could stem from shocks to investor portfolios unrelated to the fund in question (e.g., portfolio rebalancing), from marketing efforts of the fund complex, from investors responding to benchmark appreciation or depreciations, etc.

We follow the literature (Sirri and Tufano, 1998; Ferreira, Keswani, Miguel, and Ramos, 2012) and estimate the flow-performance relationship by regressing a fund's growth on its percentile performance rank, allowing for a piecewise linear functional form in the different quartiles of the performance distribution:

$$Flow_{it} = \frac{AUM_{it} - (1 + R^{net}_{it})AUM_{it-1}}{AUM_{it-1}} = \underbrace{bRank_{it-1}(R^{abn}_{it-1})}_{FlowPerf} + \underbrace{a + cZ_{it-1} + e_{it}}_{RestFlow}. \tag{14}$$

Rank is determined by sorting all mutual funds in a given investment category based on their net abnormal return in year $t-1$. It is the net abnormal return that is the relevant concept of outperformance from the investor's perspective. Control variables at the fund level are grouped in the vector Z. $FlowPerf_{i,t-1} = \hat{b}Rank_{i,t-1}(R^{abn}_{i,t-1})$ is the performance-related fitted value of this regression. We group the remaining flow components into the term $RestFlow_{i,t-1}$. Table 14 in the appendix reports the results of the flow-performance regression.[23] Our results are robust to various implementation details as discussed in the appendix.

leaves the point estimate virtually unchanged at -0.100 (t-stat of -1.56). So does adding manager fixed effects in addition: -0.119 (t-stat of -1.39).

[23]The control variables in Z are AUM, standard deviation of returns, TER and percentage flow per category. We winsorize Flow at the 1% and 99% levels.

We aggregate up the four components on the right-hand side of equation (13) from the fund-level to the manager-level. This aggregation is done over the set of funds the manager is (co-)managing at the end of the preceding year, using AUM_{it-1} as weights. The difference between AUM growth at the manager-level, $\log\left(\frac{AUM_{mt}}{AUM_{mt-1}}\right)$, and the four components of (13) aggregated to the manager level, is the new capital that the fund allocates to the manager:[24]

$$NewCap_{mt} = \log\left(\frac{AUM_{mt}}{AUM_{mt-1}}\right) - R^{B}_{mt} - R^{abn}_{mt} - FlowPerf_{mt-1} - RestFlow_{mt}. \qquad (15)$$

The term $NewCap$ is positive when the manager is given additional AUM to manage during the year or manages the same funds with fewer team members. It is negative if the manager is reassigned to manage smaller funds or has to share responsibility with more managers.

Column (5) of Table 4 contains the five-way decomposition of AUM growth, keeping the other components from column (3). Since we lose some observations in this specification, column (4) repeats the decomposition of column (3) with the same observations as those that are used in column (5). The main finding is that the sensitivity of pay to AUM growth is not driven by the two performance components of AUM growth, contemporaneous abnormal return and expected flow based on past performance. The performance components are jointly and separately indistinguishable from zero. The lagged abnormal return in the first row also remains indistinguishable from zero. Benchmark return dynamics affect AUM growth with a coefficient similar in magnitude (.0914) to that on overall AUM growth (.0603), but the former coefficient is imprecisely estimated. The only two AUM growth components that affect labor income significantly and about equally strongly are non-performance related fund flows (RestFlow) and new funds allocated to the manager (NewCap). Non-performance related fund flows could arise from investor portfolio rebalancing or from investors responding to benchmark returns (DelGuercio and Reuter, 2014).

Managers who are given responsibility over additional AUM see their pay rise. This could be interpreted as a promotion. Berk, van Binsbergen, and Liu (2017) argue that firm owners have private information about the skill of their managers and that such AUM-promotions are an important way in which they reward their best talent. We explore this possibility in our data set by asking whether manager abnormal return predicts new capital allocated to that manager. We find a negative

[24] Implicit is the approximation that $\log\left(\frac{AUM_{it}}{AUM_{it-1}}\right) \approx \frac{AUM_{it}}{AUM_{it-1}} - 1$.

relationship between performance and $NewCap$.[25] Like the "TER-promotions" discussed above, AUM-promotions seem unrelated to managerial outperformance. Indeed, since column (5) already includes lagged abnormal returns, the coefficients on TER growth and new capital allocated are to be interpreted as the effects on pay that are orthogonal to abnormal returns.

Overall, we conclude that both lagged revenue and changes in revenue during the year affect current-year compensation, that both changes in assets-under-management and changes in expense ratios matter, and that the effect of asset growth on compensation does not occur through a performance channel. Investor flows unrelated to performance affect pay as does new capital allocated to the manager by the firm's owners.

4.3 Non-linearities

Sofar we studied relationships between pay and size and between pay and performance that were linear in logs. It is quite possible that a different functional form better describes those relationships. In particular, we are interested in whether pay-for-performance sensitivity is high for the top-performers, as predicted by part of the theoretical literature on delegation. Similarly, is sensitivity of pay to fee revenue driven by the largest funds?

We estimate a version of (12) where we replace the revenue and the abnormal return terms by quartile indicator variables. A manager's revenue and abnormal return in a given year are ranked into one of the quartiles, category by category.[26,27] This specification models log labor income as piecewise constant function of revenue and/or performance. Table 5 presents the results. Columns (1) and (2) shows quartiles of the log revenue. The first specification includes controls, year fixed effects and category fixed effects. The second specification adds manager fixed effects. Columns (3) and (4) do the same for performance quartiles. Columns (5) and (6) combine both sets of quartiles.

[25]Specifically, we estimate a regression of $NewCap_{mt}$ on a constant, R^{abn}_{mt-1}, and year fixed effects. The coefficient on performance is -0.76 with a t-statistic of -3.48 and an adjusted R^2 of 0.0036. Adding controls and category fixed effects changes the slope estimate to -0.49 (-2.30), and adding manager fixed effects renders it indistinguishable from zero (-0.071 with t-stat of -0.28).

[26]To ensure sufficient observations, quartiles are formed by pooling all years. Results for terciles or quintiles are similar. We also explored (30,40,30), (20,60,20), and (10, 80, 10) groupings with consistent results.

[27]Month by month we assign the manager the category of the fund with the highest AUM. The yearly category variable is the most prevalent monthly assigned category.

Columns (1) and (2) show that managerial pay is increasing in revenue. The managers in the top quartile of revenue have labor income that is 62% higher than those in the bottom quartile. Each quartile of revenue adds about 20% to labor income, consistent with the linear-in-log specification of Table 3. In unreported results, we confirm that the data do not call for a different elasticity of pay to revenues in the different quartiles of the revenue distribution.

Column (3) show that managers with returns in the top quartile of their investment category earn compensation that is 8.9% higher than those in the bottom quartile. This 8.9% gap is measured precisely, and is economically non-trivial. The important conclusion is that there is indeed a pay-for-performance component to compensation, but that the linear-in-logs specification of Table 3 does not describe that relationship well. Instead, it is non-linear and is in the money only for superior performance. Column (4) controls for manager fixed effects. The pay differential between the fourth and first abnormal return performance quartiles remains large (7.5%) and statistically significant. In other words, even holding the identity of the manager constant, and therefore controlling for her unconditional bargaining power in negotiation over compensation and her average level of perceived skill, periods of superior personal performance are periods of significantly higher pay. In this specification, the third quartiles loses significance, further emphasizing that performance related bonuses are in the money only for top performers. Columns (5) and (6) show that the top-quartile PPS survives inclusion of revenue quartile dummies.

Compensation at the Top of the Size Distribution In a seminal paper, Gabaix and Landier (2008) study the assignment of CEOs with differential skill to firms in a competitive labor market. The central prediction is that CEO pay increases in firm size as well as in the size of the average firm in the economy. Translated to our mutual fund context, and using revenue as the appropriate measure of size, equilibrium in the labor market for mutual fund managers implies:

$$\log\left(L_{m,t}\right) = d + e\log\left(REV_{*,t}\right) + f\log\left(REV_{m,t}\right), \tag{16}$$

where $REV_{*,t}$ is the revenue of the median firm among the firms that employ the top managers by fund revenue. This is the same equation as our (12), without the performance term and with median revenue picked up by year fixed effects. In the Gabaix and Landier (2008) model, the slope $e = \frac{\beta}{\alpha}$ and the slope $f = \gamma - \frac{\beta}{\alpha}$. The coefficient γ measures the elasticity of managerial impact/effort with respect to fund revenue.[28] Managerial impact exhibits constant returns to scale with respect to fund revenue when $\gamma = 1$. The coefficient α is the tail index of the distribution of managerial fee revenues.[29] Under Zipf's law, $\alpha = 1$. The coefficient $-\beta$ is the tail index of the talent distribution.[30]

Equation (16) implies that the elasticity of wages to revenue at the median firm is given by $e+f = \gamma$. If $\gamma = 1$, a doubling in the revenue at the median firm doubles median manager compensation. This equation holds for large mutual funds, i.e., the right tail of the mutual fund manager revenue distribution. We estimate it by selecting the largest 25% (left panel of Table 6) or the largest 50% (right panel) of managers by revenue in each year. The intercept d depends on the investment category or manager if the performance impact of talent depends on the category or manager. We explore one specification where d is constant, one where d depends on the investment category and where we simultaneously include our other controls, and one where we add manager fixed effects so that d becomes manager-specific. Following Gabaix and Landier (2008), we omit year fixed effects and report standard errors both clustered at the manager level (first line) and at the year level (second line).[31]

Table 6 finds an estimate of 0.017 for e and 0.152 for f for the top 25% managers in terms of manager-level revenue (column 1). The estimates for the top 50% of managers in column (4) are similar: 0.063 for e and 0.176 for f.[32] The estimates for f are similar to the 0.148 point estimate we obtained for the full sample of managers in column (1) of Table 3. This confirms our earlier observation that a linear relationship between log labor income and log revenue fits the data well (recall Figure 1), across the entire revenue distribution.[33]

Columns (1) and (4) imply a similar point estimate for the elasticity of managerial impact $\gamma = e+f$

[28]Formally, a fund that hires a manager with talent T to run a fund of size REV_0 (AUM times TER) can increase revenue to $C \times REV_0^{\gamma} \times T$. Gabaix and Landier (2008) refer to C as the performance impact of talent.

[29]The revenue distribution is assumed to be Pareto with coefficient $1/\alpha$. Revenue of the n^{th} largest manager is $REV(n) = An^{-\alpha}$.

[30]If $T(x)$ is the talent distribution, Gabaix and Landier (2008) show that the following equation holds for the spacings in the upper tail of the talent distribution: $T'(x) = -Bx^{\beta-1}$. They assume that $\gamma > \frac{\beta}{\alpha}$.

[31]We could include year fixed effects instead of the revenue at the median firm, to estimate f in a first-stage regression, and then estimate a second-stage regression of the year fixed effects from the first-stage on median revenue to estimate e.

[32]We have also considered top 15% managers; results are similar.

[33]In unreported results, we estimate a specification of log wages on quartile indicators and quartile indicators interacted with log revenue. This specification allows the pay-revenue elasticity to differ by revenue quartile. We find essentially the same elasticity estimates in each quartile, formally confirming the visual evidence.

around 0.20. All columns of Table 6 imply values between 0.15 and 0.25. An alternative way of estimating γ is from a time-series regression of log median wages on log median revenue, where the median is within the subset of highest revenue managers. We find a value of 0.57 with standard error 0.12 in our data.[34] The 0.15-0.57 value range for γ estimated from Swedish mutual fund managers is far below the value of 1 Gabaix and Landier (2008) estimate for U.S. CEOs. It implies strongly decreasing returns to scale from having more talented managers run larger mutual funds, in terms of the additional revenues they generate, compared to constant returns to scale found for CEOs.

The point estimates for $e = \beta/\alpha$ are less than 0.07, far below the 0.66-0.84 range estimated for U.S. CEOs. Gabaix and Landier (2008) show that Zipf's law describes the tails of the U.S. firm size distribution well: $\alpha = 1$. To estimate α on our data, we follow Gabaix and Ibragimov (2011) and rank managers by revenue each year and then regress log revenue on the log of the rank minus 1/2:

$$\log\left(REV_{m,t}\right) = c - \alpha \log\left(Rank_{m,t} - \frac{1}{2}\right)$$

We find a value of $\alpha = 0.52$ ($\alpha = 1.11$) with a standard error of 0.030 (0.045) including top 50% (all) managers; clustered at the manager level.[35] In other words, the revenue distribution is similarly fat-tailed to the U.S. firm size distribution.

With this estimate for α in hand, the estimates for e in columns (1) and (4) imply β estimates below 0.1. These estimates suggest a much more thin-tailed talent distribution for Swedish mutual fund managers than for U.S. CEOs, where the implied $\beta = 2/3$.

4.4 Longer Performance Evaluation Periods

Sofar we have assumed that the performance component of labor income in year t is based on abnormal returns earned in year $t-1$. Table 4 also considered contemporaneous abnormal returns as

[34] The slope of this time-series regression is sensitive to the sample used. If we start the sample after 1995, the point estimate drops to 0.45 (0.06) and if we start the sample only in 2000, it drops to 0.14 (0.08) Visual inspection confirms that median compensation and median revenue were both growing in tandem in the years before 2000. After 2000, median wages started to grow much slower than median manager revenue.

[35] This estimation uses all available manager data, not just those manager-year observations that enter in the regressions. Adding year fixed effects changes the point estimate to 0.83 (1.58), with standard error of 0.03 (0.07). The estimates without and with fixed effects are very similar when we start the sample only in the year 2000.

part of the revenue growth decomposition. However, it is possible that compensation considers longer lags of performance. For the U.S., Ma, Tang, and Gomez (2016) report mean and median evaluation periods of 3 years.

Table 7 extends our baseline specification, reprised in column (1), by including one or two additional lags of abnormal returns. This is done in columns (4) and column (6). We find that twice-lagged abnormal returns enter as a significant determinant of manager compensation. The pay-revenue sensitivity is not much affected. Furthermore, the economic magnitude of the performance coefficients in column (6) remains modest. A one percentage point abnormal return in each of the past three years, which is a non-trivial feat in light of the evidence on performance persistence, increases pay by less than 1%.

One important issue with this evidence is survivorship bias. As more lags are added, the sample shrinks. This raises the issue of survivorship, which can induce an upward bias in the PPS coefficient. To explore the effect of sample selection, columns (2) and (3) repeat the baseline specification of column (1) for the sample of manager-year observations for which we have twice- and trice-lagged performance. The sample shrinks from 2,878 to 2,385 to 1,910 observations. The PPS point estimate increases from 0.11 to 0.28 to 0.41 as the sample shrinks, consistent with survivorship bias. Similarly, conditioning on the availability of trice-lagged returns, column (5) shows larger PPS estimates than column (4). Column (7) further conditions the sample on having data for fund revenues in period t-1, shrinking the sample to 1,799 observations and further increasing the cumulative PPS estimate from 0.91% to 1.33%.

The last four columns of Table 7 explore to what extent the effect of lagged performance is captured by current revenue, following the logic of Section 4.2. In column (8), we replace the $\log(REV_{m,t})$ term by $\log(REV_{m,t-3})$. The coefficients of the lagged abnormal return covariates now capture not only the direct effect of performance on pay but also the indirect effect through AUM growth and through the flow-performance relationship. All three PPS coefficients indeed strengthen and are measured more precisely. The cumulative PPS becomes 2.06%. Column (9) adds the three lagged benchmark returns. Higher benchmark return performance mechanically raises AUM and may also attract investor flows. The cumulative PPS coefficient becomes 2.27%. Finally, in column (10), we add a component $RestREV_{m,t,t-3}$ which measures all residual revenue growth between $t-3$ and t that is not captured by the three lagged abnormal and lagged benchmark returns.[36] Column (10) contains the exact same information as column (7), except that it allows for different sensitivities of compensation to the various components of $\log(REV_{m,t}$. The cumulative PPS estimate is 2.21%. In sum, while compensation contains a performance-related component which strengthens for longer evaluation periods, that component remains modest and is subject to upward survivorship bias.

Until 2009, Swedish fund owners received no guidance on how to set performance-based compensation. Anecdotal evidence suggests that to the extent there was performance-based compensation, the evaluation period was one year. Since 2009, new European-level regulation came into place stipulating that a fraction of variable pay must be postponed for three years. Column (11) limits the sample to the post-2009 sample and indeed finds somewhat stronger effects from lagged compensation than in the full sample (column 7). Our conclusions on the quantitative importance of performance-based pay are unaffected however.

4.5 Importance of the Firm

Our analysis so far has directly tied the assets/revenues controlled by a manager with that manager's compensation. We have also evaluated the role of manager-level returns in determining pay. In this section, we evaluate whether there is a separate role for firm-level, i.e., fund complex-level variables in determining pay. Anecdotal evidence from conversations with Swedish mutual fund managers, as well as recent empirical evidence from the U.S. in Ma, Tang, and Gomez (2016) suggests that some fund complexes set aside a bonus pool from which variable compensation is distributed. Its size depends on the performance of the fund complex as a whole. In this section we explore whether and to what extent complex-level variables affect observed performance in our sample.[37]

In a first specification, we explore to what extent the results in Table 3 are driven by variation at the fund complex. We repeat the results from column (8) of Table 3 in column (1) of Table 8. In column (2), we add fund complex fixed effects. The R^2 increases from 24.3% to 44.4%. This indicates

[36] It is the residual plus the intercept of a regression of $\log(REV_{m,t}/REV_{m,t-3})$ on a constant, the three lagged log abnormal returns, and the three lagged log benchmark returns.

[37] If a manager works for more than one firm during a given year, we assign him/her to the firm he/she has worked the longest for as of that year. For the 2,878 observations in our baseline regressions, the distribution of the variable "number of firms in a year" is 1 until the 75th percentile, 2 at the 90th and 95th and 3 at the 99th percentile.

that there are systematic pay differences across firms. Controlling for complex fixed effects lowers the elasticity of pay to revenue from 0.137 to 0.084, but the latter remains precisely estimated. It lowers the pay-for-performance sensitivity point estimate by over half. The latter remains indistinguishable from zero. In column (3) we replace the year fixed effects and firm fixed effects by year-times-firm fixed effects. Manager-level revenue remains a significant determinant of pay with an elasticity of 0.07, and abnormal returns now also become significant. In a given year and in a given firm, managers who perform better receive higher pay. While more precisely estimated, the PPS remains modest: an increase in abnormal return of 1% point only increases pay by 0.27%.

In column (4), we add fee revenues at the firm level (REV_f) as an explanatory variable while keeping the firm and year fixed effects. Firm-level revenues exert an influence on pay independent from that of manager-level revenues. In fact, pay is more sensitive to firm-level revenue (0.137) than to manager-level revenue (0.069). This suggests some risk sharing among the various managers in the fund. The impact of abnormal returns is statistically indistinguishable from zero.

In column (5), we similarly include firm-level abnormal returns in addition the manager-level abnormal returns and manager revenues. Firm-level performance enters with a point estimate of 0.30 and drives down the estimate on manager performance to -0.03, but neither is statistically different from zero. This remains the case in column (6) which has both manager-level and both firm-level explanatory variables. Both manager and firm-level revenue retain their explanatory power for manager compensation after inclusion of manager- and firm-level performance.

To refine the influence of firm-level variables on pay further, column (7) adds an indicator variable for positive firm profits in year $t-1$ and its interaction effects with manager revenue and manager performance. We find that compensation is 186% higher in profitable firms. Second, the sensitivity of manager pay to revenues from assets he manages is lower in profitable firms. This evidence is consistent with a compensation package that contains one component that depends on manager-level AUM and another component that comes out of a firm-wide bonus pool. This bonus pool only exists when the firm makes a profit. Pay-for-performance sensitivity is only present in profitable firms, but remains small and imprecisely measured.

Column (8) adds firm fixed effects to the specification in column (7). It only identifies coefficients off the time series variation within a firm. Years in which the firm makes profits see 90% higher average wages. The PPS is significantly higher and the elasticity of pay to revenue significantly weaker in positive profit firm-years.

Column (9) studies pay differences between the highest- and lowest-profit firms. In each period t-1, it splits the sample of firms in half by profitability. Column (9) reinforces the results of column (7). Pay is much higher in the most profitable firms, the PPS is significantly higher in profitable firms, and the revenue elasticity of pay is much lower.

Next we study how sensitive pay is to firm profits in firms that make positive profit. We define the variable $log(Profit^{+}_{f,t-1})$ which is equal to zero if the firm has negative profit and which is equal to the log of profit when the firm makes positive profits in year $t-1$. The point estimate of 0.12 on $log(Profit^{+}_{f,t-1})$ in column (10) can be interpreted as the elasticity of pay to firm profits, conditional on positive firm profits. A doubling of profits (one log point increase) increases pay by 12%. This is similar elasticity as that of pay to firm revenue in column (4). Consistent with the earlier evidence in column (7), we find that the elasticity of pay to revenue is lower for profitable firms. Column (10) shows how steeply that sensitivity declines with profit. The pay-revenue sensitivity is 0.099 at the average log profit and falls to 0.085 when log profits are one standard deviation higher (2.07 log points). Conversely, the sensitivity of wages to abnormal returns increases from 0.199 at the average profitable firm to 0.231 at a firm with one standard deviation higher profits. The sensitivity of wages to performance increases in profitability, but not significantly so.

Some of the largest firms in our sample are subsidiaries of the four largest commercial banks. Those firms account for 65% of AUM in our baseline regression sample. Column (11) investigate how the pay-performance and pay-revenue sensitivities differ for the largest four banks. We include an indicator variable for whether the manager-year observation belongs to a big bank as well as the interaction effects of that indicator with revenue and performance. We find that managers in the big four banks earn 164% higher fixed salaries, which is strongly significant. We also find that they display significantly lower pay-revenue sensitivity: 0.07 for bank managers versus 0.17 for non-bank managers. The PPS is also marginally lower, but not statistically different from zero in either type of firm. The results suggests that the fixed salary (variable) component represents a larger (smaller) share of pay for managers working at the big banks. We conjecture that big banks have cheaper distribution channels of mutual funds through their retail bank branch channel, as well as possibly a more captive and less financially sophisticated audience. If banks can sell mutual funds to their customers without having to justify abnormal performance, there would seem to be no need to pay managers for generating additional revenue. There could be a separating equilibrium where the more talented managers go to non-banks with more performance-sensitive customers and receive a larger variable pay component based on their marketing or investment prowess, while the least talented managers work at the big banks.

4.6 Differences Across Investment Categories

Table 9 repeats our main specification (column (8) of Table 3) for the five major investment categories, listed in the bottom part of the table. The first column is for equity mutual funds, by far the largest category of funds in our sample. We find a similar elasticity of 0.141 of pay to revenue as we did in the full sample (0.137). We find an even weaker semi-elasticity of pay to abnormal return of 0.022, compared to 0.112 for the sample of all funds, but both are not significantly different from zero. The main point of this table, then, is that our results hold for actively managed equity mutual funds. This is the set of funds most of the literature is focused on.

The other investment categories have relatively few manager-year observations which makes precise inference difficult. The strongest sensitivity of pay to revenue is found in the Alternatives category (0.173). This category includes funds that are hedge fund-like. Managerial pay in the Alternatives category has PPS of 0.117 but the coefficient is imprecisely measured and remains economically small. None of the categories display significant PPS. Fixed income has the weakest link between pay and size, the highest average compensation and the lowest dispersion in compensation of all categories.

4.7 Alternative Performance Measures

Sofar, we use a simple metric of return performance, the gross abnormal return, to assess the effect of outperformance on compensation. We found a very weak link, at least on average. Table 10, column (1), repeats our main specification for comparison. In this section, we show that this result continues to hold true for alternative performance measures. Every specification includes manager revenue, controls, and year and category fixed effects. Column (2) uses the gross fund return in excess of the risk-free rate, a more naive outperformance measure. The point estimate is essentially zero. Column (3) uses the gross abnormal return obtained from the Capital Asset Pricing Model. The PPS coefficient is zero. The same is true for the Fama-French alpha in column (4), where the factors additionally include the Swedish SMB and HML factors. In column (5) we use the global five-factor model alpha to measure outperformance. A positive five-factor alpha does not seem related with higher pay.

Column (6) uses gross value added in billions of SEK, the measure advocated by Berk and van Binsbergen (2015). The results are the same as for our main measure of abnormal returns: no PPS to value added. Replacing gross value added by net value added, since the regression already contains the revenue component of gross value added, does not affect this conclusion.

Columns (7)-(9) explore the concept of relative performance evaluation. First we rank all managers by their gross abnormal return within the firm. The worst performer in the firm in a given year receives rank 1, the best one rank N. The point estimate in column (7) is positive, as expected, but not different from zero. The second rank variable in column (8) recognizes that a ranking purely based on excess return is unfair to the investment categories that have lower return volatilities. It uses a standardized performance measure.[38] While the point estimate is now negative it is again not different from zero. Finally, column (9) uses the return of the manager in excess of the average return of all managers in the same investment category. The point estimate is similar to that in column (1) and remains insignificant.

We also considered non-linear specifications for the different performance measures. Apart from our baseline abnormal return measure, only for the value added measure, which is also based on a comparison to a benchmark, is there a boost in compensation for superior performance. For other measures there is no relation between performance and compensation. This suggests that it is unlikely that fund complexes use sophisticated factor models, or even the CAPM, to asses managerial performance for determining compensation.

[38]This is the same standardization we used in the bottom panel of Table 3, with a cross-sectional mean of 0 per category and year and scaled by the standard deviation of the category over the whole sample.

4.8 Dividend and Total Income

Sofar, our measure of compensation was labor income. We also have data on dividend income for our manager sample. As explained in the data section, dividend income includes all dividend payments from personal investments not (directly) related to the management of the funds. As such, it may bias down the elasticities of interest. But it also includes dividend income from ownership stakes in the mutual fund companies. To the extent that managers are paid in the form of own company stock, such dividend income affect the elasticities of interest. One complication arises. Given the high marginal labor income tax rates in Sweden, managers with equity stakes have an incentive to set up personal companies (LLCs) that are the beneficiaries of such ownership stakes and the associated dividends. The timing of payments from these LLCs to the manager is discretionary. That discretion may weaken the link between high performance in a given year and high dividend income in the following year.

Column (1) of Table 11 repeats our main specification (column (8) of Table 3) with log labor income as a dependent variable. Column (2) instead uses log dividend income $\log(D_{m,t})$ as a dependent variable. The elasticity of dividend income to fund revenue is weaker than that of labor income at 0.088, and imprecisely measured. But the sensitivity of dividend income to performance is large and positive. An increase in log gross abnormal returns from 0% to 1% increases dividend income by 2.38%. The PPS is 20 times larger for dividend income than for labor income. And that is despite the measurement and timing issues mentioned above. Of course, there is sample selection here since it conditions on non-zero dividend income.

Column (3) uses the log of total income, which is the sum of labor and dividend income $Y_t = L_t + D_t$. The zero dividend income observations are included. The elasticity of total income to revenue is 0.15 (with standard error of 0.02) and the semi-elasticity to performance is 0.50 (with standard error of 0.19). Once total compensation is considered, we find a robust performance-based pay component. The latter remains economically smaller than the revenue-based component.

Columns (4)-(6) add fund complex-level revenue and performance measures as well as complex fixed effects to the specifications in columns (1)-(3). They investigate to what extent complex-level variables differentially affect labor and dividend income. We find that firm-level revenue is not only associated with higher labor income but also with higher dividend income. The inclusion of firm-level fixed effects and revenue drives out the abnormal return term as a determinant of dividend income in column (5) and weakens it substantially as a determinant of total income. Manager- and firm-level revenue have an independent effect on managerial labor income, dividend income, and total income.

Columns (7)-(9) uses information on managers who are also board members of the fund complex. It includes a Board indicator variable, which is one if a manager is a board member in a given year, as well as interactions of the Board indicator with revenue and performance.[39] We find that Board members have higher average dividend income (insignificant) but lower labor and total income, all else equal. Board members display greater sensitivity of total income to performance (0.38 versus 0.24), but that difference is not significant. They do exhibit statistically significantly higher pay-revenue elasticities: 0.19 versus 0.08.

5 Conclusion

This paper brings the first empirical evidence on mutual fund manager compensation and its determinants. We find a strong relationship between a manager's labor income and the fee revenue she generates. This relationship holds both across and within firms, and across investment categories. In contrast, compensation is only weakly related to superior manager investment performance. Compensation is significantly higher for the top performers only, suggesting that performance-based pay components exist but often expire out-of-the-money.

Our analysis uncovers that, while performance-based compensation has a modest impact on managers' pay, revenues or profits at the fund complex level have a significant impact on compensation. This impact is beyond revenues or performance at the manager level. A closer inspection reveals that the link between pay and performance is present only when the fund complex is profitable. Theoretical research on portfolio delegating has in many cases focused on a contract between a principal and a single agent. Our evidence underscores that managers' compensation can not, and should not, be evaluated in isolation. Instead, to better understand contracting issues associated with delegation a more holistic perspective is in order, acknowledging compensation externalities within the fund family.

[39] Board does not only equal 1 if a manager is on the board of one of the firms he works for but also if he is on the board of a holding company that has shares in the firm that manages the funds. There are 682 manager-year observations in columns (7)-(9) for whom Board equals 1.

Our evidence on how profits are shared between the fund manager and the fund complex highlights the need to study further skill complementarities between fund managers and fund complexes.

Compared to U.S. CEOs where there is constant returns to scale from having more talented CEOs run larger firms, we find strongly decreasing returns to scale from having more talented managers run larger funds, suggesting that returns to scale from managerial talent are different for mutual funds compared to other corporations. We also find that the talent distribution of Swedish fund managers is not as fat-tailed as that of US corporate CEOs. This could be attributed to a couple of potential factors. First, the talent distributions could inherently differ across different institution types. Second, the Swedish economy is considerably smaller than the US, so even when we focus on the largest 100 funds in comparison to the largest 500 US corporations we may not be comparing equivalent segments of the tail. Disentangling the two possibilities is an interesting question for future research.

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A. Data Appendix

A.1. Finding Socials

Whenever possible, we first confirm the spelling of first and last name in the Morningstar data by comparing it to the fund company's annual report or the fund company's web site. From the same sources, we try to find the fund manager's age or year of birth. If this is not possible, we narrow down the age range by using information about their career from Morningstar. We assume that active fund managers are between 25 and 67 years old. For example, if the fund manager has been active as a fund manager for ten years and is active to this date, we adjust the age range to 35 to 67 years. We search the Internet for information on recruitment, fund performance, career history, LinkedIn profiles, pictures, comments in annual reports, etc. This search may provide additional information about year of graduation and earlier jobs. For example, information about an earlier job can make it possible to further increase the minimum age of the fund manager. We flag managers with inconsistent spelling, for example between the fund report and Morningstar.[40]

Based on the first name and last name, and if available the year of birth, we collect social security numbers using the websites www.upplysning.se and www.ratsit.se. In the best case scenario, we find exactly one social security number that fits the first name, last name, and age bracket. For some first and last name pairs, we cannot find any social security number using our data source. We send these names as well as those with spelling inconsistencies to the Swedish Tax Authority (STA). The tax authority investigates whether a person with that first and last name lives in Sweden at any time between 1995 and 2013 and reports back to us one of four possibilities: (1) tax and income information is present, (2) the person has a social security number but is not paying taxes, (3) there are more than 100 matches, or (4) there is no match. In case (1), we receive the social security number. In cases (2) and (4), we are now certain that this manager was not a Swedish tax payer at any point between 1995 and 2013, and therefore has had no labor income in Sweden. In case (3) we assign the manager as being "unidentified".

For many names and age ranges, we obtain multiple social security numbers. For some common names, we may get more than 50 matches on first name, last name, and age range. In such cases, if the manager is still active and we know his/her fund company's office is located in Stockholm, we refine the search to include only the greater Stockholm area. This may allow us to narrow down the number of socials to just one, in which case we get a perfect match, or it may leave us with multiple but fewer matches. If we still get more than 50 hits after including the area information, we classify the fund manager as "unidentified". Based on this procedure 84 managers remain unidentified.

For these 84 managers we try to find information about which university they attended. If we find such information, we request their transcript from the university in question. This transcript usually contains the social security number as well as their address. This allows us to obtain another 32 matches, reducing the unidentified ones to 52.

For those managers with multiple candidate social security numbers, we rate each social security

[40] When there are obvious spelling mistakes or erroneous type-ins of manager names we correct for it. Sometimes there is also confusion regarding which is the last name and which the first name which are sorted out through secondary sources, such as web sites.

number in terms of how likely it is to belong to the fund manager in question. Any available information from websites, etc. are used. The rating scales goes from 0 to 3, where 0 means no match at all and where 3 represents the most reliable category. Along with this rating, we ask Statistics Sweden to provide us with information about occupation and industry of employment for each candidate social. We rank all observed occupations and industries based on their appropriateness on a scale from 1 to 3. We then construct an algorithm that picks the most appropriate social based on our rating, occupation and industry. In most cases, it is evident which the best match is. In the few cases where there are ties, we ask Statistics Sweden to internally check whether the registered employer name matches with the fund complex registered in Morningstar Direct.

Table 12 shows how we arrive at our final sample of manager-year observations used in the regressions.

A.2. Imputing TER at the fund level

The imputation of TER is made in two steps, Step 1 and Step 2. The missing TER is imputed partially if only Step 1 is utilized and is completely imputed if both Step 1 and 2 are executed (which is what we do). The steps are as follows:

1. Step 1:

   1a. In the MIDDLE of series when TERs are almost CONSTANT within funds

   – Let $[k, k+N]$ be interval when funds having TER data. However, within this interval there are M periods when TERs are missing. The imputations are

   $$TER_t = \frac{1}{T}\sum_{j\in\Theta} TER_j, \quad \forall t \in K \tag{A.1}$$

   only if

   $$\begin{cases} \frac{\max(TER)-\min(TER)}{\max(TER)} \leq 5\% \\ N+1 \geq 2M \end{cases}$$

   where Θ and K are set of periods funds have and do not have TER; T is number of periods having TER; $\max(TER)$ and $\min(TER)$ are fund's TER maximum and minimum values.

   1b. At the TAILS of series when TERs are almost CONSTANT within funds

   – Panel 1 Table 5 reports cases how funds have missing TER relative to return series. Let $[t^{RET}_{start}, t^{RET}_{end}]$ and $[t^{TER}_{start}, t^{TER}_{end}]$ be the intervals when funds have return and TER data, and let $N = t^{TER}_{end} - t^{TER}_{start} + 1$. The missing TER at tails are imputed for each fund as follows:

   $$TER_t = \frac{1}{T}\sum_{j\in\Theta} TER_j, \quad \forall t \in K \tag{A.2}$$

where

$$K = \begin{cases} \left[max\{t^{RET}_{start},\ t^{TER}_{start} - N\},\ t^{TER}_{start}\right) & \text{: left tail of TER series} \\ \\ \left(t^{TER}_{end},\ min\{t^{RET}_{end},\ t^{TER}_{end} + N\}\right] & \text{: right tail} \end{cases}$$

only if

$$\begin{cases} \frac{\max(TER)-\min(TER)}{\max(TER)} \leq 5\% \\ \text{no missing TER within } [t^{TER}_{start}, t^{TER}_{end}] \end{cases}$$

– This means that the number of imputations at each tail is always less than or equal the number of periods fund have TER data, plus no imputations beyond return series. Panel 2 Table 5 reports number of cases these imputations are executed.

1c. Using management fee and TKA data.

– Since, we have management fee and TKA data for 7,260 fund_year or 1,272 funds, we can use this to do the TER imputations. Let $X = \{management\_fee, TKA\}$, the imputations will follow these ordered steps:

1ci. Within funds imputations:

$$TER_{it} = X_{it}\left(\frac{1}{T_i}\sum_{k\in\Omega_i}\frac{TER_{ik}}{X_{ik}}\right), \quad \forall t \in \Gamma_i \tag{A.3}$$

where Ω_i is set of periods when fund i has both TER and X data, Γ_i is set of periods when fund i has data on X but not TER, and $T_i = |\Omega_i|$. This step is only conducted automatically if the coefficient of variation (standard deviation divided by mean) of TER_{ik}/X_{ik} is less than 0.13 and 0.17 for management fee and TKA, respectively. Otherwise, it will be double checked by hand to see whether there is abnormal variation in TER or X.

1cii. Across funds in a given year within Morningstar category:

- Some funds have data on X but do not have TER at all, hence I will use average of TER_{it}/X_{it} across funds within Morningstar category in that year to impute as follow:

$$TER_{ijt} = X_{ijt}\left(\frac{1}{T_{jt}}\sum_{h\in\Omega_{jt}}\frac{TER_{hjt}}{X_{hjt}}\right), \quad \forall t \in \Gamma_i \tag{A.4}$$

where TER_{ijt} is TER of fund i in Morningstar category j, Ω_{jt} is set of funds in category j in year t, and $T_{jt} = |\Omega_{jt}|$.

1ciii. Across funds and year within Morningstar category:

- There are funds that we cannot apply step 2 since there are no other funds, that in the same category, having TER_{ik}/X_{ik} in that year, hence I will use average of TER_{it}/X_{it}

across funds and year within Morningstar category to impute as follow:

$$TER_{ijt} = X_{ijt}\left(\frac{1}{T_j}\sum_{h\in\Omega_j}\sum_{t}\frac{TER_{hjt}}{X_{hjt}}\right), \quad \forall t \in \Gamma_i \tag{A.5}$$

where Ω_j is set of funds in category j and $T_j = \sum_t T_{jt}$.

Steps 1ci-1ciii are conducted for $X = management\_fee$ first then $X = TKA$ since there are much more data on management fee than TKA.

2. Step 2:

2a. In the MIDDLE of series (2nd PASS)

- Let $[t, T]$ be the interval such that funds have TER data at t and T but not at any periods in (t, T). In addition, let $0 \leq H_1, H_2 \leq 2$ such that funds have TER at any periods in $[t - H_1, t]$ and $[T, T + H_2]$. The missing TERs are imputed for each fund as follows:

$$TER_j = \left(\frac{END}{START}\right)^{\frac{1}{T-t}} \times TER_{j-1}, \quad \forall j \in (t, T) \tag{A.6}$$

where

$$START = \frac{1}{H_1 + 1}\sum_{k=t-H_1}^{t} TER_k \tag{A.7}$$

$$END = \frac{1}{H_2 + 1}\sum_{k=T}^{T+H_2} TER_k \tag{A.8}$$

- This step is to fill any missing TER in the middle of its series. After this step, there is no missing TER in the middle.

The next 2 steps is to fill the missing at the tails of the series. Let $[t^{RET}_{start}, t^{RET}_{end}]$ and $[t^{TER}_{start}, t^{TER}_{end}]$ be the intervals when funds always have return and TER data. However, funds do not have TER at any periods in $[t^{RET}_{start}, t^{TER}_{start})$ or/and $(t^{TER}_{end}, t^{RET}_{end}]$.

2b. At the TAILS of series with predicted TER values

- Let TER of fund i has below specification:

$$\log TER_{it} = a_i + b_i t + \varepsilon_{it}, \quad \forall t \in [t^{TER}_{start}, t^{TER}_{end}] \tag{A.9}$$

The missing TERs are imputed for each fund as follows:

$$TER_{ij} = \exp(\hat{a}_i + \hat{b}_i j), \quad \forall j \in [t^{RET}_{start}, t^{TER}_{start}) \cup (t^{TER}_{end}, t^{RET}_{end}] \tag{A.10}$$

only if: [1] $t^{TER}_{end} - t^{TER}_{start} \geq 4$ and [2] p_value of $\hat{b}_i$ is less than or equal 5%.

2c. At the TAILS of series with the average values of TER

- Let $0 \leq H_1, H_2 \leq 2$. The missing TERs are imputed for each fund as follows:

$$TER_j = \begin{cases} \dfrac{1}{H_1+1} \displaystyle\sum_{k=t^{TER}_{start}}^{t^{TER}_{start}+H_1} TER_k, & \forall j \in [t^{RET}_{start}, t^{TER}_{start}) \\ \\ \dfrac{1}{H_2+1} \displaystyle\sum_{k=t^{TER}_{end}-H_2}^{t^{TER}_{end}} TER_k, & \forall j \in (t^{TER}_{end}, t^{RET}_{end}] \end{cases} \tag{A.11}$$

A.3. Description of Variables

Table 13 describes the variables we used in the different tables.

A.4. Flow-Performance Relationship

Table 14 shows the flow-performance relationship, as explained in equation (14). The first column shows our benchmark specification which we use to estimate the flow-performance component which enters into equation (13) and Table 4. We follow Table II in Sirri and Tufano (1998) and include a piecewise linear function of the fund's fractional rank. A funds fractional rank represents its percentile performance relative to other funds with the same investment objective in the same period, and ranges from 0 to 1. In contrast to Sirri and Tufano (1998), we use the net abnormal return over the past year to determine the rank. We allow for different coefficients on the ranks between 0 and 0.33, between 0.34 and 0.66, and 0.67 to 1. We control for lagged fund return volatility $\sigma_{i,t-1}$ measured from monthly returns during the past year, lagged total expense ratio, lagged assets under management, and the lagged growth rate of net new money to all funds in the same investment category. Consistent with the well-known convex flow-performance relationship, we find that funds who rank in the top-33% of performers in terms of their net abnormal returns see larger sensitivity of inflows to performance.

Column (2) shows that the results are similar when we include fund fixed effects and identify the flow-performance relationship purely off cross-sectional variation. Column (3) looks at only the equity funds. In columns (4) and (5) we dropped lagged size as a control and find more convexity. In columns (6) and (7) we drop the other control variables and find more convexity still. Despite these differences, the fitted value coming from the performance component is similar in all specifications. Replacing the $FlowPerf_{m,t-1}$ term in column (5) of Table 4, which is based on column (1) of Table 14, with the analogous $FlowPerf_{m,t-1}$ terms based on columns (2)-(7) of Table 14 results in a zero coefficient estimate in all cases.

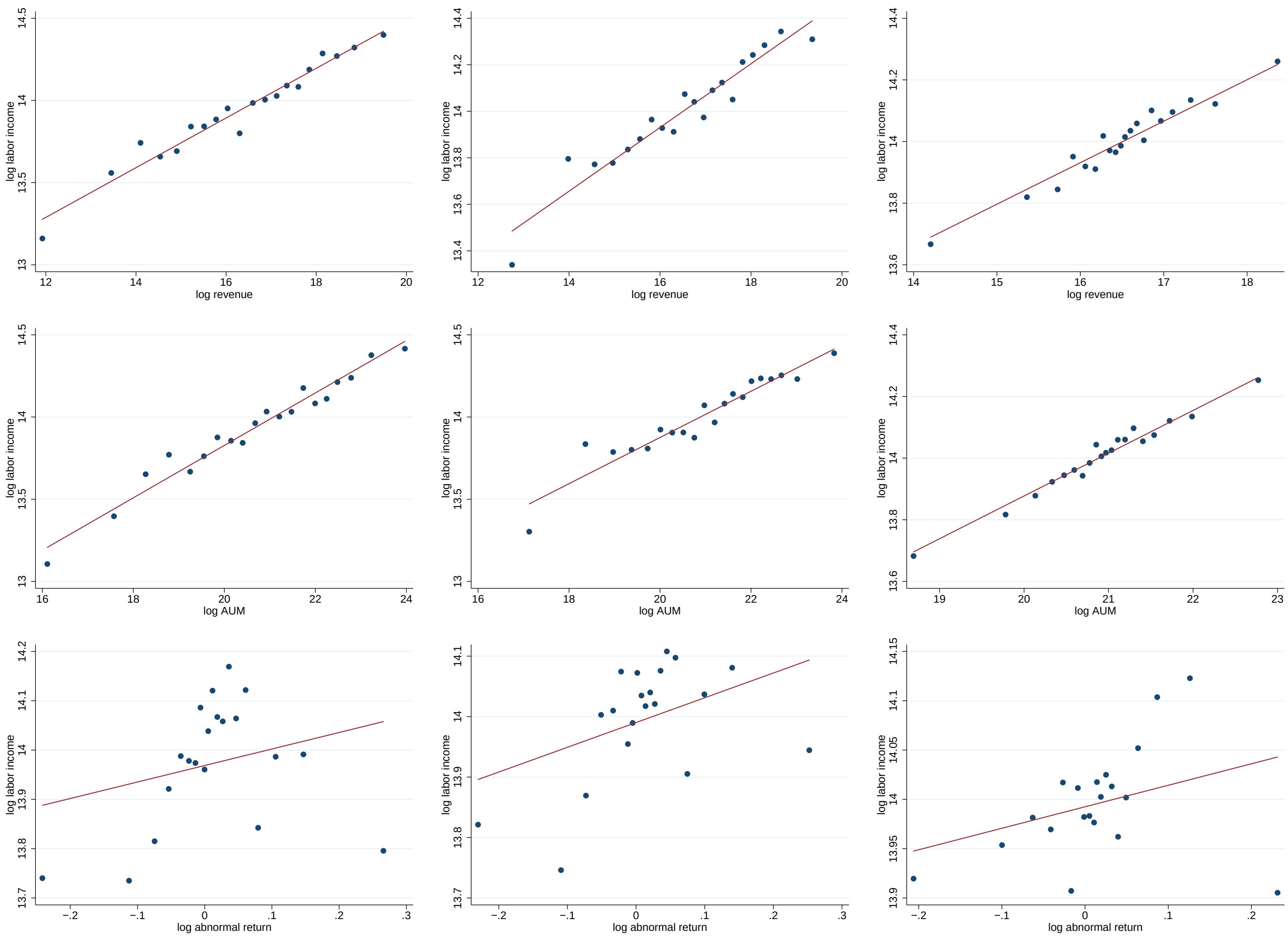

Figure 1: Elasticity of Pay to Revenue (top), Assets Under Management (middle), and Performance (bottom)

Table 1: SUMMARY STATISTICS AT THE FUND LEVEL

	10%	25%	50%	75%	90%	Mean	Sd	N
A. AUM and TER								
AUM_i (mio. SEK)	63.3	202.7	702.5	2425.2	6696.4	2327.5	4011.2	5539
TER_i (%)	0.50	0.76	1.42	1.70	2.21	1.36	0.68	5588
REV_i (mio. SEK)	0.7	2.4	7.9	28.5	80.8	27.7	47.8	5498
$\log(REV_i)$	13.5	14.7	15.9	17.2	18.2	15.8	1.8	5498
B. Gross Performance (%)								
$\log(1 + R_i^{exc})$	-20.3	-2.2	6.9	18.0	27.9	5.1	21.6	4469
$\log(1 + R_i^{abn})$	-8.6	-2.9	0.5	4.1	9.7	0.6	8.4	4452
$\log(1 + R_i^{abn,CAPM})$	-10.0	-3.9	0.3	4.0	10.1	0.0	9.3	4445
$\log(1 + R_i^{abn,FF3})$	-9.3	-3.3	0.7	4.4	9.6	0.4	8.8	4445
$\log(1 + R_i^{abn,GF5})$	-8.4	-3.8	0.1	3.7	9.7	0.2	8.1	4379
$ValueAdded_i$ (mio. SEK)	-90.2	-15.0	1.3	28.1	142.6	26.9	225.7	4401
C. Firm Level								
AUM_f (bio. SEK)	0.2	0.8	4.0	19.6	68.9	25.2	62.4	905
TER_f (%)	0.68	1.00	1.26	1.64	2.40	1.40	0.66	919
REV_f (mio. SEK)	2.1	10.3	48.6	208.6	693.1	279.3	672.9	919
$\log(REV_f)$	14.6	16.1	17.7	19.2	20.4	17.6	2.2	919
$Profit_f$ (mio. SEK)	-1.9	0.4	10.9	49.6	152.5	58.7	153.4	633
$Profit_f^+$ (mio. SEK)	1.3	4.8	22.9	69.9	217.3	76.8	169.2	493
No. of funds / year	1.0	2.0	5.0	11.0	31.5	11.2	17.8	920
No. of managers / year	1.0	2.0	3.0	9.0	20.0	7.6	10.5	920

Notes: The sample contains all fund-year observations that are used in our main analysis (column 8 of Table 3). A fund-year observation is included if it is managed by a manager in our sample in that year. We winsorize the performance variables, AUM, TER, and REV at the 1% and 99% levels. Panel C aggregates the fund-year observations up into firm-year observations.

Table 2: Summary Statistics at the Manager Level

	10%	25%	50%	75%	90%	Mean	Sd	N
A. Characteristics								
Age_m	33	37	42	48	52	42.3	7.5	2878
$Exper_m$	1.0	2.4	4.8	8.1	12.2	5.9	4.7	2878
Edu_m	12.0	15.0	15.0	16.0	16.0	15.0	1.7	2878
$Coman_m$	0.00	0.00	0.11	1.00	1.00	0.45	0.48	2878
$Teams_m$	0.00	0.00	0.92	1.00	3.00	1.21	2.27	2878
$TeamSize_m$	0.00	0.00	0.13	1.00	2.00	0.72	1.04	2878
$NumCat_m$	1.0	1.0	1.0	1.0	2.0	1.2	0.5	2878
B. Income (1000s of SEK)								
L_m	519.7	794.2	1209.8	1809.2	2745.7	1567.1	1524.2	2878
D_m	0.0	0.0	4.2	42.2	450.8	818.1	8760.2	2878
Y_m	556.9	862.0	1346.0	2047.7	3454.3	2385.2	8893.7	2878
C. AUM								
AUM_m (mio. SEK)	101.2	362.8	1377.3	4558.3	10039.7	3931.2	6596.1	2841
TER_m (%)	0.56	1.00	1.40	1.66	2.18	1.40	0.66	2878
REV_m (mio. SEK)	1.4	4.4	16.4	52.7	132.6	47.3	77.2	2878
$\log(REV_m)$	14.1	15.3	16.6	17.8	18.7	16.5	1.8	2878
L_m/REV_m (%)	1.2	2.5	7.6	24.2	73.7	47.7	247.6	2878
D. Gross Performance (%)								
$\log(1+R_m^{exc})$	-21.9	-2.6	7.3	18.3	30.6	5.6	22.8	2878
$\log(1+R_m^{abn})$	-8.4	-2.6	0.9	5.0	12.0	1.3	9.7	2878
$\log(1+R_m^{abn,CAPM})$	-10.8	-4.0	0.5	5.3	12.4	0.8	10.8	2865
$\log(1+R_m^{abn,FF3})$	-10.0	-3.4	1.1	5.6	11.9	1.1	10.4	2865
$\log(1+R_m^{abn,GF5})$	-9.3	-3.6	0.5	5.0	11.7	0.9	9.5	2776
$ValueAdded_m$ (mio. SEK)	-132.8	-20.1	3.8	56.7	251.9	40.7	297.1	2878
E. Firm Level								
AUM_f (bio. SEK)	0.7	3.2	23.4	157.2	387.8	102.6	157.4	2856
TER_f (%)	0.77	1.04	1.19	1.40	1.95	1.28	0.52	2877
REV_f (mio. SEK)	8.2	42.2	230.6	1737.7	4408.2	1104.9	1605.3	2877
$\log(REV_f)$	15.9	17.6	19.3	21.3	22.2	19.1	2.4	2877
$Profit_f$ (mio. SEK)	-1.5	3.0	39.2	223.1	532.7	156.6	262.5	2507
$Profit_f^+$ (mio. SEK)	2.7	12.8	67.7	256.6	558.6	190.5	272.1	2108

Notes: The sample is the final sample that is used in the main regression analysis (column 8 of Table 3). We winsorize the performance variables, AUM, TER, and REV at the 1% and 99% levels. We do not winsorize income or characteristics variables. Panel E aggregates up from the manager-year to the firm-year observation. If two managers work for the same firm in a given year, both observations are included.

Table 3: Sensitivity of Pay to Size and Performance

	(1) $\log(L_{m,t})$	(2) $\log(L_{m,t})$	(3) $\log(L_{m,t})$	(4) $\log(L_{m,t})$	(5) $\log(L_{m,t})$	(6) $\log(L_{m,t})$	(7) $\log(L_{m,t})$	(8) $\log(L_{m,t})$	(9) $\log(L_{m,t})$
$\log(REV_{m,t})$	0.148***	0.137***	0.128***				0.147***	0.137***	0.127***
	(0.0166)	(0.0179)	(0.0241)				(0.0166)	(0.0179)	(0.0242)
$\log\left(1+R^{abn}_{m,t-1}\right)$				0.349*	0.357**	0.147	0.135	0.112	0.0587
				(0.194)	(0.160)	(0.130)	(0.188)	(0.149)	(0.123)
$Exper_{m,t-1}$		0.0288**	0.0938**		0.0525***	0.119**		0.0289**	0.0938**
		(0.0115)	(0.0471)		(0.0119)	(0.0565)		(0.0115)	(0.0472)
$Exper^2_{m,t-1}$		-0.000451	0.00000814		-0.00109**	-0.000743		-0.000457	0.00000293
		(0.000398)	(0.000743)		(0.000438)	(0.000708)		(0.000400)	(0.000743)
$Age_{m,t-1}$		0.186***	0.0980		0.184***	0.102		0.186***	0.0980
		(0.0281)	(0.0666)		(0.0263)	(0.0748)		(0.0281)	(0.0667)
$Age^2_{m,t-1}$		-0.00201***	-0.00157***		-0.00203***	-0.00159***		-0.00201***	-0.00157***
		(0.000339)	(0.000539)		(0.000312)	(0.000583)		(0.000339)	(0.000540)
$Edu_{m,t-1}$		0.0127	-0.00560		0.0200	0.0195		0.0124	-0.00503
		(0.0146)	(0.0535)		(0.0151)	(0.0586)		(0.0147)	(0.0535)
$Coman_{m,t-1}$		-0.188**	0.0644		-0.273***	0.0103		-0.189**	0.0636
		(0.0795)	(0.102)		(0.0778)	(0.111)		(0.0796)	(0.103)
$Teams_{m,t-1}$		-0.0283***	-0.00238		0.00479	0.0137		-0.0281***	-0.00232
		(0.0101)	(0.00869)		(0.0102)	(0.00936)		(0.0102)	(0.00870)
$TeamSize_{m,t-1}$		0.107***	0.00638		0.0889**	-0.0188		0.107***	0.00653
		(0.0373)	(0.0446)		(0.0380)	(0.0490)		(0.0373)	(0.0446)
$NumCat_{m,t-1}$		0.0858	0.0918*		0.102	0.151***		0.0862	0.0923*
		(0.0696)	(0.0514)		(0.0694)	(0.0556)		(0.0695)	(0.0514)
Constant	11.05***	6.998***	9.907***	13.59***	9.205***	11.29***	11.08***	7.027***	9.908***
	(0.293)	(0.587)	(1.844)	(0.156)	(0.593)	(2.255)	(0.296)	(0.595)	(1.846)
Manager FE	No	No	Yes	No	No	Yes	No	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
N	2996	2878	2878	2996	2878	2878	2996	2878	2878
Adjusted R^2	0.145	0.243	0.628	0.024	0.154	0.603	0.145	0.243	0.628

Standardized Revenue and Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\log(REV_{m,t})_{std}$	0.271***	0.246***	0.193***				0.270***	0.246***	0.194***
	(0.0331)	(0.0336)	(0.0471)				(0.0330)	(0.0336)	(0.0471)
$\log\left(1+R^{abn}_{m,t-1}\right)_{std}$				0.0286	0.0246	0.00213	0.00940	0.00714	-0.00502
				(0.0178)	(0.0161)	(0.0137)	(0.0166)	(0.0151)	(0.0132)

Notes: The dependent variable is annual log labor income of the fund manager. The independent variables are a constant, log revenue generated by the manager in that same year, log annual fund returns at the manager level over the past year, manager experience in years working as a fund manager, experience squared, manager age, manager age squared, years of education, the fraction of funds that are co-managed with other managers, the number of management teams the manager serves on, the size of management teams, and the number of different investment categories that the manager's funds belong to. All specifications include year fixed effects. Some specifications additionally include investment category fixed effects and manager fixed effects. When category fixed effects are included, the Equity category is the omitted one. The bottom panel estimates a separate set of regressions, but replaces the variables in the first two rows by standardized versions of those same variables (denoted by the subscript std). The scaling is done by investment category and results in a variable that is mean zero and has standard deviation of one. All standard errors are clustered at the manager level.

Table 4: Decomposing the Effect of Revenue on Pay

	(1) $\log(L_{m,t})$	(2) $\log(L_{m,t})$	(3) $\log(L_{m,t})$	(4) $\log(L_{m,t})$	(5) $\log(L_{m,t})$
$\log\left(1+R^{abn}_{m,t-1}\right)$	0.112	0.131	0.140	0.211	0.0209
	(0.149)	(0.150)	(0.150)	(0.154)	(0.230)
$\log\left(REV_{m,t}\right)$	0.137***				
	(0.0179)				
$\log(REV_{m,t-1})$		0.139***	0.139***	0.139***	0.140***
		(0.0182)	(0.0182)	(0.0190)	(0.0193)
$\log(REV_{m,t}/REV_{m,t-1})$		0.0876***			
		(0.0214)			
$\log(TER_{m,t}/TER_{m,t-1})$			0.142***	0.141**	0.146**
			(0.0534)	(0.0580)	(0.0594)
$\log(AUM_{m,t}/AUM_{m,t-1})$			0.0763***	0.0603**	
			(0.0227)	(0.0295)	
$R^{b}_{m,t}$					0.0914
					(0.0918)
$R^{abn}_{m,t}$					-0.0483
					(0.170)
$FlowPerf_{m,t-1}$					0.338
					(0.321)
$RestFlow_{m,t-1}$					0.0619**
					(0.0303)
$NewCap_{m,t}$					0.0596**
					(0.0297)
Constant	7.027***	7.140***	7.021***	7.077***	6.999***
	(0.595)	(0.599)	(0.597)	(0.613)	(0.602)
Manager FE	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
N	2878	2875	2875	2697	2697
Adjusted R^2	0.243	0.244	0.245	0.246	0.245

Notes: See Table 3. This table presents successively finer decompositions of log revenue (in column 1) in columns 2-5, as detailed in the main text. The last column draws on an auxiliary set of Flow-Performance regressions estimated at the fund level as detailed in Table 14 in the appendix.

Table 5: Non-linearities in Pay

	(1) $\log(L_{m,t})$	(2) $\log(L_{m,t})$	(3) $\log(L_{m,t})$	(4) $\log(L_{m,t})$	(5) $\log(L_{m,t})$	(6) $\log(L_{m,t})$
$\log(REV_{m,t,2})$	0.263***	0.203***			0.258***	0.199***
	(0.0620)	(0.0621)			(0.0622)	(0.0627)
$\log(REV_{m,t,3})$	0.438***	0.402***			0.429***	0.396***
	(0.0670)	(0.0744)			(0.0672)	(0.0747)
$\log(REV_{m,t,4})$	0.616***	0.538***			0.605***	0.531***
	(0.0862)	(0.0899)			(0.0859)	(0.0900)
$\log(REV_{m,t})$			0.135***	0.126***		
			(0.0178)	(0.0242)		
$\log\left(1+R^{abn}_{m,t-1,2}\right)$			0.0376	0.0159	0.0550	0.0254
			(0.0367)	(0.0311)	(0.0378)	(0.0314)
$\log\left(1+R^{abn}_{m,t-1,3}\right)$			0.0690*	0.00814	0.0852**	0.0155
			(0.0412)	(0.0319)	(0.0431)	(0.0322)
$\log\left(1+R^{abn}_{m,t-1,4}\right)$			0.0894**	0.0750**	0.103**	0.0792**
			(0.0413)	(0.0312)	(0.0425)	(0.0319)
Constant	8.954***	11.50***	7.060***	9.799***	8.996***	11.37***
	(0.578)	(1.989)	(0.596)	(1.862)	(0.587)	(2.012)
Manager FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	2878	2878	2878	2878	2878	2878
Adjusted R^2	0.229	0.625	0.245	0.629	0.231	0.626

Notes: See Table 3. The independent variables are indicator variables for whether manager revenue or manager abnormal return belongs in the first (omitted), second, third, or fourth quartiles of their respective investment-category specific distributions.

Table 6: Pay in the Tail of the Size Distribution

	(1)	(2)	(3)	(4)	(5)	(6)
	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$
	Top 25% by Revenue			Top 50% by Revenue		
$\log(REV_{m,t})$	0.152**	0.149**	0.214***	0.176***	0.140***	0.159***
	(0.0652)	(0.0633)	(0.0704)	(0.0348)	(0.0378)	(0.0487)
	(0.0354)	(0.0318)	(0.0473)	(0.0124)	(0.0120)	(0.0326)
$\log(REV_{f,t,median,25})$	0.0169	-0.00000537	0.0203			
	(0.0796)	(0.0749)	(0.0723)			
	(0.0667)	(0.0519)	(0.0709)			
$\log(REV_{f,t,median,50})$				0.0627	0.0157	-0.0114
				(0.0465)	(0.0493)	(0.0411)
				(0.0605)	(0.0404)	(0.0596)
Constant	11.13***	6.094**	1.684	9.830***	6.019***	6.246***
	(1.380)	(2.513)	(4.479)	(0.978)	(1.373)	(2.207)
	(1.081)	(1.355)	(2.822)	(1.058)	(0.824)	(1.649)
Manager FE	No	No	Yes	No	No	Yes
Year FE	No	No	No	No	No	No
Category FE	No	Yes	Yes	No	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
N	915	796	796	1832	1586	1586
Adjusted R^2	0.020	0.202	0.581	0.060	0.213	0.605

Notes: Panel regression of log manager labor income on a constant, log manager revenue, and log median revenue. The first set of standard errors is clustered at the manager level, the second set is clustered at the year level. The first three columns select the top-25% of observations each year based on manager revenue. The last three columns select the top-50% of observations each year based on manager revenue. The median revenue we use is taken among the firms that employ the managers in the included part of the manager revenue distribution (top-25% or top-50%).

Table 7: Longer Evaluation Periods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$
$\log(REV_{m,t})$	0.137***	0.135***	0.123***	0.133***	0.121***	0.120***	0.123***				0.137***
	(0.0179)	(0.0204)	(0.0233)	(0.0205)	(0.0233)	(0.0233)	(0.0235)				(0.0254)
$\log(REV_{m,t-3})$								0.0845***	0.0856***	0.125***	
								(0.0205)	(0.0204)	(0.0254)	
$\log\left(1+R^{abn}_{m,t-1}\right)$	0.112	0.275	0.410*	0.279	0.412*	0.421*	0.617***	0.882***	0.928***	0.917***	0.813***
	(0.149)	(0.184)	(0.209)	(0.185)	(0.211)	(0.218)	(0.215)	(0.221)	(0.240)	(0.232)	(0.280)
$\log\left(1+R^{abn}_{m,t-2}\right)$				0.283*	0.387**	0.393**	0.486**	0.767***	0.906***	0.866***	0.603**
				(0.161)	(0.189)	(0.194)	(0.192)	(0.199)	(0.207)	(0.202)	(0.236)
$\log\left(1+R^{abn}_{m,t-3}\right)$						0.0985	0.223	0.414***	0.434***	0.423***	0.348*
						(0.154)	(0.135)	(0.141)	(0.146)	(0.145)	(0.195)
$\log\left(1+R^{b}_{m,t-1}\right)$									0.188	0.204	
									(0.138)	(0.137)	
$\log\left(1+R^{b}_{m,t-2}\right)$									0.372***	0.360***	
									(0.108)	(0.106)	
$\log\left(1+R^{b}_{m,t-3}\right)$									0.132	0.157*	
									(0.0827)	(0.0840)	
$RestREV_{m,t,t-3}$										0.107***	
										(0.0233)	
Constant	7.027***	6.689***	6.509***	6.769***	6.534***	6.566***	6.587***	7.776***	7.733***	6.628***	6.849***
	(0.595)	(0.707)	(0.841)	(0.715)	(0.843)	(0.849)	(0.859)	(0.829)	(0.827)	(0.864)	(0.951)
Manager FE	No	No	No	No	No	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No	No
N	2878	2385	1910	2385	1910	1910	1799	1799	1799	1799	1278
Adjusted R^2	0.243	0.224	0.191	0.225	0.192	0.192	0.194	0.166	0.171	0.195	0.233

Notes: See Table 3. We include additional lags of fund abnormal return. Columns (8)-(10) replace log revenue by trice-lagged log revenue and include the three lagged returns (column 7), adding the three lagged benchmark returns (column 8), and the rest of the growth in revenue between t-3 and t (RestRev in column 10). Column (11) re-estimates the same specification as in column (7) but limits the sample to the post-2009 period. Columns (1)-(2)-(3) differ by the number of manager-year observations. So do columns (4)-(5), and (5)-(6). These comparisons allow us to gauge the importance of sample selection.

Table 8: The Importance of the Firm

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$
$\log(REV_{m,t})$	0.137***	0.0842***	0.0695***	0.0686***	0.0844***	0.0687***	0.215***	0.126***	0.189***	0.215***	0.166***
	(0.0179)	(0.0134)	(0.0145)	(0.0133)	(0.0134)	(0.0133)	(0.0333)	(0.0230)	(0.0332)	(0.0354)	(0.0247)
$\log(1+R^{abn}_{m,t-1})$	0.112	0.0534	0.272**	0.0492	-0.0410	-0.0344	-0.0140	-0.446	-0.186	-0.0700	0.109
	(0.149)	(0.115)	(0.127)	(0.111)	(0.131)	(0.130)	(0.318)	(0.311)	(0.227)	(0.318)	(0.190)
$\log(REV_{f,t})$				0.137***		0.138***					
				(0.0301)		(0.0301)					
$\log(1+R^{abn}_{f,t-1})$					0.340	0.304					
					(0.265)	(0.260)					
$Profit_{f,t-1} > 0$							1.860***	0.896**			
							(0.513)	(0.390)			
$(Profit_{f,t-1} > 0) \times \log(1+R^{abn}_{m,t-1})$							0.184	0.657**			
							(0.338)	(0.324)			
$(Profit_{f,t-1} > 0) \times \log(REV_{m,t})$							-0.105***	-0.0521**			
							(0.0318)	(0.0232)			
$Profit_{f,t-1} > 50pctile$									2.152***		
									(0.530)		
$(Profit_{f,t-1} > 50pctile) \times \log(1+R^{abn}_{m,t-1})$									0.479*		
									(0.264)		
$(Profit_{f,t-1} > 50pctile) \times \log(REV_{m,t})$									-0.114***		
									(0.0336)		
$\log(Profit^{+}_{f,t-1})$										0.119***	
										(0.0299)	
$\log(Profit^{+}_{f,t-1}) \times \log(1+R^{abn}_{m,t-1})$										0.0152	
										(0.0188)	
$\log(Profit^{+}_{f,t-1}) \times \log(REV_{m,t})$										-0.00656***	
										(0.00185)	
$Big4_{m,t}$											1.638***
											(0.470)
$Big4_{m,t} \times \log(REV_{m,t})$											-0.0181
											(0.233)
$Big4_{m,t} \times \log(REV_{m,t})$											-0.0967***
											(0.0284)
Constant	7.027***	7.924***	7.668***	5.589***	7.935***	5.593***	5.882***	7.830***	6.281***	5.827***	6.458***
	(0.595)	(0.605)	(0.824)	(0.751)	(0.601)	(0.748)	(0.725)	(0.694)	(0.690)	(0.733)	(0.619)
Manager FE	No	No	No	No	No	No	No	No	No	No	No
Year FE	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No
Firm FE x Year FE	No	No	Yes	No	No	No	No	No	No	No	No
Observations	2878	2878	2878	2877	2875	2874	2519	2519	2519	2519	2878
Adjusted R^2	0.243	0.444	0.527	0.453	0.444	0.454	0.255	0.437	0.286	0.264	0.253

Notes: See Table 3. Variables with subscript m are measured at the manager level while variables with subscript f are measured at the firm level. $Profit > 0$ is an indicator variable for positive net profits at the firm level; the data are from Serrano. $Profit > 50pctile$ is an indicator variable for whether a firm has profits in the top half of the profit distribution in a given year. $Profit^{+}$ is net profits times an indicator variable for positive profits. Big^{4} is an indicator variable for whether the manager works for one of the four large commercial banks in Sweden in a given year.

Table 9: Investment Categories

	(1)	(2)	(3)	(4)	(5)
	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$
$\log(REV_{m,t})$	0.141^{***}	0.117^{**}	0.0330	0.173^{***}	-0.0310
	(0.0187)	(0.0453)	(0.0362)	(0.0605)	(0.131)
$\log\left(1+R^{abn}_{m,t-1}\right)$	0.0221	-0.183	-0.194	0.117	0.372
	(0.149)	(0.583)	(0.377)	(0.547)	(0.899)
Constant	7.331^{***}	8.449^{***}	8.830^{***}	5.283^{*}	19.41^{**}
	(0.622)	(1.445)	(1.096)	(2.748)	(8.487)
Manager FE	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes
Category	Equity	Allocation	Fixed Income	Alternative	Rest
Controls	Yes	Yes	Yes	Yes	Yes
N	1732	347	316	433	50
Adjusted R^2	0.296	0.313	0.293	0.312	0.260

Notes: Re-estimates the specification in column (8) of Table 3, investment category by investment category.

Table 10: Alternative Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$	$\log(L_{m,t})$
$\log(REV_{m,t})$	0.137***	0.138***	0.137***	0.137***	0.138***	0.136***	0.137***	0.138***	0.137***
	(0.0179)	(0.0178)	(0.0181)	(0.0181)	(0.0184)	(0.0175)	(0.0183)	(0.0183)	(0.0179)
$\log\left(1+R^{abn}_{m,t-1}\right)$	0.112								
	(0.149)								
$\log\left(1+R^{exc}_{m,t-1}\right)$		-0.0147							
		(0.0821)							
$\log\left(1+R^{abn,CAPM}_{m,t-1}\right)$			0.0641						
			(0.125)						
$\log\left(1+R^{abn,FF3}_{m,t-1}\right)$				0.0699					
				(0.130)					
$\log\left(1+R^{abn,GF5}_{m,t-1}\right)$					-0.0615				
					(0.150)				
$V_{m,t-1}$						0.0513			
						(0.0591)			
$rank\left(R^{abn}_{m,t-1}\right)$ within firm							0.0000237		
							(0.00184)		
$rank\left(R^{abn}_{m,t-1}\right)_{std}$ within firm								-0.000526	
								(0.00183)	
$\log\left(1+R^{exc}_{m,t-1}\right)$ within category									0.0961
									(0.0939)
Constant	7.027***	6.997***	6.992***	6.996***	7.395***	7.013***	6.998***	6.993***	7.017***
	(0.595)	(0.588)	(0.601)	(0.602)	(0.629)	(0.588)	(0.587)	(0.587)	(0.591)
Manager FE	No	No	No	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2878	2878	2865	2865	2776	2878	2878	2878	2878
Adjusted R^2	0.243	0.243	0.242	0.242	0.231	0.244	0.243	0.243	0.244

Notes: See Table 3. Columns (2)-(9) replace our baseline measure of manager abnormal return by manager gross CAPM alpha, gross Fama-French 3-factor alpha, gross global five-factor alpha, manager value-added (V_m), the rank of the manager with the firm (worst performing manager receives rank of 1), the rank based on standardized abnormal return, or the gross return of the manager in excess of the average return of all managers in the same investment category.

Table 11: Labor, Dividend, and Total Income

	(1) $\log(L_{m,t})$	(2) $\log(D_{m,t})$	(3) $\log(Y_{m,t})$	(4) $\log(L_{m,t})$	(5) $\log(D_{m,t})$	(6) $\log(Y_{m,t})$	(7) $\log(L_{m,t})$	(8) $\log(D_{m,t})$	(9) $\log(Y_{m,t})$
$\log(REV_{m,t})$	0.137***	0.0881	0.151***	0.0686***	0.152**	0.0743***	0.0715***	0.196***	0.0772***
	(0.0179)	(0.0702)	(0.0191)	(0.0133)	(0.0672)	(0.0140)	(0.0138)	(0.0703)	(0.0148)
$\log\left(1+R^{abn}_{m,t-1}\right)$	0.112	2.377***	0.501**	0.0492	0.510	0.265*	0.206*	0.0652	0.235*
	(0.149)	(0.729)	(0.194)	(0.111)	(0.652)	(0.155)	(0.121)	(0.673)	(0.124)
$\log(REV_{f,t})$				0.137***	0.510***	0.187***			
				(0.0301)	(0.172)	(0.0359)			
$Board_{m,t}$							-1.273**	0.155	-1.749***
							(0.503)	(2.315)	(0.633)
$Board_{m,t} \times \log\left(1+R^{abn}_{m,t-1}\right)$							-0.489*	1.307	0.148
							(0.274)	(1.434)	(0.374)
$Board_{m,t} \times \log(REV_{m,t})$							0.0790**	0.0609	0.114***
							(0.0314)	(0.144)	(0.0379)
Constant	7.027***	-4.625	6.394***	5.589***	-11.71***	4.687***	8.081***	-3.008	8.096***
	(0.595)	(3.054)	(0.690)	(0.751)	(4.143)	(0.877)	(0.597)	(2.965)	(0.652)
Manager FE	No	No	No	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	2878	2248	2878	2877	2247	2877	2878	2248	2878
Adjusted R^2	0.243	0.186	0.256	0.453	0.400	0.513	0.448	0.402	0.507

Notes: See Table 3. The dependent variable is log labor income (L_{mt}) in columns (1), (4), and (7). It is log dividend income (D_{mt}) for those with dividend income in columns (2), (5), and (8). It is log total income ($Y_{mt} = L_{mt} + D_{mt}$) in columns (3), (6), and (9).

Table 12: Sample Selection Criteria

Step	Manager-year	Managers	Funds
Raw sample			1,744
Drop ‘Team Management’ and ‘Not Disclosed’	10,123	1,324	1,600
Drop Index, Money Market and Pension Funds	9,881	1,298	1,517
Assign social security number candidate	6,571	765	1,271
Uniquely identify social security number	5,129	628	1,099
Require non-missing variables & lags	2,878	529	941

Notes: This table shows how we arrive at our final sample of manager-year observations.

Table 13: Description of Variables

Variable	Description
A. General	
AUM	Assets under management
$Big4$	Dummy for the four biggest banks in Sweden (Handelsbanken, Swedbank, SEB and Nordea)
$\log(1 + R^{exc})$	log (gross) excess return
$\log(1 + R^{abn})$	log abnormal return w.r.t. benchmark (imposing $\beta = 1$)
$\log(1 + R^{abn})_{std}$	Standardized (across categories) log abnormal return
$\log(1 + R^{abn,CAPM})$	log abnormal return w.r.t. CAPM
$\log(1 + R^{abn,FF3})$	log abnormal return w.r.t. Swedish FF 3-factor model
$\log(1 + R^{abn,GF5})$	log abnormal return w.r.t. Global 5-factor model
$\log(1 + R^{exc})$ within category	log abnormal return w.r.t. same category funds/managers
REV	Revenue ($AUM \times TER$)
REV_{std}	Standardized (across categories) revenue
TER	Total expense ratio
$ValueAdded$	Value Added w.r.t to benchmark calculated as in Berk and van Binsbergen (2014)
B. Manager level	
$Board$	Dummy indicating board membership in one of the firms a manager works for or an associated holding company
$Coman$	Fraction of co-managed funds
$Exper$	Years worked as a fund manager
Edu	Years of schooling
$FlowPerf$	Predicted flow based on Table 13, Column 1 after aggregation to the manager level
$NewCap$	Additional AUM due to promotions/demotions
$NumCat$	Number of categories a manager manages
$rank(R^{abn})$ within firm	Rank variable for performance within a firm (low to high)
$rank(R^{abn})_{std}$ within firm	Standardized (across categories) rank variable (low to high)
$RestFlow$	Unexplained flow based on Table 13, Column 1 after aggregation to the manager level
$Teams$	Number of teams a manager is on
$TeamSize$	Team size excluding manager herself
C. Firm level	
$Profit$	Operating firm profit/loss calculated as: net sales + other operating income +/- items affecting comparability - personnel expenses - depreciation and amortization - other operating expenses
$Profit^{+}$	positive part of $Profit$, otherwise 0
$Profit > 0$	Dummy indicating positive profit

Table 14: Flow-Performance Relationship

	(1) $FLOW_{it}$	(2) $FLOW_{it}$	(3) $FLOW_{it}$	(4) $FLOW_{it}$	(5) $FLOW_{it}$	(6) $FLOW_{it}$	(7) $FLOW_{it}$
$LOWPERF_{i,t-1}$	0.374	-0.317	-0.111	-0.397	-1.008**	-0.485	-1.286***
	(0.367)	(0.452)	(0.492)	(0.354)	(0.454)	(0.363)	(0.472)
$MIDPERF_{i,t-1}$	0.175**	0.186**	0.307***	0.136	0.182*	0.120	0.134
	(0.0820)	(0.0859)	(0.104)	(0.0833)	(0.0942)	(0.0842)	(0.0961)
$HIGHPERF_{i,t-1}$	0.977**	0.948**	0.632	1.549***	1.440***	1.974***	2.037***
	(0.396)	(0.464)	(0.530)	(0.419)	(0.508)	(0.453)	(0.546)
$\sigma_{i,t-1}$	0.255	0.815	1.209**	0.556	2.442***		
	(0.325)	(0.561)	(0.476)	(0.343)	(0.547)		
$TER_{i,t-1}$	-0.0824***	-0.0447	-0.123***	-0.00890	0.0406		
	(0.0233)	(0.0498)	(0.0309)	(0.0216)	(0.0504)		
Flows to category$_{i,t-1}$	0.0295	-0.00301	0.0822	-0.0202	0.0642		
	(0.0603)	(0.0606)	(0.0682)	(0.0642)	(0.0708)		
$AUM_{i,t-1}$	-0.197***	-0.439***	-0.181***				
	(0.0164)	(0.0716)	(0.0192)				
Constant	4.274***	9.141***	3.867***	0.327***	0.111	0.408***	0.547***
	(0.337)	(1.443)	(0.417)	(0.0734)	(0.121)	(0.0588)	(0.0736)
Fund FE	No	Yes	No	No	Yes	No	Yes
Categories	All	All	Equity	All	All	All	All
N	10576	10576	6295	10576	10576	10633	10633
Adjusted R^2	0.081	0.221	0.082	0.005	0.069	0.005	0.060

Notes: This table regresses mutual fund flows $FLOW_{it} = \frac{AUM_{i,t}-(1+R_{i,t}^{gross})AUM_{i,t-1}}{AUM_{i,t-1}}$ *on the tercile rank of the fund at time* $t-1$. *Each year, funds are ranked based on their net abnormal returns* $R_{i,t-1}^{abn,net}$ *in three tercile groups called LOWPERF, MIDPERF, and HIGHPERF. We estimate specifications with and without controls, and include a specification that is only for the equity mutual funds.*