What Does Compensation of Portfolio Managers Tell Us About Mutual Fund Industry? Evidence from Israeli Tax Records*

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Abstract

We study the determinants of compensation in the mutual fund industry using Israeli tax records. The portfolio manager compensation is influenced by fund flows driven by past raw returns. Managers are thus paid equally for fund superior performance and for the fund's passive benchmark returns. We interpret these results though a model that combines trust-mediated money management in the spirit of Gennanioli, Shleifer and Vishny (2015) and imperfect labor market competition. In our model, compensation and fund size are jointly determined by expected raw returns and by the level of intermediary's trustworthiness. Additional empirical evidence confirms the distinct model predictions.

Keywords: Mutual Funds; Portfolio Managers; Compensation

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1 Introduction

The benefits of investing into actively managed mutual funds appear to be one of the most controversial topics in financial economics. A large literature documents that many funds cannot beat their benchmarks net of fees and some funds even underperform gross of fees.[1] Given substantial costs of active investing (French (2008)), it remains unclear why the typical investor prefers actively managed funds. These findings have sparked a long lasting academic debate and have given rise to a number of theories addressing the puzzle. Berk and Green (2004) suggests that investors seek to maximize performance but competition for access to more skilled managers eliminates potential benefits from active investing. However, recent studies cast doubt on the idea that many investors look for money managers solely to improve performance (Bergstresser, Chalmers and Tufano (2009); Gennaioli, Shleifer and Vishny (2015)). As a result, mutual fund companies may have less reason to provide their portfolio managers with strong incentives to generate alpha if investor flows are less responsive to it (Del Guercio and Reuter (2014)).

In this paper, we directly analyze the incentives of individual portfolio managers by studying how they are rewarded and what they are rewarded for. To do this, we assemble a novel hand-collected dataset combining data on 233 mutual fund portfolio managers managing 1,446 Israeli mutual funds from 2006 to 2014 with administrative tax records. The dataset covers the 87% of Israeli mutual fund industry between 2010 and 2014 and 49% of the industry between 2006 and 2009. The key advantage of our approach is that we precisely observe how mutual fund companies compensate their portfolio managers, how investor flows shape compensation and what form of incentives the managers face. Our dataset allows for an empirical examination of portfolio manager compensation in light of theories of money management.

First, we document a number of basic facts about managerial compensation. Since mutual fund companies seek to maximize their assets under management, we start by analyzing

[1] This literature goes back to Jensen (1968), Ippolito (1989) and Gruber (1996). For the recent advancements in this debate, see Fama and French (2010) and Berk and van Binsbergen (2015). The estimates of underperformance and of the amount of underperforming funds vary substantially with methodologies and samples used by various studies.

the relationship between fund size and compensation of its portfolio manager. We document a strong relationship between fund size, the resulting fee revenues and managerial compensation. This relationship is manager-specific and is only partially driven by the overall amount of fees collected by the entire mutual fund company. We next decompose changes in fund size into investor flows, current raw returns and additional funds assigned to the manager or taken from him by the firm. The results show that investor flows are the key component of changes in fund size that drives the short-term variation in compensation. Our findings suggest that managers are paid a share of fees primarily generated by their specific funds, and that the aggregate amount of these fees is strongly affected by investors' behavior.

This leads us to study how the determinants of flows are transmitted into the compensation of portfolio managers. As prior work suggests that flows are driven by both active and passive returns (Del Guercio and Reuter (2014); Barber, Huang and Odean (2016)), we follow Berk and van Binsbergen (2015) and decompose fund total returns to alpha and to returns traced to passive benchmarks. We confirm that investor flows are equally responsive to both components of fund raw performance. Given the importance of flows in determining fund fees and the role played by passive and active returns in determining fund flows, we continue by examining how manager compensation is affected by these two components. The results show that mutual fund companies do not "filter out" passive returns from fund performance, with managers being compensated approximately equally for both. Managers are thus provided with little insurance against the market movements, and further the pay for alpha appears to be relatively small. Taken together the evidence shows that investors do not filter out passive returns in determining flows and, correspondingly, mutual fund companies do not filter out passive returns in determining fund manager compensation.[2]

To rationalize the findings, we next present a simple model of compensation in the money management industry. Overall, our model builds on Gennaioli, Shleifer and Vishny (2015) (GSV) combing it with a standard labor economics model of wage determination based on

[2]We also test the hypothesis that managers can predict passive benchmark movements and, therefore, the pay for the passive benchmark returns reflects the incentives to time these benchmarks. However, we do not find strong evidence for the existence of timing ability.

rent sharing. The key idea of GSV is that investors lack expertise or confidence to make risky investments on their own, and they will take risks only through financial intermediaries whom they know and rely on. Further, investor willingness to bear risk will depend on the degree of trust that might arise from *familiarity* with the intermediary. As a result, trust and familiarity with intermediaries represents an important source of product differentiation. Even if intermediaries offer access to identical generic passive assets and compete on fees, substantial market segmentation remains and fees do not fall to costs. Consequently, GSV explains why investors do not distinguish between active and passive returns and why they are willing to pay rents to the intermediaries even in the absence of alpha.

To study compensation, we introduce a portfolio manager who is hired by the firm to attract additional capital from investors. The manager has two separate characteristics that investors care about. First, she is able to increase fund returns by generating alpha on top of the passive risky return. Second, the manager contributes to fund familiarity in the eyes of the investors consistently with Massa, Reuter and Zitzewitzc (2010). As result, hiring the manager boosts fund size and the resulting fee revenue due to both enhanced performance and familiarity. If the manager is not hired, the fund is anonymous managed and operates as an index fund with a lower level of familiarity.

We follow a longstanding literature in labor economics in which wages are determined via a rent sharing process.[3] Such a process can arise from a scarcity of more skilled or more visible managers as well as from other sources of imperfect labor market competition. Under the rent sharing assumption, manager have some bargaining power and she is able to obtain a share of product market rents that arise from from her ability to generate alpha as well as from her "personal" familiarity to the investors.

The model yields a number of implications that help to explain the empirical evidence. First, because the manager is paid a share of the aggregate fees that, in turn, depend on fund size, changes in manager compensation are driven by changes in fund size arising from fund flows. Second, as investors do not invest into risky assets on their own, they treat equally

[3] This literature goes back to Krueger and Summers (1988) and Katz and Summers (1989) and it appears to be important for explaining the recent evidence on wage premium in the financial sector (Böhm, Metzger and Strömberg (2016)). As summarized by Manning (2011), "labor markets are pervasively imperfectly competitive [and] there are rents to the employment relationship for both worker and employer".

alpha and return traced to fund passive benchmark. As a consequence, fund size depends on both fund alpha and the return on fund passive benchmark, and the resulting changes in fund size feed into the manager's compensation through the bargaining process. Thus, our model explains why portfolio managers are paid for flows and why they are paid for both superior performance and passive benchmark returns.

Beyond explaining our empirical results, the model generates an additional distinct implication: investor' familiarity with individual managers and mutual fund companies should magnify the sensitivity of flows and compensation to past performance. As the investors trade mean against variance, fund size increases together with the expected return per unit of risk. When the degree of familiarity is higher, the percieved riskiness of the investment is lower and the investors delegate more funds for the same expected return. Therefore, an increase in the expected returns generates a larger increase in the fund size when the intermediary is considered to be more trustworthy. Because of the bargaining the variation in the expected returns is also translated into larger increases in compensation.

We test this set of predictions using two measures of familiarity. Our first measure is firm-specific and equals the ratio of salespeople in the firm to the number of funds offered. This measure is motivated by studies on the effect of marketing and advertising in the mutual fund industry (Reuter and Zitzewitz (2006); Solomon, Soltes and Sosyura (2012); Gallaher, Kaniel and Starks (2015); Kaniel and Parham (2016)). Our second measure of familiarity is manager-specific and equals the number of media mentions of each individual manager. This measure stems from prior literature documenting the effect of manager characteristics on fund flows, even when these characteristics do not affect fund performance (Pareek and Zuckerman (2014); Kostovetsky (2015); Niessen-Ruenzi and Ruenzi (2015); Kumar, Niessen-Ruenzi and Spalt (2015)). Using these two measures of familiarity, we confirm the model's additional prediction: familiarity almost doubles the sensitivity of compensation to fund alpha as well as its passive return. Similarly, and consistent with the model, familiarity also doubles the sensitivity of flows to both components of fund return.

In sum, the results indicate that the managers are paid for fund flows that arise from both components of past performance: alpha and passive benchmark return. Even with zero alpha, the average manager's compensation grows significantly over time because of positive passive returns and the resultant fund flows. The compensation of managers who are more visible or who work at more familiar firms grows significantly faster, as does their fund size. Overall, our results are consistent with the view that (i) money managers obtain rents from investors in return for the provision of access to risky investments, (ii) the size of rents is magnified by investors' familiarity with individual managers and firms, and (iii) the compensation of portfolio managers reflects a share of these rents.

1.1 Literature review

This paper is related to a number of recent and ongoing papers. In the ongoing work, Ibert, Kaniel, Nieuwerburgh and Vestman (2017) examine the compensation of Swedish mutual fund porfolio managers. Similarly to us, they find that compensation is related to fund fee revenue and that the incenitves to generate alpha are weak on average. They further focus on the cross-sectional determinants of compensation among top perfomers as well as in the interplay between firm revenue, fund revenue in their effects on compensation. Our paper follows a different direction providing a unified theoretical framework that accounts for the basic facts and generates testable predictions.

In the recent work, Ma, Tang and Gómez (2016) study the compensation structure of U.S. mutual fund managers. While they have no data on the actual levels of pay, they provide a number of closely related findings. For example, Ma, Tang and Gómez (2016) show that many contacts are based on fund size or on fund performance. When fund family explicitly ties compensation to performance, manager funds have higher alphas and higher betas. Consistently with our view, performance-based compensation structure does not appear to be solely based on superior performance and is related to exposure to passive benchmarks.

Our paper is also related to the several broad areas of research. The evidence suggests that access to intermediaries boosts risk taking capacity of investors (Chalmers and Reuter (2015)) and that many investors allocate funds without making sufficient risk adjustment to fund performance (Del Guercio and Reuter (2014); Berk and van Binsbergen (2016); Barber, Huang and Odean (2016)). A number of studies in labor economics show that the amount of rents accruing to employees depends on the product market conditions (Abowd and Lemieux (1993); Van Reenen (1996); Black and Strahan (2001)). Our contribution to these strands of literature is to build a link between the behavior of investors and the sources of rents that arise specifically in the money management industry and to empirically illustrate the transmission of these rents into the compensation of portfolio managers. Our results are also in line with the hypothesis that mutual fund companies are not likely to provide strong incentives to generate superior performance in the presence of investors who care about raw returns rather than solely about alpha (Del Guercio and Reuter (2014)).

Voluminous research on executive compensation documents the lack of filtering of industry shocks and other macroeconomic shocks.[4] Some papers on corporate governance treated this phenomenon as a pay for luck that arises from manager ability to influence compensation structure (Bertrand and Mullainathan (2001)). Our approach is very different as we do not think that the pay for the passive returns arises from poor corporate governance. Instead we argue and provide evidence that the compensation for passive returns arises from complementarity between manager scarce characteristics and fund characteristics. The governance view also predicts that the pay for observed shock to performance should be asymmetric: in good times managers are paid more but in bad times they are not necessarily paid less. We test this argument directly and do not find evidence in favor of asymmetric pay for passive returns.

Finally, our paper is related to the literature on compensation in the financial industry (Philippon and Reshef (2012); Lindley and McIntosh (2014); Célérier and Vallée (2015); Boustanifar, Grant and Reshef (2016); Böhm, Metzger and Strömberg (2016)). The key difference between this literature and our paper is we focus on the compensation *within* the financial sector with very specific implications for money management rather than analyzing the differences in pay between financial and non-financial sectors. Closer to our work, Axelson and Bond (2015) explain the increasing wages of financial professionals through the combination of agency problems and the growing size of finance (Greenwood and Scharfstein (2013)). Gabaix and Landier (2008), Terviö (2008) and Thanassoulis (2012) argue that wages are de-

[4]See Lazear and Oyer (2012) for the summary of the literature.

termined by matching between more skilled managers and larger firms. Our model has no incentives, size is endogenously determined by investors' preferences and the relationship between size and pay arises even in the absence of agency problems or matching. However, we do not rule out the possibility that managers are provided with incentives to generate familiarity and performance (Ma, Tang and Gómez (2016)) as well as that matching plays an important role. These mechanisms, perhaps, contribute to the wage determination process alongside the channels presented in this paper.

Section 2 describes the dataset and the basic methodology. Section 3 presents a number of basic facts about the relationship between fund flows, managerial compensation and fund performance. In Section 4, we develop a simple model of compensation and discuss its main implications. Section 5 further tests the predictions of the model and documents the empirical relationships between familiarity, flows and compensation. Section 6 presents additional empirical tests and Section 7 concludes. Additional empirical results appear in the Appendix.

2 Data

2.1 The Israeli Mutual Fund Market

In 2014, the Israeli mutual market included roughly 1,400 funds that managed $80B. The number of funds and their aggregate assets under management went up significantly since a major capital market reform (The Bahar Reform) that launched in 2005. As a result, the market became more competitive, fees substantially declined and the number of products increased. Table 1, Panel B, lists asset categories that Israeli mutual fund families offer to the investors. The market consists of different types of funds starting from pure equity funds and ending with government bond funds. Many funds are hybrid and invest into a number of different asset classes simultaneously. As a group, Israeli mutual funds allocate roughly 25% of assets to equities, 30% to corporate bonds and another 25% to government bonds.

2.2 Sample construction

We construct our sample from several data sources. Detailed definitions of variables and sources appear in Appendix B. We start with public disclosures of mutual fund companies (Part B of Fund Prospectus) to identify individual mutual fund portfolio managers. Since 2010, mutual fund companies in Israel have to disclose the identity of their portfolio managers through public reports submitted to the Israel Securities Authority and to the Tel-Aviv Stock Exchange on annual basis.[5] We hand-collect the information on portfolio managers including age, job tenure, the list of funds that they manage in given year as well as the date when they started to manage a particular fund.[6] This data allows us to track almost the entire population of mutual fund portfolio managers in Israel from 2010 to 2014.[7] As we observe the dates when managers became responsible for particular funds, we extend the dataset back to 2006 for a subset of managers and funds. For example, if we know that the manager started managing the fund in February 2006, we include this fund in his portfolio since the given date.

Next we match this data using unique fund identifiers with a database on monthly characteristics of funds purchased from Praedicta - a large private Israeli data vendor.[8] This survivorship bias-free database covers the entire universe of Israeli mutual funds, and it includes detailed fund characteristics such as fees, commissions, assets under management, returns, fund's style and asset allocation across broadly defined sets of securities. We use this data to estimate models of fund performance as described in section 3.3. The overall matched sample covers the 87% of Israeli mutual fund industry's assets under management between 2010 and 2014 and 49% of this industry between 2006 and 2009 (see Appendix D, figure D.1). We exclude index funds and money market funds from this sample. As reported in Table 1, Panel A, our final data set contains 1,446 actively managed funds across a variety of asset classes.

[5] This information is publicly available both on http://maya.tase.co.il and on https://www.magna.isa.gov.il.

[6] The firms are not obliged to disclose names of fund managers but they have to disclose their license numbers. All portfolio managers in Israel have to pass the Israel Securities Authority qualification exam to obtain a license to be able to work as portfolio managers. In cases when we had only a license number, we used this to find the individual manager's name on the Israel Securities Authority website.

[7] Very small mutual fund companies are not subject to this disclosure, so the data set does not completely cover the population of fund managers.

[8] This data set has been previously used in Shaton (2015).

We then construct portfolios of funds for each manager on an annual basis to later fit the compensation data which is reported annually. Fund managers can be listed as managers of multiple funds, and funds can have multiple managers. If the fund was managed by N managers in a given month, we follow Chevalier and Ellison (1999) and attribute 1/N assets to every manager assuming that all the managers listed contribute equally to the management of the fund. While it is a strong assumption, we feel that it would be problematic to assume otherwise given that we did not have any other measures of individual manager's contribution. We constructed annualized measures of manager portfolio characteristics such as fees and fund age as an asset-weighted sum of characteristics of individual funds.

Finally, we match portfolios of individual managers with their compensation data using administrative tax records from Israel Tax Authority.[9] As we want to focus on the employment relationship between portfolio managers and mutual fund companies, we exclude from our sample 17 managers who held ownership stakes in the companies they worked for. We also exclude a small number of cases where managers worked less than a full year in the company. The final dataset includes 233 managers and 1,125 manager-year observations.

Table 1, Panel A, reports the descriptive statistics of our sample. The average mutual fund portfolio manager earns $136,000 per year putting him into the top 2% of labor income distribution in Israel. He is managing a portfolio with $204 million under management that generates $2.09 million in fees. The average manager is paid 6% of the portfolio's revenues in fees.

2.3 Estimation of alpha and passive returns

We use two models to evaluate fund performance in order to derive its alpha and its passive benchmark return. The first model is a single factor market model in which Tel Aviv 100 Index proxies equity market risk. This model focuses on the most important source of risk in many investors' portfolios (Asness, Krail and Liew (2001)). The second model uses five benchmarks as proxies for risk factors: two equity market indices, Tel Aviv 100 Index and the MSCI World Index, as well as the three bond indices: inflation-indexed corporate bonds,

[9] We used Form 106 (the equivalent of the U.S. W-2) which is an annual statement of wage and taxes.

inflation-indexed government bonds and non-indexed government bonds (Hamdani, Kandel, Mugerman and Yafeh (2016)). This model was developed for the Israeli Ministry of Finance to compare long-term investment instruments such as pension funds and provident funds. We use the same model for estimating performance of mutual funds because their holdings are very similar to the holdings of the provident funds and most of them are in these five asset categories (Shaton (2015)) .

In the main analysis, we estimate fund's betas using fund-level monthly data in the following specification for both models:

$$R_{im} - R_m^{RF} = \alpha_i + \sum_{f=1}^{F} \beta_{if} \left(R_{fm} - R_m^{RF} \right) + \epsilon_{im}, \tag{1}$$

where $R_{im} - R_m^{RF}$ is an excess return of fund i in month m above the risk free rate R_m^{RF} and $R_{fm} - R_m^{RF}$ is an excess return of factors f in month m. The risk-free rate R_m^{RF} is defined as monthly return on Israeli government bonds with a one-year of maturity.

We follow Berk and van Binsbergen (2015) and generate fund's benchmark return multiplying the estimated fund betas by annual excess returns on the indices in year t:

$$R_{it}^B = \sum_{f=1}^{F} \hat{\beta}_{if} \left(R_{ft} - R_t^{RF} \right). \tag{2}$$

Intuitively, benchmark return represents a return on the portfolio of passive assets that is the "closest" to the fund's asset holdings. This is the return that investors can achieve on their own purely relying on passive benchmarks that represent the alternative investment opportunity set.

A fund's annual alpha is calculated as the difference between the fund's annual return R_{it} and its benchmark return R_{it}^B:

$$\alpha_{it} = R_{it} - R_{it}^B. \tag{3}$$

Finally, we construct an annual alpha and benchmark return for each individual manager as an asset-weighted alpha and benchmark return of her funds and we report them in Table

1, Panel A. In both models the average alpha is statistically indistinguishable from zero. In the market model, 2.3% of fund's return can be traced to the stock market that reflects an average equity premium of 8.8% over the sample years and a market beta of 0.26. In the 5-benchmark model, the passive return is 4% and it arises from the combined exposure to all the benchmarks.

We also employ a number of alternative models to verify robustness of our results. First, we allow for time-varying betas and estimate equation (1) over 2-year and 3-year periods with the last year being the year of interest. For example, in the 3-year model we estimate equation (1) over 2012-2014 to derive betas for 2014. Second, we estimate our fund performance model using a shrinkage estimator for betas that allows to adjust fund betas towards the betas of fund's asset class (Vasicek (1973); Elton, Gruber, Brown and Goetzmann (2014)). The shrinkage estimator is defined as

$$\bar{\beta}_{if} = w_{ic}\hat{\beta}_{if} + (1 - w_{ic})\hat{\beta}_{cf}, \tag{4}$$

where $\hat{\beta}_{if}$ is estimated from (1) , $\hat{\beta}_{cf}$ is fund's asset class betas and $0 < w_{ic} < 1$ is a weighting parameter. We describe the construction of this estimator in Appendix C.

3 Basic Facts

3.1 Compensation, size and fees

We first study the relationship between size, fees and compensation. Figure 2(a) shows the strong positive correlation between fund income in fees and manager compensation. Figure 2(b) finds similar relationship between fund size and portfolio manager compensation. We formally estimate the relationship between compensation, size and fees using the following specifications:

$$Ln(Compensation_{ict}) = \gamma Ln(Size_{ict}) + \lambda_i + \lambda_{ct} + \theta X_{ict} + \epsilon_{ict}, \tag{5}$$

$$Ln(Compensation_{ict}) = \gamma Ln(Fees_{ict}) + \lambda_i + \lambda_{ct} + \theta X_{ict} + \epsilon_{ict}, \quad (6)$$

where $Ln(Compensation_{ict})$ is a natural logarithm of manager compensation, $Ln(Fees_{ict})$ is a natural logarithm of manager portfolio's revenue in fees, $Ln(Size_{ict})$ is a natural logarithm of manager portfolio size, λ_i are manager fixed effects, λ_{tc} are firm-year fixed effects and X_{ict} are manager- and portfolio-specific variables such as manager age and tenure as well as the portfolio funds' age. Standard errors clustered at the manager level are in parentheses.

Table 2 presents the results confirming the stylized facts presented in Figure 1. Column (1) shows that in the cross-section the average manager's pay increases by 0.3% when the fund's size goes up by 1%. Adding controls and firm-year fixed effects does not affect the results substantially (column (2)) . These results confirm that the relationship between fund's size and pay is manager-specific: it is not driven by the variation in fees at the company-level. In column (3), we include individual manager's fixed effects to exploit the within-manager variation. We find that an increase of 1% in fund's size for a given manager is associated with roughly 0.3% increase in managerial compensation.

Columns (4), (5) and (6) present the regressions of compensation on portfolio aggregate fees. We observe a similar relationship between fees and compensation with a smaller economic magnitude. Consistent with the mutual fund literature, these results suggest that changes in fund size are important drivers of changes in aggregate fees. Overall, the evidence implies that fund size is an important determinant of manager compensation, this relationship is manager-specific and holds controlling for firm-year fixed effects. This finding motivates us to look into the time-series changes in fund size to understand which of these changes are important for changes in compensation. We start with a simple decomposition of manager portfolio size changes as follows:

$$\frac{s_t - s_{t-1}}{s_{t-1}} = R_t + \frac{s_t - s_t^{ext} - (1 + R_t)s_{t-1}}{s_{t-1}} + \frac{s_t^{ext}}{s_{t-1}} \quad (7)$$

where s_{t-1} is the portfolio's size at the beginning of the year, s_t is the size at the end of the year and s_t^{ext} is the "extensive" margin adjustment - the size of funds that are added to manager's portfolio in year t or are taken from him by the firm. The equation (7) tells us that changes in a manager's portfolio size can arise from three sources: her funds' current returns, from flows that come from the investors and from changes in the manager's portfolio that are initiated by the firm and can be seen as promotions and demotions.

Next, we ask how these components are associated with changes in compensation. We further decompose a fund's raw returns R_{ict} as a sum of the fund's current year alpha, α_{ict}, and its benchmark return, R^B_{ict}, and regress the changes in compensation on changes in fund size presented in equation (7):

$$\Delta ln(w_{ict}) = \beta_1 \alpha_{ict} + \beta_2 R^B_{ict} + \beta_3 NetFlow_{ict} + \beta_4 AdditionalCapital_{ict} + \lambda_{tc} + X_{ict} + \epsilon_{it} \quad (8)$$

where we include all the previously discussed sources of changes. λ_{tc} are firm-year fixed effects and X_{ict} are manager- and portfolio-specific variables such as manager age and tenure as well as the portfolio funds age.

Table 3 presents the results and shows that the key source of short-term variation in compensation is fund flows. Column (1) shows that a change of 1% in fund size from fund flows increases compensation by 0.4%. Interestingly, neither changes in size that arise from *current* performance nor changes in size that are initiated by the firm have a statistically significant effect on compensation. These results indicate that investor behavior is an important driver of short-term changes in compensation of mutual fund portfolio managers. We later provide rationale for this finding arguing that compensation is determined by "sharing" of fees collected from the investors between the manager and the firm and that the aggregate fees are tightly related to fund size.

3.2 Compensation and past performance

Even if managers are not paid for *current* performance, they might be compensated for *past* performance indirectly through the flow-performance relationship. A number of studies showed that many investors, especially the least sophisticated ones, delegate new funds based on past raw performance and do not distinguish between alpha and passive returns (Del Guercio and Reuter (2014); Barber, Huang and Odean (2016)). This leads us to ask whether the mutual fund companies "filter out" the changes in size that are driven by past passive returns and compensate their managers based on changes induced only by alpha. This question is in line with the predictions of the standard incentive models that seek balance between incentives and insurance (Holmstrom and Milgrom (1987)).

Figure 3 plots the relationship between the lagged benchmark returns and changes in manager compensation across the sample years. In 7 out of 8 sample years, lagged benchmark returns and compensation move together. This graphical evidence suggests that, contrary to the prediction of the basic incentive models, observed changes in benchmark returns are not "filtered out", and instead lead to the subsequent changes in compensation.

To further illustrate this idea, Figure 4 plots the relationship between alpha, benchmark returns and changes in compensation in the cross-section of managers. We observe that the compensation is strongly correlated not only with alpha but also with passive returns at the individual manager level. The relationship roughly represents a 45 degree line: a 1% increase in the fund's past year returns is translated into approximately 1% higher compensation of the portfolio manager.

Table 4 looks formally into this idea and presents the panel data regression estimating the specifications of the form:

$$\Delta ln(w_{ict}) = \gamma_1 \alpha_{ic,t-1} + \gamma_2 R^B_{ic,t-1} + \lambda_{ct} + \theta X_{it} + \epsilon_{ict}, \tag{9}$$

$$Netflow_{ict} = \gamma_1 \alpha_{ic,t-1} + \gamma_2 R^B_{ic,t-1} + \lambda_{ct} + \theta X_{it} + \epsilon_{ict}, \tag{10}$$

where $\Delta ln(w_{ict})$ stands for a change of manager i's wage in year t in company c, $Netflow_{ict}$ stands for net flow into manager funds, $\alpha_{ic,t-1}$ and $R^B_{ic,t-1}$ are manager i's alpha and her portfolio's benchmark return in year $t-1$, λ_{ct} are firm-year fixed effects and X_{it} are manager- and portfolio-specific variables such as manager age and tenure as well as the portfolio funds age. Standard errors are clustered at the manager level. Having firm-year fixed effects allows us to exploit the variation within a given manager and to ensure that the relationship between compensation and performance is not driven by the variation in the firm's overall performance or its compensation policies. We separately estimate the relationship between flows and returns, and changes in wages and returns.

Panel A presents the results for the 5-Benchmark Model. Columns (1) and (2) show that generating an alpha of 1% over the recent year increases the fund size by roughly 2% and adds 0.8% to manager's compensation. A 1% increase in a fund's benchmark return is translated into a 1% increase in fund size and adds 1% to the manager's compensation. We cannot reject the hypothesis that alpha and passive returns have similar effects on either flows or changes in compensation. Adding controls (columns (3) and (4)) and firm-year fixed effects (columns (5) and 6)) does not substantially affect these results. We observe that variation in the benchmark return generates substantially larger variation in compensation that annual changes in alpha. In particular, an increase of one standard deviation in alpha raises the compensation by 5% while an increase of one standard deviation in benchmark return generates a 11% higher compensation. In fact, the compensation substantially grows over time even in the absence of alpha because of the overall tendency of the markets to go up. Panel B presents the results for the Market Model. The results are very similar to those from Panel A. In all the specifications, flows and changes in compensation are tightly related to the both components of fund performance.

Overall, we conclude that portfolio managers appear to be paid for flows that arise from both alpha and from the passive returns.

3.3 Robustness

Table 5 presents a number of robustness checks of our results. We report the results for the specifications in Table 4, column (5), that include control variables as well as the firm-year fixed effects. Panel A shows the results for alternative models of estimating betas that are described in details in the Section 2.3. The first two models allow for time-varying betas that are estimated over 24-month and 36-month windows. The third model introduces a Vasicek-adjusted estimator for betas that is described in Appendix C. The results are close to the baseline with the smaller coefficients for both alpha and the benchmark returns suggesting that the estimation error in betas is small. In the vast majority of specifications, we cannot reject the hypothesis that passive and active performance have similar effects on manager compensation.

Panel B tests robustness of the results to exclusion of different time periods. We show that the results are not sensitive to exclusion of the financial crisis (2008) that led to extremely low returns on many benchmarks. We also exclude the entire 2006-2009 period where our sample not only mostly consists of very experienced portfolio managers but also does not cover the entire industry. After applying both sample restrictions separately, the results remains quite similar to the baseline.

As both alpha and benchmark return are estimated, we might face a "generated regressor" problem and, therefore, the standard errors might be too small. In Panel C we report the baseline results from Table 4 but introduce a Murphey-Topel correction to standard errors for the coefficients of interest. This alternative way of estimating standard errors does not affect our results.

Our final concern is related to the models that investors use to evaluate fund performance. In particular, one of the simplest ways to make a "risk adjustment" would be to compare fund return to the average return of its peers within the same style. The idea is that investors might not be sophisticated enough to evaluate performance properly and in their minds "alpha" equals to whatever the fund adds on top of the average return of its peers. Formally, in this case investors' benchmark is simply the average return of all the funds in a particular style and equals to

$$R_{st}^{B} = \frac{1}{K}\sum_{k=1}^{K} R_{skt}, \tag{11}$$

where K is a total number of funds in style s in year $t$and R_{skt} equals to a raw return for fund k in style s over year t.[10] Similarly, fund "alpha", as perceived by the investors,

[10] The Israel Securities Authority categorizes funds into 57 categories according to asset classes they invest in. We use these categories as styles for the our calculations of style-adjusted performance.

equals to $\alpha_{it} = R_{it} - R^B_{st}$. In Panel D, we look into the effect of this "naive" method to separate between active and passive returns on compensation. Consistently with our previous findings, we find that style-adjusted return and average style return approximately equially affect managerial compensation. Thus, the results are not sensitive to how the real world investors risk-adjust.

We conclude that our results are robust to various performance evaluation models, time periods, standard errors estimation methods and the methods utilized by the investors to make adjustment for passive returns.

4 Model of fund size and compensation

In this section we develop a simple model of interrelationship between fund size, its active and passive returns and managerial compensation. Our goal is to explain the previously shown basic facts and to develop additional predictions. We follow Gennaioli, Shleifer and Vishny (2015)(GSV) to model the allocation of funds by the investors, and we turn to labor economics literature on rent sharing to model wage determination. To organize the evidence and the further empirical work, we make necessary assumptions to simplify and clarify the analysis. In section 3.5 we explain the basic setup and our key assumptions. In section 3.6 we provide closed form solutions for equilibrium fund size, its fee revenue and portfolio manager compensation.

4.1 Setup

In the model, there are two time periods, $t = 0, 1$ and three types of agents: firms, portfolio managers and investors. There is a unit measure of identical investors endowed with one unit of wealth each at $t = 0$. The investors have mean variance preferences given by:

$$U_I = E(\tilde{R}) - \frac{\gamma}{2} V(\tilde{R}), \tag{12}$$

where $\tilde{R}$ is the return on investor portfolio.

For simplicity, we further normalize investor level of risk aversion, γ, to 1. There are two assets: a riskless asset such that yields $R_g > 0$ at $t = 1$ and the risky asset that yields a passive expected *excess* return of R over the riskless asset and has a variance of σ. Both assets are in perfectly elastic supply. There is no asymmetric information in the model, all the parameters are known and perfectly observable by all the agents.

Assumption 1 (No "homemade" risk taking). We follow Gennaioli, Shleifer and Vishny (2015) and make two key assumptions. First, we assume that the investors cannot access the risky investment on their own - taking financial risks requires having an intermediary. The key idea is that many investors do not invest on their own because they might not have necessary expertise or confidence to make risky investments.[11] This assumption is consistent with the empirical evidence showing that access to intermediaries boosts risk taking capacity of investors (Chalmers and Reuter (2015)).

Assumption 2 (Trust and familiarity reduce perceived riskiness). Second, we assume that, all else equal, investors delegate more funds to intermediaries they are familiar with either personally or through persuasive advertising and financial media. This is an important assumption that generates additional source of product differentiation that is not related to superior performance and allows fund companies to charge fees even in the absence of alpha. For simplicity, we assume that there is single intermediary (mutual fund) that investors can approach to make a risky investment. The results will hold with multiple funds under the assumption the some investors are more familiar and, therefore, prefer to invest with some intermediaries than with others. GSV shows that in this case intermediaries have some local market power and substantial market segmentation remains.

We follow GSV and model trust and familiarity as a perceived reduction in risk such that the *perceived* variance of the risky asset, equals to $\frac{\sigma}{\tau}$, where $\tau \geq 1$ is a "familiarity" parameter. Intuitively, investors treat each "unit" of return as less risky when they invest with more familiar and trustworthy intermediaries. The central idea is that investors feel less "anxious" when investing with whom they know and are ready to delegate more capital to intermediaries even if the expected performance remains the same. Consistently with this assumption, the recent evidence shows that investors care about nonperformance characteristics of indi-

[11] The recent literature on delegated money management makes similar assumption. See, for example, Kaniel and Kondor (2013).

vidual managers and funds, and fund size might change even in the absence of changes in fund performance.[12]

Portfolio managers. Next, we introduce a portfolio manager to the model to study compensation. The firm can either hire a manager or operate as an "index" fund making purely passive investments. There are two features of the manager that can attract additional funds: his ability to add alpha to the risky asset's return and his personal familiarity that adds to the overall level of trust. For concreteness, we think that the firm's baseline familiarity comes from its brand name and its marketing efforts while the manager's familiarity is related to how visible and famous the manager is. We define fund baseline familiarity as τ^c. If the manager is hired, the risky return increases to $\bar{R} = \alpha + R$ and the level of familiarity increases to $\tau^c + \tau^m$ where τ^m is manager's personal familiarity. If the manager is not hired, fund return remains purely passive, that is $\bar{R} = R$. We show later that in the equilibrium the manager is always hired. The intermediary charges a percentage fee of f^c for its services in the absence of the manager and a fee of f^m when the manager is hired.

Assumption 3 (Compensation is determined through rent sharing). Following Hall and Lazear (1984) and Van Reenen (1996) wage determination is modeled as a bargain between the firm and the manager over the *incremental* fees that arise from hiring the manager. Specifically for the mutual fund industry, Massa, Reuter and Zitzewitzc (2010) find that manager track record and marketing benefits from naming a manager can be important sources of manager bargaining power. [13] Define π^c as the aggregate fee revenue that the firm can obtain operating without of the manager. If the manager is hired, the fee revenue increases to $\pi^m > \pi^c$. As a result, the firm and the manager will bargain over the additional fees, $\pi^m - \pi^c$, that arise from combination of the manager's characteristics with the firm's baseline characteristics. Assume that the manager has a linear utility of wealth

[12] See, for example, Reuter and Zitzewitz (2006), Solomon, Soltes and Sosyura (2012), Gallaher, Kaniel and Starks (2015) and Kaniel and Parham (2016) for evidence on effects of financial advertising and media on fund flows, and Pareek and Zuckerman (2014), Kostovetsky (2015), Niessen-Ruenzi and Ruenzi (2015) and Kumar, Niessen-Ruenzi and Spalt (2015) for evidence on effects of nonperformance characteristics of individual managers.

[13] The imperfect labor market competition implies that both firms and workers can not costlessly find perfect substitutes for each other and they are engaged in some form of bargaining over wages (Manning (2011)). Hall and Krueger (2008) find that the incidence of wage bargaining raises dramatically with education. As the financial sector comprises of skilled and well-educated individuals (Célérier and Vallée (2015); Philippon and Reshef (2012)), the bargaining view of wage determination seems to be especially appealing.

$$U_M = w \tag{13}$$

This assumption is not restrictive and the results will also hold with the risk averse manager. The manager's reservation wage equals $\bar{w}$ and we assume that $\bar{w} \leq \pi^m - \pi^c$. Recall that the highest salary the firm is ready to pay equals to the its gain in fees, $\pi^m - \pi^c$. Therefore, this assumption ensures that the manager is ready to work as his reservation wage is less than his earning potential as the firm's employee. The firm and the manager efficiently bargain over wages ex-post with the manager having a relative bargaining power of $0 \leq s \leq 1$.

Timing. The timing of the model is summarized in Figure 1. In period $t = 0$, the intermediary sets fee f, the investors choose risky investment x and the aggregate fee revenue, π, is determined. Immediately after asset allocation by investors, the firm and the manager bargain over the incremental fees determining managerial compensation, w. In period $t = 1$, the returns are realized and distributed to the investors.

4.2 Determination of size, fee revenue and compensation

Investor problem and determination of fund size. We start by solving the investor problem. Investors are price-takers and treat the percentage fee, f, as given. They choose the amount of risky investment by solving:

$$\max_x \left\{ R_f + x(\bar{R} - f) - \frac{\sigma}{2\tau} x^2 \right\}. \tag{14}$$

The following lemma characterizes the fund size. All the proofs appear in the Appendix A.

Lemma 1: *Under assumptions 1-2, the equilibrium fund size is given by the following expressions:*

- *If the manager is not hired, the fund size equals to* $x^c = \tau^c \frac{R - f^c}{\sigma}$.
- *If the manager is hired, the fund size equals to* $x^m = (\tau^c + \tau^m) \frac{\alpha + R - f^m}{\sigma}$.

We observe that the presence of the manager boosts fund size contributing to the expected fund performance as well as to the overall familiarity. We can immediately see that the size will respond to changes in investors' expectations of both a fund's α and its passive return R. This result follows from Assumption 1 as investors, not being able to make a risky investment on their own, treat active and passive returns equally.[14] In addition, the sensitivity of flows to both components of returns will be higher when either τ^c or τ^f is higher. This effect results from Assumption 2 because investors perceive each unit of return as less risky and delegate more funds.

The intermediary's problem and determination of equilibrium fee revenue. In out model, the intermediary operates as an monopolist and sets fee f to maximize the aggregate fee revenue. Notice that fees are independent of manager compensation because, from the firm's perspective, compensation is best viewed as a fixed cost while the marginal cost of offering an additional fund "share" to investors is zero. Therefore, the intermediary solves the following problem:

$$\underset{f}{max}\left\{ f\left(\tau\frac{\bar{R}-f}{\sigma}\right)\right\}. \tag{15}$$

The next lemma yields the equilibrium aggregate fee revenue of the intermediary with and without the manager.

Lemma 2: *Under assumptions 1-2, the equilibrium aggregate fee revenue is given by the following expressions:*

- *If the manager is hired, the aggregate fees equal to* $\pi^m = (\tau^c + \tau^m)\frac{(\alpha+R)^2}{4\sigma}$.
- *If the manager is not hired , the aggregate fees equal to* $\pi^c = \tau^c\frac{R^2}{4\sigma}$.

In our model, investors are willing to pay to the intermediary not only for α but also for the access to the passive return R. As a result, the intermediary obtains rents which size depends on both active and passive components of the fund's return. Trust not only boosts

[14] If investors were able to invest into the generic risky asset directly without paying fees to the intermediary, they would filter out the passive performance from the intermediary's returns. As a result, fund size and the resulting fee revenue would depend solely on alpha. In the reality, passive index funds are readily available to investors directly in a return for a negligible fee but still represent a significant minority of the industry AUM. For example, Vanguard charges 4-5bp on an annual basis for making a passive investment into S&P 500 Index. Similarly, Israeli investors can invest into TA 100 Index by paying 7-13bp on an annual basis.

the aggregate fee revenue but also make it more sensitive to either passive or active performance. It happens because the aggregate fees are tightly related to fund size which, as shown in Lemma 1, is more sensitive to the expected performance when the level of familiarity is higher.

Wage determination. If the manager is hired, she will bargain over her compensation with the firm. Recall that we assume that the manager's reservation wage is lower than the incremental fees generated from the combination of her characteristics and firm's characteristics such as fund's passive returns as well as its baseline familiarity. The assumption ensures that the manager is always hired and allows us study the implication of our model for managerial compensation.

The Nash-bargaining solution is obtained by maximizing the following expression with respect to w:

$$\Omega = (w - \bar{w})^s \left(\pi^m - \pi^c - w\right)^{1-s} \tag{16}$$

The following proposition presents a closed form solution to the bargaining problem.

Proposition 1: *Under assumptions 1-3 , there is a unique Nash-bargaining solution to the bargaining problem. In the equilibrium the manager is always hired and her wage equals to*

$$\hat{w} = (1-s)\bar{w} + s\left[(\tau^c + \tau^m)\frac{(\alpha + R)^2}{4\sigma} - \tau^c \frac{R^2}{4\sigma}\right]. \tag{17}$$

This expression helps to explain the previously documented basic facts about fund size and compensation. The manager is paid a share of the fund's fees which depend on its size. When investors' expectations of either alpha or passive returns are updated, they delegate additional capital or withdraw capital from the intermediary and the fund's size changes accordingly. The changes in size and fees feed into the manager's compensation through the bargaining process. Thus, the model delivers the fundamental fact about compensation that is hard to explain by standard models: portfolio managers are paid for their funds' passive returns.

4.3 Additional predictions

The key additional implication of the model that familiarity increases sensitivity of both flows and compensation to performance. As the investors trade mean against variance, the fund size increases when the expected net return per unit of risk, $[\alpha + R - f]/\sigma$, is larger. When the level of familiarity is larger, the percieved σ is lower and the investors delegate more funds for the same $[\alpha + R - f]/\sigma$. Therefore, each increase in $\alpha + R - f$ is viewed by the investors as being larger that it actually is. Because of the bargaining these increases in raw returns are also translated into larger increases in compensation. This idea is formalized in the following corollary.

Corollary 1: *A sensitivity of compensation to both α and R is higher when investors are more familiar either with firms or with individual managers. That is,*

1. $\frac{\partial^2 \hat{w}}{\partial R \partial \tau^c} > 0$
2. $\frac{\partial^2 \hat{w}}{\partial \alpha \partial \tau^c} > 0$.
3. $\frac{\partial^2 \hat{w}}{\partial R \partial \tau^f} > 0$
4. $\frac{\partial^2 \hat{w}}{\partial \alpha \partial \tau^f} > 0$.

This result points to the important complementarity between performance and familiarity that manifests itself in the relationship between flows and performance as well as between compensation and performance. We next take this sets of predictions to the data to further test the validity of the model.

5 Testing the effects of familiarity

5.1 Measures of familiarity

We create two measures of familiarity: $salesforce$ - a measure of the company's marketing efforts and $visibility$ - a measure of the manager's visibility. These measured are motivated by the recent literature that documents the effects of marketing and advertising in money management as well as the effect of the manager's characteristics that are unrelated to the fund performance.

To construct our $salesforce$ measure, we go through the Part B of the Prospectus where each mutual fund company provides a disclosure about the firm's structure and the number of employees in different departments. We define $salesforce_c$ as

$$salesforce_c = \frac{salespeople_c}{funds_c} \quad (18)$$

where $salespeople_c$ is a number of employees who are involved in sales, marketing, business development or financial adviser relations in company c in year 2010 and $funds_c$ is a total number of funds in company c in year 2010. This measure has a number of limitations. First, some firms do not report the number of salespeople. Second, these disclosures are available only after 2010 so we can use this measure only for a subsample of managers. Overall, we are able to collect these measures for 23 out of 32 sample companies and to match it with 631 manager-year observations representing roughly 60% of our sample. We keep our salesforce measure fixed starting from 2010 as we would like to reduce potential endogeneity concerns that can arise from changes in marketing efforts or in a number of funds over time due to the past performance.[15]

We go through the websites of the three major Israeli financial newspapers and one popular financial website to construct our *visibility* measure.[16] We perform searches of each manager name and count the number of articles that mention her at all the websites from 2006 to 2014. We read all the articles to verify that the name mentioned in the article belongs to the manager. We exclude all the articles that involved ranking of managers or mentioned their past performance because we want to minimize the effect of performance on familiarity. Most of the articles left describe managers' opinions on financial markets, securities recommendations and their career moves. Table 1, Panel A, reports summary statistics for the both our measures of familiarity.

The key limitation of our measures of familiarity is that they can be related to performance in investors' minds and might be a proxy for alpha rather than for trust. Many investment managers do not advertise their services based on past performance and, therefore,

[15]In the unreported analysis, we use a time varying measure of salesforce allowing it to change from year to year and the results remain very similar. We also used other measures of sales efforts such as a share of salespeople out of the total number of employees. The choice of a particular measure does not substantially affect the results.

[16]The four sources are The Marker, Globes, Calcalist and Bizportal.

we are less concerned that the salesforce measure is tightly related to performance (Mullainathan, Schwartzstein and Shleifer (2008)). Excluding all the performance-related articles for construction of the visibility measure also helps us to ensure that this measure is minimally affected by past performance.

5.2 Effects of familiarity on flows and compensation

Having established measures of familiarity, we further test the predictions of the model as suggested by Corollary 1. For salesforce regressions, we generate a dummy variable that equals one if the firm's salesforce is above the median salesforce. We cannot use firm-year fixed effects in the analysis of the effect of salesforce because this measure of familiarity is firm-specific. Therefore, we include year fixed effects and a number of firm-level control variables such as aggregate asset under management, average fee and a number of managers in the firm. For manager visibility regressions, we introduce a dummy variable that equals one if the manager's visibility is above the median visibility. We then report the main specifications from Tables 2 and 3 for both flows and changes in compensation adding the interactions between our familiarity measures and fund performance.

Figure 5 presents the results graphically running the compensation regressions separately for high and low levels of familiarity. To match the predictions of the model, we run four different regressions for each measure of familiarity and each part of fund performance (alpha and its benchmark returns). We can immediately observe that the slope of the compensation profile is higher when the level of familiarity is higher in all the specifications as predicted by the model.

In the next set of tables, we use the regressions of the form:

$$\Delta ln(w_{ict}) = \gamma_1 \alpha_{ic,t-1} + \gamma_2 R^B_{ic,t-1} + \beta_1 F_{ic} + \beta_2 R^B_{ic,t-1} \cdot F_{ic} + \beta_3 \alpha_{ic,t-1} \cdot F_{ic} + \lambda_{ct} + \theta X_{it} + \epsilon_{ict}, \quad (19)$$

$$Netflow_{ict} = \gamma_1 \alpha_{ic,t-1} + \gamma_2 R^B_{ic,t-1} + \beta_1 F_{ic} + \beta_2 R^B_{ic,t-1} \cdot F_{ic} + \beta_3 \alpha_{ic,t-1} \cdot F_{ic} + \lambda_{ct} + \theta X_{it} + \epsilon_{ict}, \tag{20}$$

In these regressions, F_{ic} is the related measure of familiarity. Table 6 reports the results where we use salesforce as a measure of familiarity and it confirms the results presented in Figure 5. In companies that invest more in marketing and sales, the elasticities of flows and changes in pay to both alpha and passive returns are roughly 1.5-2 times higher. Columns (1) and (2) show having an alpha of 1% increases flows by 0.70% and a compensation by 0.58% in companies with lower levels of salesforce. In companies with higher level of salesforce an alpha of 1% raises the flow by an *additional* 1% next period and the compensation by 0.6%. As predicted by the model, we can also observe similar results for the passive returns: an increase of 1% in benchmark return adds 1% more to flows and 0.4% more to compensation for companies that invest more into sales and marketing. The magnitudes of these effects are similar for the Market Model, but the coefficients on the interaction variables are not statistically significant.

Table 7 presents the results where we use manager's visibility as a measure of familiarity. The pay of more visible managers is much more sensitive to both alpha and passive returns. Column (1) shows than annual alpha of 1% translates into a 0.5% increase in annual compensation for less visible managers. More visible managers are paid 0.6% more for each percentage point of alpha that represents a substantial increase in sensitivity. A 1% increase in the fund's passive returns generates a 0.87% increase in compensation for less visible managers while the highly visible managers obtain an additional 0.91%. The relative magnitude of short term effects of returns on flows across managers with high and low visibility is very similar (columns (2) and (4))

We conclude that familiarity appears to be complementary to performance and it substantially magnifies the effects of returns on flows and compensation as predicted by the model.[17]

[17]It is also theoretically possible that familiarity serves as a complement to good performance but as a substitute to poor performance. In the unreported analysis, we study the effect of familiarity on pay separately for positive and negative performance and do not find any differences.

6 Additional Tests

6.1 Incentives to time benchmarks

A possible alternative explanation for the relationship between benchmark returns and wages is a provision of incentives to time benchmarks. We formally test for benchmark-timing ability of managers using the two tests suggested by the priot literature.[18] Let $R_t - R_t^{RF}$ denote the excess of manager's portfolio return and let $R_{ft} - R_t^{RF}$ denote the excess return on benchmark f. Treynor and Mazuy (1966) suggest to test for benchmark timing using the regression

$$R_{it} - R_t^{RF} = \alpha + b\left(R_{ft} - R_t^{RF}\right) + \gamma\left(R_{ft} - R_t^{RF}\right)^2 + \epsilon_t, \tag{21}$$

and estimating the coefficient γ. Henriksson and Merton (1981) propose to estimate the coefficient γ from the regression

$$R_{it} - R_t^{RF} = \alpha + b\left(R_{ft} - R_t^{RF}\right) + \gamma \cdot max\left(R_{ft} - R_t^{RF}, 0\right) + \epsilon_t. \tag{22}$$

Intuitively, benchmark timing ability should introduce positive covariance between time-varying beta and the excess benchmark return.[19] In presence of such a timing ability the relationship between the benchmark return and the portfolio return becomes non-linear as the manager is able to increase benchmark exposure when the return on the benchmark is positive. Therefore, if managers are able to time the benchmarks, γ should be positive and significant.

Table 8 shows the estimates of the coefficient γ using the both methods for the market and the 5-benchmark models at the portfolio level. The estimates of γ in all the regressions are not

[18]The literature proposes two types of market timing measures: return-based measures and holding-based measures (Jiang, Yao and Yu (2006)). As we do not have detailed information on fund holdings, we use return-based measures.

[19]In Treynor and Mazuy (1966), the implied time-varying benchmark beta is

$$\beta_t = b + \gamma\left(R_{ft} - R_t^{RF}\right) + u_t,$$

and in Henriksson and Merton (1981), it is equal to

$$\beta_t = b + \gamma \cdot I_{ft} + u_t,$$

where I_{ft} is an indicator variable that equals one when the benchmark excess return is positive. Therefore, $cov(\beta_t, R_{ft} - R_t^{RF}) > 0$ if and only if $\gamma > 0$.

significant and negative for 4 out of 5 benchmarks. However, it seems the managers are able to time the corporate bond market. In an unreported analysis, we reevaluate the baseline result from Table 4 when we exclude the corporate bond index from the construction of the benchmark return to check whether the relationship between pay and benchmark returns is driven by the corporate bond index timing ability, and the results remain unaffected.

It is still possible that managers are able to time the benchmarks for the individual funds but not for their entire portfolios. This argument, however, would not explain why managers are paid for their *portfolio* betas. It is important to mention that the relationship between alpha and pay can be rationalized through the incentive model where firms do not perfectly observe effort and incentivize managers to seek alpha. However, the relationship between passive returns and performance does not arise in such a model in the absence of the market timing ability while the rent sharing model naturally accounts for the both the pay for alpha and the pay for passive returns.

6.2 Relation to "pay for luck" theories and pay convexity

Our results are somewhat related to the "pay for luck" literature that focuses on the effects of observed shocks to performance on compensation, mostly for corporate executives (see Lazear and Oyer (2012) for a detailed survey). In particular, a number of studies showed that CEOs are paid for luck, that the level of pay for luck depends on corporate governance and that pay for luck is asymmetric: CEO's pay increases in "lucky" periods but does not necessarily decreases in the "unlucky" periods (Bertrand and Mullainathan (2001)). These theories argue that the pay for luck is a result of CEO's ability to extract rents from the shareholders and it does not reflect an optimal contractual arrangement between the two parties.

Our results, however, represent a significant departure from these theories. First, in simple "pay for luck" models CEOs extract rents from the firms due to their ability to affect board's compensation decisions. In our model, firm and managers extract rents from the investors and share these rents among them. Managers are compensated for passive returns not due to their ability to influence the pay but rather due to their unique skills, namely, their ability to generate alpha and their own familiarity. Second, our model does not predict any asymmetries in response of pay to passive returns: when the markets go up and the passive returns are high, managers are paid more, but they are also paid less during the industry downturns.

To test this idea formally, we define R^{B+} and R^{B-} as follows:

$$R^{B+} = \begin{cases} R^B & R^B > 0, \\ 0 & otherwise. \end{cases} \tag{23}$$

$$R^{B-} = \begin{cases} R^B & R^B < 0, \\ 0 & otherwise. \end{cases} \tag{24}$$

Intuitively, R^{B+} represents a market upturn and R^{B-} represents a market downturn. We repeat the regression from Table 4 using both R^{B+} and R^{B-} instead of R^B in the following spesification:

$$\Delta ln(w_{ict}) = \gamma_1 \alpha_{ic,t-1} + \gamma_2 R^{B+}_{ic,t-1} + \gamma_3 R^{B-}_{ic,t-1} + \lambda_{ct} + \theta X_{it} + \epsilon_{ict}, \tag{25}$$

The difference between the coefficients indicates if the pay is more sensitive to positive passive returns than to negative passive returns. In particular, our model predicts no difference between market upturns and downturns while the rent extraction models predict a significantly higher coefficient on R^{B+} than on R^{B-}.

Table 9 present the results and does not find evidence for pay convexity. Columns (1) and (2) show that the pay is equally sensitive to both positive and negative passive returns. In the market model, the compensation is more sensitive to market downturns than to the upturns (columns (3) and (4)), however the difference is not statistically or economically significant. Therefore, we conclude that the evidence is consistent with our model and inconsistent with the rent extraction models related to the CEO compensation literature.

7 Conclusion and implications

Our paper contributes to the understanding of the compensation practices in the mutual fund industry by studying the actual pay of portfolio managers. The evidence on substantial pay for passive returns is inconsistent with the view that managers are paid only for superior performance as predicted by the basic agency theory. The further modifications to the principal-agent model, such as provision of incentives to time benchmarks, cannot explain the results either. Instead, we argue and present evidence that pay is determined by the economics of the mutual fund industry based on the product market competition and rent sharing. Our view is that the size of product market rents that arise from performance, passive returns and trust, determines managerial compensation. We next discuss the two implications of our results that are related to the recent literature on mutual fund industry and on compensation in the financial sector.

First, the evidence presented in our paper implies that the average manager faces quite weak incentive to generate superior performance in the short run. In particular, consider an average manager with a benchmark return of 4% per year that is translated to roughly 4% of annual increase in compensation. The manager can work hard to generate additional alpha of 1% but he will only gain an additional 1% in compensation. Moreover, in bad times the manager's compensation is highly likely to go down even if his alpha is positive. Such an arrangement between the firm and the manager creates weak incentives to generate alpha in the short-term and may explain why the average actively managed mutual fund underperforms.[20] This result is consistent with Del Guercio and Reuter (2014) who show that funds with less sophisticated investors face weaker incentive to perform because these investors are less likely to distinguish between active and passive performance.

Second, the recent research shows that compensation in financial sector has increased dramatically over the past 30 years (Philippon and Reshef (2012); Lindley and McIntosh (2014); Célérier and Vallée (2015); Boustanifar, Grant and Reshef (2016); Böhm, Metzger and

[20] It is important to mention that managers can face stronger long-term incentive to perform in presence of career concerns. In particular, they can get promoted to managing a larger fund or to get hired by a different firm after building a good track record. Some of the long-term cross-sectional varitation in the level of pay can be attributed to the manager skill. Appendix D presents some suggestive evidence that manager long-term pay is affected by his skill.

Strömberg (2016)). Our view offers the following simple explanation to this phenomenon. Over the last decades, the markets went up substantially, investors delegated additional funds following the positive passive returns and the money management industry expanded dramatically (Greenwood and Scharfstein (2013)). As a result, the assets under management for individual managers increased as well that was translated into the substantial increase in compensation. Our explanation does not require the existence of agency problems (Axelson and Bond (2015)) or sorting of more talented individuals into the financial industry (Gabaix and Landier (2008), Terviö (2008) and Thanassoulis (2012)). These mechanisms, perhaps, contribute to the recent increase in compensation in the financial industry alongside the channels presented in this paper.

Finally, the key question for further research is to better understand how the nonperformance characteristics of managers and firms, such as trust and familiarity, are determined and what their effects on the financial markets are. For example, how do mutual fund companies decide how much to advertise? How do their hiring decisions depend on manager track record and his familiarity to the investors? More generally, our analysis points out to a complementarity between performance and nonperformance characteristics of firms and individual managers which remains to be explored.

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Figure 1: Timeline of the Model

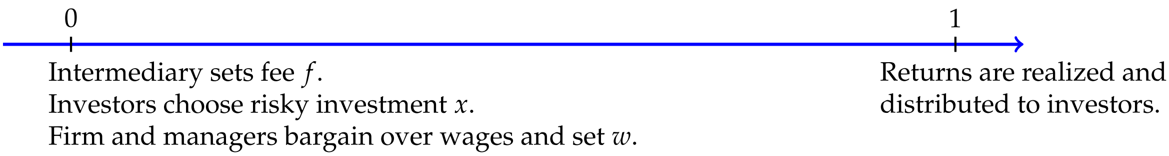

Figure 2: Relationship between compensation, fees and size

These figures present the relationship between compensation, size and fees using binned-scatter plots with 20 bins. Detailed definitions of variables can be found in Appendix B. Compensation is the manager's compensation in year t, size is his portfolio size in year t, and fees represent the total revenues in fees generated by his portfolio. All the variables are presented using a natural logarithm transformation.

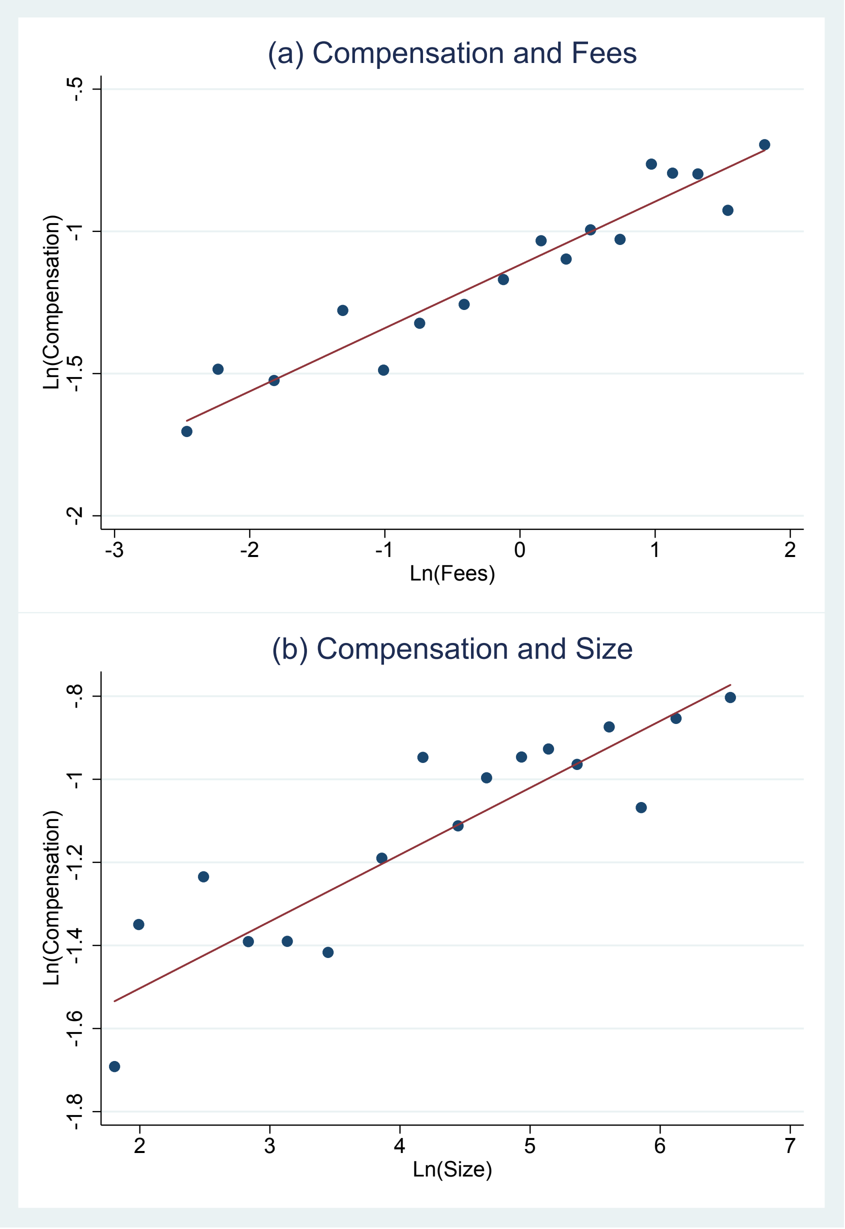

Figure 3: Compensation and Passive Benchmark Returns

This figure presents the relationship between the average portfolio manager's compensation and benchmark returns across the sample years. Detailed definitions of variables can be found in Appendix B.

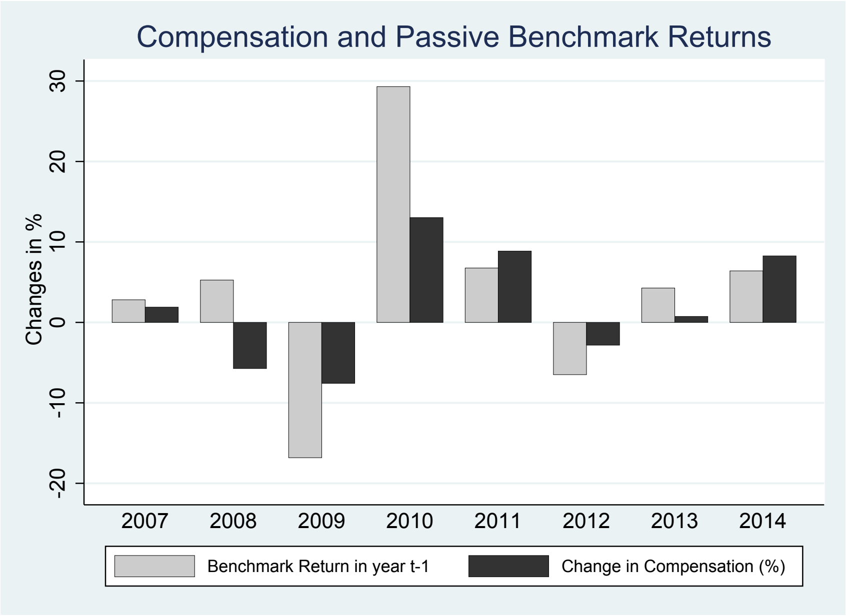

Figure 4: Relationship between Compensation, Alpha and Benchmark Returns

These figures present the relationship between compensation growth rates, alpha and risk premium for the entire sample of the portfolio managers. Detailed definitions of variables can be found in Appendix B. Compensation growth rate is calculated from year $t-1$ to year t, alpha is his portfolio's alpha in year $t-1$ and Benchmark Return is the portfolio's benchmark return in year $t-1$. The 5-Benchmark model is used to evaluate fund performance. The two panels are binned scatter plots of actual regressions from Table 4.

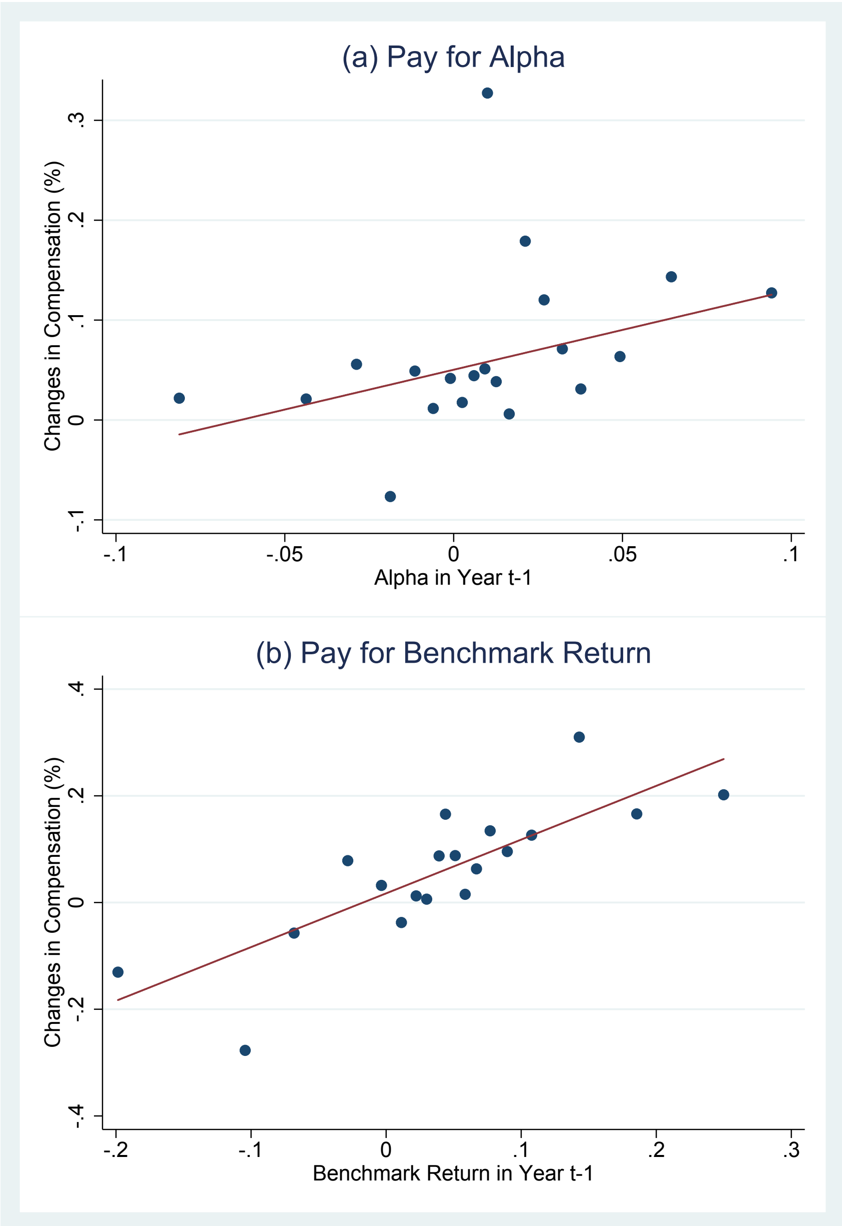

Figure 5: Effects of Familiarity on Compensation Profiles

These figures present the effects of our measures of familiarity on the relationship between compensation growth rates and performance. Detailed definitions of variables can be found in Appendix B. Compensation growth rate is calculated from year $t-1$ to year t, alpha is his portfolio's alpha in year $t-1$ and Benchmark Return is his portfolio's benchmark return in year $t-1$. The 5-Benchmark model is used to evaluate fund performance. The four panels are binned scatter plots of the regressions from Tables 6 and 7.

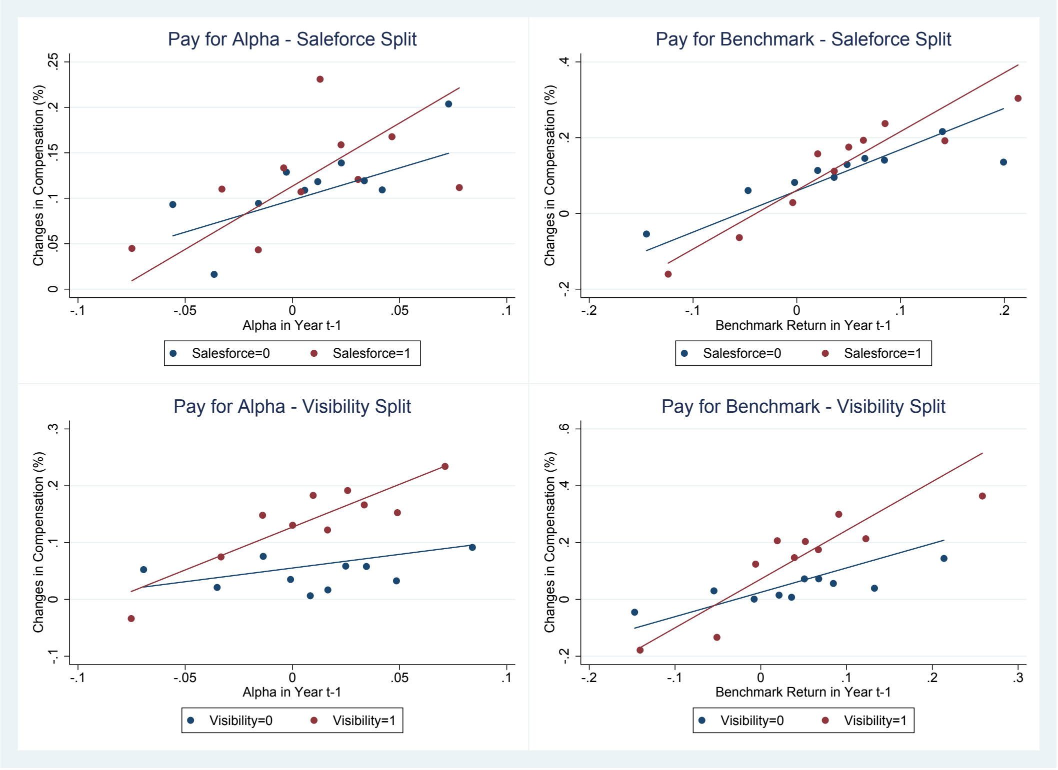

Table 1: Summary Statistics

This table presents summary statistics for the sample that consists of 233 portfolio managers who managed 1,446 Israeli mutual funds between 2006 and 2014. Detailed definitions of variables can be found in Appendix B. Panel A reports descriptive statistics of the managers and the characteristics of their portfolios. Panel B shows the breakdown of funds by the asset classes Israeli mutual funds invest in.

Panel A: Managers - Descriptive Statistics

	Observations	Mean	SE	Median
Compensation, Demographics and Portfolio Characteristics				
Compensation (millions, USD)	1,125	0.13	0.18	0.09
Changes in Compensation	1,021	0.11	0.46	0.06
Tenure (years)	1,125	5.25	5.02	4
Manager Age (years)	1,125	39.90	8.57	38
Number of Funds Under Management	1,125	5.39	2.21	3
Assets Under Management (millions, USD)	1,125	204.31	240.12	93.94
Percentage Fee (%)	1,125	1.49%	0.69%	1.38%
Income in Fees (millions, USD)	1,125	2.09	2.11	1.30
Fund Age (years)	1,125	8.99	6.39	7.43
Netflow (%)	1,021	0.19	0.66	0.10
Measures of Familiarity				
Visibility	1,125	7.98	12.14	4.57
Salesforce	631	0.36	0.11	0.37
Risk and Performance				
5-Benchmark Model				
α_{it}	1,125	0.009	0.049	0.013
R^B_{it}	1,125	0.040	0.117	0.038
Market Model				
α_{it}	1,125	0.024	0.053	0.031
R^B_{it}	1,125	0.023	0.101	0.016

Panel B: Fund Categories

Primary Asset Class	Number of Funds	Percentage by Count
Israeli Fixed Income - Broad Market	294	21%
Israeli Fixed Income - Sheqels	272	18%
Israeli Fixed Income - Corporate and Convertibles	206	15%
Israeli Fixed Income - Government	191	12%
Israeli Equity	159	11%
Global Equity	136	10%
Global Fixed Income	74	5%
Flexible	35	3%
Fund of Israeli Funds	34	2%
Leverage & Strategic	27	2%
Israeli Fixed Income - Foreign Currency	18	1%
Total	1446	

Table 2: Compensation, Size and Fees

This table reports the results from regressing compensation on portfolio size and fees. Detailed definitions of variables can be found in Appendix B. Column (1) reports the baseline specification for fund size, column (2) adds controls and firm-year fixed effects and column (3) adds manager fixed effects. Columns (4), (5) and (6) repeat the same specifications for fees. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	$Ln(Wage_{ict})$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Ln(Size_{ict})$	0.324***	0.238***	0.289***			
	(0.030)	(0.031)	(0.045)			
$Ln(Fees_{ict})$				0.236***	0.214***	0.142***
				(0.028)	(0.030)	(0.033)
Observations	1,125	1,125	1,125	1,125	1,125	1,125
R-squared	0.156	0.313	0.765	0.204	0.374	0.772
Controls	No	Yes	Yes	No	Yes	Yes
Company x Year FE	No	Yes	Yes	No	Yes	Yes
Portfolio Manager FE	No	No	Yes	No	No	Yes

Table 3: Changes in Compensation and Changes in Fund Size

This tables reports the results from regressing the changes in compensation on various components of changes in fund size. Detailed definitions of variables can be found in Appendix B. Column (1) reports the baseline specification for the changes, column (2) adds controls and column (3) adds firm-year fixed effects. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	$\Delta Ln(Wage_{ict})$		
	(1)	(2)	(3)
α_{ict}	0.022	0.022	0.029
	(0.020)	(0.020)	(0.021)
R^B_{ict}	0.135	0.088	0.103
	(0.120)	(0.119)	(0.120)
$NetFlow_{ict}$	0.381***	0.353**	0.335**
	(0.132)	(0.134)	(0.136)
$AdditionalCapital_{ict}$	0.317	0.151	0.111
	(0.358)	(0.363)	(0.367)
Observations	1,021	1,021	1,021
R-squared	0.012	0.037	0.042
Controls	No	Yes	Yes
Company x Year FE	No	No	Yes

Table 4: Flows, Compensation and Performance

This table reports the results from regressing flows and the changes in compensation of mutual fund portfolio managers on the performance of their funds. Detailed definitions of variables can be found in Appendix B. Panel A presents the results for the 5-Benchmark Model and Panel B shows the results for the Market Model. The p-values of the Wald test for the equality between the coefficients are reported. Columns (1) and (2) present the baseline specification for flows and compensation. Columns (3) and (4) add controls and columns (5) and (6) add firm-year fixed effects. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

Panel A: 5-Benchmark Model	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha_{ic,t-1}$	0.80**	2.68**	0.72**	2.12**	0.62**	1.83**
	(0.39)	(1.31)	(0.29)	(1.02)	(0.25)	(0.89)
$R^B_{ic,t-1}$	1.01***	3.38***	0.90***	2.68**	0.97***	3.01**
	(0.19)	(1.21)	(0.16)	(1.25)	(0.20)	(1.39)
H_0 : Coefficient on $\alpha_{ic,t-1}$ equals to coefficient on $R^B_{ic,t-1}$						
P-value	0.597	0.557	0.631	0.629	0.451	0.479
Observations	1,021	1,021	1,021	1,021	1,021	1,021
R-squared	0.08	0.08	0.15	0.10	0.21	0.14
Controls	No	No	Yes	Yes	Yes	Yes
Company x Year FE	No	No	No	No	Yes	Yes

Panel B: Market Model	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha_{ic,t-1}$	0.65**	1.95**	0.86**	2.64***	0.81**	2.43**
	(0.31)	(0.95)	(0.38)	(0.96)	(0.45)	(1.15)
$R^B_{ic,t-1}$	0.96***	2.88**	1.05***	3.15**	0.97***	2.91**
	(0.17)	(1.34)	(0.16)	(1.45)	(0.20)	(1.37)
H_0 : Coefficient on $\alpha_{ic,t-1}$ equals to coefficient on $R^B_{ic,t-1}$						
P-value	0.287	0.474	0.599	0.924	0.551	0.619
Observations	1,021	1,021	1,021	1,021	1,021	1,021
R-squared	0.08	0.06	0.15	0.18	0.21	0.22
Controls	No	No	Yes	Yes	Yes	Yes
Company x Year FE	No	No	No	No	Yes	Yes

Table 5: Robustness

This table presents robustness tests. Detailed definitions of variables can be found in Appendix B. We report the coefficients from specifications from Table 4, columns (5), for the panel data analysis. Panel A tests alternative models for estimation of fund performance. The first two models allow for time-varying betas over 24-month and 36-motnhs periods with the last 12 months being the year of interest. The third model generates a shrinkage estimator for betas adjusting the fund betas towards the betas of its asset class. The construction of the shrinkage estimator is described in Appendix C. Panel B, first test, excludes 2008 from the sample. In the second test we exclude 2006-2009 from the sample. Panel C presents the baseline specifications from Table 4 when the standard errors are calculated using a Murphey-Topel procedure to account for the estimation error. Panel D presents the results for style-adjusted returns representing an alternative model that investors might use.The p-values of the Wald test for the equality between the coefficients are reported. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	(1)	(2)	(3)	
	$\alpha_{i,t-1}$	$R^B_{ic,t-1}$	H_0 : Coefficient on $\alpha_{i,t-1}$ equals to coefficient on $R^B_{ic,t-1}$	Observations
Panel A: Performance evaluation methods				
Market model				
24-months	0.32***	0.75**	0.183	1,021
	(0.06)	(0.31)		
36-months	0.44***	1.00**	0.152	1,021
	(0.08)	(0.38)		
Vasicek-adjusted	0.58***	0.81***	0.230	1,021
	(0.11)	(0.22)		
5-Benchmark model				
24-months	1.25**	1.33***	0.911	1,021
	(0.60)	(0.40)		
36-months	1.32***	1.34**	0.977	1,021
	(0.46)	(0.55)		
Vasicek-adjusted	0.97***	1.54**	0.260	1,021
	(0.31)	(0.40)		

	(1)	(2)	(3)	
	$\alpha_{i,t-1}$	$R^B_{ic,t-1}$	H_0 : Coefficient on $\alpha_{i,t-1}$ equals to coefficient on $R^B_{ic,t-1}$	Observations
Panel B: Sample period restrictions				
Exclude 2008				
Market model	0.76***	1.07**	0.486	966
	(0.20)	(0.45)		
5-Benchmark model	0.86***	1.37**	0.272	966
	(0.19)	(0.54)		
Exclude 2006-2009				
Market model	0.54**	0.67**	0.858	737
	(0.20)	(0.25)		
5-Benchmark model	0.71**	0.60**	0.864	737
	(0.28)	(0.31)		
Panel C: Murphy-Topel standard errors				
Market model	0.65**	0.80**	0.520	1,021
	(0.29)	(0.41)		
5-Benchmark model	0.96***	1.01***	0.182	1,021
	(0.25)	(0.31)		
Panel D: Style-adjusted returns	0.81***	1.13***	0.697	1,021
	(0.34)	(0.33)		

Table 6: Effects of Firm Sales Efforts

This table estimates the effects of the firm's familiarity as measured by its salesforce on the relationship between flows, compensation and performance. Detailed definitions of variables can be found in Appendix B. Columns (1) and (2) present the results for the 5-Benchmark model. Columns (3) and (4) repeat the same specifications when the fund's beta is estimated using the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	5-Benchmark Model		Market Model	
	(1)	(2)	(3)	(4)
	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$
$\alpha_{ic,t-1}$	0.58	0.70**	1.17	1.55
	(0.44)	(0.34)	(0.71)	(1.24)
$R^B_{ic,t-1}$	1.11***	1.13**	1.19***	1.50**
	(0.35)	(0.55)	(0.36)	(0.67)
$Salesforce_c$	0.13**	0.46**	0.13**	0.44**
	(0.06)	(0.11)	(0.06)	(0.24)
$\alpha_{ic,t-1} \cdot Salesforce_c$	0.60**	1.11**	0.08	0.79
	(0.25)	(0.52)	(0.07)	(0.61)
$R^B_{ic,t-1} \cdot Salesforce_c$	0.38**	1.27**	0.40	1.09
	(0.17)	(0.62)	(0.35)	(0.79)
Observations	631	631	631	631
R-squared	0.08	0.11	0.10	0.15
Manager and Company Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 7: Effects of Manager Visibility

This table estimates the effects of the manager's familiarity as measured by her visibility on the relationship between flows, compensation and performance. Detailed definitions of variables can be found in Appendix B. Columns (1) and (2) present the results for the 5-Benchmark model. Columns (3) and (4) repeat the same specifications when the fund's beta is estimated using the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	5-Benchmark Model		Market Model	
	(1)	(2)	(3)	(4)
	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$	$\Delta Ln(Wage_{ict})$	$Netflow_{ict}$
$\alpha_{ic,t-1}$	0.49	1.20**	0.64**	1.22
	(0.36)	(0.52)	(0.31)	(1.34)
$R^B_{ic,t-1}$	0.87***	1.30**	0.94***	1.99***
	(0.16)	(0.67)	(0.18)	(0.71)
$Visibility_i$	0.04	0.05	0.05	0.13
	(0.07)	(0.07)	(0.08)	(0.16)
$\alpha_{ic,t-1} \cdot Visibility_i$	0.66**	1.79**	0.39	1.97**
	(0.25)	(0.81)	(0.40)	(0.98)
$R^B_{ic,t-1} \cdot Visibility_i$	0.91**	1.72*	0.90*	1.05
	(0.37)	(1.05)	(0.53)	(0.88)
Observations	1,021	1,021	1,021	1,021
R-squared	0.10	0.11	0.12	0.15
Controls	Yes	Yes	Yes	Yes
Company x Year FE	Yes	Yes	Yes	Yes

Table 8: Market Timing Tests

This table reports the tests of manager ability to time the benchmarks at the monthly level. Detailed definitions of variables can be found in Appendix B. Column (1) tests for market timing using Treynor-Mazuy measure and column (2) repeats the test using Henriksson-Merton measure. Columns (3) and (4) repeat the same tests for the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Robust standard errors are in parentheses.

	Treynor-Mazuy	Henriksson-Merton	Treynor-Mazuy	Henriksson-Merton
	(1)	(2)	(3)	(4)
	5-Benchmark Model		Market Model	
γ^{TA100}	-0.44	-0.08	-0.08	-0.08
	(0.32)	(0.06)	(0.29)	(0.07)
γ^{MSCI}	-0.08	-0.04		
	(0.24)	(0.05)		
$\gamma^{CORPBONDS}$	3.97***	0.46***		
	(1.33)	(0.15)		
$\gamma^{GOVBONDS}$	-6.96	-0.63		
	(11.06)	(0.48)		
$\gamma^{GOVBONDS-CPI}$	-5.83	-0.23		
	(8.61)	(0.35)		
Observations	15,354	15,354	15,354	15,354
R-squared	0.394	0.385	0.363	0.363

Table 9: Pay Convexity and Benchmark Returns

This table separately estimates the effect of positive and negative benchmark returns on the manager's compensation. Detailed definitions of variables can be found in Appendix B. Column (1) presents the baseline specification and column (2) adds controls. Columns (3) and (4) repeat the same tests for the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	(1)	(2)	(3)	(4)
	5-Benchmark Model		Market Model	
	$\Delta Ln(Wage_{ict})$	$\Delta Ln(Wage_{ict})$	$\Delta Ln(Wage_{ict})$	$\Delta Ln(Wage_{ict})$
$\alpha_{ic,t-1}$	0.72**	0.62**	0.86**	0.81**
	(0.29)	(0.25)	(0.38)	(0.45)
$R^{B+}_{ic,t-1}$	0.97***	0.90**	0.74**	0.75**
	(0.33)	(0.41)	(0.37)	(0.38)
$R^{B-}_{ic,t-1}$	0.92***	1.01***	1.05**	1.06**
	(0.39)	(0.31)	(0.46)	(0.50)
Observations	1,021	1,021	1,021	1,021
R-squared	0.15	0.21	0.15	0.21
Controls	No	Yes	No	Yes
Company x Year FE	Yes	Yes	Yes	Yes

Appendix A. Proofs

Proof of Lemma 1.

By solving the standard mean-variance investor problem formulated in the equation (13), we obtain following solution to the optimal risky share:

$$\hat{x} = \tau \frac{\bar{R} - f}{\sigma} \tag{26}$$

Plugging the expressions for τ and R under the assumptions that manager either is hired or is not hired, yields the expressions for the fund size.

Proof of Lemma 2.

If the manager is hired, the intermediary sets fee to maximize the revenues that are given by:

$$\pi = f^m \left((\tau^c + \tau^m) \frac{\alpha + R - f^m}{\sigma} \right). \tag{27}$$

The first order condition yields the equilibrium percentage fee $\hat{f}^m = \frac{\alpha+R}{2}$. Substituting back, we obtain the expression for the equilibrium revenues in fees:

$$\pi^m = (\tau^c + \tau^m) \frac{(\alpha + R)^2}{4\sigma}. \tag{28}$$

In the absence of the manager, the intermediary turns into an index fund and sets fees to maximize the following expression

$$\pi = f^c \left(\tau^c \frac{R - f^c}{\sigma} \right). \tag{29}$$

In this case, the fees are equal to $\hat{f}^c = \frac{R}{2}$ and the equilibrium revenues in fees equal to:

$$\pi^c = \tau^c \frac{R^2}{4\sigma}. \tag{30}$$

Proof of Proposition 1.

We solve the bargaining problem when the firm and the manager bargain over the incremental revenues in fees, $\pi^m - \pi^c$. The standard Nash-bargaining solution is maximizing the following expression with respect to w:

$$\Omega = (w - \bar{w})^s \left(\pi^m - \pi^c - w\right)^{1-s}. \tag{31}$$

The first order condition is given by

$$s\,(w-\bar{w})^{s-1}\left(\pi^m - \pi^c - w\right)^{1-s} - (1-s)\,(w-\bar{w})^s\left(\pi^m - \pi^c - w\right)^{-s} = 0, \tag{32}$$

and the solution is

$$\hat{w} = (1-s)\bar{w} + s\left[\pi^m - \pi^c\right]. \tag{33}$$

Substituting the expressions for π^m and π^c from Lemma 1, we obtain a closed form solution for the equilibrium compensation:

$$\hat{w} = (1-s)\bar{w} + s\left[(\tau^c + \tau^m)\frac{(\alpha+R)^2}{4\sigma} - \tau^c\frac{R^2}{4\sigma}\right]. \tag{34}$$

Proof of Corollary 1.

We calculate the derivatives using the previously derived expression for the equilibrium compensation.

$$\frac{\partial^2 \hat{w}}{\partial R \partial \tau^c} = \frac{s}{4\sigma}\,(2\alpha) > 0 \tag{35}$$

$$\frac{\partial^2 \hat{w}}{\partial \alpha \partial \tau^c} = \frac{s}{4\sigma}\,(2\alpha + R) > 0 \tag{36}$$

$$\frac{\partial^2 \hat{w}}{\partial R \partial \tau^m} = \frac{s}{4\sigma} \left(2\alpha + 2R\right) > 0 \tag{37}$$

$$\frac{\partial^2 \hat{w}}{\partial \alpha \partial \tau^m} = \frac{s}{4\sigma} \left(2\alpha + 2R\right) > 0 \tag{38}$$

Appendix B. Variable Definitions

Table B.1 - Definitions of variables

Variable	Description	Source
Compensation	A total compensation of the manager before taxes in millions of USD as it appears in his annual statement of wages and tax. To construct a dollar value we use Shekel-USD exchanges rate as of June 30 for each year. Exchange rates were taken from the Bank of Israel website.	Israel Tax Authority - Form 106
Tenure	A manager's firm specific experience.	Israel Securities Authority - Part B of Fund's Prospectus
Manager's Age	A manager's age.	Israel Securities Authority - Part B of Fund's Prospectus
Number of Funds Under Management	A number of mutual funds where the manager is listed as one of the fund's managers.	Israel Securities Authority - Part B of Fund's Prospectus
Size	A manager's combined assets under management (AUM). In case of N fund managers, the manager's AUM is calculated as 1/N of fund's total AUM.	Preadicta Israeli Mutual Fund Database
Fee	An asset-weighted fee of the manager's funds.	Preadicta Israeli Mutual Fund Database
Funds Age	A fund's age. At the manager level, we calculate asset-weighted age of all the manager's funds.	Preadicta Israeli Mutual Fund Database
Netflow	A net fund annual flow at the manager level defined as $$Netflow_{it} = \frac{size_{it} - (1 + R_{it})size_{i,t-1}}{size_{i,t-1}}.$$	Preadicta Israeli Mutual Fund Database

Table B.1 - Definitions of variables (continued)

Variable	Description	Source
Visibility	A number of articles that mentioned the manager's name at the online version of the top Israeli magazines: The Market, Globes, Calcalist and Bizportal. We collect all the articles over 2006-2014. We exclude all the articles that either specifically mention manager performance or present any ranking of managers.	Internet Websites: themarker.com globes.co.il calcalist.co.il bizportal.co.il.
Salesforce	A share of mutual fund company's employees who work in sales divided by the number of funds. We define sales employees as those who are involved in sales, marketing, business development or financial advisor relations.	Israel Securities Authority - Part B of Fund's Prospectus
Benchmark Return - 5-Benchmark Model	A return on the portfolio of passive assets that is defined as: $$R^B_{it} = \sum_{f=1}^{F} \hat{\beta}_{if} \left(R_{ft} - R^{RF}_t \right).$$ The model uses five benchmarks as proxies for risk factors: two equity market indices, Tel Aviv 100 Index and the MSCI World Index, as well as the three bond indices: inflation-indexed corporate bonds, inflation-indexed government bonds, non-indexed government bonds. The details of the estimation procedure appear in section 3.3.	Authors' calculations
Alpha - 5-Benchmark Model	A difference between the annual return and the annual benchmark return. The benchmark return is computed using the 5 Benchmark Model.	Authors' calculations
Benchmark Return - Market Model	A part of the fund return that can be traced to the market return defined as: $$R^B_{it} = \hat{\beta}_{i,TA100}(R_{TA100,t} - R^{RF}_t).$$ The model uses Tel Aviv 100 Index as proxy for the broad equity market. The details of the estimation procedure appear in section 3.3.	Authors' calculations
Alpha - Market Model	A difference between the annual return and the annual benchmark return. The benchmark return is computed using the Market Model.	Authors' calculations

Appendix C. Description of Shrinkage Estimator

We follow Vasicek (1973) and Elton, Gruber, Brown and Goetzmann (2014) and construct the following shrinkage estimator for betas:

$$\bar{\beta}_{if} = w_{ic}\hat{\beta}_{if} + (1 - w_{ic})\hat{\beta}_{cf},$$

where $\hat{\beta}_{if}$ is estimated as in the main analysis, $\hat{\beta}_{cf}$ is the fund's asset class beta and $0 < w_{ic} < 1$ is a weighting parameter. We estimate asset class betas using monthly data on all the funds within asset classes that are described in Table 1, Panel B. We also obtain standard deviation of these betas $\sigma^2_{\hat{\beta}_{cf}}$. Next, we create adjusted betas as follows:

$$\bar{\beta}_{if} = \frac{\sigma^2_{\hat{\beta}_{cf}}}{\sigma^2_{\hat{\beta}_{cf}} + \sigma^2_{\hat{\beta}_{if}}}\hat{\beta}_{if} + \frac{\sigma^2_{\hat{\beta}_{if}}}{\sigma^2_{\hat{\beta}_{cf}} + \sigma^2_{\hat{\beta}_{if}}}\hat{\beta}_{cf}.$$

This estimator is a Bayesian estimator of beta where the asset class beta serves as a prior mean. The weights reflect noisiness of the estimated fund's beta relatively to its prior and are used to form a posterior mean. Intuitively, when fund's beta is very noisy ($\sigma^2_{\hat{\beta}_{if}}$ is high), the posterior beta is adjusted towards the asset class beta. We repeat this procedure for both the 5-Bechmark Model and the Market Model.

Appendix D. Additional Evidence

Figure D.1 - Sample Coverage

This figure presents the assets under management (AUM) of the entire Israeli mutual fund industry and the aggregated AUM of our sample.

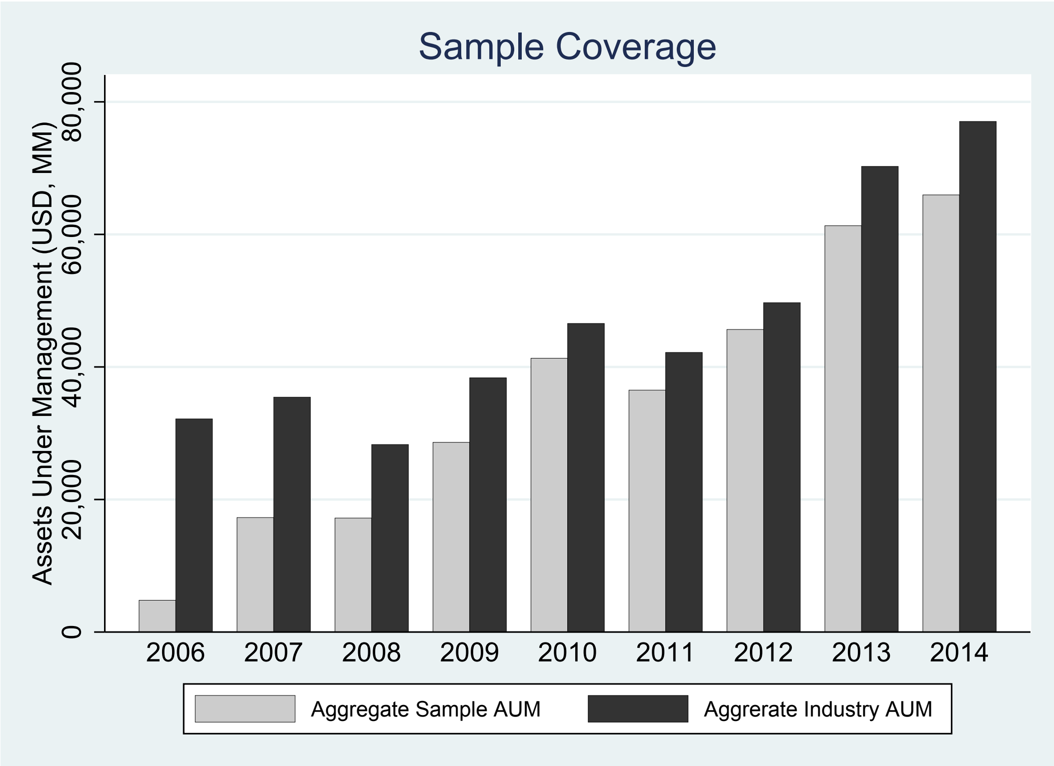

Figure D.2 - Age and Tenure Splits

This figure presents the binned-scatter plots of the regression of compensation on performance for different subsets of managers according to two measures of experience. The first measure is manager age and the second measure is manager tenure in the firm. We run separate regressions for managers above and below the median values of our measures of tenure. *Old* equals to one if the manager's age is higher than the median manager age. *Exp* equals to one if the manager's tenure is higher than the median manager tenure.

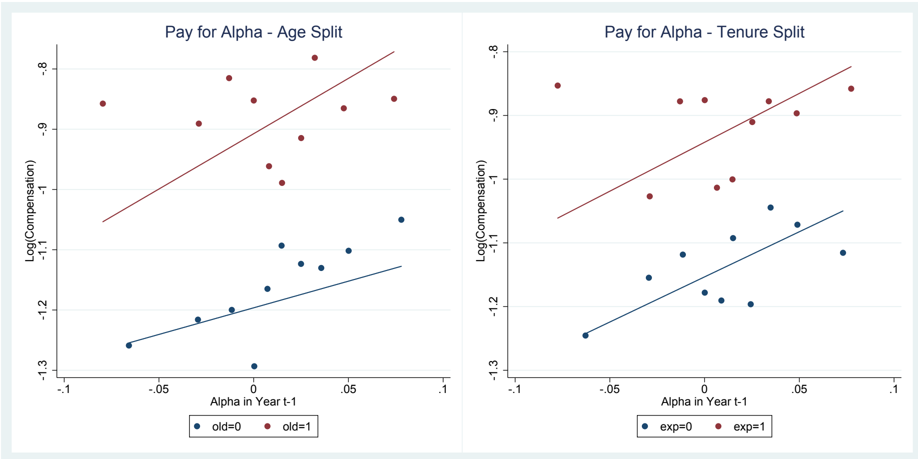

Figure D.3 -Visibility and Manager Alpha

This figure presents correlation between manager visibility and her average alpha across the sample years. Alpha is calculated using the 5 -Benchmark Model.

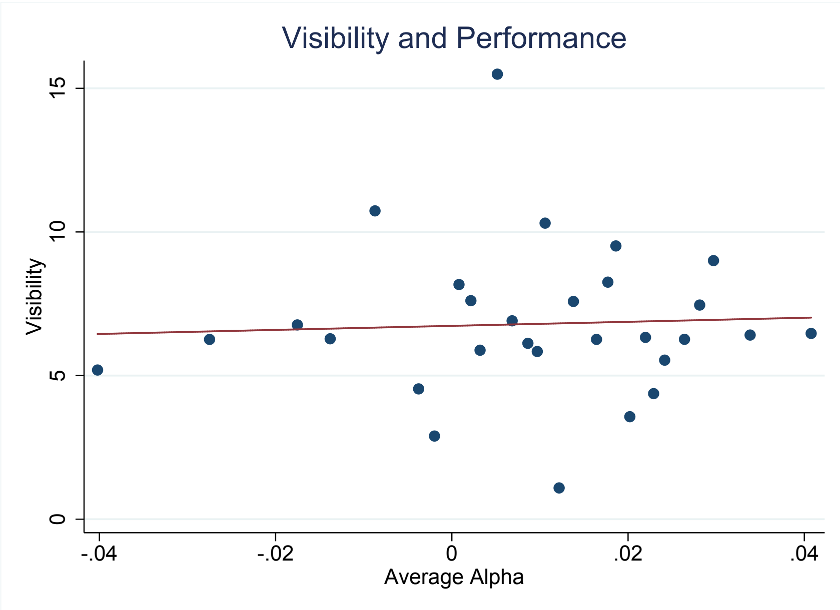

Figure D.4 - Compensation and Performance - Level Regressions

These figures present the relationship between the level of compensation, alpha and becnhmark returns for the entire sample of the portfolio managers. Detailed definitions of variables can be found in Appendix B. Ln(compensation) is a natural logarithm of the manager's compensation in year t, Alpha is his portfolio's alpha in year $t-1$ and Bechmark Return is his portfolio's passive return in year $t-1$. 5-Benchmark model is used to evaluate fund performance. The two panels are the binned-scatter plots of the actual regressions similarly to those from Table 4.

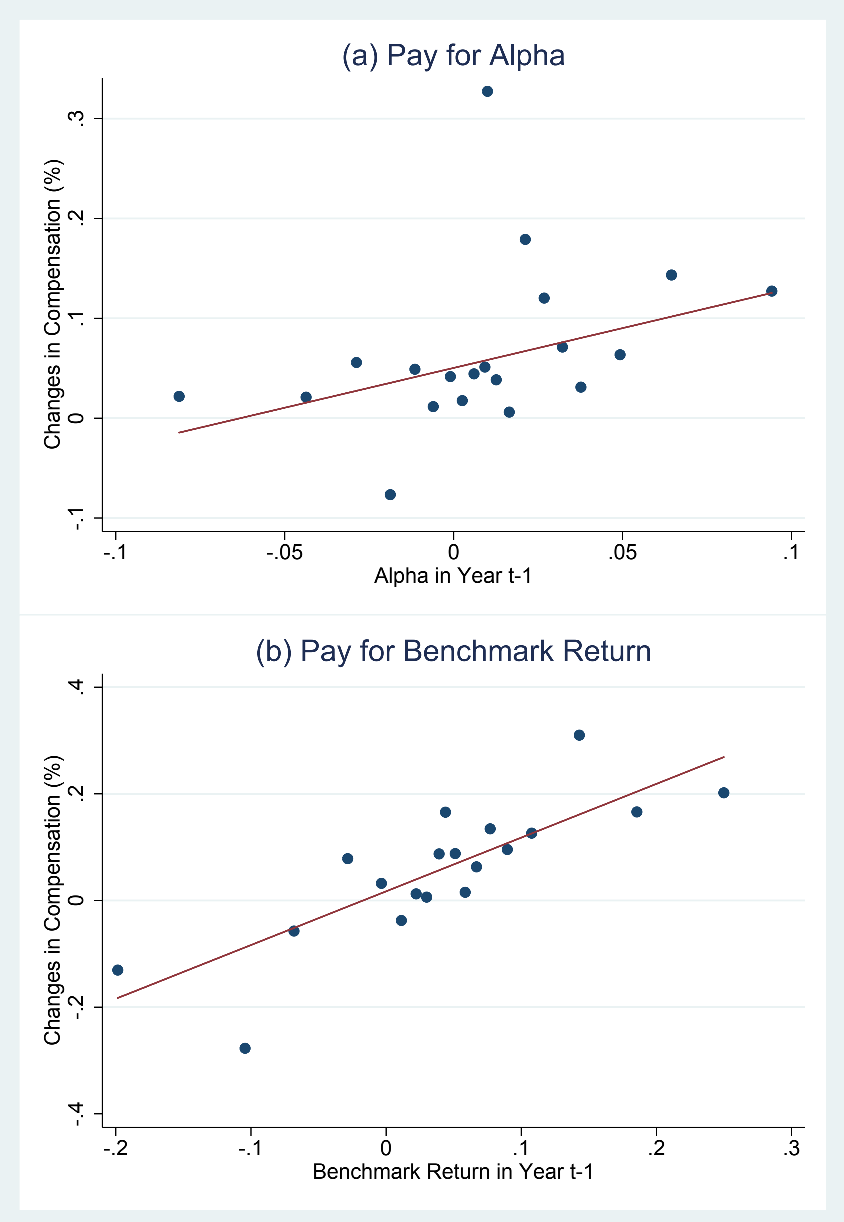

Figure D.5 - Compensation and Performance - Cross-Sectional Relationship

These figures present the relationship between the level of compensation, alpha and passive returns for the pooled cross-section of 233 mutual fund portfolio managers. Detailed definitions of variables can be found in Appendix B. Ln(Compensation) is a natural logarithm of the manager's compensation, Alpha is his portfolio's alpha and Benchmark Return is the portfolio's passive return. 5-Benchmark model is used to evaluate fund performance. All the variables represent weighted averages of the relevant variables computed over the sample period where the weights are the numbers of years that the manager appears in the sample. The two panels are binned scatter plots of actual variables using thirty bins.

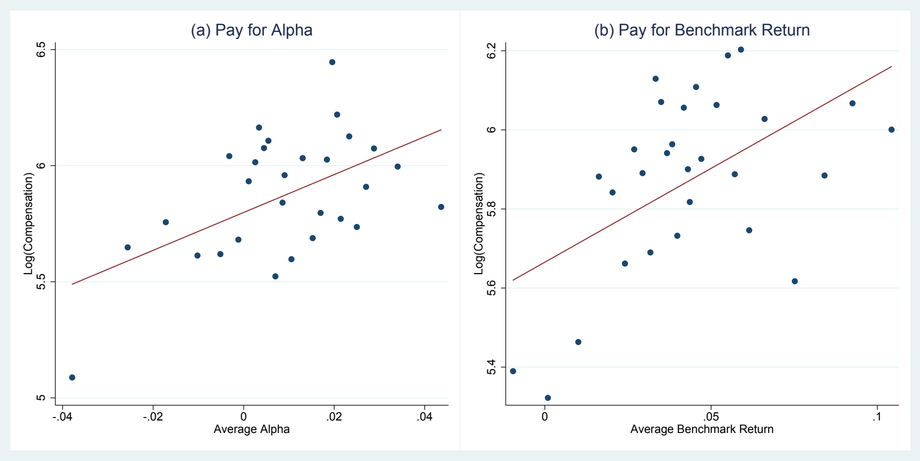

Figure D.6 - Compensation, Fund Size, Fee Revenue and Percentage Fees

These figures present the relationship between compensation, size, percentage fees and fee revenues. Detailed definitions of variables can be found in Appendix B. Total Pay is the manager's compensation in year t, size is his portfolio size in year t, Fee is an asset-weighted percentage portfolio fee in year t and Revenue is a product of the size and the percentage fee.

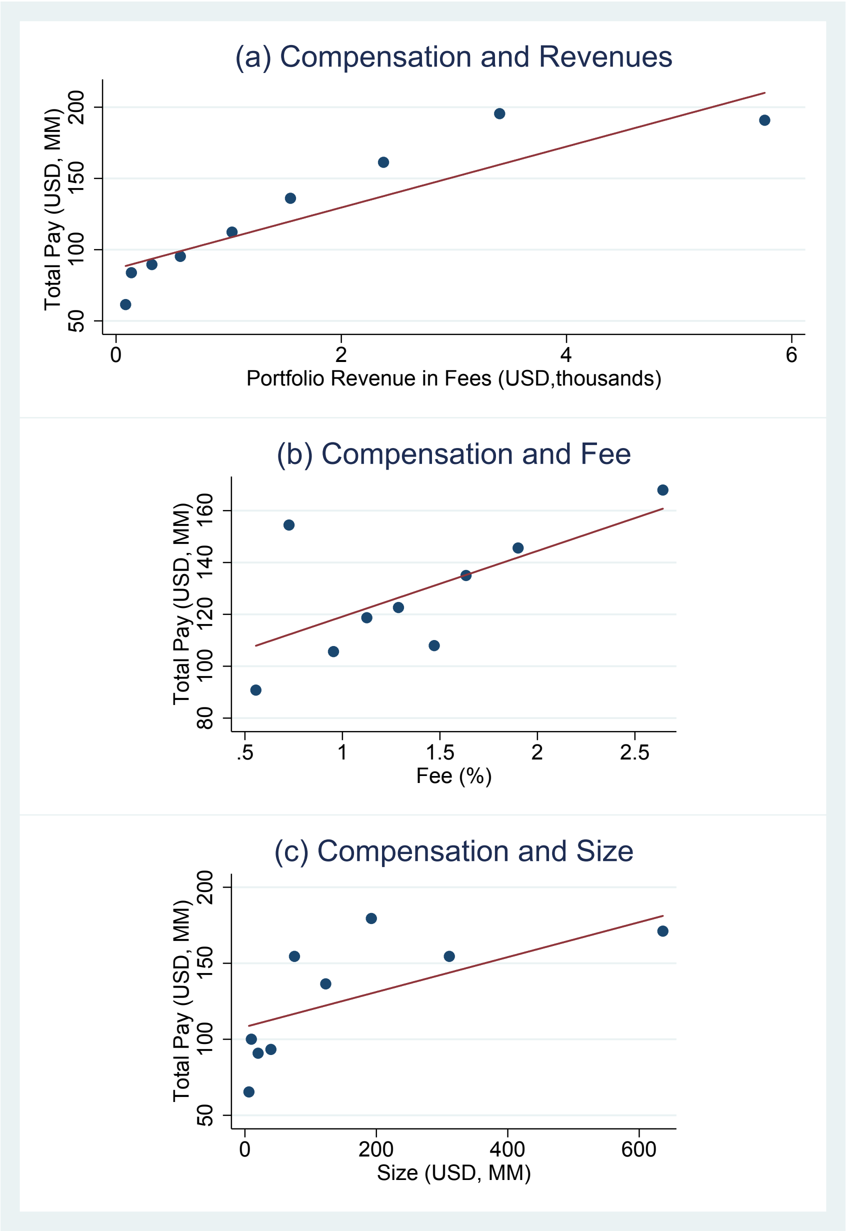

Figure D.7 - Changes in Compensation and Stock Market Returns

This figure presents the relationship between the changes in the average portfolio manager's compensation and the returns on Tel Aviv 100 Stock Index across the sample years. Detailed definitions of variables can be found in Appendix B.

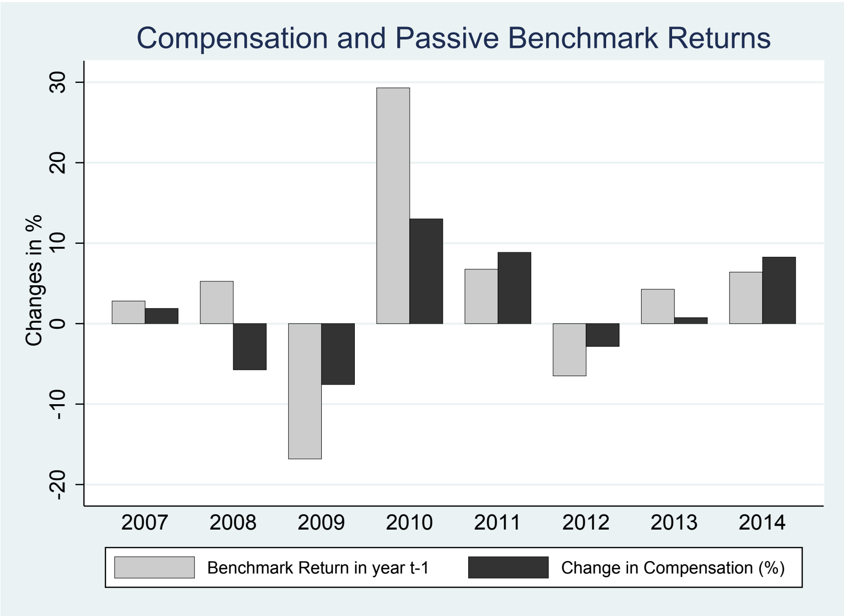

Table D.2 - Compensation and Performance - Level Regressions

This table reports the results from regressing the compensation of mutual fund portfolio managers on the performance of their funds. Detailed definitions of variables can be found in Appendix B. The p-values of the Wald test for the equality between the coefficients are reported. Column (1) presents the baseline spesification and column (2) adds controls. Columns (3) and (4) repeat the same spesification when the fund's passive return is estimated using the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	$Ln(Compensation_{ict})$			
	(1)	(2)	(3)	(4)
	5-Benchmark Model		Market Model	
$\alpha_{ic,t-1}$	1.58***	1.46***	1.16**	1.13**
	(0.54)	(0.54)	(0.46)	(0.43)
$R^B_{ic,t-1}$	0.95***	0.92***	0.86***	0.83***
	(0.20)	(0.19)	(0.20)	(0.19)
H_0 : Coefficient on $\alpha_{ic,t-1}$ equals to coefficient on $R^B_{ic,t-1}$	0.177	0.181	0.510	0.498
Observations	1,021	1,021	1,021	1,021
R-squared	0.78	0.80	0.78	0.80
Controls	No	Yes	No	Yes
Company x Year FE	Yes	Yes	Yes	Yes
Portfolio Manager FE	Yes	Yes	Yes	Yes

Table D.1 - Compensation, Fund Size, Fee Revenue and Percentage Fees

This table reports the results from regressing the manager compensation on portfolio revenue, size and fees. Detailed definitions of variables can be found in Appendix B. Column (1) reports the baseline spesification for the revenue, column (2) adds controls and firm-year fixed effects and column (3) adds manager fixed effects. Columns (4), (5) and (6) repeat the same spesifications separating between size and fees. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parenthesis.

	$Compensation_{it}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Revenue_{it}$ (USD, Millions)	0.023***	0.026***	0.012*			
	(0.005)	(0.006)	(0.006)			
Fee_{it} (%)				0.046***	0.046***	0.022**
				(0.017)	(0.013)	(0.011)
$Size_{it}$ (USD, Billions)				0.204***	0.203***	0.095*
				(0.044)	(0.049)	(0.050)
Observations	1,125	1,125	1,125	1,125	1,125	1,125
R-squared	0.110	0.260	0.669	0.096	0.246	0.669
Controls	No	Yes	Yes	No	Yes	Yes
Company x Year FE	No	Yes	Yes	No	Yes	Yes
Portfolio Manager FE	No	No	Yes	No	No	Yes

Table D.3 - Cross-Sectional Relationship between Compensation and Performance

This table reports the results from regressing the compensation on alpha and passive returns in the cross-section of portfolio managers. All the variables represent weighted averages of the relevant variables computed over the sample period where the weight is a number of years that the manager appears in the sample. The p-values of the Wald test for the equality between the coefficients are reported. Column (1) presents the baseline spesification , column (2) adds controls and column (3) adds firm fixed effects. Columns (3), (4) and (5) repeat the same spesifications when the fund's beta is estimated using the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parentheses.

	$Ln(\overline{Compensation_{ic}})$					
	(1)	(2)	(3)	(4)	(5)	(6)
	5-Benchmark Model			Market Model		
$\bar{\alpha}_{ic}$	8.16***	7.07***	7.80**	5.26**	4.45*	4.47*
	(2.67)	(2.27)	(2.56)	(2.52)	(2.67)	(2.44)
$\bar{R}^B_{ic}$	4.74***	4.11***	4.61**	5.38***	4.73***	5.52***
	(1.68)	(1.75)	(1.67)	(1.71)	(1.74)	(1.74)
H_0 : Coefficient on $\bar{\alpha}_{ic}$ equals to coefficient on $\bar{R}^B_{ic}$	0.146	0.203	0.158	0.959	0.902	0.641
Observations	233	233	233	233	233	233
R-squared	0.04	0.07	0.41	0.04	0.05	0.39
Controls	No	Yes	Yes	No	Yes	Yes
Company FE	No	No	Yes	No	No	Yes

Table D.4 - Compensation and Berk and van Binsbergen (2015) Measure of Skill

This table reports the results from regressing the compensation of mutual fund portfolio managers on Berk and van Binsbergen (2015) measure of skill. All the variables represent weighted averages of the relevant variables computed over the sample period where the weights are the numbers of years that the manager appears in the sample. Column (1) presents the baseline specification , column (2) adds controls and column (3) adds firm fixed effects. Columns (3), (4) and (5) repeat the same specification when the fund's beta is estimated using the market model. *,**, and *** denote statistical significance at 10%, 5% and 1% levels respectively. Standard errors clustered at the manager level are in parenthesis.

	$\overline{Compensation_{ic}}$					
	(1)	(2)	(3)	(4)	(5)	(6)
	5-Benchmark Model			Market Model		
$\bar{\alpha}_{ic} \cdot \overline{Size_{ic}}$	0.0047**	0.0045*	0.0046**	0.0018	0.0017	0.0018
	(0.0023)	(0.0023)	(0.0022)	(0.0016)	(0.0015)	(0.0016)
Observations	233	233	233	233	233	233
R-squared	0.41	0.61	0.64	0.40	0.54	0.57
Controls	No	Yes	Yes	No	Yes	Yes
Company FE	No	No	Yes	No	No	Yes