Fund Flows and Income Risk of Fund Managers*

Xiao Cen Winston Wei Dou Leonid Kogan Wei Wu

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Abstract

We develop a unique dataset, the first-ever of its kind, by leveraging the US Census Bureau's LEHD program and various big textual data sources, to examine the factors influencing the compensation and career trajectories of US active equity mutual fund managers. We find that managers' compensation is primarily determined by assets under management (AUM), with return performance directly influencing bonuses beyond its impact on AUM. Despite not aligning with client interests, fund flows significantly affect manager compensation and career outcomes. Large fund outflows increase a manager's likelihood of job turnover (with a substantial decline in compensation) by 4 percentage points.

Keywords: Fund managers, Manager compensation, Career concerns, Mutual fund flows, Fund performance, Labor economics. (**JEL:** G11, G23, J24, J31, J33, J44)

*Cen is at Texas A&M University (Mays). Dou is at University of Pennsylvania (Wharton) and NBER. Kogan is at MIT (Sloan) and NBER. Wu is at Texas A&M University (Mays). Emails: xcen@mays.tamu.edu, wdou@wharton.upenn.edu, lkogan@mit.edu, and wwu@mays.tamu.edu. We are grateful to Jonathan Berk, Jan Eberly, Richard Evans, Itay Goldstein, Urban Jermann, Ron Kaniel, Stijn Van Nieuwerburgh, Uday Rajan, Nick Roussanov, Sergio Salgado, Larry Schmidt, Luke Taylor, Yu Xu, and Russ Wermers, as well as seminar and conference participants at Colorado Finance Summit, NBER Big Data and Securities Markets, Texas A&M University, University of Delaware (Lerner), University of Michigan (Ross), and Wharton for their comments and suggestions. We thank Gajendra Choudhary, Wenting Dai, Yijing Ren, Lorry Wu, Xiaoling Wu, Shuman Zhang, and Zitong Zhao for excellent research assistance. Cen and Wu acknowledge the financial supports from Mays Mini Research Grant. Dou is grateful for the financial supports from the Rodney L. White Center for Financial Research, Wharton Dean's Research Fund, and the Golub Faculty Scholar Award at Wharton. This research uses data from the Census Bureau's Longitudinal Employer-Household Dynamics Program, a program partially supported by the following National Science Foundation Grants SES-9978093, SES-0339191, and ITR-0427889; National Institute on Aging Grant AG018854; and grants from the Alfred P. Sloan Foundation. This research was performed at a Federal Statistical Research Data Center. All results have been reviewed to ensure that no confidential information is disclosed.

1 Introduction

In recent decades, the prominence of delegated asset management services, notably mutual funds and pension funds, has grown significantly in the United States (US) financial markets (e.g., French, 2008). Data from the Investment Company Institute reveals that approximately half of all US households have consistently invested in mutual funds across the past decades, spanning a broad range of age and income groups. In 2016, mutual and pension funds collectively held roughly 44% of the US equity market, maintaining a consistently high share of ownership over the past two decades. Given their considerable stake, the investment strategies and trading decisions of active equity funds – primarily active mutual and pension funds – not only wield significant influence over stock market valuations but also directly impact the wealth accumulation of a significant portion of US households.

Managers of active equity funds make daily trading and asset allocation decisions in the equity market, on behalf of a diverse cross-section of US households spanning various demographics and income levels. Their role is not merely unique; it's pivotal to the economic landscape. To understand the investment decisions of these fund managers and their implications for the capital market, it's imperative to examine the incentives they operate under, as well as the income and career risks they face. In particular, Dou, Kogan and Wu (2023) find that managers of active funds tilt their portfolios to hedge against fund flow shocks, even at the expense of performance. They further demonstrate that this flow-hedging behavior by active fund managers significantly influences stock market valuations. Central to their argument is the notion that fluctuations in a fund's assets under management (AUM) causally affect its managers' compensations. Given that fund flows are a primary driver of these AUM variations, managers are concerned about the inherent income risks associated with these flows. Drawing on Swedish data, Ibert et al. (2018) demonstrate a statistically significant but concave relationship between a fund manager's compensation and the fund's AUM. However, similar conclusive or causal evidence for US mutual funds is still lacking in the current literature.

This paper fills this gap by offering direct and causal evidence concerning the factors influencing fund managers' compensations in US active equity mutual funds. Undertaking this empirical exploration is challenging, largely owing to the scarcity of comprehensive and precise data on the compensation and career trajectories of individual managers. Consequently, prior research has predominantly concentrated on studying the advisory contracts between funds and their clients. Meanwhile, the intricacies of the compensation agreements between fund companies and their fund managers remain largely understudied, particularly in major economies like the US, where capital markets are instrumental in driving economic activities.

A primary contribution of this paper is the creation of a unique and novel dataset detailing the compensation and employment history of managers within US active equity mutual funds. We emphasize that this paper represents the first endeavor to construct a fund manager compensation and employment panel dataset at the individual level, based on authentic income data within the US. Our data construction process starts with the entire universe of US active mutual funds. From there, we meticulously extracted the names of all fund managers using both the CRSP survivor-bias-free mutual fund database and the Morningstar direct mutual fund database. While the resulting dataset appears straightforward, the intricacies and challenges involved in its construction, even in the first step, are substantial. Approximately 13% of fund managers are not listed with their full names (with first names missing) in the combined CRSP-Morningstar dataset. To address this, we employ data scraping techniques, complemented by manual searches and verifications. We source this information from mutual fund prospectus, LinkedIn profiles, and the official websites of the mutual funds.

We further gather information regarding fund managers' age, partial social security number (SSN) information, and home address history from public record datasets such as LexisNexis and CoreLogic. Facilitated by these data, we are able to map fund managers to the Longitudinal Employer-Household Dynamics (LEHD) data to obtain their detailed compensation information and comprehensive employment history. The LEHD data is a large-scale confidential administrative dataset made available through the research data center of the US Census Bureau. The dataset provides a longitudinal match between employer and employee and tracks each individual's job history from 2000 to 2014 at a quarterly frequency. The LEHD data covers all individuals in the unemployment insurance wage records, which account for more than 95% of employment in the US over our sample period. In our analysis, we aggregate each manager's quarterly compensations annually. We then link this yearly compensation with the AUMs, performance, and fund flows of the funds overseen by that manager. The dataset we have assembled provides a unique opportunity to study the determinants of fund managers' compensations and career prospects. Furthermore, it allows us to examine the factors behind fund managers' portfolio choices and their implications for asset pricing in capital markets.

Leveraging our newly assembled dataset, we accomplish five key research goals. First, we demonstrate that fund managers' compensation intrinsically depends on both their performance and fund flows; yet, importantly, these dependencies primarily act through a fund's AUM. Specifically, the strong positive link between fund managers' compensation and their performance dissipates when we control for funds' AUMs. A similar pattern is observed for the link between fund managers' compensation and the fund flows they face. Furthermore, consistent with Ibert et al. (2018) who examine Swedish mutual funds, we find that the compensation of fund managers in the US is significantly and monotonically associated with fund AUM, though the relationship exhibits a strong concave pattern. Our results, in conjunction with those presented in Ibert et al. (2018), robustly challenge the predictions of some existing contract theories. These theories suggest that a significant portion of a fund manager's compensation is directly linked to fund return performance, separate from the fund's AUM, particularly in situations where there is uncertainty regarding managers' ability or effort. Importantly, our study extends the analysis conducted by Ibert et al. (2018) by decomposing a fund manager's total compensation into base pay and bonus components. We then investigate the factors influencing each component separately, offering a more nuanced understanding of the determinants of fund manager compensation. By doing so, our findings regarding bonuses reconcile the main results of Ibert et al. (2018) and our study with the predictions of some other contract theories in the literature, which suggest that only a relatively small, not significant, portion of a fund manager's compensation is likely directly linked to fund return performance. Interestingly, drawing from the US data in the Statement of Additional Information (SAI), Ma, Tang and Gómez (2019) report that as many as 79% of funds purport to use compensation contracts that include a bonus contingent upon fund return performance. In contrast, fewer than 20% of funds explicitly claim that they have AUM-based managerial compensation. However, this seems at odds with our findings. Our study strongly suggests that extra caution is necessary when interpreting the sparse and ambiguous language used in the Statements of Additional Information (SAI) regarding managers' salaries, which seems to be strategically ambiguous or even misleading. In particular, this disparity may indicate that the assertions made in SAIs do not genuinely mirror the real-world compensation agreements between funds and their managers. Such a discrepancy is likely driven by the strategic marketing considerations of the fund companies. It is quite believable that funds would be highly motivated to present their managers' incentives as being perfectly aligned with the performance outcomes that potential investors desire.

Second, our study goes beyond simply identifying what determines a fund manager's total compensation by breaking down compensation into base pay and bonuses. In particular, we examine how fund flows and return performance separately influence managers' base pay and bonuses. We find that fund flows significantly impact both components of compensation, albeit predominantly through their effect on AUM. On the other hand, while return performance significantly affects both base pay and bonuses, its influence on bonuses is not entirely mediated by AUM, suggesting a more nuanced relationship between managers' bonuses and their return performance. Importantly, this observation aligns with certain contract theories regarding fund managers' incentives when private actions are involved, shedding light on the intricate incentive structures that fund companies implement in practice. This finding aligns with the result that the additional impact of return performance on fund manager compensation, beyond its influence on AUM, is not significant. This is attributed to the fact that bonuses comprise only a small part of the overall pay for a typical active equity fund manager in the US, despite considerable heterogeneity among managers. Indeed, in our sample, the median bonus-to-pay ratio stands at about 30%, and the mean is approximately 40%.

Third, we show that fund flows, as opposed to fund performance, exert a strong impact on the career outcomes of fund managers, especially concerning their downside career risk. Understanding the impact of fund flows on fund managers' downside career risk is essential for unraveling the determinants of fund managers' asset allocation decisions, especially their flow hedging motivations. We explore the career risk along both intensive and extensive margins. For the intensive margin, we examine the percentage change in income before and after a fund manager's job turnover, given that the turnover has occurred. Our findings suggest that larger fund inflows prior to these turnovers are typically associated with bigger boosts in income, while larger outflows lead to more substantial income drops. In contrast, the changes in income that fund managers experience around these turnovers seem unrelated to their performance prior to these events. For the extensive margin, we examine the likelihood of a job turnover leading to a significant income promotion (20% increase or more) and the likelihood of one resulting in a significant income demotion (20% decrease or more). Our analysis reveals that enormous fund inflows elevate the likelihood of a turnover accompanied by a significant income promotion, while enormous fund outflows heighten the likelihood of a turnover accompanied by a significant income demotion. Interestingly, while severely negative fund performance minimally impacts the chances of a turnover with a significant income decline, very positive fund performance bolsters the likelihood of a turnover with a significant income increase.

Fourth, we delve deeper by decomposing fund flows into two distinct components: the systematic fund flow and the idiosyncratic fund flow, as outlined by Dou, Kogan and Wu (2023). This decomposition allows us to isolate and measure the effects of each type of fund flow on the career risk of fund managers. Our analysis reveals that both the systematic and idiosyncratic components of fund flows consistently and significantly influence the career risk of fund managers. We show that both systematic and idiosyncratic components of fund flows affect the compensation of fund managers. Intriguingly, while the systematic fund flow component predominantly influences the base-pay segment of a manager's compensation, the idiosyncratic fund flow component mainly sways the bonus segment. Next, we examine whether manager compensations and career outcomes depend on the performance and fund flows of other peer funds in the same fund family. Based on Swedish data, Ibert et al. (2018) find that the sensitivity of manager compensation to fund family revenue is comparable to that of manager revenue. Their findings suggest that the compensation of fund managers contains one component that depends on manager-level revenues and another component that comes out of a fund-family-wide bonus pool. A natural question is whether the same pattern exists for U.S. mutual fund managers and, if so, whether the compensation structure can help rationalize the cross-fund subsidization phenomena documented by previous studies (e.g., Gaspar, Massa and Matos, 2006; Bhattacharya, Lee and Pool, 2013) and reconcile the observed competition and cooperation patterns in mutual fund families (e.g., Evans, Prado and Zambrana, 2020). Our findings provide strong support for the cross-fund subsidization hypothesis. Specifically, we observe a significant positive comovement between fund family flows and a fund manager's compensation growth. This comovement is primarily evident in base pay rather than bonus.

Finally, we present compelling evidence supporting a causal relationship between fund manager compensation and the corresponding fund AUM and revenues. Our findings demonstrate a robust positive correlation between fund manager compensation and the lagged AUM and revenue of the funds under their management. However, it's essential to recognize that this evidence, by itself, does not suffice to establish a definitive causal link, indicating that fund manager compensation is primarily driven by the AUM or revenue of the funds they oversee. This limitation arises due to an endogeneity issue. Specifically, the observed positive correlation between fund manager compensation and the lagged AUM and revenue of the funds they manage may be influenced by unaccounted-for variables. For instance, both manager compensation and fund AUM (and revenue) can be simultaneously affected by the skill level of fund managers, regardless of whether these skills are reflected in the fund's returns. On one hand, manager compensation is, to some extent, determined by the skill level of fund managers. On the other hand, fund AUM experiences accelerated growth with higher levels of fund manager skills, not only due to the potential for superior fund returns but also because of capital inflows from clients who recognize the skills of these fund managers (e.g., Berk and Green, 2004).

To establish a definitive causal relationship, indicating that mutual funds primarily compensate their managers based on fund AUM (or revenue), even though the pass-through from fund revenue to manager compensation is not complete, we rely on variations in a fund's AUM (or revenue) that go beyond the inherent skill level and influence of its fund managers. These variations in fund AUM (or revenue) are often attributed to luck, whether it's in a favorable or unfavorable direction. If mutual funds actively adjust manager compensation based on fluctuations in fund AUM (or revenue) that are independent of the perceived skill levels of fund managers — commonly referred to as "non-skill-related" variations in fund AUM (or revenue) — then the positive correlation observed between fund manager compensation and the lagged AUM and revenue of the funds they oversee is likely to signify a causal relationship.

To capture non-fundamental fluctuations in fund AUM and revenue, we adopt an instrumental variable approach inspired by the idea of heterogeneous demand-driven price impacts, as originally introduced by Koijen and Yogo (2019). This instrumental variable is designed to capture the changes in a fund's AUM and revenue that stem from exogenous shifts in demand by other institutions, which are beyond the control of the fund family.

Related Literature. Our study contributes to the literature on managerial incentives in the delegated asset management industry. Owing to a dearth of data on individual fund manager incentives, most existing literature has concentrated on advisory contracts between fund shareholders and investment advisors (e.g., Starks, 1987; Grinblatt and Titman, 1989; Golec, 1992; Tufano and Sevick, 1997; Coles, Suay and Woodbury, 2000; Das and Sundaram, 2002; Deli, 2002; Elton, Gruber and Blake, 2003; Golec and Starks, 2004; Dass, Massa and Patgiri, 2008; Massa and Patgiri, 2009; Warner and Wu, 2011). There's limited research on the compensation structures of individual portfolio managers, despite their significance in understanding managerial incentives in the mutual fund industry. However, two studies stand out. Ibert et al. (2018) collate a registry-based dataset on the compensation of Swedish mutual fund managers. They observe a positive relationship between pay and revenue and identify a surprisingly weak sensitivity of pay to performance, even after considering the indirect effects of performance on revenue. While Ibert et al. (2018)'s results are intriguing, it remains to be seen how applicable they are to the larger and differently-regulated U.S. mutual fund industry. In contrast, Ma, Tang and Gómez (2019) source data on portfolio manager compensation structures from the SAI for U.S. open-end mutual funds between 2006 and 2011. Their findings indicate that approximately 79% of these funds disclose that a component of their fund managers' compensation is tied to the funds' investment performance. However, the SAIs don't provide information on the magnitude of the compensation, leaving a gap in understanding the exact magnitude of the performance-sensitive pay. It's also ambiguous whether the disclosures in the SAIs genuinely mirror the actual compensation structures in practice. Our paper complements both Ibert et al. (2018) and Ma, Tang and Gómez (2019) by examining the actual compensation amounts of fund managers in the U.S. mutual fund industry. Contrary to their self-disclosures, we find that the AUMs of U.S. funds primarily determine their managers' compensation. Both fund flows and performance play a role in influencing this compensation through AUM, a finding consistent with those of Ibert et al. (2018) in their Swedish dataset. We go beyond topics studied by their paper to further document the impact of fund performance, flows and their systematic and idiosycratic components on compensation growth.

Our paper makes contribution to the empirical literature on labor economics that studies the contractual structure of workers, that is, how shocks transmit to wages and employment of workers. While there has been notable progress in this field of study, existing research still falls short of being completely satisfactory. A major limitation is the scarcity of studies with clear, exogenous sources of variation in productivity, revenue, or profit. Many papers, such as those by Guiso, Pistaferri and Schivardi (2005) and Card, Cardoso and Kline (2016), primarily rely on timing assumptions about the stochastic process driving productivity to justify using lags as instruments. Other studies, including Abowd and Lemieux (1993) and Card, Devicienti and Maida (2014), utilize industry-level shocks as instruments for productivity. However, these approaches may not meet the exclusion restriction criteria, particularly if labor supply to the sector is inelastic. This is because even fully competitive models acknowledge that industry-level shocks can lead to equilibrium wage responses. Furthermore, such shocks could provoke general equilibrium responses that alter workers' external options. Our paper zeroes in on a critical yet unique sector of the economy: the mutual fund industry. This industry represents one of the rare instances in the modern professional services economy where individual output can be accurately quantified. Crucially, this context enables us to generate exogenous variation in fund revenue, independent of fund managers' perceived skill levels. Consequently, this allows us to provide causal evidence on the contractual structures of workers, specifically focusing on fund managers.

Our study further contributes to the literature on the effects of fund performance and fund flows on the career outcomes of fund managers. Hu, Hall and Harvey (2000) analyze 307 managerial changes over the period from 1976 to 1996. They find that fund performance has a positive correlation with promotions and an inverse one with demotions. In contrast, fund flows do not significantly predict either outcome. Examining a sample of U.S. equity funds from 1995 to 2002, Evans (2006) determines that fund return alphas are significant predictors for both promotions and demotions, while fund flows are not. However, Evans (2006) also observes that fund flows play a crucial role in predicting fund terminations, after which managers often depart from the fund family. With an expanded dataset in terms of time series and cross-section, Barber, Scherbina and Schlusche (2017) support previous findings, emphasizing fund performance as a strong predictor of managers' career trajectories. They further underscore a notable association between career outcomes and fund flows. Our research augments this body of literature by exploiting the actual compensation information after job turnovers. We show that, contrary to fund performance, fund flows exert a significant influence on the career outcomes of fund managers, particularly regarding their downside career risk.

Our study further enriches the literature on cross-fund subsidization. Chevalier and Ellison (1997) posit that the primary goal of a mutual fund family is to enhance the value of the entire firm rather than focusing solely on individual funds. Gaspar, Massa and Matos (2006) demonstrate that mutual fund families strategically reallocate performance among member funds to prioritize those that bolster the overall family profits. Bhattacharya, Lee and Pool (2013) highlight that affiliated funds serve as an insurance mechanism against transient liquidity shocks impacting other funds within the family. Meanwhile, Berk, van Binsbergen and Liu (2017) explore capital reallocation decisions of mutual fund firms, revealing that fund executives possess keen insights into their managers' capabilities and duly reward the most adept with larger portfolios. Our paper adds to this stream of literature on by evaluating how fund manager incentives might drive such cross-fund subsidization behaviors. Specifically, we establish that manager compensation is influenced by the fund flows within the same fund family. Our results elucidate the internal incentive dynamics within fund families that shape managers' portfolio choices.

Lastly, our study connects with the emerging literature on the role of intermediaries, especially in the context of delegated portfolio management, and its implications for asset pricing (e.g., Brennan, Jegadeesh and Swaminathan, 1993; Goldman and Slezak, 2003; Asquith, Pathak and Ritter, 2005; Cornell and Roll, 2005; Nagel, 2005; Cuoco and Kaniel, 2011; He and Krishnamurthy, 2011, 2013; Basak and Pavlova, 2013; Kaniel and Kondor, 2013; Vayanos and Woolley, 2013; Adrian, Etula and Muir, 2014; Koijen, 2014; Savov, 2014; He, Kelly and Manela, 2017; Drechsler, Savov and Schnabl, 2018; Koijen and Yogo, 2019; Gabaix and Koijen, 2021; Haddad, Huebner and Loualiche, 2021; Dou, Wang and Wang, 2022). Dou, Kogan and Wu (2023) show that common fund flow shocks play an important role in the financial markets. They highlight the role of endogenous fund flows as an invisible hand in the capital market, connecting the asset allocation choices of institutions, as well as their asset pricing implications, to the aggregate economic shocks affecting households. Our paper adds to this literature by documenting that common fund flows and the systematic component of manager-level flows significantly and positively comove with compensation growth. This suggests that fund managers possess pronounced incentives to hedge against flow risks, thereby lending direct empirical support to Dou, Kogan and Wu (2023).

2 Data and Measurements

We have assembled a unique dataset on the compensation and career trajectories of US mutual fund managers, drawing from multiple sources. This dataset includes information on their quarterly compensation and employment histories, extracted from the Longitudinal Employer-Household Dynamics (LEHD) data. The LEHD is an extensive administrative dataset on individual-level employment, provided by the US Census Bureau. With support from the Census Bureau, we combined the administrative data from the Census with manually collected data from various "big" textual sources. This effort has enabled us to integrate the LEHD data with both the CRSP Survivor-Bias-Free US Mutual Fund and Morningstar databases, which provide extensive details on fund asset size, fund returns, expense ratios, and other pertinent fund information. In addition to data on fund managers' compensation and employment histories, we also manually gather information on the self-disclosed compensation structure for each mutual fund from the Statement of Additional Information (SAI).

In Sections 2.1 through 2.4, we delve into the aforementioned datasets and the intermediate datasets used for merging. In Section 2.5, we outline the empirical measures and present their summary statistics.

2.1 Longitudinal Employer-Household Dynamics (LEHD) Data

We utilize the LEHD dataset to collect information on the compensation and employment histories of mutual fund managers. The LEHD data, a comprehensive administrative dataset, is provided to researchers by the US Census Bureau. The LEHD dataset is compiled through a process that involves merging pre-existing survey and administrative data related to jobs, businesses, and workers. These data are the result of a partnership between the Census Bureau and US states, and they incorporate existing census and survey information sourced from the US Census Bureau and administrative data sources such as

Unemployment Insurance (UI) earnings data and the Quarterly Census of Employment and Wages (QCEW) from 50 US states, Puerto Rico, and the District of Columbia. In addition, individual-level annual residence data is provided for workers who appear in the Job data. Residences are sourced from the Composite Person Record (CPR) tables or the Residential Candidates File (RCF). At the employer level, information such as Employer Identification Number (EIN), age, and size of the national firm are sourced from the Internal Revenue Service (IRS).

The coverage of LEHD extends well beyond individuals employed in the mutual fund industry. This dataset provides a longitudinal linkage between employers and employees, capturing personal income data and job transitions from 2000 to 2014 at a quarterly frequency. Each individual in the dataset is assigned a unique Personal Identification Key (PIK), and every employer is identified by a distinct firm ID.[1] In addition, the dataset encompasses comprehensive demographic information for each individual, including details such as date of birth, gender, race, educational attainment, and exact residence location, represented by six-decimal-digit precision in longitudes and latitudes. Notably, the dataset encompasses all individuals recorded in the unemployment insurance wage records, representing over 95% of employment in the US.[2]

The LEHD data is exceptionally well-suited for our project for three compelling reasons. First, as a confidential administrative employment dataset, it provides precise and accurate metrics on the actual compensation of fund managers. To the best of our knowledge, this study is the first to construct an individual-level fund manager compensation and employment panel dataset using authentic income data in the US. Second, the LEHD data facilitates meticulous tracking of each fund manager's career transitions over time.

[1]The firm ID is a unique identifier for employers shared between LEHD and Business Registry data (SSEL) of the US Census Bureau. For single-establishment employers, it is equivalent to an EIN. For multi-establishment firms, it may correspond to multiple EINs, with the specific mapping provided by the SSEL.

[2]For this particular project, our access to the LEHD data covers 17 states, namely Arizona, Arkansas, California, the District of Columbia, Delaware, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Nevada, New Mexico, Oklahoma, Pennsylvania, Tennessee, and Texas.

This capability allows us to identify subsequent employers and income levels of fund managers following their departure from fund management roles. Such information is crucial in exploring the implications of job turnovers for fund managers, thereby enhancing our understanding of their career motivations and decision-making processes in portfolio management. Third, the lack of transparency in fund manager compensation is well-known. Pay secrecy or non-transparency persists as either an informal norm or a formal policy for approximately half of all US employees, including the majority of mutual fund managers, for a variety of economic reasons (e.g., Mas, 2017; Cullen and Pakzad-Hurson, 2023). Consequently, reliance on a survey-based dataset for mutual fund managers' compensation may be questionable. Administrative datasets are likely the only reliable sources for obtaining accurate information on fund manager compensation.

The income data from the LEHD covers total compensation for each individual-employer pair every quarter, including both base salary and bonuses. It is crucial to note three key aspects of this dataset. First, the dataset does not include equity-based compensation elements, such as option grants or restricted-stock grants, a detail pointed out by Kerr et al. (2015). However, for the purposes of our study, this limitation is not significant. CEOs or other executives at the fund company level such as directors of the board may hold shares of their funds from compensation plans (e.g., Chen, Goldstein and Jiang, 2008). Unlike these top executives, mutual fund managers typically receive their compensation in the form of base pay and bonuses, with less emphasis on stock-related compensation, given their roles as primarily salaried employees rather than firm executives. Second, the original data does not explicitly distinguish between base salary and bonuses. To overcome this limitation, we developed a method to separate compensation into base pay and bonuses using the quarterly variations in the LEHD data. Specifically, to estimate a fund manager's annual bonus, we identify the highest-earning quarter of the year as the "bonus quarter" if the compensation during that period exceeds the average of the two adjacent quarters by at least 20%. In the majority of cases, the bonus quarter aligns with the first quarter of the year. To calculate a fund manager's bonus for a particular year, we subtract the average compensation of the adjacent quarters from their earnings during the bonus quarter. The base pay for the year is then determined by deducting this calculated bonus from the total annual compensation. Third, fund companies actively reallocate their AUM among managers by assigning or withdrawing them to and from funds (e.g., Berk, van Binsbergen and Liu, 2017). When AUM reallocation occurs, it is important to note that changes in AUM are largely the decisions of mutual fund firms, rather than reflections of fund returns and flows. As a result, the relation between changes in AUM (and revenue changes) and performance or flows can be obscured when conditional on AUM reallocation. We demonstrate the robustness of our findings by examining a subsample where AUM reallocation is absent.

2.2 CRSP and Morningstar Mutual Fund Databases

We obtain fund names, monthly returns, monthly total net assets (TNAs), investment objectives, and other fund characteristics from the CRSP Survivorship-Bias-Free Mutual Fund Database. In line with prior studies (e.g., Kacperczyk, Sialm and Zheng, 2008; Huang, Sialm and Zhang, 2011), we classify actively managed US equity mutual funds using their objective codes and disclosed asset compositions.[3] Because data coverage on monthly TNAs prior to 1991 is scarce and poor, our CRSP sample starts from January 1991. Following the approach of earlier studies (e.g., Elton, Gruber and Blake, 2001), we focus on active mutual funds with AUM larger than $15M.

The CRSP mutual fund database includes manager names for both individually-

[3] We first select funds with the following Lipper objectives: CA, CG, CS, EI, FS, G, GI, H, ID, LCCE, LCGE, LCVE, MC, MCCE, MCGE, MCVE, MLCE, MLGE, MLVE, MR, NR, S, SCCE, SCGE, SCVE, SG, SP, TK, TL, UT. If a fund does not have any of the above objectives, we select funds with the following strategic insight (SI) objectives: AGG, ENV, FIN, GMC, GRI, GRO, HLT, ING, NTR, SCG, SEC, TEC, UTI, GLD, RLE. If a fund has neither the Lipper nor the SI objective, then we use the Wiesenberger fund type code to select funds with the following objectives: G, G-I, G-S, GCI, IEQ, ENR, FIN, GRI, HLT, LTG, MCG, SCG, TCH, UTL, GPM. If none of these objectives is available and the fund holds more than 80% of its value in common shares, then the fund will be included. After finishing the procedure described above, we further identify and exclude index funds based on their names and the index fund identifiers in the CRSP data.

managed and team-managed funds. However, for team-managed funds, CRSP only lists the managers' last names. To supplement the CRSP dataset, we additionally gather manager names and their tenure histories from the Morningstar Direct mutual fund database. By merging the CRSP and Morningstar data, we successfully obtain full manager names for 87% of the fund-year observations.

2.3 Intermediate Datasets to Bridge LEHD and CRSP-Morningstar

To merge the CRSP-Morningstar mutual fund data with the LEHD data at the fund manager level, we initiate the process by preprocessing the fund manager data. This preprocessing step involves addressing incomplete fund manager names through information gathered from mutual fund prospectuses, LinkedIn profiles, company websites, and other sources. Subsequently, we locate each fund manager within the LEHD data through a combined intermediate dataset. This dataset is created by leveraging individual real estate transaction information from the CoreLogic data and detailed individual demographic information from the LexisNexis data. These two datasets serve as intermediary sources that connect the fund manager databases to the LEHD data. Further details about each dataset are elaborated in the following paragraphs.

Mutual Fund Prospectuses, LinkedIn Profiles, and Company Websites. By merging the CRSP and Morningstar datasets, we are able to retrieve full manager names for approximately 87% of the fund-year observations concerning active equity funds. For those instances where manager names remain incomplete, we employ a manual search process to gather their full names. This search involves consulting mutual fund prospectuses, LinkedIn profiles, and other online resources. A comprehensive description of the procedure used to acquire complete manager names is available in Online Appendix 1. This meticulous approach guarantees the accuracy and comprehensiveness of the collected full names, resulting in our dataset containing full names for over 98% of the fund-year observations related to active equity funds.

CoreLogic Deeds and Listings Data. Using the pre-processed fund manager names, we employ CoreLogic as an intermediary dataset to bridge the CRSP-Morningstar mutual fund data with the Census LEHD data. CoreLogic is a prominent dataset covering deed records for over 147 million residential and commercial properties in the US. It offers detailed information about property transactions and mortgage terms spanning from 1980 to 2017. Relevant variables for our matching method include property owners' names, sellers' names, comprehensive property street addresses (encompassing street names, numbers, suite numbers, cities, counties, states, zip codes, and so forth), and property's geographical coordinates (latitude and longitude).

In our efforts to identify fund managers within the LEHD, our initial step involves matching each fund manager from the CRSP and Morningstar databases with deed records in CoreLogic. We consider a match valid when a fund manager's first, middle, and last names correspond with those of a property owner or seller in the records. Subsequently, our second step entails associating each property owner (or seller) from the deed records with an individual listed in the LEHD data. To facilitate this process, we utilize a bridge connecting the CoreLogic data to the unique individual identifiers in the LEHD, known as PIK. This bridge is established by the Person Identification Validation System (PVS) office at the US Census Bureau (Cen, 2021). The establishment of a match between an individual in the LEHD and an owner (or seller) in CoreLogic necessitates an exact match of both the individual's full name and residential address, as these are shared data fields in both CoreLogic and the PVS database.

The two-step individual-level matching process outlined above enables us to identify a set of unique individual identifiers in the LEHD data that may correspond to fund managers in the CRSP and Morningstar datasets. To further refine the identification of these fund managers within the LEHD, we take advantage of the available employment information. Among the individuals matched in the LEHD, we require that they be employed by the same fund management company that employs the fund managers, as indicated in the CRSP and Morningstar datasets for a given year. To ascertain whether the employer of an individual indicated in the LEHD corresponds to a fund management company in the CSRP/Morningstar datasets, we utilize data from the Business Register (SSEL) provided by the Census. The SSEL encompasses various business details, including the business name, address, industry code, firm ID (can be mapped to EIN), start year, and a set of business identifiers enabling the linkage of SSEL records with other Census datasets like the LEHD. To confirm that a particular firm aligns with the focal fund management company, we stipulate that the business registry entry must match in terms of business name, address, industry code, and EIN with the firm of interest in the CRSP and Morningstar datasets. Consequently, our bridging file between fund managers and LEHD individuals is created based on an exact match of three distinct criteria: the manager's name, residential address, and the fund management company where they are employed during a specific year.

LexisNexis Public Records. In addition to the CoreLogic data, we incorporate individual demographic information from LexisNexis Public Records to enhance the bridging process between the CRSP-Morningstar mutual fund data and the LEHD data. Sole reliance on CoreLogic may lead to incomplete coverage of active equity fund managers employed by fund management companies operating in the 17 states covered by the available LEHD data. This limitation emerges for two reasons. First, CoreLogic does not possess residential addresses for fund managers who reside in rented places rather than purchased properties. Many fund managers may have their residential addresses recorded as rentals in the Census LEHD. Second, CoreLogic may not cover active equity fund managers if they own houses for which property transactions occurred before CoreLogic began recording such data. To address these limitations, we employ the LexisNexis data to expand the set of matched active equity fund managers between the Census LEHD and the CRSP-Morningstar mutual fund datasets. Additionally, the supplemental information from LexisNexis, including partial Social Security Numbers (SSN) and birth month and year, enhances the accuracy of the matching process.

LexisNexis Public Records serves as a leading data source providing comprehensive information on individuals' demographics, identification information, contact details, employment histories, and residential address histories. This extensive dataset encompasses more than 84 billion public records related to individuals. To compile comprehensive information on fund managers, we employ the "People Search" feature available within the LexisNexis online public record database. Similar to Pool, Stoffman and Yonker (2012), we utilize name, age range, and location information to identify fund managers in the LexisNexis data. For instance, we begin by using the "People Search" function to search for a fund manager's name. Next, we utilize their location details obtained from their LinkedIn profiles or company websites to refine the search results. Finally, we confirm the fund manager's identity through a meticulous manual review of their employment histories within the LexisNexis individual public record report.

After identifying fund managers in the LexisNexis database, we collect their year and month of birth, the first 5 digits of their social security number (SSN), and their entire residential histories from the reports. Using these details, we map each fund manager from the LexisNexis data to an individual in the LEHD data using a matching service provided by the Person Identification Validation System (PVS) office at the US Census Bureau. This matching process requires an exact match on five individual characteristics: the fund manager's full name, residential address, the first 5 digits of the SSN, year and month of birth, and the fund manager's employer information.

2.4 Self-Disclosed Fund Manager Compensation Structure

Information regarding the compensation structure of each mutual fund's manager is sourced from the Statement of Additional Information (SAI), which is a part of Form N-1A filed by open-end management investment companies.[4] We access Form N-1A from the SEC EDGAR database and manually gather annual information on manager compensation for actively managed US equity mutual funds from 2005 to 2018. Additionally, we collect fund names and fund tickers/CUSIPs (when available) and utilize this information to match the compensation structure data to the CRSP Mutual Fund database. We successfully obtain the self-disclosed compensation structure for 28,359 fund share-year observations out of the 44,285 fund share-year observations in our CRSP active mutual fund data sample for the period from 2005 to 2018, resulting in 64.0% coverage. We stress that the textual information about managers' salaries, derived from the sparse and ambiguous language in the Statements of Additional Information (SAI), is likely intended to be strategically ambiguous or potentially misleading.

2.5 Sample Overview and Summary Statistics

The merge of CRSP-Morningstar mutual fund data with LEHD data results in approximately 2,400 observations at the manager-year level, spanning from 2000 to 2014.[5] This dataset comprises roughly 450 fund managers and approximately 200 distinct fund management companies as employers. The construction of a new data panel capturing compensation and employment histories for active equity fund managers represents a major contribution of this paper. We detail and visualize the data construction process in Figure 1. Summary statistics for the key variables of our study are provided in Table 1, which we will detail further below.

[4] In 2004, the SEC introduced a new regulation requiring mutual funds, starting from March 2005, to disclose the compensation structure of its portfolio managers in the SAI.

[5] To comply with US Census Bureau disclosure requirements, observation counts are rounded to the nearest hundred if they fall between 1,000 and 10,000, and to the nearest fifty if they range from 100 to 1,000. This rounding convention applies to all tables in our study.

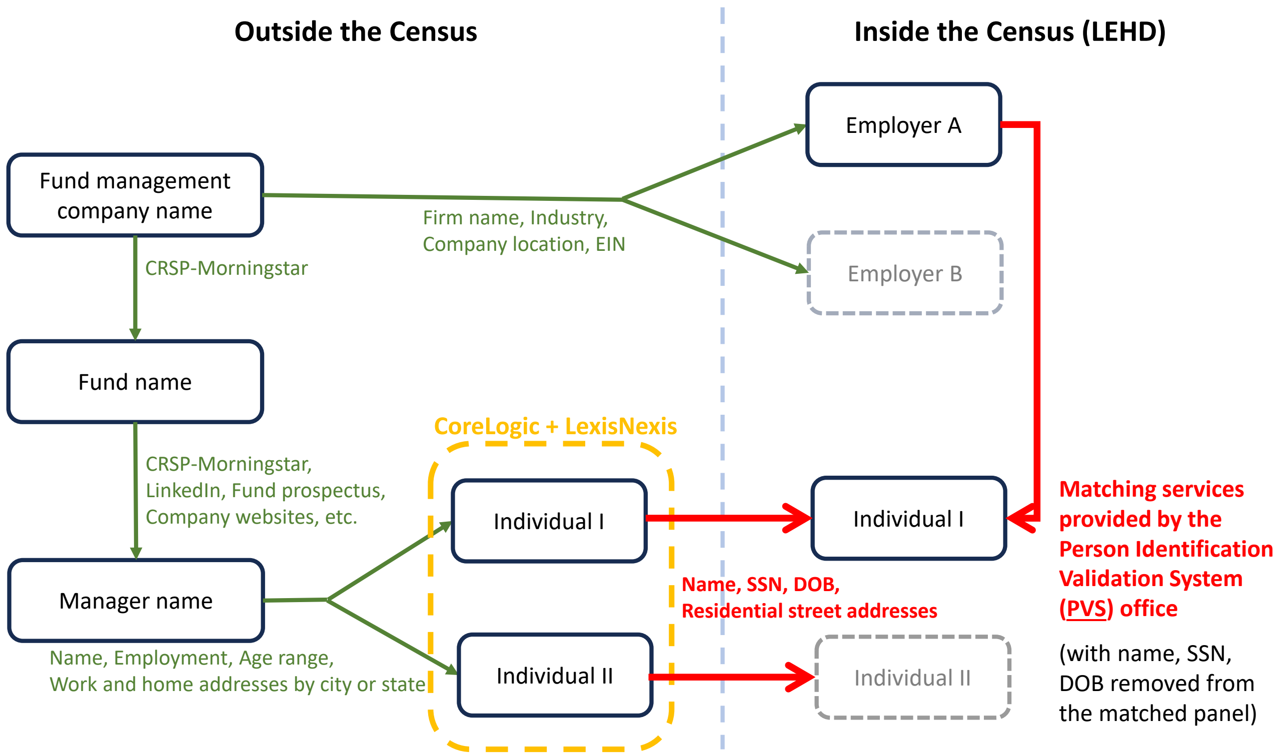

Figure 1: Illustration of data construction.

Fund Manager Pay. Panel A of Table 1 presents the summary statistics for the natural logarithm of annual compensation levels, denoted as $\ln(Pay_{m,t})$. The median value of this measure stands at 12.90, corresponding to an estimated median annual compensation of approximately \$400 thousand for an active fund manager.

In the $\ln(Pay_{m,t})$ row, columns (2) through (7) of Table 1 indicate a highly right-skewed distribution for the compensation level $Pay_{m,t}$, exhibiting a log-normal right tail. The distribution closely approximates a log-normal shape, as evidenced by the mean of $\ln(Pay_{m,t})$ aligning closely with the median, the symmetry about the median, and the distance from the median to the 95th percentile being nearly twice the standard deviation. Thus, the absolute compensation level, $Pay_{m,t}$, is expected to have a mean considerably higher than the median. Indeed, columns (1) and (5) for the $Pay_{m,t}$ row confirm that the mean compensation is \$1,112 thousand, significantly exceeding the median of \$400 thousand, a disparity primarily due to superstar fund managers whose pay reaches the

95th percentile ($4,325 thousand, as shown in column (7)) or higher.

We analyze the logarithmic growth rate of annual compensation levels for fund managers, represented as $\ln(Pay_{m,t}/Pay_{m,t-1})$. Panel B of Table 1 reveals that, within the sample excluding job turnovers (i.e., there is no change of employers), the median growth rate of annual compensation for active equity fund managers is approximately 4.5%, while the mean growth rate is around 3.8%. When job changes happen (that is, when there's a change of employers), the median growth rate of pay is 7.2%, whereas the average (mean) growth rate drops to approximately −6.5%. This highlights that the distribution of log pay growth rates leans significantly towards lower values, indicating a pronounced left skewness and tail. Such a pattern reveals that job changes are often associated with significant career downside risks for active fund managers. This risk becomes even more evident when examining the percentage change in pay over the three years following a job change, represented as $\ln(\overline{Pay}_{m,t+1\to t+3}/Pay_{m,t-1})$. Here, $\overline{Pay}_{m,t+1\to t+3}$ refers to the average salary received by manager m from years $t+1$ to $t+3$ post-job change in year t. On average, the three-year average income after changing jobs experiences a decline of about −15.6% compared to the pay before the job turnover, signifying a notable decrease in income, while the median percentage change stands at around 3.9%. Moreover, when a job change occurs, at least 25% of fund managers will experience an income decrease of −33.5% ($= e^{-0.408} - 1$) in the year following the change (year $t+1$) and a three-year average income reduction of −38.1% ($= e^{-0.479} - 1$) over the years $t+1$ through $t+3$ compared to the pay before the job turnover in year t. Furthermore, in the event of a job change, at least 5% of fund managers will encounter an income decrease of −80.9% ($= e^{-1.657} - 1$) in the year following the change (year $t+1$) and a three-year average income reduction of −90.9% ($= e^{-2.396} - 1$) over the years $t+1$ through $t+3$ compared to the pay before the job turnover in year t. Thus, active fund managers indeed confront significant career downside risk that can severely impact their incomes.

Fund Manager Base Pay and Bonus. We also break down compensation into base pay and bonuses by leveraging the quarterly compensation data in the LEHD. To estimate an annual bonus for a fund manager, we identify the quarter with the highest compensation within the year as the "bonus quarter" if the pay for that quarter is significantly higher – specifically, at least 20% higher than the average pay of the two adjacent quarters. A fund manager's bonus for year t is determined by subtracting the average pay of the two quarters adjacent to the bonus quarter from the pay received during the bonus quarter in year t. The base pay for year t is calculated by deducting the manager's bonus for that year from their total annual pay. The majority of managers' bonuses are observed to be distributed in the first quarter of the year. The summary statistics, presented in Table 1, are based on the data regarding bonuses issued during this period. The median value of $\ln(Base_{m,t})$ is 12.61, which translates to an approximate amount of $300 thousand for the median base salary. Similarly, the median value of $\ln(Bonus_{m,t})$ is 12.00, corresponding to an approximate median bonus of $163 thousand. Just like the distribution of annual compensation, the distributions of base pay and bonuses closely resemble log-normal shapes. This is evidenced by the mean closely matching the median, the symmetry around the median, and the distance from the median to the 95th percentile being nearly twice the standard deviation. Indeed, examining columns (1) and (5) for the $Base_{m,t}$ row reveals that the average base salary is $509.6 thousand, significantly higher than the median of $299.5 thousand. In a similar vein, columns (1) and (5) for the $Bonus_{m,t}$ row show that the average bonus stands at $738.2 thousand, greatly surpassing the median of $162.8 thousand. These disparities are largely attributed to the exceptional earnings of superstar fund managers, whose base salaries and bonuses reach the 95th percentiles ($\$1,591$ thousand and $\$3,335$ thousand, respectively, as indicated in column (7)) or beyond.

The fraction of bonus in total pay has a mean of 40.1% and a median of 31.5%, indicating that bonuses typically constitute a relatively small but significant portion of total compensation. Aligned with the relatively modest share of bonuses in a typical manager's compensation package, our findings suggest that return performance mainly influences compensation through AUM, albeit also having an additional effect on bonuses beyond its impact on AUM. Meanwhile, this proportion of bonus to total pay can vary significantly among different managers and over time, ranging from 3.7% at the 5th percentile to 89.6% at the 95th percentile. Assuming base pay and bonus follow similar ranking patterns across managers, their summary statistics suggest that active fund managers with lower compensation tend to receive a larger percentage of their total income as base pay, while those with higher compensation usually have a greater proportion of their compensation derived from bonuses. On one hand, the 75th and 95th percentiles for base pay stand at \$451.4 thousand and \$1,591 thousand, respectively. These figures are significantly lower than those for bonuses, which are \$839.0 thousand and \$3,335 thousand at the 75th and 95th percentiles, respectively. On the other hand, at the lower end of the compensation spectrum, the pattern inverts: the 5th and 25th percentiles for base pay, at \$40.13 thousand and \$215.4 thousand, significantly exceed those for bonuses, which are \$9.32 thousand and \$37.05 thousand at the 5th and 25th percentiles, respectively.

Manager-Level AUM and Fee Revenue. Funds can be managed by multiple managers, and a single manager might oversee several funds. Following Ibert et al. (2018), we allocate a fund's assets equally among all its managers. The total net asset for manager m in month t is:

$$TNA_{m,t} = \sum_{i \in \Omega_{m,t}} \frac{TNA_{i,t}}{M_{i,t}}, \tag{2.1}$$

where $\Omega_{m,t}$ represents the set of funds managed by manager m in month t and $M_{i,t}$ denotes the number of managers overseeing fund i in month t. As emphasized by Berk, van Binsbergen and Liu (2017), the set of funds overseen by manager m can change due to AUM reallocation. In Panel A of Table 1, the row $\ln(TNA_{m,t})$ shows the distribution of the natural log of $TNA_{m,t}$ for each December (i.e., each year-end AUM). The median value of $\ln(TNA_{m,t})$ is 19.69, which suggests that a typical fund manager in our sample

Table 1: Summary statistics.

	(1) Mean	(2) SD	(3) 5^{th} pct	(4) 25^{th} pct	(5) Median	(6) 75^{th} pct	(7) 95^{th} pct
All sample:	Panel A: Manage-year panel data						
$\ln(Pay_{m,t})$	13.08	1.34	10.78	12.50	12.90	13.93	15.28
$\ln(Base_{m,t})$	12.70	0.899	10.60	12.28	12.61	13.02	14.28
$\ln(Bonus_{m,t})$	12.02	1.923	9.14	10.52	12.00	13.64	15.02
$Pay_{m,t}$ (\$k)	1,112	2,072	48.05	268.3	400.3	1,121	4,325
$Base_{m,t}$ (\$k)	509.6	750.5	40.13	215.4	299.5	451.4	1,591
$Bonus_{m,t}$ (\$k)	738.2	1,409	9.32	37.05	162.8	839.0	3,335
$Bonus_{m,t}/Pay_{m,t}$	0.401	0.289	0.037	0.130	0.315	0.682	0.896
$\ln(TNA_{m,t})$	19.66	1.85	16.50	18.29	19.69	21.05	22.68
$\ln(Rev_{m,t})$	15.17	1.762	12.27	13.83	15.21	16.57	18.01
$\ln(Rev_{m,t}/Rev_{m,t-1})$	0.075	0.704	−0.782	−0.138	0.069	0.309	0.972
$\ln(1+Flow_{m,t})$	−0.008	0.327	−0.414	−0.139	−0.030	0.110	0.512
$\ln(1+Systematic\ Flow_{m,t})$	−0.008	0.125	−0.042	−0.001	0.000	0.001	0.017
$\ln(1+Idiosyncratic\ Flow_{m,t})$	−0.033	0.295	−0.439	−0.155	−0.051	0.092	0.467
$\ln(1+Family\ Flow_{m,t})$	−0.009	0.214	−0.288	−0.089	−0.019	0.063	0.363
$\ln(1+R^{gross}_{m,t})$	0.076	0.221	−0.397	0.012	0.116	0.200	0.315
$\ln(1+R^{abn,capm}_{m,t})$	0.018	0.057	−0.058	−0.014	0.010	0.043	0.125
$\ln(1+R^{abn,van}_{m,t})$	0.010	0.046	−0.053	−0.013	0.007	0.027	0.082
Sample without job turnovers:							
$\ln(Pay_{m,t}/Pay_{m,t-1})$	0.038	0.661	−1.071	−0.151	0.045	0.205	0.790
$\ln(Base_{m,t}/Base_{m,t-1})$	0.026	0.718	−1.084	−0.156	0.049	0.158	0.841
$\ln(Bonus_{m,t}/Bonus_{m,t-1})$	0.128	2.746	−1.878	−0.093	0.032	0.222	3.495
Sample with job turnovers in year t:							
$\ln(Pay_{m,t+1}/Pay_{m,t-1})$	−0.065	1.289	−1.657	−0.408	0.072	0.493	1.203
$\ln(\overline{Pay}_{m,t+1\to t+3}/Pay_{m,t-1})$	−0.156	1.467	−2.396	−0.479	0.039	0.484	1.497
All sample:	Panel B: Income risk (cross-manager distribution of time-series SD)						
SD of $\ln(1+Flow_{m,t})$	0.302	0.278	0.056	0.145	0.245	0.345	0.723
SD of $\ln(1+Systematic\_Flow_{m,t})$	0.046	0.106	0.001	0.002	0.004	0.047	0.195
SD of $\ln(1+Idiosyncratic\_Flow_{m,t})$	0.220	0.168	0.041	0.092	0.173	0.302	0.580
SD of $\ln(1+Family\_Flow_{m,t})$	0.185	0.218	0.035	0.067	0.113	0.233	0.545
SD of $\ln(1+R^{gross}_{m,t})$	0.223	0.103	0.090	0.147	0.220	0.274	0.378
Sample without job turnovers:							
SD of $\ln(Pay_{m,t}/Pay_{m,t-1})$	0.385	0.318	0.075	0.175	0.291	0.500	0.969
SD of $\ln(Base_{m,t}/Base_{m,t-1})$	0.461	0.480	0.064	0.154	0.297	0.638	1.328
SD of $\ln(Bonus_{m,t}/Bonus_{m,t-1})$	2.495	1.998	0.083	0.466	2.599	4.144	5.948
SD of $\ln(Rev_{m,t}/Rev_{m,t-1})$	0.552	0.441	0.108	0.255	0.426	0.681	1.547
Further without AUM reallocation:							
SD of $\ln(Pay_{m,t}/Pay_{m,t-1})$	0.341	0.344	0.018	0.088	0.222	0.510	0.955
SD of $\ln(Rev_{m,t}/Rev_{m,t-1})$	0.296	0.190	0.065	0.166	0.260	0.376	0.633

Notes. This table presents the summary statistics for the primary variables of interest. Columns (1) and (2) display the mean and standard deviation of each variable, respectively. Columns (3) through (7) detail the 5th, 25th, 50th (median), 75th, and 95th percentiles of each variable, in that order. The data covers the sample period from 2000 to 2014.

oversees approximately $356 million.

We calculate the revenue earned by manager m in month t using the following formula:

$$Rev_{m,t} = \sum_{i \in \Omega_{m,t-1}} \frac{TNA_{i,t-1}}{M_{i,t-1}} \times TER_{i,t}, \tag{2.2}$$

where $TER_{i,t}$ denotes the total expense ratio of fund i in month t. To determine the annual revenue earned by manager m, we sum up the monthly fee revenues for each year. In Panel A of Table 1, the row $\ln(Rev_{m,t})$ shows the distribution of the natural log of fee revenues for each manager and each year. The median of the log annual revenue is 15.21, which translates to approximately $4.0 million in dollar terms. Similar to the distribution of annual compensation, including its base pay and bonus components, the distributions of AUM and fee revenue also closely resemble log-normal shapes. This resemblance is demonstrated by the mean aligning closely with the median, the distribution's symmetry about the median, and the gap from the median to the 95th percentile being nearly double the standard deviation. In practice, the total expense ratio, $TER_{i,t}$, remains nearly constant across different months t for the same fund i. Consequently, it follows logically that the distribution of log revenue exhibits a shape similar to that of log AUM. Moreover, one of the main findings of our study is that fund manager compensation is predominantly influenced by their AUM (and revenue), and thus, fund managers compensation naturally follow an approximate log-normal distribution. This discovery draws an intriguing parallel with the patterns of CEO pay emphasized by Gabaix and Landier (2008), who find that CEO pay is significantly linked to firm size, and both tend to follow a power law, highlighting similar underlying principles despite differences in context.

Manager-Level Fund Flows. We first compute the monthly fund-level fund flows as:

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \times (1 + Ret_{i,t})}{TNA_{i,t-1}}, \tag{2.3}$$

where $Ret_{i,t}$ denotes the net return for fund i in month t. Following Elton, Gruber and Blake (2001), we require that the lagged TNA (i.e., $TNA_{i,t-1}$) exceed \$15 million. If it doesn't, the flow observation for fund i in month t is excluded. Additionally, we account for the incubation bias following Evans (2010).

We proceed to compute the monthly manager-level flows by aggregating the monthly fund-level flows across all funds overseen by manager m. The average is weighted based on the one-month lagged fund asset, divided by the number of managers, as follows:

$$Flow_{m,t} = \frac{1}{TNA_{m,t-1}} \sum_{i \in \Omega_{m,t-1}} \frac{TNA_{i,t-1}}{M_{i,t-1}} \times Flow_{i,t}. \tag{2.4}$$

To determine the flow of manager m on an annual basis, we aggregate the monthly manager-level flows for each year.

Dou, Kogan and Wu (2023) demonstrate that the fund flows of active mutual funds exhibit a pronounced factor structure, with the common component reacting to macroeconomic shocks. From a theoretical perspective, manager-level fund flows are expected to consist of two components. The first component corresponds to the common fund flows as identified by Dou, Kogan and Wu (2023), while the second component is designed to capture the residual flows that are orthogonal to the common fund flows. The common fund flow primarily captures the capital into and out of the equity sector, whereas the idiosyncratic fund flows essentially capture the movements of capital across different active equity funds.

To decompose these manager-level flows, we regress the monthly manager-level flows against the common fund flows, utilizing a 3-year rolling window. This is done provided there are at least 12 monthly observations within the rolling window:

$$Flow_{m,t-\tau} = a_{m,t} + \beta^{flow}_{m,t} \times Common\_Flow_{t-\tau} + \varepsilon_{m,t-\tau}, \quad \text{with } \tau = 0, 1, \cdots, 35, \tag{2.5}$$

where $Common\_Flow_{t-\tau}$ represents the common fund flow in month $t-\tau$ and $\beta^{flow}_{m,t}$

denotes manager m's common flow beta in month t.

The systematic flow for each manager on a monthly basis is defined as:

$$Systematic\_Flow_{m,t} = \overline{\beta}_{m,t}^{flow} \times Common\_Flow_t, \tag{2.6}$$

where $\overline{\beta}_{m,t}^{flow}$ represents the average common flow beta for manager m as of the preceding year. Our analysis yields similar results when we utilize the common flow betas from the final month, instead of averaging across all months, of the preceding year. We utilize lagged common flow betas to deliberately avoid reliance on contemporaneous information when estimating exposure to common flows, viewing this as a persistent trait.

The residual, or the difference between the manager-level flow $Flow_{m,t}$ and its associated systematic flow $Systematic\_Flow_{m,t}$, is termed the idiosyncratic flow:

$$Idiosyncratic\_Flow_{m,t} = Flow_{m,t} - Systematic\_Flow_{m,t}. \tag{2.7}$$

To calculate the systematic and idiosyncratic flows for manager m annually, we time-aggregate the monthly flows for each manager by summing up the respective monthly flows over the year for that manager.

Manager-Level Returns. To measure monthly manager-level returns, we aggregate the monthly fund-level gross (or risk-adjusted) returns across all funds overseen by manager m. This aggregation is weighted by the one-month lagged total net assets of each fund, divided by the number of managers of the fund, as illustrated in the equation:

$$R_{m,t} = \frac{1}{TNA_{m,t-1}} \sum_{i \in \Omega_{m,t-1}} \frac{TNA_{i,t-1}}{M_{i,t-1}} \times R_{i,t}, \tag{2.8}$$

where $R_{m,t}$ either represents the gross return earned from the portfolios and AUM overseen by manager m, denoted by $R_{m,t}^{gross}$, or represents the risk-adjusted return (i.e., alpha) relative to the market or tradable Vanguard indices, denoted by $R_{m,t}^{abn,capm}$ or $R_{m,t}^{abn,van}$, respectively. The specifics of how the risk-adjusted return is constructed are elaborated upon in Online Appendix 2. To calculate the annual returns of manager m, we time-aggregate the monthly manager-level returns for the year.

Fund Family Flows. We compute the fund family flows by aggregating the fund-level flows across all funds belonging to the same fund family. These flows are averaged, with weights derived from the one-month lagged fund asset size, as follows:

$$Family\_Flow_{m,t} = \frac{\sum_{i \in \Omega_{m,f,t-1}} TNA_{i,t-1} \times Flow_{i,t}}{\sum_{i \in \Omega_{m,f,t-1}} TNA_{i,t-1}}. \tag{2.9}$$

where $\Omega_{m,f,t}$ represents the set of funds overseen by fund family f where manager m is employed during month t. To calculate the annual fund family flows, we time-aggregate the monthly fund family flows for each year. Similar to Ibert et al. (2018), we also compute the fund family flows with the flows of funds overseen by individual fund manager m excluded, as outlined below:

$$Family\_Flow_{m,t}^{(-m)} = \frac{\sum_{i \in \Omega_{m,f,t-1} \setminus \Omega_{m,t-1}} TNA_{i,t-1} \times Flow_{i,t}}{\sum_{i \in \Omega_{m,f,t-1} \setminus \Omega_{m,t-1}} TNA_{i,t-1}}. \tag{2.10}$$

We also establish and calculate the total return for the fund family, as well as the family return excluding those from funds specifically overseen by individual manager m.

Income Risk of Fund Managers. To summarize the income risk, particularly the flow and return risk faced by fund managers, we first calculate the time-series standard deviation of the growth rates of pay, base pay, bonus, and revenue, for each manager, conditional on the sample without job turnovers. We then compile and tabulate the cross-manager distribution of these standard deviations.

As illustrated in Panel C of Table 1, the average standard deviation of the log growth rates of manager pay is approximately 38.5%, with a significant number of fund managers encountering pay volatility as high as 50% and 96.9% at the 75th and 95th percentiles, respectively. This indicates that fund managers are exposed to considerable income risk. Not surprisingly, the growth rate of bonuses is much more volatile than that of base pay. The average standard deviation of the log growth rates of bonus is approximately 249.5%, with a significant number of fund managers facing bonus growth rate volatility as high as 414.4% and 594.8% at the 75th and 95th percentiles, respectively.

Importantly, the average and median standard deviations of the log growth rates of manager pay, at 38.5% and 29.1% respectively, are significantly higher than those for fund returns, which stand at 22.3% and 22% respectively. This suggests that income risk for fund managers stems from sources beyond just fund returns. As highlighted by the research of Dou, Kogan and Wu (2023), manager compensation is expected to be influenced greatly by fund revenue, which is affected not only by fund returns but also by fund flows. Thus, a significant portion of pay volatility is expected to be attributed to the volatility in fund flows. Fund managers indeed face significant variations in their fund flows, with the average, median, 75th, and 95th percentiles of flow volatility across managers being 30.2%, 24.5%, 34.5%, and 72.3%, respectively. In alignment with this, the bottom two rows of Panel B illustrate that the volatility in pay growth, with an average and median of 34.1% and 22.2% respectively, closely mirrors the volatility in revenue growth, which has an average and median of 29.6% and 26%, respectively, when focusing on the cases without job turnovers or AUM reallocation. Interestingly, when we concentrate on scenarios without job turnovers but do not exclude AUM reallocation, the average and median of revenue growth volatility increase to 55.2% and 42.6%, respectively. These figures are now considerably higher than the average and median of pay growth volatility, which stand at 38.5% and 29.1%, respectively. These observed patterns collectively indicate an active reallocation of AUM within a fund family among its mutual fund managers.[6]

[6]As emphasized by Berk, van Binsbergen and Liu (2017), such reallocation is critical, with their findings indicating that at least 30% of the value mutual fund managers add can be attributed to the firm's effective

Self-Disclosed Manager Salary Information in the SAI. Drawing from the text-based compensation structure disclosures in the SAI, which utilize sparse, ambiguous, and potentially misleading language, we establish two indicator variables. It's important to note that these variables are not mutually exclusive. The variable $D_{m,t}^{NonPerf}$ equals one if a manager's compensation is not tied to the fund's investment performance, and zero otherwise. In our sample, the average value of this indicator variable across manager-years is 0.149. Similarly, $D_{m,t}^{AUM}$ equals one if the manager's compensation is linked to the fund's AUM, and zero otherwise. The average value of this variable across fund manager-years in our sample is 0.096.

3 Empirical Analysis

In this section, we explore the factors influencing compensation and career outcomes for active equity fund managers, given the well-known fact that pay contracts in this sector are characterized by secrecy, non-transparency, and ambiguity. First, in Section 3.1, we explore the compensation structure of fund managers, including both base pay and bonus components, without a job turnover. We specifically delve into how AUM, fee revenue, fund flows, and return performance contractually influence a manager's compensation in the absence of job turnover. Subsequently, in Section 3.2, we investigate the compensation of managers after they move to new positions, analyzing how flows and return performance from their previous funds affect their compensation at new firms and career trajectories. Finally, in Section 3.3, we provide causal evidence pertaining to the contractual structure of manager compensation.

capital allocation among its managers.

3.1 Compensation Structure of Fund Managers

Relation Between Manager Compensation and AUM, Revenue, Return Performance, and Fund Flows. We start by exploring whether, and if so, how, the compensation of fund managers is affected by the fee revenue (and AUM) of the funds they manage, the fund flows they generate, and their return performance. Importantly, it's essential to recognize that the log levels of a manager's compensation, fee revenue, and AUM exhibit common stochastic trends. Their period-to-period changes are significantly influenced by identical stationary processes, such as portfolio returns and fund flows of the same manager within a single period. Intuitively, the log levels of a manager's compensation, fee revenue, and AUM should adhere to certain long-term equilibrium relationships. Deviations from these relationships are expected to be governed by stationary processes with mean zero, suggesting that these log levels are likely cointegrated, in line with economic theories. More specifically, a manager's fee revenue is typically a fixed fraction of the AUM they oversee. Meanwhile, due to optimal contractual arrangements in response to agency frictions and the labor market sorting equilibrium, a manager's compensation is closely linked to the revenue they generate. Therefore, to accurately estimate and statistically infer the cointegration coefficients defining the long-term equilibrium relationship between compensation and fee revenue (or AUM), one should avoid directly regressing log compensation on log fee revenue (or log AUM) due to concerns of spurious regression and the non-standard asymptotic distribution of the estimators (e.g., Granger and Newbold, 1974; Phillips, 1986). Specifically, the significance of the t-value for the OLS estimated cointegration coefficient is typically significantly overstated.

To address these empirical questions and econometric challenges, we utilize two methodologies. The first method involves panel dynamic ordinary least squares (panel DOLS) estimation, accompanied by heteroskedasticity and autocorrelation consistent (HAC) standard errors. The approach of DOLS for estimating cointegration coefficients traces back to Stock and Watson (1993). The HAC standard errors are derived using two-way cluster-robust standard errors, as described by Thompson (2011). This technique provides a more reliable approach for computing HAC standard errors compared to the conventional sandwich method, particularly when the cross-sectional dimension of the panel data significantly exceeds the time-series length (e.g., Stock and Watson, 2008). The significance of the t-value for the DOLS estimated cointegration coefficient is correct. Instead of relying on the lead and lag of period-to-period changes in log revenue (or log AUM) in the panel DOLS regression, we utilize the corresponding return performance and fund flow of the same fund manager, which are the primary drivers of the period-to-period changes in log revenue (and log AUM). Specifically, we conduct the following panel regression:

$$\ln(Pay_{m,t}) = \gamma \ln(Rev_{m,t-1}) + \sum_{\tau=-h}^{h} \gamma_\tau^{ret} \ln(1 + R_{m,t-1+\tau}) + \sum_{\tau=-h}^{h} \gamma_\tau^{flow} \ln(1 + Flow_{m,t-1+\tau}) + \theta_m + \delta_t + \varepsilon_{m,t}, \quad (3.1)$$

where $Pay_{m,t}$ is the compensation of fund manager m in year t, $Rev_{m,t-1}$ is the revenue produced by fund manager m during year $t-1$, as defined in (2.2), $R_{m,t-1+\tau}$ captures the gross return or risk-adjusted return relative to the market (or tradable indices) for the funds managed by m over year $t-1+\tau$, as defined in (2.8), $Flow_{m,t-1+\tau}$ represents the fund flow of the funds overseen by manager m over year $t-1+\tau$, as defined in (2.4), θ_m represents the manager fixed effect, δ_t represents the year fixed effect, and $\varepsilon_{m,t}$ is the error term. The annual compensation for a manager is calculated as the time-aggregation of quarterly compensations over that year. We only include a manager-year observation in our sample if all four quarterly compensations for the manager are positive. Our analysis draws from a sample of about 2,200 manager-year observations. To accommodate for aggregate time-series fluctuations in compensation that are common across all managers, year fixed effects are included. More critically, to ensure that the estimation accurately reflects the contractual structure of an individual fund manager's compensation, incorporating manager fixed effects is vital. The parameters of interest, γ, γ_0^{ret}, and γ_0^{flow}, are fundamental to our analysis, offering clear economic interpretations that we seek to identify and estimate. While γ captures the long-term equilibrium relationship between a manager's compensation and the associated fee revenue, γ_0^{ret} and γ_0^{flow} quantify the extent to which annual return performance and fund flow respectively contribute to the short-term deviations of a manager's compensation from its long-term equilibrium with the fee revenue. The estimation results are summarized in Table 2.

As depicted in Column (1) of Panel A in Table 2, the coefficient for fee revenue is positive and statistically significant. The magnitude of the pay-revenue sensitivity stands at roughly 0.23, noticeably less than 1. This indicates that the pass-through of fund revenues to compensation is not complete, suggesting a strong concave relation between compensation and fee revenue. Although the coefficient for fund performance in year $t-1$ is positive, its lack of statistical significance suggests that fund performance may not exert a significant direct impact on manager compensation in year t beyond its effect on fee revenue by the end of year $t-1$. In Column (2) of Panel A in Table 2, when introducing manager fixed effects, the results remain largely unchanged although the magnitude of the pay-revenue sensitivity further reduces to 0.119.

In Columns (3) and (4) of Panel A in Table 2, we consider fund flows over year $t-1$ rather than return performance over year $t-1$ as in columns (1) and (2). Although the coefficient for fund flows over year $t-1$ is positive, its lack of statistical significance suggests that fund flow may not exert a significant direct impact on manager compensation in year t beyond its effect on fee revenue by the end of year $t-1$. In Columns (5) and (6) of Panel A in Table 2, we include both the one-year lagged return performance and fund flow at the manager level as independent variables. We observe that the coefficients for both one-year lagged return performance and fund flow remain statistically insignificant. This outcome indicates that any potential impact of return performance and fund flow on a manager's total pay, if significant, primarily occurs through their effect on manager-level

Table 2: Panel DOLS for the dependence of total pay on revenue, performance, and flow.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Panel DOLS with fee revenue							
	$\ln(Pay_{m,t})$							
$\ln(Rev_{m,t-1})$	0.230***	0.119***	0.230***	0.122***	0.231***	0.122***	0.231***	0.119***
	[5.85]	[2.94]	[5.82]	[3.08]	[5.84]	[3.06]	[5.76]	[3.06]
$\ln(1 + R^{gross}_{m,t})$							0.188	−0.154
							[0.47]	[−0.77]
$\ln(1 + R^{gross}_{m,t-1})$	0.392	0.052			0.386	0.016	0.398	0.007
	[1.27]	[0.46]			[1.30]	[0.14]	[1.47]	[0.06]
$\ln(1 + Flow_{m,t})$							−0.025	−0.001
							[−0.24]	[−0.01]
$\ln(1 + Flow_{m,t-1})$			0.038	0.115	0.019	0.114	0.056	0.108
			[0.25]	[1.63]	[0.13]	[1.59]	[0.49]	[1.65]
Adjusted R^2	0.137	0.797	0.136	0.797	0.137	0.797	0.137	0.797
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: Panel DOLS with AUM							
	$\ln(Pay_{m,t})$							
$\ln(A_{m,t-1})$	0.225***	0.128***	0.226***	0.127***	0.225***	0.126***	0.225***	0.123***
	[5.89]	[3.29]	[5.88]	[3.23]	[5.89]	[3.22]	[5.81]	[3.23]
$\ln(1 + R^{gross}_{m,t})$							0.201	−0.133
							[0.49]	[−0.66]
$\ln(1 + R^{gross}_{m,t-1})$	0.290	0.031			0.317	0.015	0.239	0.060
	[0.93]	[0.27]			[1.05]	[0.17]	[0.91]	[0.48]
$\ln(1 + Flow_{m,t})$							−0.039	−0.001
							[−0.29]	[−0.01]
$\ln(1 + Flow_{m,t-1})$			0.023	0.068	0.027	0.071	0.048	0.068
			[0.20]	[0.95]	[0.22]	[0.97]	[0.42]	[1.03]
Adjusted R^2	0.139	0.797	0.139	0.797	0.139	0.798	0.139	0.798
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table explores the relationship between fund manager compensation and variables such as fee revenue, return performance, and fund flow, utilizing panel DOLS regressions for cointegration relationships. The dependent variable is the natural logarithm of the fund manager's compensation for year t. In Panel A, the independent variables comprise the natural logarithm of the fee revenue generated by the manager in year $t-1$, the log annual fund returns at the manager level for years t and $t-1$, and the natural logarithm of one plus the annual fund flows at the manager level for years t and $t-1$. Panel B includes as independent variables the natural logarithm of the AUM overseen by the manager at the end of year $t-1$, the log annual fund returns at the manager level for years t and $t-1$, and the natural logarithm of the annual fund flows at the manager level for years t and $t-1$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

fee revenue. Our findings are consistent with those reported by Ibert et al. (2018), who found that the compensation of Swedish mutual fund managers is primarily influenced by manager-level fee revenue, with any performance-sensitive compensation beyond fee revenue having a minimal effect on total pay.

To enhance the panel dynamic DOLS regression, we additionally adjust for one-year lead return performance and fund flow in Columns (7) and (8) of Panel A. This adjustment aims to secure potentially more reliable t-statistics for the coefficient representing the long-term equilibrium relationship associated with $\ln(Rev_{m,t-1})$. Notably, the magnitude of the estimated coefficient for $\ln(Rev_{m,t-1})$, denoted by γ, which captures the long-run equilibrium compensation structure, and its associated t-statistic, whether including or excluding the manager fixed effect, remain nearly identical to those reported in Columns (1) through (6). This consistency underscores the validity and robustness of the estimation and its t-statistics. Moreover, the magnitude of the estimated coefficients for $\ln(1 + R^{gross}_{m,t-1})$ and $\ln(1 + Flow_{m,t-1})$, denoted by γ_0^{ret} and γ_0^{flow} respectively, along with their associated t-statistics, both with and without the manager fixed effect, also closely match those detailed in Columns (1) through (6), further affirming the reliability of these estimations.

The sensitivity of pay to revenue is estimated at approximately 0.23 when excluding the manager fixed effect, and 0.12 when including it, across different econometric models. We stress the importance of incorporating the manager fixed effect to accurately identify and estimate the sensitivity of pay to revenue, which is a crucial aspect of the compensation contract for fund managers. Notably, our estimation of the pay-to-revenue sensitivity, at 0.12, for US mutual funds aligns closely with the estimation by Ibert et al. (2018) for Swedish mutual funds, reported as 0.123. It indicates that a 1% increase in fee revenue leads to an approximate 0.12% rise in compensation, suggesting that fund managers receive a relatively modest share of the additional fund fee revenue they generate. To illustrate the economic significance, consider that the median manager-level revenue is approximately \$4.033 million (calculated as $e^{15.21}$), while the median manager's compensation is \$400,312 (calculated as $e^{12.90}$). If the fee revenue doubles from \$4.033 million to \$8.066 million, the pay of a manager would increase from \$400,312 to approximately \$435,033, according to the formula $\ln(435033) - \ln(400312) = 0.12 \times (\ln(8.066) - \ln(4.033))$. Thus, the manager captures only \$34,721 of this \$4.033 million revenue increase, which is equivalent to 0.86%, while the remaining 99.14% benefits the fund family. Following this increase, the share of managerial pay in revenue drops from

9.93% to 5.39%.

In Panel B of Table 2, we replace fee revenue with AUM, and the results are very similar to those in Panel A in both the economic magnitude and statistical significance. Specifically, we find that the dependence of a manager's compensation on the AUM overseen by the same manager is significantly positive yet strongly concave, with γ estimated to be approximately 0.23 and 0.12, respectively, with and without the manager fixed effect, across various econometric specifications. Moreover, the estimated coefficients for one-year lagged return performance and fund flow, while positive, continue to be statistically insignificant. These outcomes corroborate the notion that return performance and fund flow predominantly impact compensation via their effects on AUM. The consistency observed across the results of the two panels is expected, given the high persistence of mutual fund expense ratios, meaning that fluctuations in fee revenue are primarily attributable to changes in AUM.

We perform a series of robustness tests for the results we show in Table 2. First, following the methodology of Ibert et al. (2018), we investigate the relationship between fund manager compensation and both fee revenue and return performance over extended evaluation periods. Specifically, in Columns (1) through (4) of Table OA.1 in the Online Appendix 2, we include the returns of fund managers for the years $t-1$, $t-2$, $t-3$, and $t-4$ as independent variables. Additionally, in Columns (3) and (4) of Table OA.1, we substitute fee revenue with fee revenue orthogonalized to current and lagged return performance, incorporating it into our set of independent variables. Our findings confirm that both fund revenue and orthogonalized revenue significantly move in tandem with compensation, while historical returns and fund flows lack a significant influence on compensation after controlling for revenues. These findings indicate that compensation is not mainly influenced by the investment prowess of fund managers. Instead, it is largely driven by aspects of fund flows that do not relate to skills. This perspective could help explain why a very small portion of additional fund revenue is passed on to fund managers. These results also resonate with earlier research investigating the role of marketing in the investment allocation process, further contributing to the debate on the relative importance of investment skill versus salesmanship skill (e.g., Roussanov, Ruan and Wei, 2021).

Second, we address the potential concern that mutual funds may base their manager compensation on risk-adjusted excess returns (i.e., alphas) instead of gross returns (or excess returns relative to a common benchmark). Since we incorporate year fixed effects, replacing gross returns with any excess returns relative to a common benchmark, like the market return, would not affect the results whatsoever. To tackle this issue, we employ the CAPM alpha relative to the S&P 500 index return and the Vanguard-index alpha relative to Vanguard index fund benchmark portfolio returns. The outcomes are consistent. As illustrated in Table OA.2 in the Online Appendix 2, the coefficients for the risk-adjusted returns remain statistically insignificant after controlling for fee revenues.

Finally, we acknowledge a limitation in our dataset stemming from the absence of data from the state of New York, a common issue for research projects reliant on LEHD data. The LEHD data necessitates authorization from each state, and our project has obtained access to data from 17 states, achieving coverage comparable to that of many research projects. Nevertheless, the unavailability of data from New York raises concerns regarding the representativeness of our findings for the compensation structure of fund managers in major financial centers, notably New York City. However, these concerns are likely not significant for two reasons. First, the US fund manager labor market is notably fluid, making it unlikely that compensation contracts in New York City would significantly differ from those in other regions of the country. Second, our dataset includes Chicago, another major financial center, via Illinois. If compensation contracts for managers in financial centers were distinctly different, discrepancies in our findings should be apparent upon the exclusion of such centers. Yet, as illustrated in Table OA.4 in the Online Appendix 2, our results remain unchanged after excluding Chicago from the analysis, indicating that omitting financial centers like New York and Chicago does not materially affect our conclusions.

The second method leverages the concept of error correction models (ECM) to address cointegration relationships and related econometric challenges (e.g., Engle and Granger, 1987). Specifically, we consider the following panel regressions:

$$\Delta \ln(Pay_{m,t}) = \phi \left[\ln(Pay_{m,t-1}) - \gamma \ln(A_{m,t-2})\right] + \varphi \Delta \ln(A_{m,t-1}) + \theta_m + \delta_t + \varepsilon_{m,t}, \quad (3.2)$$

where $Pay_{m,t}$ represents the total compensation of manager m in year t, $A_{m,t}$ denotes the AUM of all funds overseen by m in year t, the term $\Delta \ln(Pay_{m,t}) = \ln(Pay_{m,t}/Pay_{m,t-1})$ calculates the year-over-year percentage change in pay, $\Delta \ln(A_{m,t-1}) = \ln(A_{m,t-1}/A_{m,t-2})$ measures the percentage change in year-end AUM from the previous year, and the term $\ln(Pay_{m,t-1}) - \gamma \ln(A_{m,t-2})$ quantify the short-run deviation from the long-term equilibrium relationship between a fund manager's pay and AUM, as established in the cointegration framework.

The period-to-period change in log AUM on right hand side of (3.2), $\Delta \ln(A_{m,t-1})$, is mainly driven by the fund return over year $t-1$, denoted by $\ln(1 + R^{gross}_{m,t-1})$, the fund flow over the same year, denoted by $\ln(1 + Flow_{m,t-1})$, and the AUM reallocation for manager m within the fund family during year $t-1$. Thus, this accounting identity can be approximately expressed as follows:

$$\Delta \ln(A_{m,t}) \approx \varsigma^{ret} \ln(1 + R^{gross}_{m,t}) + \varsigma^{flow} \ln(1 + Flow_{m,t}) + AUM\_Reallocation_{m,t}, \quad (3.3)$$

where ς^{ret} and ς^{flow} are approximation constants.

According to the estimation results of the panel cointegration model (3.1), summarized in Table 2, the short-run deviation from the long-term (cointegrated) equilibrium relationship, $\ln(Pay_{m,t-1}) - \gamma \ln(A_{m,t-2})$, is not significantly influenced by return performance $\ln(1 + R^{gross}_{m,t-1})$ or fund flow $\ln(1 + Flow_{m,t-1})$. Thus, plugging (3.3) into (3.2), the

Table 3: Relation of compensation growth with return performance and fund flow.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\Delta \ln(Pay_{m,t})$											
$\ln(1+Flow_{m,t})$	0.019	0.068							0.014	0.059		
	[0.47]	[1.28]							[0.34]	[1.11]		
$\ln(1+Flow_{m,t-1})$	0.073**	0.145**	0.167***	0.199**					0.071**	0.140**	0.154***	0.184**
	[2.51]	[2.60]	[5.21]	[2.52]					[2.57]	[2.61]	[5.85]	[2.48]
$\ln(1+Flow_{m,t-2})$			−0.080	−0.074							−0.078	−0.076
			[−1.41]	[−1.18]							[−1.33]	[−1.15]
$\ln(1+R^{gross}_{m,t})$					−0.016	0.093			−0.007	0.117		
					[−0.11]	[0.58]			[−0.05]	[0.68]		
$\ln(1+R^{gross}_{m,t-1})$					0.271***	0.386***	0.286*	0.402**	0.251***	0.338**	0.211	0.331*
					[3.37]	[3.11]	[1.95]	[2.44]	[3.43]	[2.79]	[1.41]	[2.07]
$\ln(1+R^{gross}_{m,t-2})$							0.209*	0.366**			0.194	0.358**
							[1.80]	[2.58]			[1.45]	[2.51]
Adjusted R^2	0.044	0.149	0.098	0.183	0.043	0.144	0.094	0.180	0.046	0.152	0.100	0.187
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of total pay growth with return performance and fund flows. The dependent variable is the growth in fund managers' total pay over year t, calculated as the year-over-year change in the natural logarithm of a fund manager's total pay in year t relative to year $t-1$. The independent variables comprise the natural logarithm of the annual fund flows at the manager level for years t, $t-1$, and $t-2$, as well as the natural logarithm of one plus the annual fund returns at the manager level for the same years t, $t-1$, and $t-2$. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

relationship between manager pay, return performance, and fund flow can be largely captured by the following regression model:

$$\Delta \ln(Pay_{m,t}) = \varphi^{ret} \ln(1+R^{gross}_{m,t-1}) + \varphi^{flow} \ln(1+Flow_{m,t-1}) + \theta_m + \delta_t + \widetilde{\varepsilon}_{m,t}, \quad (3.4)$$

where the error term $\widetilde{\varepsilon}_{m,t}$ comprises the error term $\varepsilon_{m,t}$, as defined in equation (3.3), the deviation term $\ln(Pay_{m,t-1}) - \gamma \ln(A_{m,t-2})$ representing the short-run deviation from the long-term equilibrium between a manager's pay and AUM, and the effect of AUM reallocation among fund managers within a fund family.

Table 3 displays the estimation results from the regression specified in equation (3.4). Similar to the methodology in Table 2, the annual compensation for managers is calculated as the sum of their quarterly compensation throughout the year. To ensure accuracy and prevent scenarios where managers work only part of the year, we require that all quarterly compensations be positive, facilitating a meaningful comparison of the compensation growth rate. In line with Table 2, our analysis draws on a sample of approximately

2,200 manager-year observations. In the regressions, we incorporate year fixed effects to adjust for aggregate changes in compensation growth rate, return performance, and fund flows that are common across all managers. As emphasized in the panel DOLS regression setting, incorporating manager fixed effects is crucial to guarantee that the estimation precisely captures the contractual structure of an individual fund manager's compensation.

As illustrated in Table 3, the percentage change in a manager's compensation from year $t-1$ to t is significantly and positively associated with the return performance and fund flow of the same fund manager during year t. In Columns (2), (4), (10), and (12), where both manager and year fixed effects are applied, the coefficient for $\ln(1+Flow_{m,t-1})$ is consistently estimated to range between 0.140 and 0.199, exhibiting robust statistical significance across different econometric specifications. Furthermore, in Columns (6), (8), (10), and (12), with the application of both manager and year fixed effects, the coefficient for $\ln(1+R^{gross}_{m,t-1})$ is reliably estimated to lie between 0.331 and 0.402, also showing robust statistical significance across different econometric specifications. These effects are also economically significant. From Panel A of Table 1, the standard deviation for $\ln(1+Flow_{m,t-1})$ is computed as 0.327, and for $\ln(1+R^{gross}_{m,t-1})$, it is 0.221. A one-standard-deviation increase in fund flow (i.e., an increase in $\ln(1+Flow_{m,t-1})$ by 0.327) is associated with a 6.50% rise in manager pay (calculated as 0.327×0.199). In a similar vein, a one-standard-deviation increase in return performance (i.e., an increase in $\ln(1+R^{gross}_{m,t-1})$ by 0.221) is associated with a 8.88% increase in manager pay (calculated as 0.221×0.402).

Furthermore, if the significant impact of return performance and fund flow on a fund manager's compensation primarily operates through their effects on the year-over-year change in AUM (and consequently revenue), as detailed in equation (3.3), rather than through their influence on the short-term deviation from the long-term equilibrium relationship between manager compensation and AUM, then it is the gross return, rather than the risk-adjusted excess returns, that should be relevant for the percentage change

Table 4: Relation of compensation growth with different measures for return performance.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$\Delta \ln(Pay_{m,t})$									
$\ln(1+R^{gross}_{m,t-1})$	0.277**	0.359**					0.281**	0.391**	0.253*	0.307**
	[2.64]	[2.29]					[2.72]	[2.51]	[1.94]	[2.22]
$\ln(1+R^{gross}_{m,t-2})$									0.217*	0.209*
									[1.86]	[1.78]
$\ln(1+R^{abn,capm}_{m,t-1})$			0.169	0.366			−0.062	−0.078	−0.137	−0.234
			[0.71]	[1.54]			[−0.16]	[−0.18]	[−0.49]	[−0.62]
$\ln(1+R^{abn,capm}_{m,t-2})$									−0.182	−0.259
									[−0.71]	[−0.87]
$\ln(1+R^{abn,van}_{m,t-1})$					0.198	0.490**	0.258	0.387	0.262	0.489*
					[0.52]	[2.15]	[0.60]	[1.42]	[0.61]	[1.77]
$\ln(1+R^{abn,van}_{m,t-2})$									0.017	0.196
									[0.04]	[0.53]
$\ln(1+Flow_{m,t-1})$									0.147***	0.263**
									[2.81]	[2.36]
$\ln(1+Flow_{m,t-2})$									−0.044	−0.036
									[−0.71]	[−0.56]
Adjusted R^2	0.244	0.315	0.242	0.314	0.242	0.314	0.245	0.316	0.311	0.429
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of compensation growth with flow and different performance measures. The dependent variable is the compensation growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's labor income between year t and year $t-1$. The independent variables include the natural log of the annual fund flows at the manager level in years $t-1$ and $t-2$, and log annual fund returns (gross returns, CAPM alphas, and the Vanguard excess returns) at the manager level in years $t-1$ and $t-2$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

in manager compensation. To test this hypothesis, we conduct a horse race comparison among gross returns, CAPM alphas, and risk-adjusted excess returns relative to the Vanguard index fund benchmark returns. Since we require non-missing observations for risk-adjusted return measures, the analysis is based on a sample of around 2,000 manager-year observations. The results are presented in Table 4. In Columns (1) and (2), we regress log pay changes from year $t-1$ to t on gross returns over year $t-1$. We find that the coefficient is positive and statistically significant. In Columns (3) and (4), we use the abnormal returns estimated based on the CAPM model as the return performance measure. The coefficient becomes statistically insignificant. In Columns (5) and (6), we use the abnormal returns based on the Vanguard indexes as the return performance measure. We find that the coefficient is statistically significant only when both manager and year fixed effects are included. We then include all three return performance measures as independent variables in Columns (7) and (8) to conduct a horse race comparison. We find that the coefficient for the gross returns remains positive and statistically significant, while the coefficients for these two risk-adjusted returns become statistically insignificant. In Columns (9) and (10), we expand our set of independent variables to include fund flows from years $t-1$ and $t-2$, as well as both gross and risk-adjusted returns from year $t-2$. Our findings consistently reveal that among the three measures of return performance, the coefficients for gross returns are almost exclusively significant. Taken together, the results presented in Table 4 indicate that mutual funds appear to base manager compensation on gross returns rather than on risk-adjusted excess returns. This can be attributed to the direct association of gross returns with changes in AUM, which consequently influence changes in fee revenue. Conversely, risk-adjusted returns do not have a direct connection to fluctuations in AUM.

Base Pay and Bonus Structures of Fund Managers. We further decompose the total compensation of a fund manager into base pay and bonus, and then we examine their relations with AUM, fee revenue, return performance, and fund flows. Specifically, similar to we conduct panel DOLS regressions of base pay and bonus on lagged fee revenue,[7] return, and flow, focusing on the subsample where bonuses are disbursed in the first quarter of the year. This specific subsample includes around $1,400$ manager-year observations. The findings remain consistent even when this filtering criterion is not applied.

Table 5 presents the findings. Our attention is on the regression specifications that include both manager and year fixed effects, to guarantee that the estimation accurately reflects the contractual framework of a fund manager's compensation. As shown in Columns (2), (4), and (6) of Panel A, the base pay, like the total pay, demonstrates a strong and significant long-term equilibrium relationship with fee revenue (and thereby AUM), with a consistent magnitude of approximately 0.077 across various specifications.

[7] In Table OA.5 of Online Appendix 2, we replace revenue with AUM and find very similar results.

Additionally, akin to total pay, the short-term deviation from the long-term (cointegrated) equilibrium relationship between a manager's base pay and fee revenue is not significantly affected by return performance, as denoted by $\ln(1+R^{gross}_{m,t-1})$, or by fund flow, as denoted by $\ln(1+Flow_{m,t-1})$. A manager's base pay is significantly influenced by the fee revenue they generate, exhibiting a highly concave relationship, which is even more pronounced than that observed with total pay. The estimation of the base-pay-to-revenue sensitivity, at 0.077, is much smaller than that of the pay-to-revenue sensitivity, reported as 0.12. It indicates that a 1% increase in fee revenue leads to an approximate 0.077% rise in base pay, suggesting that fund managers receive a relatively tiny share of the additional fund fee revenue they generate as the base pay. To illustrate the economic significance, consider that the median manager-level revenue is approximately \$4.033 million (calculated as $e^{15.21}$), while the median manager's base pay is \$299,539 (calculated as $e^{12.61}$). If the fee revenue doubles from \$4.033 million to \$8.066 million, the base pay of a manager would increase from \$299,539 to approximately \$315,960, according to the formula $\ln(315960) - \ln(299539) = 0.077 \times (\ln(8.066) - \ln(4.033))$. Thus, the manager captures only \$16,421 of this \$4.033 million revenue increase in the base pay.

As shown in Columns (8), (10), and (12) of Panel A, the bonus, like the total pay and the base pay, demonstrates a strong and significant long-term equilibrium relationship with fee revenue (and thereby AUM), with a consistent magnitude of approximately 0.396 across various specifications. Intuitively, the long-run equilibrium relationship of bonuses with fee revenue is much more convex, yet still concave, compared to the relationship of base pay with fee revenue. Importantly, the pattern for bonuses contrasts with that of base pay, particularly in terms of its dependency on return performance. Unlike base pay, the short-term deviation from the long-term (cointegrated) equilibrium relationship between a manager's bonus and fee revenue is significantly influenced by return performance, denoted by $\ln(1+R^{gross}_{m,t-1})$, though it remains unaffected by fund flow, denoted by $\ln(1+Flow_{m,t-1})$. Our findings based on bonus are consistent with

Table 5: Panel DOLS for the dependence of base pay and bonus on revenue, performance, and systematic and idiosyncratic flows.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Panel A: Panel DOLS for base pay and bonus											
	$\ln(Base_{m,t})$						$\ln(Bonus_{m,t})$					
$\ln(Rev_{m,t-1})$	0.156***	0.075**	0.156***	0.080**	0.156***	0.077**	0.577***	0.399**	0.577***	0.380**	0.576***	0.396**
	[4.86]	[2.19]	[4.86]	[2.40]	[4.86]	[2.25]	[3.31]	[2.03]	[3.30]	[2.10]	[3.30]	[2.18]
$\ln(1+R^{gross}_{m,t-1})$	0.065	−0.139			0.079	−0.178	0.630	0.737**			0.551	0.784**
	[0.22]	[−0.85]			[0.29]	[−1.01]	[0.63]	[2.08]			[0.56]	[2.08]
$\ln(1+Flow_{m,t-1})$			0.025	0.094	0.030	0.103			0.194	0.215	0.161	0.128
			[0.16]	[1.58]	[0.20]	[1.56]			[0.31]	[0.57]	[0.25]	[0.34]
Adjusted R^2	0.080	0.757	0.080	0.757	0.080	0.757	0.054	0.774	0.054	0.773	0.054	0.774
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Panel DOLS for base pay and bonus with systematic and idiosyncratic flows					
	$\ln(Pay_{m,t})$		$\ln(Base_{m,t})$		$\ln(Bonus_{m,t})$	
$\ln(Rev_{m,t-1})$	0.225***	0.123***	0.152***	0.077**	0.558***	0.385**
	[5.03]	[2.93]	[3.90]	[2.01]	[3.02]	[2.11]
$\ln(1+R^{gross}_{m,t-1})$	0.371	0.049	0.222	−0.075	0.566	0.740*
	[0.90]	[0.32]	[0.66]	[−0.48]	[0.73]	[1.78]
$\ln(1+Systematic\ Flow_{m,t-1})$	0.211	0.186	0.214	0.246	0.198	−0.199
	[0.65]	[0.62]	[0.68]	[0.86]	[0.50]	[−0.43]
$\ln(1+Idiosyncratic\ Flow_{m,t-1})$	−0.013	0.130	−0.089	−0.084	0.354*	0.433*
	[−0.09]	[1.60]	[−0.52]	[−1.08]	[1.78]	[1.70]
Adjusted R^2	0.153	0.817	0.084	0.760	0.063	0.848
Manager FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of the levels of base pay and bonus with fee revenue, return performance, and systematic and idiosyncratic fund flows. In Panel A, the dependent variable in columns (1) – (6) is the natural log of the fund manager's base pay in year t. The dependent variable in columns (7) – (12) is the natural log of the fund manager's bonus in year t. To estimate a fund manager's bonus in a year, we first identify the highest paid quarter during a year as the "bonus quarter" if the pay during the highest paid quarter is at least 20% higher than the average pay during its two neighboring quarters. A fund manager's bonus pay in year t is defined as the pay in a bonus quarter in year t minus the average pay of the same fund manager in the two neighboring quarters. The base pay during year t is defined as the annual pay of a fund manager minus the bonus pay of the same manager during year t. We focus on the subsample where bonus is paid during the first quarter of the year for consistency. The independent variables include the natural log of the revenue generated by the manager in year $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the natural log of the annual fund flows at the manager level in year $t-1$. In Panel B, the dependent variables are the natural log of the fund manager's total pay, base pay, and bonus in year t. We further decompose the fund flows into systematic and idiosyncratic flows at the manager level, which are then used to replace the fund flows in the independent variables. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

the predictions of contract theory literature, which suggests that a portion of a fund manager's compensation is likely directly tied to fund return performance, especially in scenarios where the manager's abilities are uncertain.

Dou, Kogan and Wu (2023) show that fund flows in active mutual funds feature a common component driven by macroeconomic shocks, with fund managers particularly focused on these systematic fund flows. A key concept from Berk and Green (2004)

Table 6: Growth of total, base, and bonus pay vs. systematic and idiosyncratic flows.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Panel A: Relation of base pay and bonus growth with return performance and fund flow											
	$\Delta \ln(Base_{m,t})$						$\Delta \ln(Bonus_{m,t})$					
$\ln(1 + Flow_{m,t-1})$	0.132***	0.236***			0.126***	0.229***	0.258**	0.582***			0.238**	0.423***
	[3.55]	[3.08]			[3.39]	[3.87]	[2.60]	[2.77]			[2.39]	[2.76]
$\ln(1 + R^{gross}_{m,t-1})$			0.347**	0.252*	0.293**	0.133			0.573**	0.709*	0.508*	0.687*
			[2.46]	[1.70]	[2.04]	[1.18]			[2.14]	[1.94]	[1.87]	[1.88]
Adjusted R^2	0.048	0.217	0.044	0.197	0.052	0.214	0.040	0.190	0.040	0.182	0.046	0.195
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Relation of compensation growth with systematic and idiosyncratic flows					
	$\Delta \ln(Pay_{m,t})$		$\Delta \ln(Base_{m,t})$		$\Delta \ln(Bonus_{m,t})$	
$\ln(1 + Systematic\ Flow_{m,t})$	0.698**	0.718**	0.718*	0.737**	0.604	0.589
	[2.53]	[2.54]	[1.87]	[2.60]	[1.21]	[1.33]
$\ln(1 + Idiosyncratic\ Flow_{m,t})$	0.167*	0.195	−0.020	−0.014	0.197	0.243
	[1.75]	[1.48]	[−0.23]	[−0.12]	[1.60]	[1.66]
$\ln(1 + Systematic\ Flow_{m,t-1})$	−0.090	−0.052	−0.058	0.108	−0.123	−0.088
	[−1.27]	[−1.22]	[−0.77]	[0.41]	[−0.60]	[−0.33]
$\ln(1 + Idiosyncratic\ Flow_{m,t-1})$	0.256**	0.150**	0.220	−0.048	0.276**	0.163**
	[2.81]	[2.15]	[1.71]	[−0.32]	[2.47]	[2.29]
Adjusted R^2	0.027	0.083	0.022	0.105	0.016	0.055
Year FE	No	Yes	No	Yes	No	Yes

Notes. This table examines the relation of the growth in a manager's total pay, base pay, and bonus with return performance, systematic, and idiosyncratic fund flows. In Panel A, the dependent variables are the growth in fund managers' base pay and bonus over year t, respectively, calculated as the year-over-year change in the natural logarithm of a fund manager's base pay or bonus in year t relative to year $t-1$. Panel B of this table explores the relationship between the growth in a manager's total pay, base pay, and bonus, and both systematic and idiosyncratic fund flows. The independent variables include the natural log of one plus the annual systematic and idiosyncratic flows at the manager level in years t and $t-1$. For both panels, standard errors are double-clustered at both the manager and year levels, and the sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

and Berk and van Binsbergen (2016) is that idiosyncratic cross-fund flows mirror the unique skills of fund managers. This leads to a pivotal question: How do fund managers' compensation and its components, such as base pay and bonuses, react to systematic and idiosyncratic fund flows? To address this, we analyze fund flows further, dissecting them into systematic and idiosyncratic components to examine their relationship with total compensation, base pay, and bonuses, as detailed in Panel B of Table 5. According to the definitions in (2.6) and (2.7), systematic flows capture the portion of fund flows that comove with the common fund flows, while idiosyncratic flows are the residual component, which primarily captures the idiosyncratic cross-fund flows. Because we use a three-year rolling window to construct the systematic and idiosyncratic flow measures, the sample size for this analysis is reduced to approximately 900 manager-year observations. Column (2) of Panel B reveals that, upon incorporating both manager and year fixed effects, the long-term equilibrium relationship coefficient for $\ln(Rev_{m,t-1})$ is 0.123, closely aligning with the estimations presented in Table 2 and Ibert et al. (2018), who analyze Swedish data. Furthermore, Column (4) of Panel B illustrates that the long-term equilibrium relationship of base pay with $\ln(Rev_{m,t-1})$ is estimated at 0.077, which also closely matches the estimations presented in Panel A of Table 5. Importantly, Column (6) of Panel B highlights that the long-run equilibrium relationship between a manager's bonus and fee revenue is consistently around $0.39. Furthermore, both return performance and idiosyncratic fund flows significantly influence the short-term deviation from the long-term equilibrium relationship between a manager's bonus level and fee revenue level. In contrast, systematic fund flows do not have a significant impact beyond their effect on fee revenue or AUM. These findings align with economic intuition. Bonuses are designed to incentivize the generation of high returns and the attraction of fund flows from other fund companies, particularly in scenarios where fund managers' abilities or efforts are latent, thereby influencing short-term deviations from the established long-run compensation structure based on fee revenue or AUM. While both return performance and idiosyncratic fund flows significantly influence a manager's bonus beyond their effects on fee revenue or AUM, their impact on a manager's total pay, in addition to their effects on fee revenue or AUM, is moderated because bonuses constitute only a relatively small fraction of the total compensation for a typical manager in our sample.

Further, Table 6 presents the estimation results on how the growth of a manager's total pay, base pay, and bonus would depend on their systematic and idiosyncratic fund flows. Building on the idea highlighted in equation (3.2) through (3.4), the robust and significant long-term equilibrium relationships identified between the level of base pay (or bonus) and the level of fee revenue (or AUM) suggest that there are strong and significantly positive associations between the growth of base pay and bonus with return performance

Table 7: Compensation growth and AUM growth without AUM reallocation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta \ln(Pay_{m,t})$							
$\ln(1 + Flow_{m,t-1})$	0.227***	0.249**			−0.125	−0.283		
	[2.81]	[2.23]			[−0.76]	[−1.02]		
$\ln(1 + R^{gross}_{m,t-1})$			0.364**	0.546**			0.067	0.225
			[2.20]	[2.07]			[0.43]	[0.84]
$\Delta \ln(A_{m,t-1})$					0.310**	0.408**	0.231***	0.252**
					[2.12]	[2.09]	[2.93]	[2.33]
Adjusted R^2	0.254	0.396	0.251	0.394	0.317	0.399	0.286	0.399
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of total pay growth with AUM growth. We focus on the subsample without AUM reallocation among managers. Specifically, we require that there be no change in the set of fund shares overseen by manager m or in the number of co-managers for manager m in year $t-1$. The dependent variable is the compensation growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's labor income between year t and year $t-1$. The independent variables include the natural log of the annual fund flows at the manager level in year $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the growth of AUM in year $t-1$, calculated as the difference in the natural log of AUM between the last month of year $t-1$ and the last month of year $t-2$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

and fund flow. Panel A of Table 6 shows that this hypothesis is strongly supported in the data. Moreover, Panel B of Table 6 illustrates that although both systematic and idiosyncratic flows positively correlate with the growth in total pay, they exhibit two distinct patterns. First, systematic flows show a contemporaneous correlation with the growth in total pay, while idiosyncratic flows tend to correlate with the growth in total pay in the following year. Second, the correlation between systematic flows and compensation growth is more evident in base pay, whereas the correlation between idiosyncratic flows and compensation growth is more pronounced in bonuses. These differences can be attributed to the fact that common fund flows are responsive to macroeconomic conditions, prompting mutual fund companies to promptly adjust base pay to remain competitive with the external options available to their fund managers. On the other hand, adjusting manager bonus based on idiosyncratic flows likely requires more time, as firms need to carefully evaluate and compare each manager's individual performance and inherent capabilities.

AUM Growth without AUM Reallocation. We now directly assess whether AUM growth can encapsulate the effects of return performance and fund flow on pay growth, as suggested by our empirical results thus far. For a precise examination, we focus on cases where the portfolio of funds managed by a manager remains unchanged throughout the year. Moreover, since a fund's AUM can be allocated among its co-managers and manager-level AUM is used to convert fund-level flows and returns to manager-level measures, maintaining a constant number of co-managers throughout the year is crucial. This analysis is based on around $1,300$ manager-year observations. As detailed in the Online Appendix, the main results remain consistent after conditioning on the absence of AUM reallocation among managers. Conditioning on the subsample without AUM reallocation, the approximate accounting identity in (3.3) can be rewritten as

$$\Delta \ln(A_{m,t}) \approx \varsigma^{ret} \ln(1 + R^{gross}_{m,t}) + \varsigma^{flow} \ln(1 + Flow_{m,t}). \tag{3.5}$$

Moreover, in our analysis, by conditioning on the absence of AUM reallocation among managers, we avoid ambiguous impacts from potential AUM reallocation at unseen times of the year on the growth of total pay, base pay, or bonus. Therefore, we anticipate that the significant impact of return performance and fund flow on compensation growth will be entirely accounted for by AUM growth. Table 7 presents the direct evidence that supports this hypothesis.[8] Columns (1) through (4) reveal that within the subsample excluding AUM reallocation, the influence of return performance and fund flow on total pay growth is estimated at 0.546 and 0.249, respectively, after controlling for both manager and year fixed effects. These estimates are of comparable economic magnitude and statistical significance to the findings presented in Table 3. Conversely, Columns (5) through (8) demonstrate that, after controlling for AUM growth, the impact of return performance and fund flow on total pay growth significantly diminishes in magnitude and loses statistical significance, suggesting that they affect the total pay growth through

[8] Similar results hold for base pay and bonus, which can be found in the Online Appendix.

their influences on AUM growth.

Self-Disclosed Fund Manager Compensation Structure. We emphasize that the textual details regarding managers' salaries, obtained from the sparse and unclear language in the SAI, are probably designed to be deliberately ambiguous or even misleading. Utilizing precise compensation data for fund managers, we evaluate the accuracy or informativeness of the self-reported compensation structure of fund managers in the SAI. To achieve this, we create two indicator variables related to compensation contracts from the SAIs in year $t-1$. The first indicator variable, $D_{m,t-1}^{NonPerf}$, is set to one for managers working in funds that do not specify performance-based pay in their SAIs. The second indicator variable, $D_{m,t-1}^{AUM}$, is set to one for managers working in funds that mention AUM-based pay in their SAIs. Similar to Ma, Tang and Gómez (2019), we also find that a large majority of managers (85.1% in the merged sample) work in mutual funds that report investment performance-based pay in their SAIs, whereas only a small fraction of managers (9.6% in the merged sample) work in funds that explicitly report AUM-based pay.

We examine the interaction of these indicators with both return performance and fund flow, including them in our set of independent variables for analysis. Due to data availability of SAIs, the analysis is based on a sample spanning from 2005 to 2014 and containing around 1,100 manager-year observations. Table 8 reveals that the coefficients for these interaction terms are not statistically significant. This indicates that, irrespective of the compensation structures self-disclosed in the SAI, funds seem to compensate their managers in a similar manner, focusing on return performance and fund flow, predominantly via their impacts on AUM growth. For example, as indicated in Column (3) of Table 8, for funds that do not explicitly mention AUM-based compensation, fund flow significantly and positively correlates with compensation growth. Similarly, for funds that declare investment performance-based compensation in their SAIs, fund flow

Table 8: Assessing the accuracy of the SAI self-reported manager compensation structure.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\ln(Pay_{m,t})$					
$\ln(1+Flow_{m,t-1})$	0.136***	0.081**	0.145***			
	[4.50]	[2.31]	[5.41]			
$D^{NonPerf}_{m,t-1} \times \ln(1+Flow_{m,t-1})$		0.171				
		[1.11]				
$D^{AUM}_{m,t-1} \times \ln(1+Flow_{m,t-1})$			−0.131			
			[−0.90]			
$\ln(1+R^{gross}_{m,t-1})$				0.518***	0.480***	0.518***
				[3.58]	[2.86]	[3.08]
$D^{NonPerf}_{m,t-1} \times \ln(1+R^{gross}_{m,t-1})$					0.091	
					[0.52]	
$D^{AUM}_{m,t-1} \times \ln(1+R^{gross}_{m,t-1})$						−0.002
						[−0.00]
Adjusted R^2	0.373	0.375	0.374	0.373	0.374	0.373
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table evaluates the accuracy or informativeness of the self-reported compensation structure of fund managers in the SAI. The dependent variable is the compensation growth of fund managers in year t, which is the difference in the natural log of the fund manager's labor income in year t compared to year $t-1$. We construct two indicator variables for compensation contracts based on the SAIs in year $t-1$. The first indicator variable, $D^{NonPerf}_{m,t-1}$, equals one for managers who work in funds that do not mention performance-based pay in their SAIs. The second indicator variable, $D^{AUM}_{m,t-1}$, equals one for managers who work in funds that mention AUM-based pay in their SAIs. The independent variables include the natural log of the annual fund flows at the manager level in year $t-1$, the interaction terms between flow and the two indicator variables for compensation contracts, the natural log of the annual fund returns at the manager level in year $t-1$, and the interaction terms between returns and the two indicator variables for compensation contracts. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2005 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

also shows a significant and positive correlation with compensation growth, as illustrated in Column (2) of Table 8). These findings cast doubt on the credibility and clarity of the compensation structures self-disclosed in SAIs.

A probable reason for this discrepancy may be the strategic marketing motives of fund companies. It seems likely that funds would have a strong incentive to depict their managers' compensation as being directly aligned with the return performance outcomes desired by potential investors. Our results imply that investors should approach the language used in these disclosures with caution. Instead of equating the word "performance" in the SAIs to return performance, we should recognize that it might also encompass fund asset growth (i.e., flows). More generally, our findings are related to studies on the strategic disclosures of mutual funds. For example, it has been shown that there are substantial mismatches between the stated investment objectives and actual styles of mutual funds (e.g., Brown and Goetzmann, 1997; DiBartolomeo and Witkowski, 1997) and between the stated risk classifications of fund holdings and the actual risk exposures (e.g., Chen, Cohen and Gurun, 2021).

Fund Family Return Performance and Fund Flows. Previous studies document cross-fund subsidization phenomena (e.g., Gaspar, Massa and Matos, 2006; Bhattacharya, Lee and Pool, 2013) and show the existence of both competition and cooperation within mutual fund families (e.g., Evans, Prado and Zambrana, 2020). In this section, we investigate how a fund manager's compensation is affected by their family-level return performance and fund flows. Specifically, we conduct a regression analysis of fund managers' compensation growth against the AUM-weighted return performance and fund flows of their respective fund families. Following Ibert et al. (2018), we exclude the return performance and fund flows of those funds managed by the individual manager when computing these family-level measures. Table 9 presents our findings. Our observations indicate that fund family flows comove with compensation growth. This comovement is primarily evident in base pay rather than bonus. These patterns are consistent with the findings of Ibert et al. (2018) from Swedish data. Such findings imply that, akin to the Swedish context, the compensation structure for US fund managers likely incorporates elements derived from a collective fund-family compensation pool, suggesting a risk-sharing mechanism among fund managers within the same fund family.

In addition, Table 9 also reveals that fund family return performance comove negatively with the compensation growth of a fund manager, although the significance of this correlation appears marginal. This observation could be attributed to competition among fund managers within the same mutual fund family, as suggested by previous literature on mutual fund tournaments (e.g., Brown, Harlow and Starks, 1996; Kempf and Ruenzi, 2008; Evans, Prado and Zambrana, 2020). This observation also indicates that return performance and fund flows at the fund-family level have distinct, and even opposing,

Table 9: Relation of compensation growth with the returns and flows of fund families.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\Delta \ln(Pay_{m,t})$				$\Delta \ln(Base_{m,t})$				$\Delta \ln(Bonus_{m,t})$			
$\ln(1 + Family\ Flow_{m,t-1}^{(-m)})$	0.202***	0.165**	0.185***	0.147**	0.221***	0.267***	0.206***	0.236***	0.071	0.054	0.074	0.055
	[2.88]	[2.12]	[2.82]	[2.23]	[3.12]	[3.17]	[3.17]	[3.41]	[0.49]	[0.23]	[0.36]	[0.25]
$\ln(1 + Family\ R_{m,t-1}^{gross,(-m)})$	−0.235*	−0.258*	−0.251**	−0.246	−0.114	−0.201	−0.090	−0.125	−0.673	−0.743	−0.684*	−0.771*
	[−2.07]	[−1.82]	[−2.08]	[−1.55]	[−0.86]	[−0.98]	[−0.69]	[−0.62]	[−1.66]	[−1.65]	[−1.76]	[−1.70]
$\ln(1 + Flow_{m,t-1})$			0.124**	0.189**			0.097**	0.182**			0.317**	0.449**
			[2.11]	[2.28]			[2.08]	[2.24]			[2.36]	[2.51]
$\ln(1 + R_{m,t-1}^{gross})$			0.234*	0.272**			0.194*	0.132*			0.622*	0.789*
			[1.72]	[2.09]			[1.84]	[1.69]			[1.73]	[1.82]
Adjusted R^2	0.056	0.180	0.059	0.188	0.046	0.163	0.049	0.170	0.040	0.139	0.053	0.159
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of compensation growth with the return performance and fund flow of fund families. The dependent variable in columns (1) – (4) is the compensation growth of fund managers in year t, which is the difference in the natural log of the fund manager's labor income in year t compared to year $t-1$. The dependent variable in columns (5) – (8) is the base pay growth of fund managers in year t, which is the difference in the natural log of the fund manager's base pay in year t compared to year $t-1$. The dependent variable in columns (9) – (12) is the bonus growth of fund managers in year t, which is the difference in the natural log of the fund manager's bonus in year t compared to year $t-1$. Base pay and bonus are defined in Table 5. The independent variables include the AUM-weighted flows and returns of fund families in year $t-1$, excluding the flows and returns of funds assigned to manager m. We also control for flows and returns of fund manager m in year $t-1$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

impacts on fund managers' compensation.

One potential caveat of the exercises above is that the relation of the family-level flows and returns with the compensation growth may be driven by their correlation with manager-level variables. This concern arises because other funds within the same fund family likely share similar clientele and management styles, and they are affected by the same business environments. To address this concern, we add the lagged flows and returns of fund managers to the list of independent variables. As shown in Table 9, our findings remain consistent after controlling for the manager-level flows and returns.

3.2 Career Outcomes of Fund Managers

In Section 3.1, we have examined how the compensation of fund managers, including its base pay and bonus components, is related to AUM, fee revenue, return performance, and fund flow. These analyses are conducted under the condition that there are no job turnovers. This means that the compensation and its determinants we examine, including

Table 10: Compensation growth following job turnovers.

	(1)	(2)	(3)	(4)
	Panel A: Total flows			
	$\log(Pay_{m,t+1}/Pay_{m,t-1})$		$\log(\overline{Pay}_{m,t+1\to t+3}/Pay_{m,t-1})$	
$\ln(1+Flow_{m,t-1})$	0.256**	0.263**	0.317**	0.258**
	[2.35]	[2.36]	[2.64]	[2.30]
$\ln(1+R^{gross}_{m,t-1})$	0.574	0.252	0.354	0.026
	[1.56]	[0.54]	[1.18]	[0.07]
Adjusted R^2	0.014	0.088	0.013	0.101
Year FE	No	Yes	No	Yes
	Panel B: Systematic and idiosyncratic flows			
	$\log(Pay_{m,t+1}/Pay_{m,t-1})$		$\log(\overline{Pay}_{m,t+1\to t+3}/Pay_{m,t-1})$	
$\ln(1+Systematic\ Flow_{m,t-1})$	0.298**	0.300**	0.340**	0.297**
	[2.26]	[2.11]	[2.18]	[2.15]
$\ln(1+Idiosyncratic\ Flow_{m,t-1})$	0.552*	0.570*	0.508*	0.545*
	[1.88]	[1.78]	[1.80]	[1.82]
$\ln(1+R^{gross}_{m,t-1})$	0.641	0.309	0.424	0.081
	[1.61]	[0.67]	[1.49]	[0.21]
Adjusted R^2	0.019	0.092	0.016	0.105
Year FE	No	Yes	No	Yes

Notes. This table investigates the relationship between compensation percentage changes following job turnovers and return performance and fund flow prior to job turnovers, conditional on fund managers changing their employers in year t. The dependent variable in columns (1) and (2) is the compensation growth of fund managers from year $t-1$ to year $t+1$, which is the difference in the natural log of the fund manager's labor income in year $t+1$ compared to year $t-1$. The compensation of year $t+1$ is sourced from the new employers, whereas the compensation of year $t-1$ comes from the original employers. The dependent variable in columns (3) and (4) represents the difference in the natural log of the fund manager's average labor income from year $t+1$ up to $t+3$ compared to the labor income from year $t-1$. Compensation for the period from year $t+1$ to $t+3$ is provided by the new employers, while the compensation for year $t-1$ is from the original employers. The independent variables in Panel A include the natural log of the annual fund flows at the manager level in year $t-1$ and the natural log of the annual fund returns at the manager level in year $t-1$. The independent variables in Panel B include the natural log of the annual systematic and idiosyncratic flows at the manager level in year $t-1$ and the natural log of the annual fund returns at the manager level in year $t-1$. Standard errors are clustered at the year level. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

AUM, fund revenue, return performance, and fund flows, pertain to the same employers. In this section, we further study how the flow and performance of fund managers are related to their compensation in new firms after they change jobs.

Compensation Percentage Changes Post-Job Turnovers. We examine the relation of fund managers' career outcomes with return performance and fund flows by tracking the compensation of these managers after they depart from mutual fund firms. The LEHD data provide a unique identifier for individuals, allowing us to determine the compensation of individuals once they leave their respective firms.

In Table 10, we regress compensation growth around job changes on the return performance and fund flows preceding the job turnovers. In Panel A of Table 10, we regress pay changes surrounding manager job turnovers on the return performance and fund flow prior to these turnovers. The analysis is conditional on job turnovers of managers and is based on a sample of around 400 unique manager turnover events. We do not control for manager fixed effects because the majority of managers in our data sample do not change jobs more than once. We observe that fund flows are positively correlated with pay changes around manager job turnover events. However, fund return performance does not significantly correlate with these pay changes post-job turnovers. These findings suggest that fund flows are likely to play a significant role in influencing a fund manager's career outcomes, particularly in terms of job transitions with salary increases or decreases, whereas return performance does not. In Panel B of Table 10, we further decompose flows into systematic and idiosyncratic components. Our analysis indicates that both types of flows influence fund managers' compensation percentage changes following job turnovers.

Likelihood of Job Turnovers with Large Compensation Changes. We now investigate the relationship between the likelihood of job turnovers accompanied by significant compensation changes and the return performance and fund flow of fund managers preceding these job turnovers. We define $D^{Demotion}_{m,t}$ and $D^{Promotion}_{m,t}$ as indicator variables for significant income demotions and promotions, respectively. $D^{Demotion}_{m,t}$ takes a value of one if the compensation of manager m in year $t+1$ is at least 20% lower than the compensation in year $t-1$, and the manager undergoes a job turnover in year t. Conversely, $D^{Promotion}_{m,t}$ takes a value of one if the compensation of manager m in year $t+1$ is at least 20% higher. The mean values of the $D^{Demotion}_{m,t}$ and $D^{Promotion}_{m,t}$ are 4.2% and 3.3%, respectively.

It raises a natural question where these fund managers find new employment after departing from their previous positions at mutual fund companies. On one hand, for demotions, around 37.5% of managers stay in the mutual fund industry. Around 25.0%

Table 11: Job turnovers with large compensation changes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Total flows							
	$D^{Demotion}_{m,t}$				$D^{Promotion}_{m,t}$			
$D^{Large\ Outflow}_{m,t-3\to t-1}$	0.041**	0.037**	0.040**	0.036**			−0.005	−0.006
	[2.36]	[2.35]	[2.26]	[2.25]			[−0.36]	[−0.34]
$D^{Large\ Inflow}_{m,t-3\to t-1}$			−0.006	−0.015	0.032*	0.039*	0.031*	0.039*
			[−0.37]	[−1.07]	[1.80]	[1.85]	[1.83]	[1.81]
$D^{Large\ Negative\ Return}_{m,t-3\to t-1}$	0.011	0.003	0.009	0.003			−0.013	−0.032
	[0.42]	[0.11]	[0.33]	[0.11]			[−0.66]	[−1.28]
$D^{Large\ Positive\ Return}_{m,t-3\to t-1}$			−0.012	−0.003	0.020**	0.026**	0.019**	0.022**
			[−1.28]	[−0.38]	[2.47]	[2.50]	[2.50]	[2.28]
Adjusted R^2	0.018	0.226	0.019	0.227	0.028	0.205	0.028	0.207
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)
	Panel B: Systematic and idiosyncratic flows			
	$D^{Demotion}_{m,t}$		$D^{Promotion}_{m,t}$	
$D^{Large\ Systematic\ Outflow}_{m,t-3\to t-1}$	0.037**	0.035**		
	[2.27]	[2.18]		
$D^{Large\ Idiosyncratic\ Outflow}_{m,t-3\to t-1}$	0.029*	0.030*		
	[1.86]	[1.88]		
$D^{Large\ Systematic\ Inflow}_{m,t-3\to t-1}$			0.040**	0.044**
			[2.19]	[2.18]
$D^{Large\ Idiosyncratic\ Inflow}_{m,t-3\to t-1}$			0.028*	0.028*
			[1.87]	[1.89]
$D^{Large\ Negative\ Return}_{m,t-3\to t-1}$	0.013	0.008		
	[0.77]	[0.47]		
$D^{Large\ Positive\ Return}_{m,t-3\to t-1}$			0.016*	0.019*
			[1.77]	[1.87]
Adjusted R^2	0.020	0.235	0.031	0.214
Manager FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes

Notes. This table examines how job turnovers with large compensation changes are related to return performance and fund flow in the years preceding the job turnovers. The dependent variable in columns (1) – (4), $D^{Demotion}_{m,t}$, is an indicator variable that equals one if the labor income of manager m in year $t+1$ is at least 20% lower than the labor income in year $t-1$ and the manager experiences a job turnover in year t. The dependent variable in columns (5) – (8), $D^{Promotion}_{m,t}$, is an indicator variable that equals one if the labor income of manager m in year $t+1$ is at least 20% higher than the labor income in year $t-1$ and the manager experiences a job turnover in year t. The independent variables include a set of indicator variables that represent large inflows and outflow and large positive and negative returns. $D^{Large\ Outflow}_{m,t-3\to t-1}$ is an indicator variable that equals one if the average fund flow of the manager from year $t-3$ to year $t-1$ is ranked in the bottom decile. $D^{Large\ Inflow}_{m,t-3\to t-1}$ is an indicator variable that equals one if the average fund flow of the manager from year $t-3$ to year $t-1$ is ranked in the top decile. $D^{Large\ Systematic\ Outflow}_{m,t-3\to t-1}$ and $D^{Large\ Idiosyncratic\ Outflow}_{m,t-3\to t-1}$ are indicator variables that equal one if the average systematic and idiosyncratic flows of the manager from year $t-3$ to year $t-1$ are ranked in the bottom decile, respectively $D^{Large\ Systematic\ Inflow}_{m,t-3\to t-1}$ and $D^{Large\ Idiosyncratic\ Inflow}_{m,t-3\to t-1}$ are indicator variables that equal one if the average systematic and idiosyncratic flows of the manager from year $t-3$ to year $t-1$ are ranked in the top decile, respectively. $D^{Large\ Negative\ Return}_{m,t-3\to t-1}$ is an indicator variable that equals one if the average fund returns of the manager from year $t-3$ to year $t-1$ is ranked in the bottom decile. $D^{Large\ Positive\ Return}_{m,t-3\to t-1}$ is an indicator variable that equals one if the average fund returns of the manager from year $t-3$ to year $t-1$ is ranked in the top decile. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

move to another firm in the financial industry, but not in the mutual fund sector, with around 7.9% specifically moving to hedge funds. Finally, around 37.5% of managers transition out of the financial industry, typically to sectors such as technology and administrative and support. On the other hand, for promotions, around 70.5% of managers remain within the mutual fund industry. About 14.1% transfer to different firms in the broader financial industry, excluding mutual funds, including around 10.3% who advance to hedge funds. Lastly, around 15.4% of promoted managers also seek opportunities outside of the financial sector, often in technology and various other industries.

We regress $D_{m,t}^{Demotion}$ and $D_{m,t}^{Promotion}$ on a set of indicator variables that represent large inflows and outflow and large positive and negative returns in the years leading up to the turnovers. Note that the data sample in this analysis is a manager-year panel. The sample contains around 2,400 manager-year observations. Unlike the analysis in Table 10, the sample is not limited to job turnover events. We control for year fixed effects to account for aggregate changes in the demotions and promotions common to all managers. As illustrated in Panel A of Table 11, large outflows (i.e., those in the bottom decile) increase the probability of demotions by a significant 4 percentage points. This change is of substantial economic importance. On the other hand, large inflows and positive returns (i.e., those in the top decile) are associated with a greater probability of promotions. These results are both statistically and economically significant. Our findings suggest that the compensation of fund managers reacts asymmetrically to good and bad news about fund performance. This pattern intriguingly parallels the downward rigidity documented in the CEO pay literature (e.g., Harris and Holmstrom, 1982; Taylor, 2013). In Panel B of Table 11, we incorporate indicator variables that represent large systematic and idiosyncratic flows.[9] Our analysis indicates that both flow types are associated with both demotions and promotions.

[9] Similar to Panel B of Table 6, the sample size for this analysis is reduced to 1,500 after incorporating systematic and idiosyncratic flows.

3.3 Causal Effects of AUM and Revenue on Manager Compensation

In Tables 2 through 7, we present a comprehensive body of evidence demonstrating that it exhibits a strong and significantly positive long-run equilibrium relationship between a fund manager's compensation and fee revenue generated by the same manager (thereby AUM supervised by the same manager) with return performance and fund flow driving compensation growth primarily through their influences on AUM growth, rather than their direct impact on short-run deviations from the long-run relationship between compensation and revenue (thereby AUM). Nevertheless, it is important to note that this evidence alone falls short of establishing a definitive contractual relationship with a causal nature, indicating that fund manager compensation is contractually determined by the AUM or revenue of the funds under the manager's supervision. This limitation arises due to an endogeneity issue. Specifically, the observed positive correlation between fund manager compensation and the lagged AUM and revenue of the funds under their management may be influenced by some common unaccounted-for latent variables. For instance, both manager compensation and fund AUM (and revenue) can be simultaneously influenced by the skill level of fund managers, irrespective of whether these skills are reflected in the fund return performance. Fund manager compensation is, to some extent, influenced by the skill level of the fund managers. In the meantime, fund AUM tends to grow more rapidly with a higher skill level of fund managers, not solely due to potentially higher realized fund returns but also because of inflows from fund clients who acknowledge the skills of the fund managers (e.g., Berk and Green, 2004).

To establish a conclusive causal relationship, suggesting that mutual funds compensate their managers primarily based on fund AUM (or revenue), even though this pass-through from fund revenue to manager compensation is incomplete, we rely on variations in a fund's AUM (or revenue) that goes beyond the inherent skill level and the influence of its fund managers. These variations in fund AUM (or revenue) are commonly attributed to luck, whether it be favorable or unfavorable. If mutual fund companies actively adjust manager compensation based on variations in fund AUM (or revenue) that are independent of perceived skill levels of fund managers, which are referred to as "non-skill-related" variations in fund AUM (or revenue), the positive correlation between fund manager compensation and the lagged AUM and revenue of the funds under their management, as documented in Table 2, is likely to reflect a causal relationship.

To capture non-skill-related fluctuations in fund AUM and revenue, we employ an instrumental variable approach inspired by the idea of heterogeneous demand-driven price impacts, as introduced by Koijen and Yogo (2019).[10] This instrumental variable is crafted to capture the changes in a fund's AUM and revenue resulting from exogenous changes in demand by other institutions, beyond the control of the fund family.

Particularly, in accordance with Koijen and Yogo (2019), we begin by creating an instrumental variable to capture variations in the market equity of asset n, which are outside the control of fund i. This instrumental variable, denoted by $\widehat{me}_{i,t}(n)$, is defined as follows:

$$\widehat{me}_{i,t}(n) = \ln\left(\sum_{j \neq i} A_{j,t} \frac{\mathbb{1}_{j,t}(n)}{1 + \sum_{n'=1}^{N_t} \mathbb{1}_{j,t}(n')}\right), \tag{3.6}$$

where $A_{j,t}$ represents the total investment made by institution j in all stocks indexed by $n = 1, \cdots, N_t$ during quarter t, and $\mathbb{1}_{j,t}(n) \equiv \mathbb{1}\{n \in \mathcal{N}_{j,t}\}$ indicates whether stock n lies within institution j's investment scope during quarter t, which is denoted by $\mathcal{N}_{j,t}$. The investment scope of institution j in a given quarter is approximated by the set of stocks it has held within the past 3 years, which includes the set of all stocks it currently holds or has held in any of the past 11 quarters. The integer N_t is a large number representing the total count of stocks traded in public equity markets during quarter t. It's important

[10] In Online Appendix 4, we investigate whether fund manager compensation is primarily determined by the perceived skill level of the managers, as opposed to the realized fund AUM or revenue. Specifically, we explore whether fund manager compensation is reflective of managerial skills that go beyond what can be inferred from actual fund revenue. To assess this, we utilize the value-added measure developed by Berk and van Binsbergen (2015) as a proxy for the skill level of fund managers. Our findings reveal that the relationship between compensation and these value-added measures becomes statistically insignificant when we account for manager fixed effect, fund revenues, or fund AUM. These results cast doubt on the alternative hypothesis that fund compensation primarily mirrors managerial skills rather than the realized fund revenues.

to note that this instrumental variable, $\widehat{me}_{i,t}(n)$, relies solely on the investment scope of other institutions and the distribution of public equity ownership among all institutions over time. Neither of these factors is under the control of the manager for fund i. To put it simply, this instrumental variable, $\widehat{me}_{i,t}(n)$, can be thought of as the counterfactual market equity, determined by the market-clearing price, assuming that other investors, $j \neq i$, hold an equally weighted portfolio within their own investment scopes. The construction of the instrumental variable intentionally removes the influence of fund manager actions from the equation.

Now that we have the instrumental variable, $\widehat{me}_{i,t}(n)$, available at the stock-fund-quarter level, along with the portfolio weights of fund i, we can construct an instrumental variable designed to capture variations in fund i's AUM and revenue that are uncorrelated with the skill level of managers within fund i. In particular, we aggregate $\widehat{me}_{i,t}(n)$ across the stocks held by fund i based on its portfolio holdings in quarter $t-4$ using the following equation:

$$\widehat{me}_{i,t} = \sum_{n=1}^{N} w_{i,t-4}(n) \times \widehat{me}_{i,t}(n), \tag{3.7}$$

where $w_{i,t-4}(n)$ represents the portfolio weights of stock n within fund i during quarter $t-4$. We opt for using weights with a one-year lag, $w_{i,t-4}(n)$, to address concerns that portfolio weights formed in quarters very close to t might reflect the skills of fund managers in selecting stocks with short-term mispricing.

Finally, we further aggregate the fund-level instrumental variables, denoted as $\widehat{me}_{i,t}$, to the level of fund managers. This addresses situations where a single fund manager oversees multiple funds. The aggregation is done as follows:

$$\widehat{me}_{m,t} = \frac{1}{TNA_{m,t-4}} \sum_{i \in \Omega_{m,t-4}} \frac{TNA_{i,t-4}}{M_{i,t-4}} \times \widehat{me}_{i,t}. \tag{3.8}$$

where $\Omega_{m,t-4}$ represents the set of funds managed by fund manager m in quarter $t-4$, $M_{i,t-4}$ denotes the number of fund managers overseeing fund i in quarter $t-4$, and

Table 12: Relation of the instrumental variable for AUM, $\Delta\widehat{me}_{m,t}$, with returns and flows.

	(1)	(2)	(3)	(4)
	$\ln(1+R^{gross}_{m,t})$		$\ln(1+Flow_{m,t})$	
$\Delta\widehat{me}_{m,t}$	0.516***	0.541***	−0.019	−0.021
	[4.42]	[3.82]	[−0.42]	[−0.57]
Adjusted R^2	0.139	0.243	0.002	0.347
Manager FE	No	Yes	No	Yes

Notes. This table examines the relation of the instrumental variable for AUM with returns and flows. The dependent variable in Columns (1) and (2) is the natural log of the annual fund returns at the manager level in year t, while the dependent variable in Columns (3) and (4) is the natural log of the annual fund flows at the manager level in year t. The independent variables is the changes of the instrumental variable for AUM from year $t-1$ to t (i.e., $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$). Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

$TNA_{m,t-4}$ indicates the total net assets under the supervision of fund manager m in quarter $t-4$ as defined by equation (2.1). These quarterly variables are recorded at the quarter-end month. Since our regression analysis is conducted annually, we aggregate the quarterly $\widehat{me}_{m,t}$ into yearly averages to obtain the instrumental variable at the manager-year level.

After we have established the instrumental variable at the manager-year level to account for variations in fund AUM and revenue, we proceed to conduct a series of IV regression tests. The sample used for these tests comprises approximately 1,500 manager-year observations. The variation in the instrumental variable, $\widehat{me}_{i,t}$, for fund i arises from changes in the investment scopes of other institutions, namely, changes in $\mathcal{N}_{j,t}$ for $j \neq i$. Similar to Koijen and Yogo (2019), our identifying strategy is motivated by an observation that most financial institutions hold a small set of stocks and that the set of stocks that they have held in the recent past (e.g., over the past 3 years) hardly changes over time. Many institutions operate within the confines of an investment mandate, which comprises predefined, rigid rules that remain unaffected by contemporary shifts in asset demand driven by informational or other fundamental factors. These investment mandates serve as the primary constraints that determine the boundaries of institutions' investment scopes.

The rationale behind the instrumental variable and the associated IV regression tests can be explained as follows. Suppose a stock is included in the investment scopes of multiple institutions, particularly larger ones. This inclusion generates a greater exogenous component of demand for the stock. Given the downward-sloping nature of demand, this heightened exogenous demand component leads to higher stock prices that are not linked to contemporaneous shifts in asset demand driven by informational or other fundamental factors. Mutual funds whose portfolios are heavily weighted towards such stocks are likely to see a substantial increase in their AUM and, consequently, their revenue. However, this gain is evidently unrelated to the skills of fund managers; instead, it is purely a matter of luck from the perspective of the funds. Our IV regression tests essentially aim to investigate whether these fund managers are compensated with a significantly higher amount corresponding to this luck-driven increase in AUM and revenue.

Following the rationale behind the instrumental variable introduced above, and more importantly, to ensure the causal estimation accurately captures the contractual structure of an individual fund manager's compensation, we proceed with the analysis of changes in $\widehat{me}_{m,t}$, specifically, $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$. This approach requires us to employ an econometric setup that emphasizes time-series changes for our quasi-experimental analysis.[11]

We initially regress returns and fund flows for the year t on $\Delta\widehat{me}_{m,t}$. As detailed in Table 12, and consistent with the rationale behind the instrumental variable, changes in fund AUM (and revenue) that are not related to manager skill, captured by $\Delta\widehat{me}_{m,t}$, predominantly impact contemporaneous fund returns rather than moving in sync with flows. This outcome aligns with our intuition: An increase in demand from large institutional investors for specific assets tends to elevate their prices, often for reasons not directly tied to fundamentals. This in turn results in positive returns for fund managers who currently hold those assets in their portfolios.

Panel A of Table 13 displays the results from the first-stage IV regressions. Columns (1) through (3) show that $\Delta\widehat{me}_{m,t}$ is highly correlated with contemporaneous log change

[11] An alternative econometric setup, potentially a weaker setting, that emphasizes cross-sectional variations, using $\widehat{me}_{m,t}$ directly as the IV, can be found in the Online Appendix.

Table 13: Causal effects of AUM and fee revenue on a manager's compensation.

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: First-stage IV regressions					
	$\Delta \ln(A_{m,t})$			$\Delta \ln(Rev_{m,t})$		
	All	Small	Large	All	Small	Large
$\Delta\widehat{me}_{m,t}$	0.382***	0.555***	0.234*	0.653***	0.780***	0.447**
	[2.81]	[2.77]	[1.75]	[4.39]	[3.62]	[2.60]
F-test statistics	16.08	20.62	30.00	50.14	45.97	42.25
Manager FE	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: Second-stage IV regressions					
	$\Delta \ln(Pay_{m,t})$			$\Delta \ln(Pay_{m,t})$		
$\Delta \ln(\widehat{A}_{m,t-1})$	0.502**			0.586***		
	[2.46]			[2.13]		
$\Delta \ln(\widehat{Rev}_{m,t-1})$		0.322**			0.343***	
		[3.30]			[2.86]	
$\Delta\widehat{me}_{m,t-1}$			0.245***			0.224***
			[3.52]			[3.02]
Adjusted R^2	0.04	0.04	0.04	0.28	0.28	0.28
Manager FE	No	No	No	Yes	Yes	Yes

Notes. This table provides causal evidence for the roles of fund AUM and fee revenue in affecting manager compensation. Panel A presents results from the first stage of the IV regressions. In Columns (1) through (3), the dependent variable is the natural log of the AUM overseen by manager m in year t. In Columns (4) through (6), the dependent variable is the natural log of the revenue generated by manager m in year t. The independent variable is the instrumental variable $\Delta\widehat{me}_{m,t}$. We also sort fund managers into two groups (i.e., small and large) each year based on the AUM overseen by manager m in the last month of year $t-1$. F-test statistics are provided. Panel B presents results from the second stage of the IV regressions. The dependent variable is the natural log of the fund manager's compensation in year t. The independent variable is the log change of the AUM overseen by manager m in year $t-1$ predicted by the first-stage regressions, the log change of the fee revenue overseen by manager m in year $t-1$ predicted by the first-stage regressions, and the instrumental variable $\Delta\widehat{me}_{m,t}$ for reduced-form second-stage IV regressions. In Columns (1) through (3), the manager fixed effect is not incorporated, while in Columns (4) through (6), it is. In both panels, standard errors are double-clustered at both the manager and year levels, and the sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

in AUM, and Columns (4) through (6) show that $\Delta\widehat{me}_{m,t}$ is highly correlated with contemporaneous log change in fee revenue. The F-test scores all exceed 4.05, the Stock-Yogo critical value for rejecting the null of weak instruments (Stock and Yogo, 2005, table 5.2), demonstrating that the relevance condition of the instrumental variable is satisfied.

Panel B of Table 13 presents the results from the second-stage IV regressions, wherein we regress total pay growth on predicted values of AUM growth, revenue growth, and the instrumental variable. In Columns (1) – (2) and (4) – (5), we have adjusted the standard errors to account for the fact that the independent variables are predicted values obtained from the first-stage regressions. Columns (1) – (2) and (4) – (5) indicate that the predicted AUM growth and revenue growth are positively correlated with total pay growth of fund managers in the subsequent year. The coefficient for the predicted values are all statistically significant. The findings remain consistent whether or not the manager fixed effect is included. Collectively, the outcomes from the IV regression analyses offer compelling support for a causal and contractual linkage between an individual fund manager's compensation and both the AUM and fee revenue of the funds they oversee.

The magnitude of the pay-to-revenue sensitivity warrants further discussion. As shown in Panel B of Table 13, the pay-to-revenue sensitivity ranges from 0.502 to 0.586, significantly larger than that implied from the OLS estimation, which ranges from 0.119 to 0.231 as shown in Panel A of Table 2. This significant discrepancy may partially stem from the observation that the compliers in the IV regression predominantly consist of fund managers who oversee smaller AUM and thus are more inclined to hold concentrated portfolios. Specifically, variations in the instrumental variables are more likely to influence the AUM and fee revenue of these fund managers because the exogenous variations in stock prices are less likely to be averaged out at their portfolio level. Consistent with this intuition, Panel A of Table 13 demonstrates that such variations indeed lead to larger changes in the AUM and fee revenue for fund managers who oversee smaller funds. This suggests that the compliers of the IV regressions tend to be managers from smaller funds. Moreover, given the concave relationship between a fund manager's compensation and the fund's AUM, fund managers from smaller funds exhibit a higher pay-to-revenue sensitivity. Therefore, the IV regressions, which mainly capture local average treatment effects for the compliers, are likely to estimate a higher pay-to-revenue sensitivity compared to the OLS regressions.

Beyond the IV regressions, we conduct a reduced-form regression in Columns (3) and (6) of Table 13's Panel B, directly regressing compensation on the one-year lagged instrumental variable. The coefficient for the instrumental variable is positive and statistically significant, offering additional corroborative evidence in support of the causal relationship.

4 Conclusion

In this research, we assemble a comprehensive dataset on the compensation and career trajectory of mutual fund managers, merging CRSP and Morningstar mutual fund data with the LEHD data from the US Census.

Our study illustrates the crucial role of AUM and fee revenue in shaping the compensation levels of fund managers via a long-term equilibrium relationship. Additionally, it highlights that the return performance and fund flows significantly affect the percentage change in a fund manager's compensation mainly through their impact on AUM growth. This influence occurs rather than through direct effects on short-term deviations of compensation from its long-term equilibrium relationship with AUM (and consequently, fee revenue). Importantly, return performance and idiosyncratic fund flows exert significant and substantial direct effects on a fund manager's bonus, extending beyond their impacts on AUM growth.

In scenarios where managers transition to new positions, their compensation in these new roles is positively influenced by previous fund flows, though not by their performance preceding the job change. Finally, our analysis of job turnovers reveals a strong connection between fund managers' career prospects and prior fund flows, albeit not with return performance. Specifically, large outflows over a few years significantly increase the risk of job turnovers that come with a substantial cut in compensation (i.e., job turnovers with demotions), while large inflows and significant positive returns over a few years elevate the likelihood of job turnovers accompanied by a substantial increase in compensation (i.e., job turnovers with promotions).

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Online Appendix for
"Fund Flows and Income Risk of Fund Managers"

Xiao Cen   Winston Wei Dou   Leonid Kogan   Wei Wu

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Abstract

This is the supplemental material for the paper titled "Fund Flows and Income Risk of Fund Managers" (Cen et al., 2023). It explains how we use fund prospectuses, LinkedIn profiles, and company websites to fill out incomplete manager names. It also provides supplementary analysis for the relation of compensation with revenue, flow, and performance. In addition, it presents additional analysis for the IV regressions and studies the relation between pay and value added.

Keywords: Fund managers, Manager compensation, Career concerns, Mutual fund flows, Fund performance, Labor economics. (**JEL:** G11, G23, J24, J31, J33, J44)

Contents

1 Using Fund Prospectuses, LinkedIn Profiles, and Company Websites to Fill Out Incomplete Manager Names

We first use the fund managers' last names and the fund names to retrieve related mutual fund prospectuses (i.e., Form 485BPOS) from the SEC website. This method allows us to obtain the full names, including suffixes and middle initials, of most of the remaining managers. When these prospectuses do not provide complete names, we turn to LinkedIn profiles for additional details. The names and geographical information of the employers (i.e., mutual funds) help verify the accuracy of the LinkedIn results. For managers still lacking full names, we consult other sources, including official company websites, obituaries, and the CFA member directory. In cases of discrepancies, such as name abbreviations, we perform manual checks across all resources, prioritizing fund prospectuses when they provide the necessary details. This rigorous approach ensures the accuracy and completeness of the collected names, and our dataset includes full names for over 98% of the fund-year observations.

2 Additional Analysis for the Relation of Compensation with Revenue, Flow, and Performance

Longer Performance Evaluation Periods. Following the methodology of Ibert et al. (2018), we investigate the relation of fund manager compensation with revenue and performance over extended evaluation periods. Specifically, in Columns (1) to (4) of Table OA.1, we incorporate the returns of fund managers for years $t-1$, $t-2$, $t-3$, and $t-4$ as part of the independent variables. Additionally, in Columns (3) to (4) of Table OA.1, we replace the revenue with revenue orthogonalized to current and lagged returns, and include this in our list of independent variables. This analysis is conducted using a sample of around 1,100 manager-year observations. Our findings reaffirm that fund revenue and orthogonalized revenue are significantly correlated with compensation. However, historical returns and flows do not exhibit a significant correlation with

Table OA.1: Longer performance evaluation periods.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$				$\ln(Pay_{m,t}/Pay_{m,t-1})$			
$\ln(Rev_{m,t-1})$	0.233***	0.101***						
	[5.83]	[3.05]						
$\ln(Rev^{Orth}_{m,t-1})$			0.233***	0.101***				
			[5.83]	[3.05]				
$\ln(1+R^{gross}_{m,t-1})$	0.389	0.091	0.341	0.070	0.209	0.353*	0.235	0.387**
	[1.21]	[0.74]	[1.06]	[0.57]	[1.36]	[1.95]	[1.54]	[2.13]
$\ln(1+Flow_{m,t-1})$	0.014	0.094	0.014	0.094	0.159***	0.194**		
	[0.11]	[1.57]	[0.11]	[1.57]	[5.99]	[2.57]		
$\ln(1+Flow_{m,t-2})$					−0.074	−0.067		
					[−1.24]	[−0.98]		
$\ln(1+Flow^{Orth}_{m,t-1})$							0.158***	0.194**
							[6.00]	[2.56]
$\ln(1+Flow^{Orth}_{m,t-2})$							−0.074	−0.068
							[−1.24]	[−0.98]
$\ln(1+R^{gross}_{m,t-2})$	0.314	0.132	0.280	0.140	0.229	0.364**	0.242*	0.403**
	[1.37]	[0.76]	[1.47]	[0.83]	[1.62]	[2.51]	[1.83]	[2.61]
$\ln(1+R^{gross}_{m,t-3})$	0.301	0.131	0.319	0.165	−0.060	−0.000	−0.063	−0.003
	[1.50]	[0.89]	[1.62]	[1.12]	[−0.88]	[−0.00]	[−0.93]	[−0.03]
$\ln(1+R^{gross}_{m,t-4})$	0.122	0.072	0.122	0.072	−0.028	0.022	−0.028	0.022
	[0.68]	[0.35]	[0.68]	[0.35]	[−0.32]	[0.17]	[−0.32]	[0.17]
Adjusted R^2	0.140	0.803	0.140	0.803	0.102	0.190	0.102	0.190
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of fund manager compensation with revenue and performance with longer performance evaluation periods. The dependent variable in columns (1) to (4) is the natural log of the fund manager's labor income in year t. The dependent variable in columns (5) to (8) is the compensation growth of fund managers in year t, which is the difference in the natural log of the fund manager's labor income in year t compared to year $t-1$. The independent variables include the natural log of the revenue generated by the manager in year $t-1$, the natural log of the annual fund returns at the manager level in years $t-1$, $t-2$, $t-3$, and $t-4$, the natural log of the annual fund flows at the manager level in years $t-1$ and $t-2$. The independent variables also include revenue and flows orthogonal to historical returns. Specifically, $Rev^{Orth}_{m,t-1}$ is the revenue at the manager level in year $t-1$ that is orthogonal to the annual fund returns at the manager level in years $t-1$, $t-2$, and $t-3$. $Flow^{Orth}_{m,t-1}$ is the fund flow at the manager level in year $t-1$ that is orthogonal to the annual fund returns at the manager level in years $t-1$, $t-2$, and $t-3$. $Flow^{Orth}_{m,t-2}$ is the fund flow at the manager level in year $t-2$ that is orthogonal to the annual fund returns at the manager level in years $t-2$, $t-3$, and $t-4$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

compensation after controlling for revenues.

Using Risk-Adjusted Returns as Alternative Performance Measures. In Table 2 of the main text, we have examined the relation between the compensation of fund managers and their performance, measured by gross returns. In this section, we employ alphas estimated by the CAPM model and the excess returns over the Vanguard index fund benchmark portfolio as alternative measures of performance.

To estimate the CAPM alphas of a fund, we regress the excess fund returns over the risk-free

Table OA.2: Relation of fund manager compensation with revenue and risk-adjusted returns.

	Panel A: Relation of fund manager compensation with revenue and CAPM alphas							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$							
$\ln(Rev_{m,t-1})$	0.238***	0.143***	0.238***	0.44***	0.238***	0.144***	0.238***	0.145***
	[5.61]	[2.98]	[5.60]	[3.01]	[5.62]	[3.06]	[5.62]	[3.07]
$\ln(1+R^{abn,capm}_{m,t-1})$	0.390	0.175	0.336	0.064				
	[0.88]	[0.35]	[0.81]	[0.14]				
$\ln(1+R^{abn,van}_{m,t-1})$					0.391	−0.044	0.400	−0.172
					[0.96]	[−0.07]	[1.04]	[−0.30]
$\ln(1+Flow_{m,t-1})$			0.071	0.057			0.061	0.708
			[0.46]	[0.75]			[0.40]	[0.95]
Adjusted R^2	0.140	0.836	0.140	0.836	0.140	0.836	0.140	0.836
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of fund manager compensation with revenue and performance. The dependent variable is the natural log of the fund manager's labor income in year t. The independent variables include the natural log of the revenue generated by the manager in year $t-1$, the natural log of the annual fund performance at the manager level in year $t-1$, and the natural log of the annual fund flows at the manager level in year $t-1$. We measure performance with CAPM alphas and Vanguard excess returns. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

rates against the market excess returns, utilizing a 3-year rolling window. This is done provided there are at least 12 monthly observations within the rolling window:

$$Ret_{i,t-\tau} - Rf_{t-\tau} = R^{abn,capm}_{i,t} + \beta^{mkt}_{i,t} \times (Ret^{mkt}_{t-\tau} - Rf_{t-\tau}) + \varepsilon_{i,t-\tau}, \quad \text{with } \tau = 0, 1, \cdots, 35, \tag{OA.1}$$

where $R^{abn,capm}_{i,t}$ denotes fund i's CAPM alphas in month t.

We proceed to compute the monthly manager-level CAPM alphas by aggregating the monthly fund-level CAPM alphas across all funds overseen by manager m. The average is weighted based on the one-month lagged fund asset, divided by the number of managers.

$$R^{abn,capm}_{m,t} = \frac{1}{TNA_{m,t-1}} \sum_{i \in \Omega_{m,t-1}} \frac{TNA_{i,t-1}}{M_{i,t-1}} R^{abn,capm}_{i,t}. \tag{OA.2}$$

To determine the CAPM alphas of manager m on an annual basis, we aggregate the monthly manager-level CAPM alphas for each year.

To estimate the excess returns over the Vanguard index fund benchmark portfolio, we follow Berk and van Binsbergen (2015) to project the excess fund returns onto the the excess returns of a set of Vanguard index funds, which include S&P 500 Index Fund (VFINX), Extended Market Index Fund (VEXMX), Small-Cap Index Fund (NAESX), European Stock Index Fund (VEURX), Pacific Stock Index Fund (VPACX), Value Index Fund (VVIAX), Balanced Index Fund (VBINX), Emerging Markets Stock Index Fund (VEIEX), Mid-Cap Index Fund (VIMSX), Small-Cap Growth Index Fund (VISGX), and Small-Cap Value Index Fund (VISVX). We determine the date to include the above index funds to the benchmark set based on their inception dates as illustrated in Table 1 of Berk and van Binsbergen (2015). Specifically, for each fund i, we run the following regression with a 3-year rolling window. This is done provided there are at least 12 monthly observations within the rolling window:

$$Ret_{i,t-\tau} - Rf_{t-\tau} = R_{i,t}^{abn,van} + \sum_{j=1}^{n(t)} \beta_{i,t}^{Vanguard,j} \times (Ret_{t-\tau}^{van,j} - Rf_{t-\tau}) + \varepsilon_{i,t-\tau}, \quad \text{(OA.3)}$$

where $\tau = 0, 1, \cdots, 35$. Here, $R_{i,t}^{abn,van}$ denotes fund i's excess returns over the Vanguard index fund benchmark portfolio in month t, and $n(t)$ represents the number of Vanguard index funds included in the benchmark set in month t.

We proceed to compute the monthly manager-level Vanguard excess returns by aggregating the monthly fund-level excess returns across all funds overseen by manager m. The average is weighted based on the one-month lagged fund asset, divided by the number of managers.

$$R_{m,t}^{abn,van} = \frac{1}{TNA_{m,t-1}} \sum_{i \in \Omega_{m,t-1}} \frac{TNA_{i,t-1}}{M_{i,t-1}} R_{i,t}^{abn,van}. \quad \text{(OA.4)}$$

To determine the Vanguard excess returns of manager m on an annual basis, we aggregate the monthly manager-level excess returns for each year.

We then use CAPM alpha and Vanguard excess returns as alternative performance measures to examine their relation with fund managers' compensation. Consistent with the findings in the main text, as illustrated in Table OA.2, these performance measures are insignificantly related to compensation after we control for fund revenues. Since we require non-missing observations for risk-adjusted return measures, the analysis is based on a sample of around 2,000 manager-year

Table OA.3: Relation of fund manager compensation with revenue and performance in the subsample without AUM reallocation among managers.

	Panel A: Total pay											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\ln(Pay_{m,t})$						$\ln(Pay_{m,t})$					
$\ln(Rev_{m,t-1})$	0.259***	0.225**	0.260***	0.218**	0.259***	0.225**						
	[5.18]	[2.53]	[5.13]	[2.43]	[5.15]	[2.51]						
$\ln(A_{m,t-1})$							0.260***	0.228***	0.262***	0.228**	0.261***	0.229**
							[5.45]	[2.66]	[5.45]	[2.58]	[5.46]	[2.59]
$\ln(1 + R^{gross}_{m,t-1})$	0.503	0.339			0.507	0.310	0.406	0.259			0.441	0.270
	[1.08]	[1.43]			[1.11]	[1.44]	[0.78]	[1.60]			[0.85]	[1.62]
$\ln(1 + Flow_{m,t-1})$			0.008	0.098	0.015	0.070			0.011	0.025	0.013	0.027
			[0.05]	[0.88]	[0.09]	[0.63]			[0.06]	[0.19]	[0.07]	[0.21]
Adjusted R^2	0.162	0.846	0.160	0.845	0.162	0.846	0.170	0.846	0.170	0.846	0.171	0.846
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: Base pay and bonus											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\ln(Base_{m,t})$						$\ln(Bonus_{m,t})$					
$\ln(Rev_{m,t-1})$	0.180***	0.096**	0.182***	0.103**	0.181***	0.104**	0.679***	0.577**	0.686***	0.584**	0.680***	0.596***
	[4.23]	[2.25]	[4.21]	[2.36]	[4.21]	[2.23]	[3.17]	[2.55]	[3.21]	[2.63]	[3.18]	[2.68]
$\ln(1 + R^{gross}_{m,t-1})$	0.239	0.113			0.175	0.104	0.941	1.018**			0.861	1.173**
	[0.42]	[0.53]			[0.32]	[0.41]	[1.07]	[2.10]			[0.91]	[2.33]
$\ln(1 + Flow_{m,t-1})$			0.168	0.225**	0.159	0.219**			0.518	0.279	0.449	0.386
			[0.83]	[2.27]	[0.80]	[2.23]			[0.50]	[0.59]	[0.43]	[0.79]
Adjusted R^2	0.106	0.808	0.107	0.809	0.107	0.809	0.082	0.785	0.082	0.785	0.082	0.786
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of fund manager compensation with revenue and performance in the subsample without AUM reallocation among managers. Specifically, we require that there be no change in the set of fund shares overseen by manager m or in the number of co-managers for manager m in year $t-1$. In Panel A, the dependent variable is the natural log of the fund manager's labor income in year t. The independent variables include the natural log of the revenue generated by the manager in year $t-1$, the natural log of the AUM at the manager level in the last month of $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the natural log of the annual fund flows at the manager level in year $t-1$. In Panel B, the dependent variable in Columns (1) – (6) is the natural log of the fund manager's base pay in year t. The dependent variable in Columns (7) – (12) is the natural log of the fund manager's bonus in year t. Base pay and bonus are defined in Table 5. The independent variables include natural log of the revenue generated by the manager in year $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the natural log of the annual fund flows at the manager level in year $t-1$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

observations.

Subsample Without AUM Reallocation Among Managers. Fund companies actively reallocate their AUM among managers by assigning or withdrawing them to and from funds (e.g., Berk, van Binsbergen and Liu, 2017). When AUM reallocation occurs, changes in AUM are largely the decisions of mutual fund firms, rather than reflections of fund returns and flows. As a result, the relation between changes in AUM (and revenue changes) and performance or flows can be

Table OA.4: Relation of fund manager compensation with revenue and performance excluding fund managers working in the state of Illinois.

	(1)	(2)	(3)	(4)
	$\ln(Pay_{m,t})$		$\ln(Pay_{m,t}/Pay_{m,t-1})$	
$\ln(Rev_{m,t-1})$	0.221***	0.110**		
	[5.16]	[2.59]		
$\ln(1+Flow_{m,t-1})$	0.034	0.091	0.136***	0.168**
	[0.26]	[1.61]	[5.00]	[2.23]
$\ln(1+Flow_{m,t-2})$			−0.063	−0.077
			[−1.23]	[−1.05]
$\ln(1+R^{gross}_{m,t-1})$	0.301	0.055	0.198	0.381*
	[0.96]	[0.60]	[1.28]	[2.09]
$\ln(1+R^{gross}_{m,t-2})$			0.079	0.322**
			[0.55]	[2.30]
Adjusted R^2	0.153	0.780	0.102	0.189
Manager FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes

Notes. This table examines the relation of fund manager compensation with revenue and performance excluding fund managers working in the state of Illinois. The dependent variable in columns (1) and (2) is the natural log of the fund manager's labor income in year t. The dependent variable in columns (3) and (4) is the compensation growth of fund managers in year t, which is the difference in the natural log of the fund manager's labor income in year t compared to year $t-1$. The independent variables include the natural log of the revenue generated by the manager in year $t-1$, the natural log of the annual fund returns at the manager level in years $t-1$ and $t-2$, and the natural log of the annual fund flows at the manager level in years $t-1$ and $t-2$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

obscured when conditional on AUM reallocation. Here, we demonstrate the robustness of our findings by examining a subsample where AUM reallocation is absent. Specifically, we focus on scenarios where the set of fund shares overseen by manager m remains unchanged in year $t-1$. Additionally, since the AUM of a fund is divided among its co-managers and manager-level AUM is used as weights to convert fund-level flows and returns to manager-level variables, we also require that the number of co-managers remains constant in year $t-1$. This analysis is conducted using a sample of around 1,300 manager-year observations. As demonstrated in Table OA.3, our findings stay consistent after conditioning on the absence of AUM reallocation among managers.

Excluding Fund Managers Working in the State of Illinois. We address the limitation of our data excluding the state of New York. The LEHD data requires approval from each state, and our research project has access to data from 17 states, achieving a coverage rate comparable to a typical research project. However, our lack of access to data from New York raises the possibility that our findings may not represent the compensation structure of fund managers in major financial centers like New York City. This concern is unlikely to be substantial in reality. First, the labor market

Table OA.5: Relation of base pay and bonus with AUM and performance.

Panel A: Baseline regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\ln(Base_{m,t})$						$\ln(Bonus_{m,t})$					
$\ln(A_{m,t-1})$	0.150***	0.078**	0.150***	0.078**	0.150***	0.076**	0.499***	0.415**	0.499***	0.403**	0.498***	0.412**
	[4.85]	[2.33]	[4.85]	[2.31]	[4.85]	[2.20]	[2.87]	[2.29]	[2.86]	[2.19]	[2.86]	[2.25]
$\ln(1+R^{gross}_{m,t-1})$	0.069	−0.193			0.050	−0.229	0.609	0.833**			0.578	0.881**
	[0.23]	[−1.20]			[0.18]	[−1.35]	[0.68]	[2.16]			[0.57]	[2.16]
$\ln(1+Flow_{m,t-1})$			0.045	0.087	0.043	0.097			0.308	0.198	0.282	0.138
			[0.35]	[1.59]	[0.35]	[1.65]			[0.61]	[0.63]	[0.58]	[0.45]
Adjusted R^2	0.080	0.756	0.080	0.757	0.080	0.757	0.050	0.773	0.050	0.772	0.050	0.773
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Relation with systematic and idiosyncratic flows

	(1)	(2)	(3)	(4)	(5)	(6)
	$\ln(Pay_{m,t})$		$\ln(Base_{m,t})$		$\ln(Bonus_{m,t})$	
$\ln(A_{m,t-1})$	0.250***	0.147***	0.162***	0.079**	0.632***	0.367**
	[5.20]	[2.89]	[4.12]	[2.15]	[3.71]	[2.18]
$\ln(1+R^{gross}_{m,t-1})$	0.367	0.039	0.220	−0.096	0.526	0.768*
	[0.89]	[0.25]	[0.66]	[−0.55]	[0.66]	[1.74]
$\ln(1+Systematic\ Flow_{m,t-1})$	0.219	0.184	0.216	0.249	0.199	−0.208
	[0.66]	[0.60]	[0.68]	[0.87]	[0.49]	[−0.46]
$\ln(1+Idiosyncratic\ Flow_{m,t-1})$	−0.016	0.131	−0.090	−0.086	0.371*	0.442*
	[−0.11]	[1.61]	[−0.52]	[−1.10]	[1.73]	[1.72]
Adjusted R^2	0.155	0.816	0.090	0.759	0.068	0.847
Manager FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of base pay and bonus levels with AUM and performance. In Panel A, the dependent variable in Columns (1) – (6) is the natural log of the fund manager's base pay in year t. The dependent variable in Columns (7) – (12) is the natural log of the fund manager's bonus in year t. Base pay and bonus are defined in Table 5. The independent variables include the natural log of the AUM at the manager level in the last month of $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the natural log of the annual fund flows at the manager level in year $t-1$. In Panel B, the dependent variables are the natural log of the fund manager's total pay, base pay, and bonus in year t. We further decompose the fund flows into systematic and idiosyncratic flows at the manager level, which are then used to replace the fund flows in the independent variables. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

for fund managers in the US is fluid. It is unlikely that fund managers in New York City have labor contracts dramatically different from those in other parts of the country. Second, Chicago, another financial hub in the US, is included in our data through the state of Illinois. If managers in financial hubs have significantly different labor contracts, we would expect discrepancies in the findings of Table 2 of the main text when excluding such hubs. However, as shown in Table OA.4, our results remain consistent, suggesting that the exclusion of financial hubs such as New York does not significantly impact our findings. This analysis is conducted using a sample of around 2,000 manager-year observations.

Relation of Base Pay and Bonus with AUM and Performance. We decompose total compensation into base pay and bonus and examine their relation with AUM and performance separately. Specifically, we regress base pay and bonus on lagged AUM, flow, and return. Table OA.5 presents the results. Consistent with Table 5, the analysis in Panel A is conducted using a sample of around 1,400 manager-year observations. As indicated in Columns (1) to (6) of Panel A, base pay, similar to total pay, shows a significant correlation with AUM, but it does not have a significant correlation with either flow or return after controlling for AUM. In contrast, the pattern for bonuses differs. After controlling for AUM, lagged return is still positively and significantly correlated with bonuses, particularly when manager fixed effects are included, as seen in Columns (8) and (12) of Panel A in Table OA.5.

In Panel B of Table OA.5, we further analyze the breakdown of flows into systematic and idiosyncratic components to examine their relation with compensation. Consistent with Table 5, the analysis in Panel B is conducted using a sample of around 900 manager-year observations. As shown in Columns (5) and (6), idiosyncratic flows are positively and significantly correlated with bonus level, even when controlling for AUM. This suggests that, akin to the case with performance, mutual funds reward the flows attributable to the individual abilities of fund managers, and this reward extends beyond mere compensation for revenue.

Relation of Compensation Growth with AUM Growth. We examine whether the observed correlation of compensation growth with both flow and return can be attributed to a correlation between compensation growth and AUM growth. Specifically, we conduct a regression analysis of compensation growth on AUM growth, flow, and returns. We then check whether AUM growth can drive out flow and returns in predicting compensation growth. To ensure a clean setting, we focus on the subsample without AUM reallocation among managers. This is because AUM growth in scenarios with AUM reallocation is a result of changes in the set of funds (or fund shares) overseen by the managers, reflecting decisions made by the fund family rather than the managers' own efforts to grow the underlying assets through attracting flows and delivering performance. The subsample without AUM reallocation consists of approximately 1,300 manager-

Table OA.6: Relation of compensation growth with AUM growth in the subsample without AUM reallocation.

	Panel A: Compensation growth and AUM growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t}/Pay_{m,t-1})$							
$\ln(1+Flow_{m,t-1})$	0.227***	0.249**			−0.125	−0.283		
	[2.81]	[2.23]			[−0.76]	[−1.02]		
$\ln(1+R^{gross}_{m,t-1})$			0.364**	0.546**			0.067	0.225
			[2.20]	[2.07]			[0.43]	[0.84]
$\ln(A_{m,t-1}/A_{m,t-2})$					0.310**	0.408**	0.231***	0.252**
					[2.12]	[2.09]	[2.93]	[2.33]
Adjusted R^2	0.254	0.396	0.251	0.394	0.317	0.399	0.286	0.399
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Panel B: Base pay growth and AUM growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Base_{m,t}/Base_{m,t-1})$							
$\ln(1+Flow_{m,t-1})$	0.177***	0.219**			−0.178	−0.308		
	[3.22]	[2.60]			[−0.97]	[−1.18]		
$\ln(1+R^{gross}_{m,t-1})$			0.231*	0.200**			−0.057	0.146
			[1.77]	[2.16]			[−0.35]	[1.01]
$\ln(A_{m,t-1}/A_{m,t-2})$					0.285*	0.347**	0.162***	0.207***
					[1.87]	[2.21]	[3.02]	[2.73]
Adjusted R^2	0.039	0.292	0.034	0.224	0.047	0.298	0.040	0.297
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Panel C: Bonus growth and AUM growth							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Bonus_{m,t}/Bonus_{m,t-1})$							
$\ln(1+Flow_{m,t-1})$	0.380**	0.449**			−0.089	−0.223		
	[2.41]	[2.15]			[−0.49]	[−0.74]		
$\ln(1+R^{gross}_{m,t-1})$			0.521*	0.869**			0.140	0.303
			[1.74]	[2.08]			[0.35]	[0.68]
$\ln(A_{m,t-1}/A_{m,t-2})$					0.293*	0.541**	0.427**	0.445*
					[1.75]	[2.00]	[2.03]	[1.83]
Adjusted R^2	0.056	0.251	0.026	0.249	0.101	0.286	0.057	0.254
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation of compensation growth with AUM growth. We focus on the subsamples without AUM reallocation among managers. Specifically, we require that there be no change in the set of fund shares overseen by manager m or in the number of co-managers for manager m in year $t-1$. In Panel A, the dependent variable is the compensation growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's labor income between year t and year $t-1$. In Panel B, the dependent variable is the base pay growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's base pay between year t and year $t-1$. In Panel C, the dependent variable is the bonus growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's bonus between year t and year $t-1$. The independent variables include the natural log of the annual fund flows at the manager level in year $t-1$, the natural log of the annual fund returns at the manager level in year $t-1$, and the growth of AUM in year $t-1$, calculated as the difference in the natural log of AUM between the last month of year $t-1$ and the last month of year $t-2$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table OA.7: Relation of the instrumental variable for AUM with flows and returns.

	(1)	(2)	(3)	(4)
	$\ln(1+R^{gross}_{m,t})$		$\ln(1+Flow_{m,t})$	
$\Delta\widehat{me}_{m,t}$	0.516^{***}	0.541^{***}	-0.019	-0.021
	[4.42]	[3.82]	[−0.42]	[−0.57]
Adjusted R^2	0.139	0.243	0.002	0.347
Manager FE	No	Yes	No	Yes

Notes. This table examines the relation of the instrumental variable for AUM with flows and returns. The dependent variable in Columns (1) and (2) is the natural log of the annual fund returns at the manager level in year t, while the dependent variable in Columns (3) and (4) is the natural log of the annual fund flows at the manager level in year t. The independent variables is the changes of the instrumental variable for AUM from year $t-1$ to t (i.e., $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$). Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

year observations. The detailed results of this analysis are presented in Table OA.6. Columns (1) to (4) in Panel A of Table OA.6 demonstrate that flow and return are strongly correlated with pay growth individually. However, after controlling for AUM growth, neither flow nor return has a statistically significant correlation with compensation growth (see Columns (5) to (8) in Panel A of Table OA.6), suggesting that both flow and return primarily influence pay growth through AUM growth. In Panels B and C of Table OA.6, we examine the relation between base pay growth and bonus growth with AUM growth, respectively. We find that AUM growth can also drive out flow and returns in predicting both base pay growth and bonus growth.

3 Additional Analysis for the IV Regressions

Relation of the IV with Flows and Returns. In the main text, we present results from the IV regressions to provide causal evidence for the relation between AUM and compensation. To further illustrate the economic channel through which the instrumental variable $\widehat{me}_{i,t}$ affects AUM, we examine the relation between the instrumental variable and fund flows and returns in this section.

Specifically, we regress fund flows and returns in year t on changes in the instrumental variable from year $t-1$ to t (i.e., $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$). Consistent with Table OA.10, the analysis is based on a sample of around 1,500 manager-year observations. As presented in Table OA.7, the instrument primarily influences contemporaneous fund returns while it does not move in

Table OA.8: Compliers of the IV tests are more likely to be managers from small funds.

	Panel A: Heterogeneity in the first-stage regressions, using $\widehat{me}_{m,t}$ as the IV for the levels of AUM and renenue			
	(1)	(2)	(3)	(4)
	$\ln(A_{m,t})$		$\ln(Rev_{m,t})$	
	Small Funds	Large Funds	Small Funds	Large Funds
$\widehat{me}_{m,t}$	0.713***	0.323***	0.712***	0.316***
	[9.16]	[4.20]	[8.87]	[3.96]
Adjusted R^2	0.724	0.687	0.703	0.619
Manager FE	Yes	Yes	Yes	Yes

	Panel B: Heterogeneity in the first-stage regressions, using $\Delta\widehat{me}_{m,t}$ as the IV for the growth of AUM and renenue			
	(1)	(2)	(3)	(4)
	$\ln(A_{m,t}/A_{m,t-1})$		$\ln(Rev_{m,t}/Rev_{m,t-1})$	
	Small Funds	Large Funds	Small Funds	Large Funds
$\Delta\widehat{me}_{m,t}$	0.555***	0.234*	0.780***	0.447**
	[2.77]	[1.75]	[3.62]	[2.60]
Adjusted R^2	0.292	0.375	0.479	0.458
Manager FE	Yes	Yes	Yes	Yes

Notes. This table examines heterogeneity in the first-stage IV regressions across fund size. Specifically, we sort fund managers into two groups (i.e., small funds and large funds) each year based on the AUM overseen by the manager in the last month of year $t-1$. Panel A examines the heterogeneity in the first-stage regressions, in which we use $\widehat{me}_{m,t}$ as the instrumental variable for the levels of AUM and revenue. In Columns (1) and (2), the dependent variable is the natural log of the AUM overseen by the manager in year t. In Columns (3) and (4), the dependent variable is the natural log of the revenue generated by the manager in year t. The independent variable is the instrumental variable $\widehat{me}_{m,t}$. Panel B examines the heterogeneity in the first-stage regressions, in which we use $\Delta\widehat{me}_{m,t}$ as the instrumental variable for the growth of AUM and revenue. In Columns (1) and (2), the dependent variable is the growth of AUM in year t, calculated as the difference in the natural log of AUM between the last month of year t and the last month of year $t-1$. In Columns (3) and (4), the dependent variable is the growth of revenue in year t, calculated as the difference in the natural log of the revenue generated by the manager between year t and year $t-1$. The independent variable is the instrumental variable $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

tandem with flows. This finding is intuitive: an increase in demand from other investors drives up the prices of the underlying stocks, which, in turn, generates positive fund returns for the focal investor due to spillover effects.

Compliers of the IV tests. we discuss the magnitude of the pay-to-revenue sensitivity in the IV regression. As shown in Panel B of Table OA.10 in the main text, the pay-to-revenue sensitivity ranges from 0.482 to 0.704, significantly larger than that observed in the OLS regressions, detailed in Panel A of Table 2 in the main text. This notable difference could be in part attributed to the fact that the compliers in the IV regression are primarily managers from smaller funds, which are more likely to hold concentrated positions. Specifically, variations in the instrumental variables are more likely to result in changes in the AUM of these funds, since the exogenous variations in stock prices are less likely to be smoothed out at the fund level. Consistent with this conjecture,

Table OA.9: Causal effects of AUM and revenue growth on compensation growth.

	Panel A: First-stage IV regressions			
	(1)	(2)	(3)	(4)
	$\ln(A_{m,t}/A_{m,t-1})$		$\ln(Rev_{m,t}/Rev_{m,t-1})$	
$\Delta\widehat{me}_{m,t}$	0.488***	0.382***	0.761***	0.653***
	[4.49]	[2.81]	[6.87]	[4.39]
F-test statistics	25.97	16.08	76.01	50.14
Manager FE	No	Yes	No	Yes

	Panel B: Second-stage IV regressions			
	(1)	(2)	(3)	(4)
	$\ln(Pay_{m,t}/Pay_{m,t-1})$		$\ln(Pay_{m,t}/Pay_{m,t-1})$	
$\ln(\widehat{A_{m,t-1}/A_{m,t-2}})$	0.502**	0.586**		
	[2.46]	[2.13]		
$\ln(\widehat{Rev_{m,t-1}/Rev_{m,t-2}})$			0.322***	0.343***
			[3.30]	[2.86]
Manager FE	No	Yes	No	Yes

	Panel C: Reduced-form regressions	
	(1)	(2)
	$\ln(Pay_{m,t}/Pay_{m,t-1})$	
$\Delta\widehat{me}_{m,t-1}$	0.245***	0.224***
	[3.52]	[3.02]
Adjusted R^2	0.040	0.280
Manager FE	No	Yes

Notes. This table provides causal evidence of the impact of fund AUM and revenue growth on the growth of manager compensation. The analysis is conducted in the subsample without AUM reallocation among managers. Specifically, we require that there be no change in the set of fund shares overseen by manager m or in the number of co-managers for manager m in year $t-1$. Panel A presents results from the first stage of the IV regressions. In Columns (1) to (2), the dependent variable is the growth of AUM in year t, calculated as the difference in the natural log of AUM between the last month of year t and the last month of year $t-1$. In Columns (3) to (4), the dependent variable is the growth of revenue in year t, calculated as the difference in the natural log of the revenue generated by the manager between year t and year $t-1$. The independent variables is the instrumental variable for AUM growth from year $t-1$ to t (i.e., $\Delta\widehat{me}_{m,t} = \widehat{me}_{m,t} - \widehat{me}_{m,t-1}$). F-test statistics are provided. Panel B presents results from the second stage of the IV regressions. The dependent variable is the compensation growth of fund managers in year t, calculated as the difference in the natural log of the fund manager's labor income between year t and year $t-1$. In Columns (1) to (2), the independent variable is the natural log of the AUM growth in year $t-1$ predicted by the first-stage regressions. In Columns (3) to (4), the independent variable is the natural log of the revenue growth in year $t-1$ predicted by the first-stage regressions. Panel C presents results from the reduced form regressions. The dependent variable is the compensation growth of fund managers in year t. The independent variable is the instrumental variable $\Delta\widehat{me}_{m,t-1}$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table OA.8 demonstrates that such variations indeed lead to larger changes in the AUM for managers working in smaller funds. This suggests that the compliers of the IV regressions are predominantly managers from these funds. Given the concave relationship between a fund manager's compensation and the fund's AUM, managers from smaller funds exhibit a higher pay-to-revenue sensitivity. Thus, the IV regressions, which capture the average treatment effects for the compliers, are likely to estimate a higher pay-to-revenue sensitivity compared to the OLS regressions, for the reasons explained above.[1]

IV for the Growth of AUM and Revenue. We employ $\Delta\widehat{me}_{i,t}$ as an instrumental variable for AUM growth. We use the IV regressions to identify the causal impact of AUM growth on compensation growth. As in Table OA.6, we focus on the subsample without AUM reallocation among managers to ensure a clean setting, consisting of around 900 manager-year observations. This set of results is presented in Table OA.9. The findings are consistent with those of Table OA.10 in the main text, providing additional causal evidence for AUM's role in influencing compensation.

Using $\widehat{me}_{m,t}$ directly as the IV. Panel A of Table OA.10 displays the results from the first-stage IV regressions. Columns (1) and (4) show that $\widehat{me}_{i,t}$ is highly correlated with contemporaneous AUM and fee revenue, respectively. The F-test scores all exceed 4.05, the Stock-Yogo critical value for rejecting the null of weak instruments (Stock and Yogo, 2005, table 5.2), demonstrating that the relevance condition of the instrumental variable is satisfied. To further illustrate the economic channel through which the instrumental variable $\widehat{me}_{i,t}$ affects AUM, we examine the relation between the instrumental variable and fund flows and returns in Online Appendix 3. Specifically, we regress fund flows and returns in year t on changes in the instrumental variable from year $t-1$ to t (i.e., $\Delta\widehat{me}_{m,t}$). As presented in Table OA.7, $\widehat{me}_{i,t}$ primarily influences contemporaneous fund returns while it does not move in tandem with flows. This finding is intuitive: an increase in demand from other investors drives up the prices of the underlying stocks, which, in turn, generates positive fund returns for the focal investor due to spillover effects.

Panel B of Table OA.10 presents the results from the second-stage IV regressions, wherein we regress compensation on predicted values of AUM and fund revenues. We have adjusted the standard errors to account for the fact that the independent variables are predicted values obtained from the first-stage regressions. Columns (1) and (4) indicate that the predicted AUM and fee revenue are positively correlated with compensation of fund managers in the subsequent year. The coefficient for the predicted values are statistically significant. In addition to the

[1]It is probable that other explanations exist for the disparity in pay-to-revenue sensitivity observed between the IV and OLS regressions. We do not assert that our explanation is the only one for this difference.

baseline regressions in Columns (1) and (4), we incorporate manager fixed effects or year fixed effects in both stages of the IV regression to isolate time-series or cross-sectional variations in the instrumental variable, respectively. As shown in Panels A and B of Table OA.10, our findings remain robust. Collectively, the results from the IV regression tests provide strong evidence supporting a causal relationship between compensation and both AUM and fee revenues.

The magnitude of the pay-to-revenue sensitivity warrants further discussion. As shown in Panel B of Table OA.10, the pay-to-revenue sensitivity ranges from 0.482 to 0.704, significantly larger than that observed in the OLS regressions, which ranges from 0.119 to 0.231 as shown in Panel A of Table 2. This notable difference could be in part attributed to the fact that the compliers in the IV regression are primarily managers from smaller funds, which are more likely to hold concentrated positions. Specifically, variations in the instrumental variables are more likely to result in changes in the AUM of these funds, since the exogenous variations in stock prices are less likely to be smoothed out at the fund level. Consistent with this conjecture, Table OA.8 in Online Appendix 3 demonstrates that such variations indeed lead to larger changes in the AUM for managers working in smaller funds. This suggests that the compliers of the IV regressions are predominantly managers from these funds. Given the concave relationship between a fund manager's compensation and the fund's AUM, managers from smaller funds exhibit a higher pay-to-revenue sensitivity. Thus, the IV regressions, which capture local average treatment effects for the compliers, are likely to estimate a higher pay-to-revenue sensitivity compared to the OLS regressions, for the reasons explained above.[2]

Beyond the IV regressions, we conduct a reduced-form regression, directly regressing compensation on the one-year lagged instrumental variable. As indicated in Panel C of Table OA.10, the coefficient for the instrumental variable is positive and statistically significant, offering additional corroborative evidence in support of the identification tests.

Finally, instead of using $\widehat{me}_{i,t}$ as an instrumental variable for AUM, we employ $\Delta\widehat{me}_{i,t}$ as an instrumental variable for AUM growth. We then use the IV regressions to identify the causal

[2]It is probable that other explanations exist for the disparity in pay-to-revenue sensitivity observed between the IV and OLS regressions. We do not assert that our explanation is the only one for this difference.

Table OA.10: Causal effects of fund AUM and fee revenue on compensation.

Panel A: First-stage IV regressions

	(1)	(2)	(3)	(4)	(5)	(6)
		$\ln(AUM_{m,t})$			$\ln(Rev_{m,t})$	
$\widehat{me}_{m,t}$	0.464***	0.573***	0.648***	0.361***	0.527***	0.628***
	[2.74]	[11.03]	[3.62]	[2.72]	[10.28]	[3.58]
F-test statistics	13.50	91.61	16.63	13.67	88.48	16.67
Manager FE	No	Yes	No	No	Yes	No
Year FE	No	No	Yes	No	No	Yes

Panel B: Second-stage IV regressions

	(1)	(2)	(3)	(4)	(5)	(6)
		$\ln(Pay_{m,t})$			$\ln(Pay_{m,t})$	
$\ln(\widehat{AUM}_{m,t-1})$	0.546**	0.492***	0.467**			
	[2.35]	[3.58]	[2.44]			
$\ln(\widehat{Rev}_{m,t-1})$				0.704**	0.535***	0.482**
				[2.37]	[3.39]	[2.42]
Manager FE	No	Yes	No	No	Yes	No
Year FE	No	No	Yes	No	No	Yes

Panel C: Reduced-form regressions

	(1)	(2)	(3)
		$\ln(Pay_{m,t})$	
$\widehat{me}_{m,t-1}$	0.254***	0.282***	0.303**
	[4.21]	[3.85]	[2.45]
Adjusted R^2	0.011	0.617	0.069
Manager FE	No	Yes	No
Year FE	No	No	Yes

Notes. This table provides causal evidence for the roles of fund revenues in affecting manager compensation. Panel A presents results from the first stage of the IV regressions. In Columns (1) to (3), the dependent variable is the natural log of the AUM overseen by the manager in year t. In Columns (4) to (6), the dependent variable is the natural log of the revenue generated by the manager in year t. The independent variable is the instrumental variable $\widehat{me}_{m,t}$. F-test statistics are provided. Panel B presents results from the second stage of the IV regressions. The dependent variable is the natural log of the fund manager's labor income in year t. In Columns (1) to (3), the independent variable is the natural log of the AUM overseen by the manager in year $t-1$ predicted by the first-stage regressions. In Columns (4) to (6), the independent variable is the natural log of the revenue generated by the manager in year $t-1$ predicted by the first-stage regressions. Panel C presents results from the reduced form regressions. The dependent variable is the natural log of the fund manager's labor income in year t. The independent variable is the instrumental variable $\widehat{me}_{m,t-1}$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

impact of AUM growth on compensation growth. This set of results is presented in Table OA.9 in Online Appendix 3. The findings are consistent with those in Table OA.10, providing additional causal evidence for AUM's role in influencing compensation.

4 Relation Between Pay and Value Added

As discussed in the main text, one alternative explanation for the correlation between manager compensation and fee revenue is that both are influenced by management skills. According to

Table OA.11: Relation between pay and value added.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Relation between pay and value added of next year												
	$arcsinh(VA^{capm}_{m,t})$						$arcsinh(VA^{van}_{m,t})$					
$\ln(Pay_{m,t-1})$	0.152*	0.130	0.052	0.087	0.034	0.064	0.193**	0.055	0.105	0.023	0.098	0.028
	[2.06]	[1.40]	[0.90]	[1.08]	[0.58]	[0.84]	[2.55]	[0.76]	[1.28]	[0.49]	[1.39]	[0.52]
$\ln(Rev_{m,t-1})$			0.324***	0.209***					0.284***	0.194***		
			[4.24]	[2.84]					[3.44]	[2.78]		
$\ln(A_{m,t-1})$					0.370***	0.222***					0.331***	0.192***
					[4.81]	[2.98]					[4.87]	[2.76]
Adjusted R^2	0.115	0.379	0.140	0.382	0.151	0.389	0.042	0.377	0.064	0.380	0.074	0.380
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Relation between pay and the average value added of next three years												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$arcsinh(\overline{VA}^{capm}_{m,t\to t+2})$						$arcsinh(\overline{VA}^{van}_{m,t\to t+2})$					
$\ln(Pay_{m,t-1})$	0.095	0.132	0.021	0.081	0.002	0.078	0.238**	0.115	0.136	0.078	0.120	0.066
	[1.11]	[1.21]	[0.28]	[0.82]	[0.03]	[0.78]	[2.45]	[1.43]	[1.47]	[0.80]	[1.46]	[0.72]
$\ln(Rev_{m,t-1})$			0.234***	0.151**					0.320***	0.134***		
			[3.12]	[2.53]					[3.24]	[2.49]		
$\ln(A_{m,t-1})$					0.283***	0.197***					0.361***	0.164***
					[3.68]	[2.73]					[4.52]	[2.55]
Adjusted R^2	0.108	0.482	0.121	0.485	0.129	0.485	0.045	0.572	0.073	0.534	0.085	0.534
Manager FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation between pay and value added. Panel A investigates the relation between pay and value added of next year, while Panel B investigates the relation between pay and the average value added of next three years. The dependent variable in Columns (1) to (6) is the inverse hyperbolic sine transformation (e.g., Burbidge, Magee and Robb, 1988) of value added computed as the product between AUM and gross CAPM alphas. The dependent variable in Columns (7) to (12) is the inverse hyperbolic sine transformation of value added computed as the product between AUM and the Vanguard excess returns. The independent variables include the natural log of the fund manager's labor income in year $t-1$, the natural log of the revenue generated by the manager in years $t-1$, and the natural log of the AUM managed by manages in year $t-1$. Standard errors are double-clustered at both the manager and year levels. The sample period of the data is from 2000 to 2014. We include t-statistics in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

this alternative explanation, fund investors recognize these skills and consequently allocate their money to these funds, as modeled by Berk and Green (2004). Concurrently, mutual funds set their managers' compensation based on these skills, which leads to the observed correlation between AUM and compensation. In Section 3.3, we employ an instrumental variable that captures the exogenous components of investor demand unrelated to the fund managers' families. This approach is used to provide causal evidence of the impact of fund revenue on compensation. In this section, we test the alternative explanation directly, utilizing the value-added measure developed by Berk and van Binsbergen (2015) as a proxy for fund managers' skills.

Specifically, we investigate whether fund manager compensation reflects management skills that extend beyond what is indicated by realized fund revenue. To explore this, we regress the value-added measure against compensation. Value added is defined as the product of before-fee alphas and AUM. We calculate alphas based on the CAPM alphas and the excess returns over the Vanguard index fund benchmark. Due to the distribution of the value-added measures having heavy tails at both the positive and negative sides, we apply the inverse hyperbolic sine transformation (e.g., Burbidge, Magee and Robb, 1988) to the value-added measures in our regressions.

In Panel A of Table OA.11, we regress the value-added measure against one-year lagged compensation. The analysis is based on a sample of around 2,000 manager-year observations. Although compensation can predict subsequent year's value added, this relation becomes statistically insignificant when we focus on the within-manager time-series variations by including manager fixed effects (see Columns (2) and (8)). This result holds true regardless of the gross alpha measures used. Furthermore, the relation between compensation and value added also loses statistical significance after controlling for either fund revenues or AUM. This finding is consistent across different measures of gross alphas and remains the same whether or not manager fixed effects are included. These results challenge the view that mutual funds compensate their managers based on skills beyond those reflected in realized fund revenues.

One potential concern with our analysis in Panel A of Table OA.11 is that the value-added measure, particularly when measured on a one-year basis, may be noisy. To address this concern, we average the value-added measures from year t to year $t+2$ and use this three-year average as the outcome variable. As shown in Panel B of Table OA.11, we observe similar results. These findings further undermine the alternative hypothesis that fund compensation reflects management skills rather than realized fund revenues.

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