A Note on Additional Materials for "Fund Flows and Income Risk of Fund Managers"*

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February 18, 2024

Abstract

This note provides additional materials for the paper titled "Fund Flows and Income Risk of Fund Managers" (Cen et al., 2023). In this note, we compare our findings with some of the results in Bai et al. (2023), a recent working paper that also studies the compensation of fund managers.

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1 Executive Summary

Our paper, titled "Fund Flows and Income Risk of Fund Managers," examines the compensation of US active fund managers based on the US Census Bureau's LEHD program and various "big" textual data sources (Cen et al., 2023). Bai et al. (2023, henceforth "BMMT") is a related recent working paper with a particular focus on the pay-performance sensitivity.

Our paper was developed prior to BMMT; our draft was posted on SSRN in September 2023, and the first draft was composed in April 2023. Our findings were first presented at the brown-bag series at Texas A&M University in April 2023. We also publicly presented our findings at Michigan's departmental seminar on November 29th, 2023, the 2023 Fall NBER Big Data and Securities Markets Conference on December 1st, 2023, the Wharton MLG seminar on December 5th, and the 2023 Colorado Finance Summit on December 17th, 2023. BMMT's first appearance on SSRN occurred on December 27th, 2023, following our NBER conference and other public presentations. In this note, we provide comparisons with some of the results presented in their paper.

In this note, we compare our analysis to some of the results presented in BMMT. We focus on the relationship between the growth in a typical manager's pay and their recent performance. BMMT's analysis captures a distinct economic phenomenon. It appears that their analysis primarily estimates how persistent cross-sectional differences in pay relate to persistent cross-sectional differences in performance. Such cross-sectional differences can emerge even in the absence of any sensitivity of pay to performance. In other words, their estimates fail to accurately reflect the economic concept they aim to measure, and the econometric specifications used are inconsistent with the economic interpretations they present.

Empirically, to capture pay-to-performance sensitivity, one must include manager fixed effects in analyses that use pay level as the outcome variable. Alternatively, one can examine the relation between pay growth and performance, as extensively documented in Cen et al. (2023). Additionally, using multi-year returns as the independent variable should be avoided, as this complicates the distinction between time-series sensitivity of pay to performance and persistent cross-sectional differences.

Columns (1) to (3) in Table 2 of BMMT regress pay level on one-year lagged abnormal

returns, which is econometrically problematic. The reason is well known in applied economics and empirical studies. When regressing a level variable that exhibits a stochastic trend, such as log manager compensation, log AUM, or log revenue, on a stationary shock variable like return and fund flow, the conventional OLS t-statistic does not asymptotically follow a standard normal distribution, resulting in severely problematic spurious regressions. This issue likely explains the extremely large t-values, around 10, observed in these regressions. In fact, using linear regression models in these instances is inappropriate, because their error terms are not stationary random variables. This misapplication can lead to erroneous inferences and conclusions, underscoring the importance of choosing the correct econometric model that aligns with the nature of the data and the underlying economic relationships. Despite the concerns about the regression specifications, we replicate the analyses only for the purpose of comparison. Consistent with Table 2 of BMMT, we find that including manager fixed effects significantly diminishes the magnitude of the coefficients for abnormal returns.

Columns (4) to (6) in Table 2 of BMMT present different serious econometric issues. It's a well-established fact that the conventional OLS t-value becomes invalid and is typically overstated when regressing a level variable that shows a stochastic trend, such as log manager compensation, on another level variable also exhibiting a stochastic trend, like log revenue. This has been highlighted in seminal works by Granger and Newbold (1974), Phillips (1986), and Stock and Watson (1993). To ensure valid inference, it's necessary to include leads and lags of differences of the dependent variables, or other stationary variables that are influenced by the same underlying shocks as the differences of the dependent variables, as suggested by Stock and Watson (1993). This issue likely explains the problematically large t-values, around 20, observed in these regressions.

Table 3 of BMMT regresses pay level on average abnormal returns over multiple years. Our replication reveals that including manager fixed effects significantly reduces the magnitude of the coefficients for average abnormal returns. BMMT report a slight increase in these coefficients upon incorporating manager fixed effects in their Table 3. However, this finding seems inconsistent with their own results presented in Columns (1) to (3) of their Table 2, indicating a potential discrepancy in their findings.

Neither Table 2 nor Table 3 from BMMT reveals whether abnormal returns are related to compensation beyond their impact on AUM, which is one of our main findings. Cen

et al. (2023) demonstrate that, after controlling for AUM (or AUM growth), abnormal performance does not significantly contribute to explaining pay levels (or pay growth). BMMT does not conduct the same analysis. The most similar analysis in their work appears in Table 5. However, they examine 3-year average returns rather than single-year returns and, importantly, do not incorporate manager fixed effects. In our replication efforts, we observe a significant discrepancy between using 1-year versus 3-year returns. Without manager fixed effects, the coefficient for 1-year returns varies from 0.390 to 0.946, whereas for 3-year average returns, it ranges from 1.441 to 2.560. Furthermore, including manager fixed effects notably reduces the magnitude of the coefficients for abnormal returns, sometimes even rendering them negative. The decision by BMMT to use 3-year average returns and exclude manager fixed effects might account for the larger coefficients on performance observed in their Table 5, compared to our findings with manager fixed effects and 1-year returns. Our conjecture is that their coefficient on performance would have been significantly lower had they accounted for both lagged pay and lagged revenue, even in the absence of manager fixed effects. This conjecture is supported by our replication.

Taken together, we conclude that the specifications in the BMMT paper are primarily designed to capture persistent cross-sectional differences in managers' pay and performance, rather than the true sensitivity of pay to performance at the manager level, which is the focus of our study.

2 Detailed Comparison with BMMT

2.1 Comparison with Columns (1) to (3) in Table 2 of BMMT

Columns (1) to (3) in Table 2 of BMMT examine the relation between compensation level and one-year lagged abnormal returns. We quote their table in Figure A.1 of this note. In these regressions, the dependent variable is the compensation level, which is persistent. The independent variable is the one-year lagged abnormal returns, which is a shock. The concerns for these regression specifications are explained briefly above.

Results Comparison. Despite the concerns about the BMMT regression specifications, we replicate the analyses to better understand their findings. Table 1 of this note presents

Table 1: Comparison with Columns (1) to (3) in Table 2 of BMMT.

	Panel A: CAPM alphas and abnormal returns benchmarked by returns of Vanguard index funds					
	(1)	(2)	(3)	(4)	(5)	(6)
	$\ln(Pay_{m,t})$					
$\ln(1+R^{abn,capm}_{m,t-1})$	1.242*	−0.145	0.429			
	[1.91]	[−0.24]	[0.95]			
$\ln(1+R^{abn,van}_{m,t-1})$				1.602*	−0.948*	0.089
				[1.94]	[−1.92]	[0.16]
Adjusted R^2	0.056	0.780	0.830	0.057	0.781	0.830
Manager FE	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes
	Panel B: Abnormal returns benchmarked by returns of Morningstar indexes and investment category peers					
	(1)	(2)	(3)	(4)	(5)	(6)
	$\ln(Pay_{m,t})$					
$\ln(1+R^{abn,ms}_{m,t-1})$	0.770	−0.087	0.009			
	[1.49]	[−0.19]	[0.03]			
$\ln(1+R^{abn,ms\ (-m)}_{m,t-1})$				0.682	−0.375	−0.374
				[0.94]	[−1.00]	[−1.06]
Adjusted R^2	0.069	0.661	0.718	0.066	0.656	0.715
Manager FE	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes

Notes. This table examines the relation between compensation level and one-year lagged abnormal returns. The analysis of this table serves as a comparison with Columns (1) to (3) in Table 2 of BMMT (quoted in Figure A.1 of this note). 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 annual abnormal fund returns at the manager level in year $t-1$. In Panel A, we use CAPM alphas (i.e., $R^{abn,capm}_{m,t-1}$) and abnormal returns benchmarked by returns of Vanguard index funds (i.e., $R^{abn,van}_{m,t-1}$) as abnormal return measures. In Panel B, we use abnormal returns benchmarked by returns of Morningstar style indexes (i.e., $R^{abn,ms}_{m,t-1}$) and abnormal returns benchmarked by AUM-weighted returns of Morningstar investment category peers (i.e., $R^{abn,ms\ (-m)}_{m,t-1}$) as abnormal return measures. 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 results from our replications. BMMT use the abnormal returns benchmarked by returns of Morningstar investment category peers. They also claim that their results are robust to alternative abnormal return measures such as the CAPM alphas. In our analysis, we employ four abnormal return measures: 1) CAPM alphas; 2) abnormal returns benchmarked by returns of Vanguard index funds; 3) abnormal returns benchmarked by returns of Morningstar style indexes, as provided by Morningstar; and 4) abnormal returns benchmarked by AUM-weighted returns of Morningstar investment category peers, the same measure used by BMMT. In Table 1 of this note, Panel A utilizes the first and second abnormal return measures, while Panel B employs the third and fourth measures. We cluster standard errors at both the manager and year levels, as we believe it is important to account for correlation across various years for the same manager, as well as correlation across different managers within the same year.

In Columns (1) and (4) of both panels of Table 1, we include year fixed effects but not manager fixed effects. Thus, these regressions primarily capture the relation between the level of compensation and lagged abnormal returns across the cross section of fund managers. The magnitude of the coefficient for abnormal returns ranges from 0.682 to 1.602, which is sizable albeit mostly smaller than the coefficient reported by BMMT (i.e., 1.590). Regarding statistical significance, the t-statistic ranges from 0.94 to 1.94, markedly lower than the 9.59 reported by BMMT. This discrepancy in the t-statistic is not attributable to the choice of standard error clustering. In our analysis, the t-statistic for the coefficient of the abnormal returns only increases slightly when we cluster solely at the manager level, mirroring the approach taken by BMMT. BMMT also states that their standard errors are robust to heteroscedasticity. While we are not certain of their exact methodology, it is important to note that we effectively address heteroscedasticity within the data by clustering standard errors both at the manager and year levels.

Importantly, when we control for both year and manager fixed effects, the magnitude of the coefficient for abnormal returns decreases dramatically. In fact, when considering abnormal returns benchmarked against AUM-weighted returns of Morningstar investment category peers, the coefficient turns negative after we account for both year and manager fixed effects. The significant reduction in the coefficient for abnormal returns, upon including manager fixed effects, is also evident in BMMT's Table 2. Specifically, as demonstrated by Columns (1) and (3) in their Table 2 (see Figure A.1 of this note), the introduction of manager fixed effects causes the coefficient for abnormal returns to plummet from 1.590 to 0.437—a decline exceeding 70% in magnitude. In addition to manager fixed effects, Column (3) of their Table 2 controls for a variety of manager characteristics. However, these characteristics are unlikely to be the primary contributors to the reduction of the coefficient. This conclusion is supported by the minimal impact these control variables have on the coefficient of abnormal returns when added without the manager fixed effects, as indicated by Column (2) in Table 2 of BMMT.

Takeaways. We summarize several takeaways from the comparions with Columns (1) to (3) in Table 2 of BMMT. First, we have identified a concern with the regression of compensation level on lagged abnormal returns, which we find problematic for reasons related to spurious regressions, which is explained briefly above.

Second, we find that the inclusion of manager fixed effects significantly reduces the magnitude of the coefficient for abnormal returns. Because the sensitivity of pay-to-performance reflects how mutual funds adjust rewards for their managers based on changes in these managers' performance, including manager fixed effects is essential for accurately linking the coefficient for abnormal returns to pay-to-performance sensitivity and for analyzing how mutual funds structure their contracts to compensate fund managers. Without manager fixed effects, the regression analysis mainly estimates the relation between persistent cross-sectional differences in pay and performance. These cross-sectional differences could exist even in the absence of any sensitivity to pay-for-performance. Thus, manager fixed effects should be included when the analysis uses pay level as the outcome variable. In Table 2 of BMMT, the estimates in Column (3), among Columns (1) to (3), should be viewed as primary results. Alternatively, one can study the relation between pay growth and performance, as extensively documented in Cen et al. (2023).

2.2 Comparison with Table 3 of BMMT

Table 3 of BMMT examines the relation between compensation level and lagged abnormal returns, which are averaged over several years. We quote their table in Figure A.2 of this note. In these regressions, the dependent variable is the compensation level. The independent variables include abnormal returns in years $t-1$, $t-2$, and $t-3$ for Columns (1) and (5); the average abnormal returns from year $t-3$ to year $t-1$ for Columns (2) and (6); the average abnormal returns from year $t-5$ to year $t-1$ for Columns (3) and (7); and the average abnormal returns from year $t-10$ to year $t-1$ for Columns (4) and (8). Columns (1) to (4) of in Table 3 of BMMT show results with only year fixed effects, while Columns (5) to (8) show results with both year fixed effects and manager fixed effects.

Results Comparison. Tables 2 and 3 of this note present the results from our replications using four measures of abnormal returns, as detailed in Section 2.1. Specifically, Panel A of Table 2 employs CAPM alphas, while Panel B of the same table utilizes abnormal returns benchmarked against the returns of Vanguard index funds. Meanwhile, Panel A of Table 3 employs abnormal returns benchmarked against the returns from Morningstar style indexes, as sourced from Morningstar. Lastly, Panel B of Table 3 adopts abnormal

Table 2: Comparison with Table 3 of BMMT using CAPM alphas and abnormal returns benchmarked by returns of Vanguard index funds as abnormal return measures.

	Panel A: CAPM alphas							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$							
$\ln(1+R^{abn,capm}_{m,t-1})$	1.307				0.568			
	[1.61]				[1.11]			
$\ln(1+R^{abn,capm}_{m,t-2})$	−0.375				0.154			
	[−0.36]				[0.61]			
$\ln(1+R^{abn,capm}_{m,t-3})$	1.103				0.290			
	[1.64]				[0.53]			
$\ln(1+\overline{R}^{abn,capm}_{m,t-3\to t-1})$		2.056**				1.003		
		[2.17]				[1.18]		
$\ln(1+\overline{R}^{abn,capm}_{m,t-5\to t-1})$			3.489**				0.610	
			[2.40]				[0.27]	
$\ln(1+\overline{R}^{abn,capm}_{m,t-10\to t-1})$				6.090*				3.260*
				[2.22]				[1.84]
Adjusted R^2	0.069	0.068	0.071	0.218	0.890	0.889	0.907	0.915
Manager FE	No	No	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: Abnormal returns benchmarked by returns of Vanguard index funds							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$							
$\ln(1+R^{abn,van}_{m,t-1})$	1.804				0.462			
	[1.54]				[0.49]			
$\ln(1+R^{abn,van}_{m,t-2})$	−1.096				−0.364			
	[−0.95]				[−0.79]			
$\ln(1+R^{abn,van}_{m,t-3})$	1.868*				0.195			
	[1.86]				[0.23]			
$\ln(1+\overline{R}^{abn,van}_{m,t-3\to t-1})$		2.499*				0.286		
		[1.92]				[0.24]		
$\ln(1+\overline{R}^{abn,van}_{m,t-5\to t-1})$			4.461**				−1.641	
			[2.18]				[−0.57]	
$\ln(1+\overline{R}^{abn,van}_{m,t-10\to t-1})$				6.720***				3.500
				[2.83]				[1.63]
Adjusted R^2	0.071	0.069	0.088	0.441	0.889	0.889	0.907	0.912
Manager FE	No	No	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation between compensation level and average lagged abnormal returns. The analysis of this table serves as a comparison with Table 3 of BMMT (quoted in Figure A.2 of this note). 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 annual abnormal fund returns at the manager level in years $t-1$, $t-2$, and $t-3$ for Columns (1) and (5); the natural log of the average annual abnormal fund returns at the manager level from year $t-3$ to year $t-1$ for Columns (2) and (6); the natural log of the average annual abnormal fund returns at the manager level from year $t-5$ to year $t-1$ for Columns (3) and (7); and the natural log of the average annual abnormal fund returns at the manager level from year $t-10$ to year $t-1$ for Columns (4) and (8). In Panel A, we use CAPM alphas as abnormal return measures. In Panel B, we use abnormal returns benchmarked by returns of Vanguard index funds as abnormal return measures. 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 3: Comparison with Table 3 of BMMT using abnormal returns benchmarked by returns of Morningstar style indexes and investment category peers.

	Panel A: Abnormal returns benchmarked by returns of Morningstar style indexes							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$							
$\ln(1+R^{abn,ms}_{m,t-1})$	1.099				0.222			
	[1.52]				[0.94]			
$\ln(1+R^{abn,ms}_{m,t-2})$	0.878*				0.218			
	[1.94]				[0.42]			
$\ln(1+R^{abn,ms}_{m,t-3})$	1.163**				−0.066			
	[2.55]				[−0.21]			
$\ln(1+\overline{R}^{abn,ms}_{m,t-3\to t-1})$		3.126**				0.315		
		[2.36]				[0.31]		
$\ln(1+\overline{R}^{abn,ms}_{m,t-5\to t-1})$			5.399**				2.726*	
			[2.69]				[1.99]	
$\ln(1+\overline{R}^{abn,ms}_{m,t-10\to t-1})$				15.230**				3.859
				[2.52]				[0.87]
Adjusted R^2	0.060	0.060	0.107	0.392	0.860	0.859	0.935	0.994
Manager FE	No	No	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel B: Abnormal returns benchmarked by returns of Morningstar investment category peers							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\ln(Pay_{m,t})$							
$\ln(1+R^{abn,ms\,(-m)}_{m,t-1})$	0.819				0.014			
	[0.95]				[0.06]			
$\ln(1+R^{abn,ms\,(-m)}_{m,t-2})$	0.642				0.040			
	[0.97]				[0.09]			
$\ln(1+R^{abn,ms\,(-m)}_{m,t-3})$	1.164*				−0.173			
	[1.89]				[−0.61]			
$\ln(1+\overline{R}^{abn,ms\,(-m)}_{m,t-3\to t-1})$		2.598				−0.141		
		[1.70]				[−0.18]		
$\ln(1+\overline{R}^{abn,ms\,(-m)}_{m,t-5\to t-1})$			4.056***				2.215	
			[2.95]				[1.60]	
$\ln(1+\overline{R}^{abn,ms\,(-m)}_{m,t-10\to t-1})$				8.290*				−3.088
				[1.94]				[−0.34]
Adjusted R^2	0.061	0.060	0.109	0.293	0.833	0.833	0.911	0.906
Manager FE	No	No	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table examines the relation between compensation level and average lagged abnormal returns. The analysis of this table serves as a comparison with Table 3 of BMMT (quoted in Figure A.2 of this note). 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 annual abnormal fund returns at the manager level in years $t-1$, $t-2$, and $t-3$ for Columns (1) and (5); the natural log of the average annual abnormal fund returns at the manager level from year $t-3$ to year $t-1$ for Columns (2) and (6); the natural log of the average annual abnormal fund returns at the manager level from year $t-5$ to year $t-1$ for Columns (3) and (7); and the natural log of the average annual abnormal fund returns at the manager level from year $t-10$ to year $t-1$ for Columns (4) and (8). In Panel A, we use abnormal returns benchmarked by returns of Morningstar style indexes as abnormal return measures. In Panel B, we use abnormal returns benchmarked by AUM-weighted returns of Morningstar style investment category peers as the abnormal return measures. 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.

returns benchmarked against the AUM-weighted returns from Morningstar investment category peers, the same measure utilized by BMMT.

In the regressions without manager fixed effects (see Columns (1) to (4) of Tables 2 and 3 of this note), we observe that the coefficients of the average abnormal returns progressively increase with the extension of the average horizon. For average abnormal returns spanning from year $t-5$ to year $t-1$, the coefficients are statistically significant for all measures of abnormal returns. Nevertheless, interpreting these coefficients necessitates caution. Notably, the standard deviation of the average abnormal returns decreases with a longer average horizon. This implies that achieving the same magnitude of average abnormal returns signifies a superior performance compared to realizing the same percentage of returns over a single year. Intuitively, an average abnormal return of 1% over 5 years represents better performance than the same percentage over a single year.[1] Therefore, one cannot directly compare the magnitudes of coefficients for average abnormal returns across different horizons without considering these nuances. More importantly, using average returns over multiple years make it harder to distinguish time-series sensitivity of pay to performance from persistent cross-sectional differences.

In the regressions with both year and manager fixed effects (see Columns (5) to (8) of Tables 2 and 3 of this note), we observe a significant decrease in the coefficients for the average abnormal returns. Additionally, most of these coefficients become statistically insignificant, with some even turning negative. These results, aligning with those presented in Table 1 of this note, underscore the importance of including manager fixed effects when analyzing the relation between compensation and manager performance. Surprisingly, BMMT's results in Table 3 contradicts this pattern regarding manager fixed effects; in fact, the coefficient of the average abnormal returns even shows a slight increase after incorporating manager fixed effects (see Columns (5) to (8) in their Table 3, as quoted in Figure A.2). BMMT's results in their Table 3 appear inconsistent with their own findings in Columns (1) to (3) of their Table 2, where they show that the inclusion of manager fixed effects leads to a reduction of more than 70% in the coefficients for the abnormal returns.

[1] For example, an average abnormal return of 1% over 5 years can be achieved by having a 1% abnormal return *each year* during that period. This accomplishment is notably more challenging than attaining a 1% abnormal return in a single year.

Takeaways. Our comparison with Table 3 of BMMT yields several insights. First, one cannot directly compare the magnitudes of coefficients for average abnormal returns across different horizons. Achieving the same magnitude of average abnormal returns signifies a superior performance compared to realizing the same percentage of returns over a single year. Intuitively, an average abnormal return of 1% over 5 years represents better performance than the same percentage over a single year. Second, our analysis reveals that the inclusion of manager fixed effects significantly reduces the magnitude of the coefficients for average abnormal returns. In contrast, BMMT report a slight increase in these coefficients when incorporating manager fixed effects in their Table 3. This observation from BMMT appears inconsistent with their own results presented in Columns (1) to (3) of their Table 2, indicating a potential discrepancy in their findings.

2.3 Comparison with Column (1) in Table 5 of BMMT

Column (1) in Table 5 of BMMT examines the relation of compensation level with the lagged revenue and lagged abnormal returns. We quote their table in Figure A.3 of this note. In this regression, the dependent variable is the compensation level. The independent variables include lagged revenue and the average abnormal returns from year $t-3$ to year $t-1$. BMMT only include year fixed effects but not manager fixed effects in this regression.

Results Comparison. Table 4 of this note presents the results from our replications using four measures of abnormal returns. Specifically, Panel A of Table 4 employs CAPM alphas and abnormal returns benchmarked against the returns of Vanguard index funds. Meanwhile, Panel B of Table 4 uses abnormal returns benchmarked against the returns from Morningstar style indexes and AUM-weighted returns of Morningstar investment category peers. In addition to using the average abnormal returns from year $t-3$ to year $t-1$, we also consider abnormal returns from year $t-1$ as the independent variable in Table 4. Furthermore, we include regression specifications with and without manager fixed effects.

As illustrated in Table 4 of this note, lagged fund revenue at the manager level exhibits a positive and significant correlation with the compensation level in all specifications. This pattern is comprehensively documented in Cen et al. (2023) and aligns with findings

Table 4: Comparison with Column (1) in Table 5 of BMMT.

	Panel A: CAPM alphas and abnormal returns benchmarked by returns of Vanguard index funds											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\ln(Pay_{m,t})$											
$\ln(Rev_{m,t-1})$	0.238***	0.233***	0.143***	0.258***	0.228***	0.139**	0.238***	0.233***	0.144***	0.258***	0.231***	0.145**
	[5.61]	[4.10]	[2.98]	[4.89]	[2.87]	[2.22]	[5.62]	[4.16]	[3.06]	[4.89]	[2.93]	[2.43]
$\ln(1+R^{abn,capm}_{m,t-1})$	0.390	−0.283	0.175									
	[0.88]	[−0.57]	[0.35]									
$\ln(1+\overline{R}^{abn,capm}_{m,t-3\to t-1})$				1.441*	0.503	0.725						
				[1.72]	[0.77]	[0.79]						
$\ln(1+R^{abn,van}_{m,t-1})$							0.391	−1.057**	−0.044			
							[0.96]	[−2.45]	[−0.07]			
$\ln(1+\overline{R}^{abn,van}_{m,t-3\to t-1})$										1.809	−1.700**	−0.089
										[1.51]	[−2.23]	[−0.07]
Adjusted R^2	0.140	0.796	0.836	0.166	0.849	0.894	0.140	0.797	0.863	0.166	0.851	0.893
Manager FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes

	Panel B: Abnormal returns benchmarked by returns of Morningstar index and investment category peers											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	$\ln(Pay_{m,t})$											
$\ln(Rev_{m,t-1})$	0.261***	0.156***	0.132***	0.310***	0.127*	0.108**	0.228***	0.201***	0.167***	0.266***	0.141**	0.126**
	[5.28]	[2.91]	[3.02]	[6.11]	[1.80]	[2.02]	[4.59]	[3.43]	[3.80]	[4.88]	[2.05]	[2.43]
$\ln(1+R^{abn,ms}_{m,t-1})$	0.946**	0.145	0.142									
	[2.24]	[0.31]	[0.32]									
$\ln(1+\overline{R}^{abn,ms}_{m,t-3\to t-1})$				2.560	−0.748	0.354						
				[1.61]	[−0.61]	[0.40]						
$\ln(1+R^{abn,ms\,(-m)}_{m,t-1})$							0.860	−0.012	−0.104			
							[1.36]	[−0.04]	[−0.31]			
$\ln(1+\overline{R}^{abn,ms\,(-m)}_{m,t-3\to t-1})$										2.277	0.120	−0.031
										[1.37]	[0.17]	[−0.05]
Adjusted R^2	0.139	0.667	0.722	0.217	0.801	0.830	0.120	0.667	0.721	0.185	0.711	0.786
Manager FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes

Notes. This table examines the relation of compensation level with the lagged revenue and lagged abnormal returns. The analysis of this table serves as a comparison with Column (1) in Table 5 of BMMT (quoted in Figure A.3 of this note). 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 annual fund revenue in year $t-1$, the natural log of the annual abnormal fund returns at the manager level in year $t-1$, and the natural log of the average annual abnormal fund returns at the manager level from year $t-3$ to year $t-1$. In Panel A, we use CAPM alphas and abnormal returns benchmarked by returns of Vanguard index funds as abnormal return measures. In Panel B, we use abnormal returns benchmarked by returns of Morningstar style indexes and AUM-weighted investment category peers as abnormal return measures. 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.

from the Swedish data (Ibert et al., 2018). In the regressions without manager fixed effects, we observe that, after accounting for lagged revenue, lagged abnormal returns correlate positively with the compensation level. The coefficient for the 1-year lagged abnormal returns ranges from 0.390 to 0.946, while the coefficient for the average abnormal returns from year $t-3$ to year $t-1$ ranges from 1.441 to 2.560. However, most of these

Table 5: Comparison with Column (1) in Table 5 of BMMT, controlling for historical compensation and revenue.

	(1)	(2)	(3)	(4)
		$\ln(Pay_{m,t})$		
$\ln(Rev_{m,t-1})$	0.234**	0.240**	0.199**	0.200**
	[2.12]	[2.17]	[2.23]	[2.42]
$\ln(1+\overline{R}^{abn,capm}_{m,t-3\to t-1})$	0.672			
	[1.27]			
$\ln(1+\overline{R}^{abn,van}_{m,t-3\to t-1})$		0.806		
		[1.27]		
$\ln(1+\overline{R}^{abn,ms}_{m,t-3\to t-1})$			1.027	
			[0.85]	
$\ln(1+\overline{R}^{abn,ms\,(-m)}_{m,t-3\to t-1})$				0.903
				[0.79]
$\ln(Pay_{m,t-3})$	0.791***	0.790***	0.828***	0.836***
	[18.93]	[18.94]	[18.85]	[21.53]
$\ln(Rev_{m,t-2})$	−0.123	−0.121	−0.023	−0.020
	[−1.03]	[−1.01]	[−0.59]	[−0.50]
$\ln(Rev_{m,t-3})$	−0.044	−0.052	−0.091	−0.108
	[−0.98]	[−1.12]	[−1.03]	[−1.34]
Adjusted R^2	0.708	0.707	0.679	0.697
Manager FE	No	No	No	No
Year FE	Yes	Yes	Yes	Yes

Notes. This table examines the relation of compensation level with the lagged revenue and lagged abnormal returns, and further incorporates historical compensation and revenue as independent variables. The analysis of this table serves as a comparison with Column (1) in Table 5 of BMMT (quoted in Figure A.3 of this note). 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 annual fund revenue in years $t-1$, $t-2$, and $t-3$, the natural log of the average annual abnormal fund returns at the manager level from year $t-3$ to year $t-1$, and the natural log of the fund manager's labor income in year $t-3$. Abnormal return measures encompass CAPM alphas, abnormal returns benchmarked by returns of Vanguard index funds, abnormal returns benchmarked by returns of Morningstar style indexes, and abnormal returns benchmarked by AUM-weighted returns of Morningstar investment category peers. 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.

coefficients are statistically insignificant. Importantly, the inclusion of manager fixed effects significantly diminishes the magnitude of the coefficients for abnormal returns, rendering them negative in some cases. These findings suggest that fund managers' total compensation is unlikely to be structured based on performance, beyond its influence on AUM. In contrast, BMMT do not control for manager fixed effects in their Table 5. In Columns (2) through (5) of their Table 5, they control for firm fixed effects or firm $\times$ year fixed effects. However, it's important to note that these fixed effects are not the same as manager fixed effects.

Finally, to enhance our understanding of the relation between the average abnormal returns from year $t-3$ to year $t-1$ and the compensation level at year t in the specifications without manager fixed effects, we incorporate historical compensation and

revenue as independent variables in Table 5 of this note. In addition to the revenue in year $t-1$, we included fund revenue from years $t-2$ and $t-3$ because the returns from year $t-3$ to year $t-1$ can affect fund revenue during the same timeframe. Furthermore, we include the compensation level from year $t-3$ as an independent variable. This inclusion accounts for omitted variables that correlate with both average abnormal returns and compensation levels, while likely being unaffected by average abnormal returns due to the time lag. As shown in Table 5 of this note, the inclusion of these additional control variables significantly diminishes the magnitude of the coefficients for the average abnormal returns from year $t-3$ to year $t-1$, even without controlling for manager fixed effects. For example, the coefficient for the average CAPM alphas reduces from 1.441 to 0.672 after adding the additional control variables. This finding suggests that lagged pay and lagged revenue can explain a large fraction of the cross-sectional correlation between the average abnormal returns and compensation level. Our finding again indicates that the total compensation of fund managers is unlikely to be structured based on performance, beyond its impact on AUM.

Takeaways. We summarize a few takeaways from our comparison with Column (1) in Table 5 of BMMT. First, we show that lagged fund revenue at the manager level is a primary driver of compensation levels. This pattern is extensively documented in Cen et al. (2023) and is consistent with findings from the Swedish data (Ibert et al., 2018). Second, after accounting for lagged revenue, we find that abnormal returns are not significantly correlated with compensation, particularly when manager fixed effects are included in the analysis. Lastly, it appears that the cross-sectional correlation between average abnormal returns and the compensation level can be largely explained by lagged pay and lagged revenue.

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Appendix

Table 2
Portfolio Manager Compensation and Manager Performance and Revenue

This table contains the results of ordinary least squares regressions of the natural logarithm of portfolio manager compensation on managerial abnormal return and revenue. The control variables include the lagged values of manager's tenure and tenure squared, manager age and age squared, the fraction of the manager's funds that are team-managed, the total number of funds the manager is tasked with, the average number of co-managers for the manager's funds, the number of years of education the manager possesses, and an indicator variable equal to 1 if the manager possesses a degree in finance and 0 otherwise. Panel A uses raw versions of abnormal return and revenue. Panel B uses standardized versions of these variables as the key independent variables of interest. Standard errors in parentheses are heteroscedasticity-robust and clustered by fund manager. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Raw Versions of Abnormal Return and Revenue

	Log (Compensation$_{m,t}$)					
	(1)	(2)	(3)	(4)	(5)	(6)
Log (AbnormalReturn$_{m,t-1}$)	1.590***	1.662***	0.437***			
	(9.59)	(11.00)	(4.64)			
Log (Revenue $_{m,t-1}$)				0.300***	0.296***	0.148***
				(21.65)	(22.85)	(12.27)
Tenure$_{m,t-1}$		0.049***	0.027***		0.012	0.013*
		(5.01)	(3.38)		(1.38)	(1.66)
Tenure$_{m,t-1}^2$		0.00	0.00		0.00	0.00
		(-0.97)	(-1.34)		(0.86)	(0.15)
Age$_{m,t-1}$		0.217***	0.272***		0.199***	0.273***
		(10.89)	(6.22)		(10.78)	(6.15)
Age$_{m,t-1}^2$		-0.002***	-0.002***		-0.002***	-0.002***
		(-9.68)	(-7.49)		(-9.27)	(-7.27)
% Funds Team-Managed$_{m,t-1}$		-0.072	0.026		0.230***	0.074
		(-0.82)	(0.39)		(3.16)	(1.14)
# Funds Managed$_{m,t-1}$		0.012**	0.023***		-0.028***	0.008*
		(2.29)	(5.49)		(-5.36)	(1.96)
Avg. Team Size$_{m,t-1}$		0.084***	0.002		0.072***	0.01
		(7.75)	(0.31)		(7.94)	(1.33)
Education$_{m,t-1}$		-0.031			-0.008	
		(-0.79)			(-0.23)	
FinanceDegree$_{m,t-1}$ (0/1)		-0.167**			-0.103	
		(-2.16)			(-1.51)	
Constant	13.42***	7.485***	4.229**	8.880***	3.475***	1.952
	(431.7)	(16.72)	(2.30)	(44.37)	(7.64)	(1.06)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Manager Fixed Effects	No	No	Yes	No	No	Yes
Adj. R-squared	0.022	0.18	0.784	0.231	0.332	0.795
Observations	17,000	17,000	17,000	17,000	17,000	17,000

Note: This figure quotes Table 2 of BMMT, presented on Page 43 of their draft dated on December 2023.

Figure A.1: Table 2 of BMMT.

Table 3
Portfolio Manager Compensation and Long-Term Performance

This table reports the results of OLS regressions examining the relation between longer-term performance and fund manager compensation. The dependent variable is the natural logarithm of the portfolio manager's compensation at time *t*. Standard errors in parentheses are heteroscedasticity-robust and clustered by fund manager. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Log (Compensation$_{m,t}$)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (AbnormalReturn$_{m,t-1}$)	1.928***				1.905***			
	(9.42)				(10.37)			
Log (AbnormalReturn$_{m,t-2}$)	1.831***				1.814***			
	(10.30)				(11.16)			
Log (AbnormalReturn$_{m,t-3}$)	1.816***				1.837***			
	(10.19)				(11.25)			
Log (AbnormalReturn$_{m,t-3,t-1}$)		4.709***				5.267***		
		(6.25)				(8.05)		
Log (AbnormalReturn$_{m,t-5,t-1}$)			6.847***				7.764***	
			(6.03)				(7.86)	
Log (AbnormalReturn$_{m,t-10,t-1}$)				8.192***				10.260***
				(3.77)				(5.47)
Constant	13.50***	13.51***	13.51***	13.57***	7.051***	7.675***	7.478***	7.121***
	(393.9)	(375.2)	(358.0)	(292.4)	(12.53)	(12.50)	(11.42)	(8.47)
Manager Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.030	0.020	0.021	0.014	0.176	0.154	0.160	0.160
Observations	14,000	11,000	10,000	7,000	14,000	11,000	10,000	7,000

Note: This figure quotes Table 3 of BMMT, presented on Page 45 of their draft dated on December 2023.

Figure A.2: Table 3 of BMMT.

Table 5
Portfolio Manager Compensation and Firm Revenue

This table reports the results from OLS regressions examining the relation between portfolio manager compensation and investment return, manager revenue, and firm revenue. The dependent variable is the natural logarithm of portfolio manager compensation. *Log (Revenue$_{m,t}$)* is calculated following Ibert et al (2018) and is the natural logarithm of the product of the manager's assets under management and his expense ratio. *Log (Revenue$_{f,t}$)* is the firm-level revenue obtained directly from the U.S. Census Bureau's LBD database. The standard errors in parentheses are heteroscedasticity-robust and clustered by fund manager. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Log (Compensation$_{m,t}$)				
	(1)	(2)	(3)	(4)	(5)
Log (AbnormalReturn$_{m,t-3,t-1}$)	2.651***	1.984***	1.401***	2.696***	1.633***
	(5.60)	(6.15)	(2.64)	(4.67)	(3.85)
Log (Revenue$_{m,t}$)	0.311***	0.169***	0.146***	0.314***	0.154***
	(20.15)	(13.09)	(8.41)	(17.34)	(9.45)
Log (Revenue$_{f,t}$)				0.080***	0.112***
				(7.84)	(4.82)
Year Fixed Effects	Yes	Yes	No	Yes	Yes
Firm Fixed Effects	No	Yes	No	No	Yes
Firm x Year Fixed Effects	No	No	Yes	No	No
Adj. R-squared	0.321	0.692	0.742	0.425	0.756
Observations	13,000	13,000	13,000	13,000	13,000

Note: This figure quotes Table 5 of BMMT, presented on Page 47 of their draft dated on December 2023.

Figure A.3: Table 5 of BMMT.