Does mutual fund risk taking explain the beta anomaly? Evidence from portfolio manager ownership

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Abstract

The theory of leverage constraints predicts that excessive risk taking by constrained investors leads to overpricing and subsequently lower returns for high-beta stocks, or the beta anomaly. This paper tests this prediction by using a measure of constrained investors' risk-taking level based on ownership of U.S. equity mutual fund managers. I find that the beta anomaly does not exist among stocks that have high managerial ownership. This finding is robust to alternative measures of managerial ownership, market beta, and is not driven by other potential firm characteristics. Funds with high portfolio manager ownership are more likely to have lower tilt toward high-beta stocks and reduce market exposure following extreme downturns and volatile periods, suggesting that the attenuation effect is driven by heightened risk aversion during bad times. The result extends to other low-risk anomalies, including the idiosyncratic and distress risk. The paper highlights the role of risk incentive alignment mechanisms in the mutual fund industry in improving market efficiency.

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1 Introduction

A fundamental tenet in finance is that investors should be compensated by higher returns when their portfolio has higher risk exposure. The beta anomaly—the positive (negative) abnormal returns of stocks with low (high) market risk—is perhaps one of the most persistent findings that challenge this widely believed risk-return relation (Black, Jensen, and Scholes, 1972). Strong empirical evidence of this anomaly have had broad implications for investments in practice, and spurred a large literature attempting to explain it (e.g., Baker, Bradley, and Wurgler, 2011, Frazzini and Pedersen, 2014, Cederburg and O'Doherty, 2016, Bali, Brown, Murray, and Tang, 2017, Christoffersen and Simutin, 2017, Boguth and Simutin, 2018, Schneider, Wagner, and Zechner, 2020).[1]

A rational explanation among these attempts is the theory of leverage constraints, proposed by Black (1972) and extended by Frazzini and Pedersen (2014) and Boguth and Simutin (2018).[2] The intuition is that constrained investors have to tilt their portfolio toward high-beta stocks to achieve desired levels of risk, causing the overpricing and subsequently lower returns for risky stocks. One of the central predictions that validate this theory is that the level of risk taking among constrained investors should contribute to the existence of the beta anomaly. However, there is a lack of direct empirical evidence that supports this prediction, despite the prominent role of the theory in explaining the low-risk phenomenon. This paper attempts to fill this gap.[3]

Utilizing the heterogeneity in the risk-taking behavior among actively managed equity mutual funds who generally do not have access to leverage, I show that the beta anomaly does not exist among stocks held by funds whose managers' risk aversion is more aligned with that of their clients. I proxy for this risk aversion alignment using the dollar amount that portfolio managers invest in the fund that they manage (i.e., portfolio manager ownership). This result implies how risk incentive alignment mechanisms in the asset management industry can have pronounced impact on market efficiency.

[1] There is also another strand of literature that documents other low-risk anomalies, including the idiosyncratic risk (e.g., Ang, Hodrick, Xing, and Zhang, 2006) and distress risk (e.g., Campbell, Hilscher, and Szilagyi, 2008).

[2] Other explanations include investors' preference for lottery-like stock returns (e.g., Bali et al., 2017), institutional investors' benchmarking practice (e.g., Baker et al., 2011, Christoffersen and Simutin, 2017), and misspecification of capital asset pricing models (e.g., Cederburg and O'Doherty, 2016, Schneider et al., 2020).

[3] Boguth and Simutin (2018) proxy for *leverage constraint tightness* with the aggregate beta of the entire mutual fund industry, and do not consider the causes of higher demand for high-beta stocks. I leverage the heterogeneity in the risk-taking behavior across active portfolio managers, captured by the risk exposure of a portion of their wealth, to provide direct evidence of the beta anomaly and shed insights into potential causes of this demand (i.e., changing risk aversion).

Classical portfolio choice models imply that risk aversion is inversely associated with the fraction of wealth allocated to risky assets. In delegated fund management, the risk aversion of portfolio managers may differ from that of their clients due to various principal-agent issues unique to the mutual fund industry.[4] As portfolio managers make daily investment decisions, this misalignment can distort the relation between risk and future return in the stock market. In this case, fund manager ownership may serve as an alignment device to temper the demand for risky assets, because a portion of portfolio managers' personal wealth is exposed to market uncertainty. Consequently, I conjecture that high-beta stocks that have high portfolio manager ownership should experience significantly higher return relative to similar high-beta stocks with low managerial ownership, attenuating the beta anomaly.

I manually collect data on portfolio manager ownership for a sample of 2,958 actively managed U.S. domestic equity mutual funds over the period 2006-2021. Since March 2005, the U.S. Securities and Exchange Commission (SEC) requires mutual funds to disclose their portfolio manager ownership using the following seven ranges: \$0, \$1-\$10,000, \$10,001-\$50,000, \$50,001-\$100,000, \$100,001-\$500,000, \$500,001-\$1,000,000, and above \$1,000,000. Following Khorana, Servaes, and Wedge (2007) and Ma and Tang (2019), I convert the dollar ranges into dollar amounts by assuming managerial ownership to be at the midpoint of the reported intervals. I sum the converted amounts for each fund, and transform the total value back to the seven ranks (i.e., from 1 to 7) used by the SEC. Combining these ranks and portfolio holdings from the funds' 13-F filings, I construct a proxy for portfolio managers' personal wealth invested in each stock as the value-weighted ownership rank, where the weight is the value of the stock holding in each fund. I find this *stock managerial ownership* exhibits significant variations both over time and in the cross-section. For instance, Figure 1 shows that after the financial global crisis, the average stock managerial ownership of all active equity funds increased to more than \$100,000 and became more volatile, but decreased substantially during the COVID-19 crisis before bouncing back. In the cross-section, the average ownership is \$75,000 with a standard deviation of \$130,000.

I examine the relation between stock market beta and future returns across different levels of stock managerial ownership using portfolio sorts. First, I construct stocks' market beta following

[4]Notable agency problems that entice fund managers' risk taking include the convex flow-performance relation (e.g., Chevalier and Ellison, 1997, Sirri and Tufano, 1998, Huang, Wei, and Yan, 2007) and the compensation structure linked to relative performance (e.g., Brown, Harlow, and Starks, 1996).

Frazzini and Pedersen (2014), and sort all stocks into quintile portfolios based on stocks' lagged beta. Consistent with prior studies, I find that over the sample period 2006-2021, a value-weighted portfolio that longs the high-beta stocks and shorts the low-beta stocks has an abnormal return of -0.64% per month ($t-$stat = -2.01) with respect to the CAPM model. Next, I independently sort all stocks into tercile portfolios based on their stock managerial ownership, where the lowest (highest) tercile portfolio contains stocks with the lowest (highest) managerial ownership. I find that the CAPM alpha on the long-short beta portfolio among stocks with the lowest managerial ownership is -0.98% per month ($t-$stat = -3.38), while that among stocks with the highest managerial ownership portfolio is -0.25% ($t-$stat = -0.71). A closer examination reveals that the insignificant alpha at the high ownership portfolio is mainly driven by the higher abnormal return of the high-beta portfolio.[5] In particular, the CAPM alpha of the high-beta high-ownership portfolio is 0.09% (t-stat = 0.31), while that of the high-beta low-ownership portfolio is -0.70% ($t-$stat = -2.81). This result suggests that portfolio manager ownership attenuates the overpricing associated with high-beta stocks, distinguishing its mechanism from other explanations of the beta anomaly.[6]

Because funds report portfolio manager ownership in dollar ranges, I follow Ma and Tang (2019) to construct two alternative measures of managerial ownership: the first one is an indicator of whether managers have ownership in the fund, and the second one uses the natural logarithm of the total dollar amount of ownership. I also construct two alternative measures of market beta following Fama and MacBeth (1973) and Dimson (1979). Across portfolio sorts based on these alternative measures, I still find that the beta anomaly is no longer detected among high managerial ownership stocks.

A concern to my main result is that *stock managerial ownership* can capture other stock characteristics that have been found to explain the beta anomaly. Bali et al. (2017) show that the beta anomaly does not exist when they control for stocks' lottery demand, measured by maximum returns. Liu et al. (2018) document that the beta anomaly is only significant within overpriced stocks because of beta's positive correlation with idiosyncratic volatility. Recently, Schneider et al. (2020) show that controlling for coskewness renders the beta anomaly insignificant. To assess

[5]This result is robust to a 5 by 5 portfolio sort, and other prominent asset pricing models that include the Fama-French three-factor model (Fama and French, 1993), the five-factor model that augments the three-factor model with Carhart's (1997) momentum factor and Pástor and Stambaugh's (2003) liquidity factor, and the Fama-French five-factor model augmented with the momentum factor (Fama and French, 2015).

[6]For example, Liu, Stambaugh, and Yuan (2018) show that the abnormal return on the long-short beta portfolio is weak among underpriced stocks, driven by the positive abnormal returns of both long and short portfolios.

whether these and other firm characteristics can explain the attenuation effect of stock managerial ownership, I employ a series of robustness checks.

First, for each firm characteristic of interest, I perform a triple portfolio sort based on the characteristic, stock beta, and managerial ownership. In particular, I start by sorting all stocks in two portfolios based on the median value of the characteristic (e.g., Stambaugh, Yu, and Yuan's (2015) mispricing score). Next, within each portfolio, I repeat the double sorting procedure based on stock beta and managerial ownership, construct the long-short beta portfolio for each managerial ownership bucket, and record the CAPM alpha. Across 14 portfolio groups constructed from seven characteristics, including size, value, mutual fund ownership, idiosyncratic risk, maximum return, mispricing, and skewness, I find consistent evidence that the beta anomaly is not significant within the high managerial ownership stocks.

A weakness of the triple portfolio sorting approach is that it does not control for multiple firm characteristics. To address this issue, I follow prior studies (e.g., Han, Huang, Huang, and Zhou, 2022) and regress the stock managerial ownership measure on all seven characteristics to obtain a residual measure that is orthogonal to potential confounding characteristics. Repeating a double portfolio sort based on stock beta and this orthogonalized measure, I continue to find that the beta anomaly is non-existent among high managerial ownership stocks.

A natural question is whether my main result extends to other prominent low-risk anomalies, including Ang et al.'s (2006) idiosyncratic risk and Campbell et al.'s (2008) distress risk. This extension is worth investigating because beta is positively correlated with idiosyncractic risk (Liu et al., 2018), and recent studies have proposed common frameworks to explain all of these low-risk anomalies (e.g., Schneider et al., 2020). To examine if stock managerial ownership helps reducing the abnormal negative returns associated with risky stocks, I repeat the double portfolio sort for the idiosyncratic risk and distress risk. Consistent with prior studies, I find that both anomalies produce negative and significant abnormal returns over the sample period. Importantly, these abnormal returns only exist among the low managerial ownership stocks, reinforcing the implication that portfolio manager ownership mitigates the risk-taking behavior and impacts the risk-return relation in the stock market.

The results so far imply that portfolio manager ownership mitigates the association between high-beta stocks and their lower future returns. Since the theory of leverage constraints suggests

that mutual funds tilt toward high-beta stocks, my results suggest that higher stock managerial ownership should attenuate this tilting behavior. To provide formal evidence, I follow Dou, Kogan, and Wu (2024) and aggregate the portfolio of each group of funds based on their portfolio manager ownership. I start by aggregating the holdings of all funds whose managers do not have ownership in the fund, and so on. Using a stacked panel regression design, I examine the association between each portfolio holdings' deviation from market weight and market beta. Consistent with prior evidence that active mutual funds take excessive market risk, all portfolios exhibit a significant tilt toward stocks with high beta. However, this tilt is significantly lower in the portfolio of funds with high portfolio ownership, confirming the prior that these funds tend to take on less risk. This finding holds using alternative measures of market beta, portfolio manager ownership, and in Fama-MacBeth regressions.

To gain more insights into the mechanism that drives the beta anomaly, I next examine the tilting behavior at the fund level. I first estimate the level of tilt toward high-beta stocks for each fund, and confirm that funds with high manager ownership indeed have significantly lower tilt in panel regressions. Importantly, I find that this behavior is pronounced following bearish and highly volatile markets. These results are robust to alternative measures, reinforcing the prior that manager ownership is more likely to increase risk aversion exactly when managers' personal wealth faces heightened uncertainty.

This paper contributes to several strands in the literature on asset pricing and delegated asset management. First, the paper provides direct empirical evidence to complement the theory of leverage constraints in explaining the beta anomaly. Since Black et al. (1972), several papers have relied on the argument to support the empirical finding that high-beta stocks deliver lower abnormal returns (e.g., Frazzini and Pedersen, 2014, Boguth and Simutin, 2018). While these papers imply that the excessive demand for risky stocks of constrained investors contributes to the beta anomaly, there is no direct evidence about this mechanism. Taking advantage of the heterogeneity in the risk-taking behavior across constrained mutual fund managers, I show that the beta anomaly only exists among stocks with the low managerial ownership. This finding is consistent with the prediction that the level of risk taking across constrained investors is the main driver of the low-risk high-return puzzle.

Second, the paper adds to understanding potential common sources of low-risk anomalies in

the stock market (e.g., Schneider et al., 2020). The finding that other low-risk anomalies, including Ang et al.'s (2006) idiosyncratic risk and Campbell et al.'s (2008) distress risk, are not detected among stocks with low managerial ownership implies that the risk-taking behavior of the active asset management industry is an important determinant of the risk-return relation in the stock market.

The paper also contributes to the large literature on managerial incentives and market efficiency. There are well-established evidence in accounting and corporate finance that firm managers' equity incentives via stock ownership can affect market efficiency through capital allocations (e.g., Stein, 1989, Bizjak, Brickley, and Coles, 1993) or market reaction to fundamental news (e.g., Warfield, Wild, and Wild, 1995, Cheng and Warfield, 2005). In delegated asset management industry, portfolio manager ownership is mostly linked to mutual fund performance and risk taking (Khorana et al., 2007, Ma and Tang, 2019). This paper extends this line of research by highlighting the impact of incentive alignment mechanisms on the pricing of financial assets.

Finally, this paper adds to the literature on the risk-taking behavior of mutual fund managers. The finding that funds with higher manager ownership have lower tilt toward high-beta stocks complements Ma and Tang's (2019) finding that these funds tend to experience more risk-shifting. Importantly, the paper documents a new mechanism that triggers this behavior, namely the bearish and high-volatile market conditions. This mechanism is consistent with other evidence that negative wealth shocks to delegated agents can impact their risk-taking behavior (e.g., Pool, Stoffman, Yonker, and Zhang, 2019).

2 Data, variables, and descriptive statistics

2.1 Mutual fund sample

I construct the mutual fund sample from the Center for Research in Security Prices Survivor-Bias-Free U.S. Mutual Fund Database (CRSP MFDB). Following the convention in the literature (e.g., Kacperczyk, Sialm, and Zheng, 2008, Huang, Sialm, and Zhang, 2011), I restrict the sample to domestic actively managed U.S. equity funds. In particular, I eliminate index funds, balanced funds, sector funds, international funds, bond funds, money market funds, and exchange-traded funds.[7] I

[7]To exclude index and exchange-traded funds, I use both CRSP index fund flag and check for funds' name with the following key words: 'index', 'inde', 'indx', 'inx', 'idx', 'dow jones', 'ishare', 's&p', 's &p', 's& p', 's & p', '500',

also exclude funds for which fund names are missing. To address concerns related to omission bias (Elton, Gruber, and Blake, 2001) and incubation bias (Evans, 2010), I perform additional screens on the sample. In particular, I delete any observations prior to the first offer dates of funds, and exclude observations if the fund's total net assets (TNA) in the previous period is below $5 million. Finally, I include only funds that have more than 80% of their holdings on average in common stocks. I also identify the family associated with each fund following Dannhauser and Spilker III's (2023) procedure.[8]

I obtain quarterly fund equity holdings data from the Thomson Reuters Mutual Fund Holdings Database (S12) for the sample period before the third quarter of 2008, and the CRSP mutual fund holdings data for the rest of the sample. The use of CRSP data on portfolio holdings is to minimize concerns related to data quality of Thomson Reuters holdings data before 2008 (Zhu, 2020). I use the CRSP MFDB to collect information on fund characteristics such as expenses, fund portfolio turnovers, and percentage of portfolio invested in common stocks and other asset classes. Since a mutual fund can have multiple share classes, I use the MFLINKS database to identify such funds and combine different share classes into fund-level portfolios. For each period, I use the most recent TNA to construct fund-level TNA, returns, and characteristics. In particular, I take the sum of TNA across all share classes of a fund to construct the fund's TNA. The fund's returns and other characteristics are TNA-weighted averages.

I supplement this sample with information on portfolio manager ownership hand collected from funds' Statement of Additional Information (SAI). Since March 2005, the U.S. Securities and Exchange Commission (SEC) requires mutual funds to disclose their portfolio manager ownership for each fiscal year using the following seven ranges: $0, $1-$10,000, $10,001-$50,000, $50,001-$100,000, $100,001-$500,000, $500,001-$1,000,000, and above $1,000,000. I retrieve these information from the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database for each year from 2006 to 2021. Following Khorana et al. (2007) and Ma and Tang (2019), I convert the dollar ranges into dollar amounts by assuming managerial ownership to be at the midpoint of the reported in-

'wilshire', 'russell', 'msci', 'etf', 'exchange-traded', 'exchange traded'. I identify balanced, sector, international, bond, and money market funds by using the following CRSP policy code: 'C & I', 'Bal', 'Bonds', 'Pfd', 'B & P', 'GS', 'MM', 'TFM'. U.S. equity funds are further selected by using the following policy code: Lipper classes and objective codes 'EIEI', 'G', 'LCCE', 'LCGE', 'LCVE', 'MCCE', 'MCGE', 'MCVE', 'MLCE', 'MLGE', 'MLVE', 'SCCE', 'SCGE', 'SCVE', 'CA', 'EI', 'GI', 'MC', 'MR', 'SG'; Strategic Insight objective codes 'AGG', 'GMC', 'GRI', 'GRO', 'ING', 'SCG'; Wiesenberger objective codes 'G', 'GCI', 'IEQ', 'LTG', 'MCG', 'SCG'.

[8] I thank Caitlin Dannhauser for making the fund-family cleaning code available.

tervals (e.g., the range $50,001-$100,000 is converted to $75,000). Because the majority of funds in the sample is team-managed, and the ownership is reported at the individual level, I then aggregate the converted amounts for each fund, and transform the total value back to the seven ranks (i.e., from one to seven) used by the SEC (*Ownership rank*). I also use two alternative measures of manager ownership, including an indicator of whether managers have ownership in the fund (*Ownership indicator*), and the natural logarithm of the total dollar amount of ownership (*LN(Ownership dollar)*).

The final mutual fund sample contains 2,958 unique funds from 2006 to 2021.[9] Panel A of Table 1 shows the summary statistics for my mutual funds sample. The mean of *Ownership rank* is 3.61 and the standard deviation is about 2 ranks. In economic terms, one standard deviation of ownership ranges from no ownership to more than $100,000. The mean of *Ownership indicator* is 0.61, suggesting that on average 60% of funds have their managers invested in the fund. These manager ownership statistics are close to those in Ma and Tang (2019). Moreover, the average fund manages $1.94 billion of assets. On average, a fund exists for almost 7 years during the sample period. The quarterly mean return is 2.71% and its distribution appears symmetric since the median is close to the mean. Consistent with prior studies, the average flow in recent decades is negative and fund flow is positively skewed as the mean of quarterly flow (-0.21%) is significantly higher than the median (-1.93%). The average annual expense ratio is 1.10% and the average turnover ratio is 72.12% annually.

2.2 Stock sample

For the stock sample, I consider the universe of firms covered by the Center for Research in Security Prices (CRSP) and the Compustat Fundamentals Annual (Compustat). I include only U.S. common stocks that are listed on NYSE, AMEX, and NASDAQ, and exclude utility and financial firms. To mitigate the impact of micro- and small-cap stocks, I exclude firms with market capitalization below

[9]This sample is a substantial extension relative to Khorana et al. (2007) (1,406 funds in 2005) and Ma and Tang (2019) (1,610 funds between 2007 and 2014). Nevertheless, the focus of this paper on stock-level pricing ideally requires the entire population of active equity funds, and a concern is that the data collection process might inadvertently omit some funds. To mitigate this concern, I compare the number of funds and total assets under management (AUM) for funds covered in my final sample to that of the sample of active funds on CRSP MFDB. On average, my sample covers 89.53% of the domestic actively managed U.S. equity funds, and accounts for 90.74% of the industry's total AUM. These statistics suggest that the sample is representative of the active mutual fund industry.

the first NYSE decile at the portfolio formation date.[10] For all portfolio sorts, I use the breakpoints from only NYSE firms.

I follow prior studies to construct firm characteristics. I use Frazzini and Pedersen's (2014) beta as the main measure to capture stock exposure to market risk, and supplement main analyses with two alternative beta estimates of Fama and MacBeth (1973) and Dimson (1979). Panel B of Table 1 shows that across all three measures of market risk, the average betas are slightly greater than one, implying a higher level of riskiness relative to the market. This is not surprising given empirical evidence that active equity funds have a large tilt toward large cap stocks, which generally have higher market beta.

I combine the information from fund-level ownership and stock holdings to construct a proxy of stock-level portfolio manager ownership. In particular, the stock managerial ownership (*Ownership rank*) is measured as

$$\text{Ownership rank}_{i,t} = \frac{\sum_{j=1}^{J_t} V_{i,j,t} \times \text{Ownership rank}_{j,t-4}}{\sum_{j=1}^{J_t} V_{i,j,t}}, \tag{1}$$

where $\text{Ownership rank}_{i,t}$ is the stock-level ownership rank of stock i at the end of quarter t, $\text{Ownership rank}_{j,t-4}$ is the portfolio manager ownership of fund j in the quarter $t-4$, $V_{i,j,t}$ is the market value of stock i at the end of quarter t based on fund j's holdings, and J_t is the total number of funds in quarter t. I use the fund-level ownership in the previous year to avoid look-ahead bias because most funds only disclose portfolio manager ownership at the end of funds' annual fiscal date. Similarly, I also construct stock-level $\text{Ownership indicator}_{i,t}$ and $\text{LN(Ownership dollar)}_{i,t}$ using corresponding fund-level ownership measures.

Panel B of Table 1 shows the summary statistics for stock ownership. The mean of *Ownership rank* is 4.52 and the standard deviation is 0.76. In economic terms, one standard deviation of ownership contains values between \$10,000 to \$500,000. The mean of *Ownership indicator* is 0.76, suggesting that on average 76% of stocks have certain ownership by active portfolio managers. These statistics suggest that there appears to be meaningful variation in stock managerial ownership across stocks that potentially impact their market risk pricing.

[10] There is some empirical evidence that the beta anomaly concentrates only among overpriced stocks (e.g., Liu et al., 2018). Recent evidence suggest high transaction cost associated with micro- and small-cap stocks contributes to mispricing (e.g., Novy-Marx and Velikov, 2016. I therefore exclude these stocks from the main analyses. The results remain robust if I include these stocks.

To gain a better understanding about potential economic sources that drive portfolio managers' stock ownership, Figure 1 plots the time-series of the average stock ownership from 2006 to 2011. The plot also shows the 95% interval of stock ownership across all stocks in each period. Mean ownership decreased during bad economic states, such as during the 2008-2009 financial crisis and in 2020 during the COVID-19 downturn. The variation in ownership across stocks also appears to be changing in which the distribution is relatively wide between 2013 and 2017 and tighter in other periods.

Another variation in ownership that is interesting to examine is the variation across stocks' size and value. Because active equity funds are generally categorized in the two dimensions of size and value (e.g., growth big-cap funds), portfolio manager ownership in their own fund can be considered as a proxy of style investment. Figure 2 plots the time-series of the average stock ownership across the two dimension from 2006 to 2011. In particular, each stock is classified as either small or large cap based on the median value of market cap of NYSE stocks for each period. Each stock is then independently sorted as either growth, neutral, or value, depending on their book-to-market ratio. This process forms six portfolios on the size and value dimension. The average stock ownership for each portfolio is the weighted average of individual stock ownership. The figure shows that there is significant variation over time across all portfolios. On average, small stocks have lower ownership, with the exception of stocks that are also growth. Growth stocks also appear to have higher ownership and their ownership are less volatile compared to value stocks during bad economic states.

3 Stock managerial ownership and the beta anomaly

In this section, I analyze the performance of a strategy that buys high-beta stocks and sells low-beta stocks across different levels of stock managerial ownership, followed by a series of robustness checks.

3.1 Baseline result

The direct way to obtain the result is to examine the performance of portfolios from a double sort on market beta and *Ownership rank*. Specifically, at the end of each quarter, I form five-by-three portfolios by independently sorting stocks on the two variables. I start with Frazzini and Pedersen's

(2014) beta (β_{FP}) to form 15 value-weighted portfolios, and rebalance them every quarter. Because the beta anomaly is a direct violation of the capital asset pricing model (CAPM), I evaluate the performance of these portfolios using the CAPM alpha for the baseline analysis.

Panel A of Table 2 presents the results from this portfolio sort. First, I examine the performance of the strategy that buys high-beta stocks and sells low-beta stocks, which is shown in the first row of Panel A. Over the sample period 2006-2011, the CAPM alpha of the bottom quintile portfolio (i.e., low-beta portfolio) is 0.35% per month, and statistically significant at the 1% level. On the other hand, the CAPM alpha of the top quintile portfolio is negative at -0.29% but not statistically significant. The difference in abnormal return between the long and short leg of the strategy is -0.64% per month, and statistically significant at the 5% level. This result confirms that the beta anomaly, first documented by Black et al. (1972), remains robust in the recent decades.

Next, I examine the "hedging-against-beta" strategy's abnormal returns across three levels of stock managerial ownership. Column (6) shows that the alpha is monotonically increasing from the low to high managerial ownership. Specifically, the CAPM alpha of the high-low portfolio among stocks with low managerial ownership is -0.98% per month ($t-$stat = -3.38), while that among stocks with high managerial ownership is -0.25% ($t-$stat = -0.71). A closer examination reveals that the insignificant alpha at the high ownership portfolio is mainly driven by the higher abnormal return associated with the high-beta portfolio. Column (5) shows that the CAPM alpha of the high-beta high-ownership portfolio is 0.09% (t-stat = 0.31), while that of the high-beta low-ownership portfolio is -0.70% ($t-$stat = -2.81). The difference is 0.79% and is significantly different from zero. On the other hand, Column (1) shows that there is no difference in the performance of low-beta portfolios across different levels of ownership. These results show that high managerial ownership attenuates the negative abnormal returns associated with high-beta stocks.

In Panel B of Table 2, I use a 5-by-5 sort and continue to find the same pattern. Particularly, the abnormal return associated with the "hedging-against-beta" strategy is monotonically increasing the stock managerial ownership and is not statistically significant different from zero among stocks with the highest managerial ownership.

3.2 Alternative measures

3.2.1 Portfolio ownership

Since SEC does not require funds to report exact portfolio ownership, I follow Ma and Tang (2019) to consider two other alternative measures. The first measure is *Ownership indicator*, which is equal to 1 if the ownership is different from 0, and 0 otherwise. The second measure is *Ownership dollar*, which is natural logarithm of the total ownership amount in dollar. Combining with each fund's stock holdings, I construct the two corresponding measures for stock-level portfolio manager ownership and repeat the 5-by-3 portfolio sort from the baseline analysis.

Table 3 reports the results. Using *Ownership indicator* in Panel A, the results imply that the beta anomaly does not exist among stocks with high managerial ownership and the significance only concentrates only among high-beta stocks with low managerial ownership. The high-beta high-ownership stocks have a CAPM alpha indifferent from 0, and the difference relative to the high-beta low-ownership is 63 basis points per month ($t-$stat = 2.03). The results using *Ownership dollar* from Panel B show similar pattern.[11]

3.2.2 Market beta

Novy-Marx and Velikov (2022) argue that Frazzini and Pedersen's (2014) unusual empirical choices in constructing the "hedging-against-beta" portfolio contributes to its successful performance. Although my baseline analysis constructs beta portfolios by simply sorting stocks into value-weighted portfolios and excluding small-cap stocks as suggested by Novy-Marx and Velikov (2022), I provide further robust evidence using two alternative constructs of market beta.[12] Following Fama and French (1993), the first measure uses a stock's past 60-month monthly returns to estimate its beta (β_{mkt}). Following Dimson (1979), the second measure estimates beta using daily returns that include future, current, and lagged market returns.

[11] I also use the percentage ownership measure defined as the aggregate dollar amount of managerial ownership divided by the TNA of the fund and obtain similar findings. The CAPM alpha of the beta anomaly among the lowest and highest tercile of manager ownership is -65 basis points ($t-$stat = -1.81) and -47 basis points ($t-$stat = -1.38). However, Khorana et al. (2007) and Ma and Tang (2019) argue that this measure is not ideal to capture percentage ownership because a fund's total net asset is not a good proxy for its managers' personal wealth.

[12] The literature has also employed different estimates of beta. For example, Fama and MacBeth (1973) and Fama and French (1993) estimate beta using past 24 to 60 monthly returns whenever the data is available. Cederburg and O'Doherty (2016) use past 12-month daily returns, and Lewellen and Nagel (2006) and Boguth and Simutin (2018) estimate market beta following Dimson's (1979) approach to alleviate measurement errors associated with infrequent trading.

Table 4 reports the results. Sorting stocks using β_{mkt}in Panel A, the results imply that the beta anomaly does not exist among stocks with high managerial ownership and the significance only concentrates only among high-beta stocks with low managerial ownership. The high-beta high-ownership stocks have a CAPM alpha of only -9 basis points ($t-$stat = -0.34), and the difference relative to the high-beta low-ownership is 63 basis points per month ($t-$stat = 2.63). The results using $\beta_{\text{Dimson}}$from Panel B show similar pattern.

3.3 Other confounding effects

A valid concern is that other firm characteristics can capture the impact of stock managerial ownership in explaining the beta anomaly. There are several other variables in the literature that have varying degrees of attenuating effects.

The first set of firm characteristics I consider is size, value, and momentum. Because active equity funds are generally categorized in the two dimensions of size and value (e.g., growth big-cap funds), portfolio manager ownership in their own fund can be considered as a proxy of style investment. Figure 2 also suggests that there seems to be a difference in ownership between large and small cap stocks and also between value and growth stocks. I also include momentum because prior studies in the mutual fund literature (e.g., Carhart, 1997) suggest the momentum factor explains a large variation in of mutual fund's average returns. I follow Fama and French (1992) to construct size and book-to-market ratios for each stock and Jegadeesh and Titman (1993) to construct momentum.

Another characteristic is mutual fund ownership. Nagel (2005) show that many anomalies concentrate only among stocks with low institutional ownership because short-selling constraints are more likely to bind for these stocks. If portfolio manager ownership is positively correlated with mutual fund ownership, which in turn might be correlated with institutional ownership, then it is possible that the impact of portfolio manager ownership on the beta anomaly is confounded by fund ownership. I therefore consider mutual fund ownership as a characteristic of interest. A stock's mutual fund ownership is measured as the total market value of the stock's holdings by all funds divided by the stock's market value.

The next set of firm characteristics includes variables that have been used as behavioral explanations for the beta anomaly. First, Bali et al. (2017) show that conditional on lottery demand,

stocks with high beta do not underperform stocks with low beta. They argue that lottery investors have excessive demand for stocks with large chances of high returns, and such stocks are generally high-beta stocks. This pressure causes the lower future returns associated with high-beta stocks and a flatter security market line describing the relation between beta and expected returns. Thus I include their proxy for lottery demand–the most recent maximum return of a stock—in this analysis. Other characteristics that relate to the behavioral explanation of the beta anomaly are idiosyncratic and mispricing. Liu et al. (2018) show that the beta anomaly concentrates among only overpriced stocks, arguing that limits to arbitrage (e.g., short-selling constraints) among overpriced stocks prevent investors to trade to correct the beta anomaly. This pattern is driven mainly by the positive relation between a stock's beta and its idiosyncratic risk, which Stambaugh et al. (2015) show that it also only concentrates among overpriced stocks. I thus include both idiosyncratic risk and mispricing in this analysis. Following Ang et al. (2006), I measure idiosyncratic risk as the standard deviation of the residual returns from the Fama-French 3 factor model. Following Stambaugh et al. (2015), I construct a mispricing score for each stock based on the composite ranking of 11 anomalies the authors suggest.

The final variable I consider is a stock's skewness. Schneider et al. (2020) show that a CAPM model that includes coskewness can explain the low-risk anomalies that include both the beta and idiosyncratic anomalies. I therefore follow Bali, Engle, and Murray (2016) to estimate a stock's skewness using its daily returns over the past month.

To assess the extent to which other characteristics might capture stock managerial ownership, I use two empirical testing approaches. The first approach uses a series of triple portfolio sorts that starts by sorting stocks into two portfolios based on the characteristic of interest. For example, I use the median value of size in each period to sort all stocks into either small or large cap stocks. I then repeat the independent 5-by-3 double portfolio sort as in the baseline analysis within each of the two portfolios. This process produces 30 beta portfolios in total for each characteristic. Finally, I assess the performance of each beta portfolio. If the impact of stock managerial ownership is distinct from other characteristics, I expect that the beta anomaly generally does not exist among stocks with high managerial ownership, regardless of the levels of these characteristics.

A weakness of the triple portfolio sorting approach is that it does not control for multiple firm characteristics. To address this issue, I follow prior studies (e.g., Han et al., 2022) and regress the

stock managerial ownership measure on all characteristics to obtain a residual measure that is orthogonal to potential confounding characteristics. I then repeat the double portfolio sort (5-by-3) based on stock beta and this orthogonalized measure to assess the impact of managerial ownership on the beta anomaly. To maintain brevity and space, I report the results from the triple portfolio sorts in the Appendix and discuss only the results from the second approach here.

Table 5 reports the results. Panel A shows the results when I regress *Ownership rank* on size, value, and momentum. The results imply that the beta anomaly does not exist among stocks with high managerial ownership and the significance only concentrates only among high-beta stocks with low managerial ownership. The high-beta high-ownership stocks have a CAPM alpha of 8 basis points ($t-$stat $= 0.24$), and the difference relative to the high-beta low-ownership is 76 basis points per month ($t-$stat $= 2.17$). Panel B includes mutual fund ownership in the regressions. While the alpha difference between high and low ownership among high-beta stocks reduces, it is still robust that the beta anomaly is only significant among stocks with low ownership. In Panel C where I include all firm characteristics, the pattern remains. These results suggest that the attenuation effect of high managerial ownership is distinct from that of other characteristics that have been found to explain the beta anomaly.

3.4 Other low-risk anomalies

Besides the beta anomaly, the literature has provided extensive evidence of other low-risk anomalies, including Ang et al.'s (2006) idiosyncratic risk and Campbell et al.'s (2008) distress risk. Since these studies, a large number of articles has attempted to explain the phenomena that stocks with high idiosyncratic risk and failure probability have lower average returns.[13] Since it is possible that these risks share some common sources with market risk, it is natural to ask whether stock managerial ownership can have an attenuation effect on this anomaly.

I follow Ang et al. (2006) and Campbell et al. (2008) to construct stocks' idiosyncratic risk and distress risk. I then repeat the portfolio sort for the two anomalies and present the results in Table 6. Panel A shows the results for the idiosyncratic anomaly. The first row shows that over the sample period, the CAPM alpha of a strategy that buys stocks with highest idiosyncratic risk and sells stocks with lowest idiosyncratic risk is -0.40% per month and is statistically significant at the 10%

[13] See Hou and Loh (2016) for a comprehensive examination of explanations of the idiosyncratic anomaly and Chen and Zimmermann (2021) for the distress anomaly.

level, confirming the existence of the idiosyncratic risk anomaly. However, in the subsequent rows, I find that the anomalous returns concentrate only among stocks with lower managerial ownership. In particular, the strategy earns a CAPM alpha of -1.01% ($t-$stat = -3.88) among stocks at the bottom tercile of managerial ownership, while it earns only -0.22% ($t-$stat = -0.67) at the top tercile. Consistent with the previous pattern from the beta anomaly, the decrease in the anomalous returns stems from the insignificant performance of the high-risk high-ownership stocks (alpha = 0.11%, $t-$stat = 0.41) relative to the significant performance of the high-risk low-ownership stocks (alpha = -0.61%, $t-$stat = -2.77).

Panel B shows the results for the distress anomaly. The first row shows that over the sample period, the CAPM alpha of a strategy that buys stocks with highest distres risk and sells stocks with lowest distress risk is -0.51% per month and is statistically significant at the 10% level, confirming the existence of the distress risk anomaly. However, in the subsequent rows, I find that the anomalous returns concentrate only among stocks with lower managerial ownership. In particular, the strategy earns a CAPM alpha of -0.84% ($t-$stat = -2.71) among stocks at the bottom tercile of managerial ownership, while it earns only -0.30% ($t-$stat = -0.88) at the top tercile. Consistent with the previous pattern from the beta anomaly, the decrease in the anomalous returns stems from the insignificant performance of the high-risk high-ownership stocks (alpha = =-0.10%, $t-$stat = -0.32) relative to the significant performance of the high-risk low-ownership stocks (alpha = -0.45%, $t-$stat = -1.73).

The results in this section imply that managerial ownership not only affects the low anomalous returns associated with high-market risk stocks but also stocks with high idiosyncratic and distress risk. It appears that risk incentive alignment mechanisms in the active mutual fund industry can affect the pricing of different risks and help improving market efficiency.

4 Managerial ownership and market risk

In this section, I analyze the tilt toward high-risk stocks among portfolios at different levels of managerial ownership. I also provide evidence how the risk-taking behavior responds to changes in market volatility at different levels of managerial ownership.

4.1 Portfolio-level evidence of tilting toward high-beta stocks

The evidence so far show that managerial ownership attenuates the anomalous low returns associated with high-beta stocks, suggesting that funds whose managers have higher ownership tilt less toward high-beta stocks. To formally test if this is the case, I examine the tilting behavior in the portfolios of these funds.

I start by using the fund-level *Ownership rank* and re-ranking these funds into four groups: the first group contains funds whose managers do not have any ownership (i.e., *Ownership rank* is 1), the second group contains funds whose *Ownership rank* is between 2 and 4, the third group contains funds whose *Ownership rank* is 5, and the last group contains funds whose *Ownership rank* is 6 and 7. For each group, I aggregate their portfolio holdings each period to construct stacked panel in which the unit of analysis is at group and stock level. Following Dou et al. (2024), I then estimate the deviation of each holding from its market weight as the difference between the fraction of the portfolio in the holdings and the market weight.[14] I then perform the stacked panel regression in which the dependent variable is the deviation and the main independent variable is the holding's market beta interacted with the dummy variable indicating the highest group of ownership. The interacted coefficient shows the level of tilt toward high-beta stocks for high ownership portfolio. If the attenuating effect on the beta anomaly comes from funds with higher ownership tilting less toward high-beta stocks, I expect the interacted coeffcients to be negative.

Table 7 shows the results. Columns (1)-(3) of Panel A present the results from the stacked panel regressions for β_{mkt}, $\beta_{\text{Dimson}}$and β_{FP}, respectively. Consistent with prior evidence (e.g., Dou et al., 2024), the coefficient estimate on all measures of beta is positive and statistically significant at the 1% level, suggesting that on average active mutual funds tilt toward stocks with high market beta. This appears to be consistent with the argument that mutual funds are generally taking excessive market risk. Importantly, the interacted coefficient estimate is negative and statistically significant across all measures of beta, implying that portfolios of funds with high managerial ownership tilt significantly less toward high-beta stocks. The economic magnitude of the decrease in the tilt appears to be large, varying between 30% to 50% compared to those with lower managerial ownership. Panel B presents the test's results using Fama-MacBeth regressions and obtain similar

[14] A concern with this construct is that a stock that is not held in the portfolio can be considered as either missing or zero-weighted. Because researchers do not observe the investment opportunity set of portfolio managers, I follow Dou et al. (2024) and assign a stock with zero weight at each period if the stock was held in the portfolio over the last two years, and missing otherwise.

pattern. These results provides formal evidence that the attenuation of managerial ownership on the beta anomaly comes from high ownership funds taking less market risk.

4.2 Fund-level evidence of tilting toward high-beta stocks

I turn to the fund-level analyses to provide further evidence about the risk-taking behavior across different levels of managerial ownership and shed lights on the mechanisms that trigger the risk-shifting.

I repeat the analysis from the previous section but at the fund level. For each period, I first estimate the portfolio tilt toward beta for each fund using the funds' quarterly holdings from the following regression:

$$\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1} = \gamma_{j,t} \times \beta_{\text{mkt},i,t} + \lambda_t + \varepsilon_{j,i,t+1}, \tag{2}$$

where $\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1}$ is the deviation of fund j for stock i from its market weight, and λ_t is the quarter fixed effect. I then use the estimated tilting coefficient $\gamma_{j,t}$ as the dependent variable in a panel regression in which the independent variables are measures of ownership. Control variables include fund size, past performance, past flow, fund age, expense ratio, turnover ratio, family size, fund activeness, and funds' stock characteristics that include size, value, and momentum.

Table 8 presents the results using three measures of portfolio manager ownership: *Ownership rank* (Columns (1)-(2)), *Ownership indicator* (Columns (3)-(4)) and *Ownership dollar* (Columns (5)-(6)). Across different specifications, the results show that funds with higher managerial ownership have significantly lower tilting, providing fund-level evidence that moderating risk-taking behavior at the fund level is a mechanism that alleviates the anomalous returns associated with high-beta stocks.

4.3 Tilting behavior in bad times

In this section, I examine the conditions in which managerial ownership alters the tilt toward high-beta stocks across funds. If managerial ownership changes the risk aversion of portfolio managers, one would expect that the effect to be concentrated during times that portfolio managers are more likely to be experiencing wealth shocks, which are partially captured by their ownership.

To test this hypothesis, I repeat the analysis from the previous section but include indicators

that capture the bad economic times. The first indicator is *Pessimistic market*, which is an indicator equal to 1 for years that the cumulative 12-month market return is in the lowest tercile of the sample period. Another indicator, *Volatile market*, is equal to 1 for years that the annualized weekly market volatility is in the highest tercile of the sample period. Panels A and B of Table 9 present the results for the two variables, respectively.

Consistent with the prior hypothesis, Panel A shows that the effect of managerial ownership on tilting behavior concentrates among periods in which the market is bearish. Column (1) shows that the difference in tilting between funds with high and low managerial ownership is -0.017 and the $p-$value from the $F-$test is 0.002. Similar results are obtained for other measures of ownership. In Panel B where the bad market conditions are captured by the volatility, I obtain similar patterns. Overall, these results imply that the tilting behavior toward high-beta stocks is significantly mitigated during bad times via the exposure of manager ownership to bad market conditions.

5 Conclusion

The theory of leverage constraints conjectures that excessive risk taking by constrained investors contributes to the beta anomaly. This paper provides direct empirical evidence to this prediction by showing that the beta anomaly is only significant among stocks that are subjective to excess risk taking by active mutual funds. I show that the negative anomalous returns associated with high-risk stocks are substantially weaker among stocks with higher portfolio manager ownership. Further analyses show that portfolio managers who have more "skin in the game" significantly reduce market exposure following extreme downturns and volatile markets, implying that portfolio manager ownership affects their risk aversion. This result extends to other low-risk anomalies, including the idiosyncratic and distress risk. This finding re-emphasizes the negative impact of agency-issue-induced risk-taking behavior in the mutual fund industry on financial markets and highlights the role of risk incentive alignment mechanisms in improving market efficiency.

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Figure 1. Aggregate time-series distribution of stock managerial ownership
The figure shows the time-series distribution of stock managerial ownership from 2006 to 2021. The dashed line shows the mean of portfolio managerial ownership across all stocks, and the solid lines show the 95% confidence interval. A stock's portfolio managerial ownership is estimated as the weighted average of portfolio manager ownership, where the weight is the market value of the funds' stock holding. Data on fund-level portfolio manager ownership (in dollars) is collected from the Statement of Additional Information that funds file with the SEC. See the description in the main text for detail.The shaded areas represent NBER recessions.

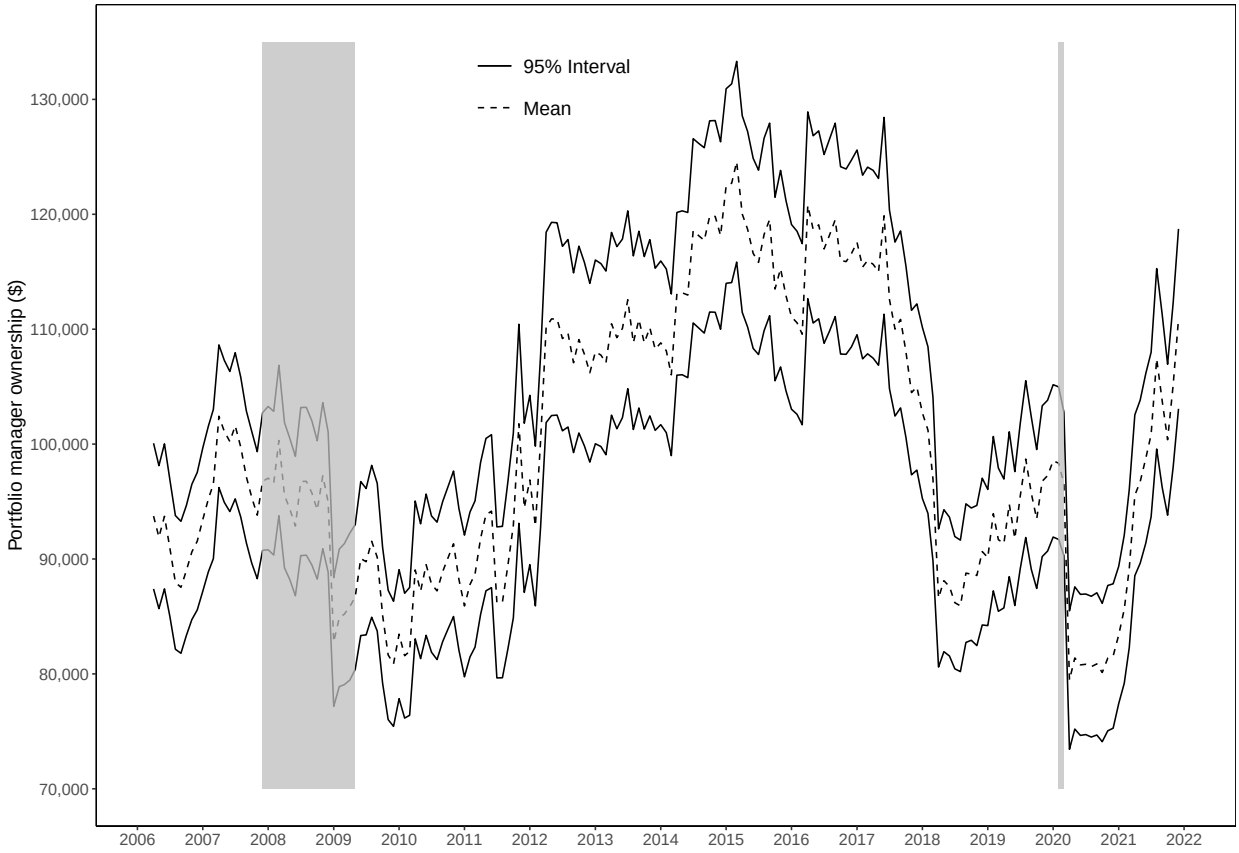

Figure 2. Time-series distribution of stock managerial ownership across size and value categories

The figure shows the mean of stock managerial ownership across six stock categories from 2006 to 2021. The stocks are independently sorted on two size (small and big) and three value portfolios (growth, neutral and value), based on their market value and book-to-market ratio, respectively. A stock's portfolio managerial ownership is estimated as the weighted average of portfolio manager ownership, where the weight is the market value of the funds' stock holding. Data on fund-level portfolio manager ownership (in dollars) is collected from the Statement of Additional Information that funds file with the SEC. See the description in the main text for detail.The shaded areas represent NBER recessions.

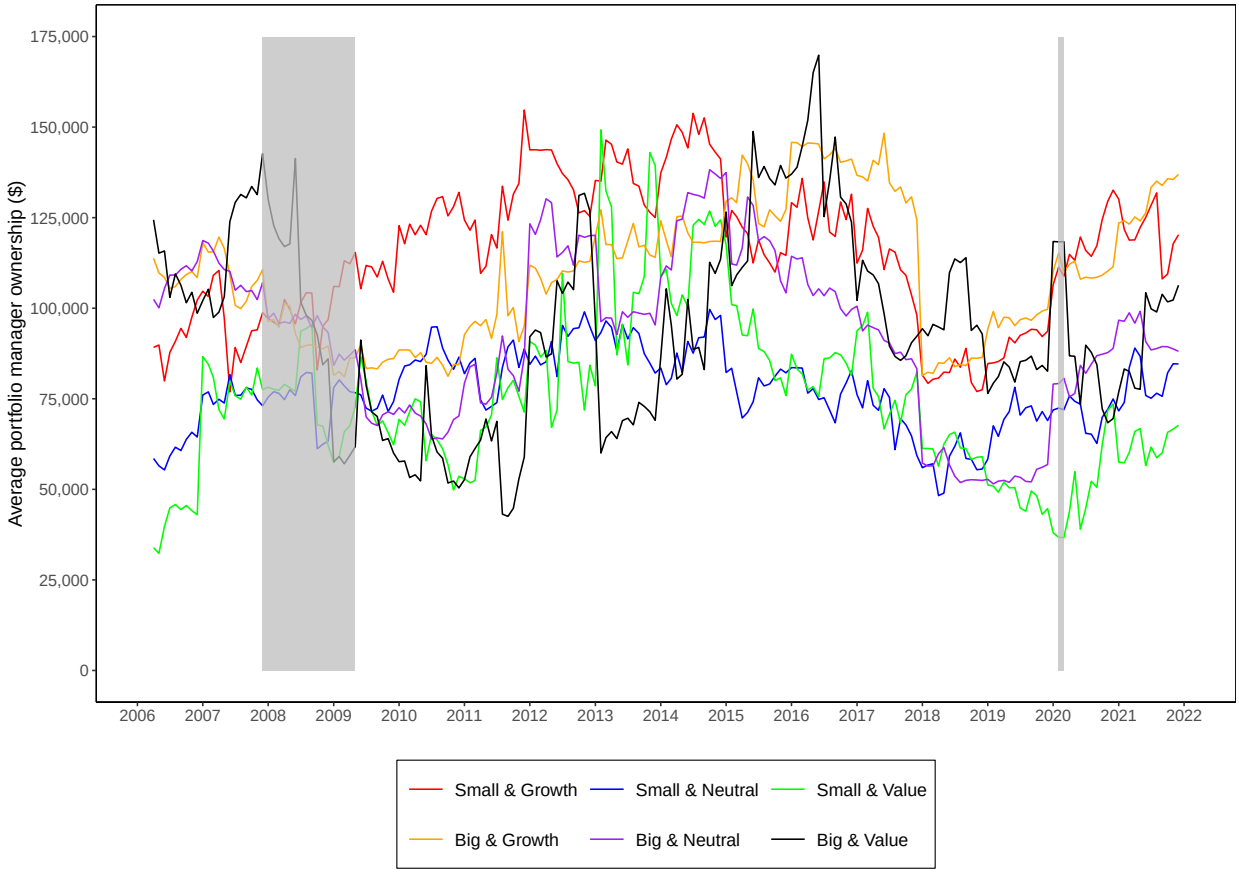

Table 1. Summary statistics

The table presents the summary statistics for the main variables used in the paper for the period 2006-2021. Panel A shows the statistics for the variables in the mutual fund sample. I retrieve portfolio manager ownership information from the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database, which requires disclosure in seven ranges: \$0, \$1-\$10,000, \$10,001-\$50,000, \$50,001-\$100,000, \$100,001-\$500,000, \$500,001-\$1,000,000, and above \$1,000,000. I convert the dollar ranges into dollar amounts by assuming managerial ownership to be at the midpoint of the reported intervals and aggregate the converted amounts for each fund. *Ownership rank* is the value obtained by transforming the total value back to the seven ranks (i.e., from one to seven) used by the SEC. *Ownership indicator* is an indicator equal to 1 if managers have ownership in the fund and 0 otherwise. *LN(Ownership dollar)* is the natural logarithm of the total dollar amount of ownership. Panel B shows the statistics for the variables in the stock sample. Managerial ownership variables are the weighted average of portfolio managerial ownership variables, where the weight is the market value of the funds' stock holdings.

	Mean	Standard deviation	p10	p25	Median	p75	p90
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Mutual fund sample							
Managerial ownership							
Ownership rank	3.611	2.279	1.000	1.000	4.344	5.938	6.000
Ownership indicator	0.610	0.487	0.000	0.000	1.000	1.000	1.000
LN(Ownership dollar)	7.814	6.326	0.000	0.000	11.693	13.572	13.816
Fund characteristics							
LN(TNA)	7.576	2.013	5.010	6.225	7.555	8.909	10.188
LN(Age) (years)	1.935	0.776	1.099	1.386	1.946	2.773	2.773
Quarterly return (%)	2.712	3.335	-1.218	0.607	2.650	4.822	6.838
Quarterly flow (%)	-0.214	18.780	-8.526	-4.528	-1.933	1.324	8.560
Expense ratio (%)	1.105	0.387	0.709	0.900	1.088	1.288	1.492
Turnover ratio (%)	72.120	76.523	17.203	31.182	54.496	89.056	137.152
Panel B: Stock sample							
Managerial ownership							
Ownership rank	4.516	0.756	3.610	4.168	4.625	4.999	5.313
Ownership indicator	0.761	0.142	0.599	0.704	0.786	0.851	0.902
LN(Ownership dollar)	10.076	1.969	7.793	9.242	10.397	11.338	12.092
Firm characteristics							
β_{FP}	1.213	0.416	0.733	0.926	1.167	1.442	1.744
β_{mkt}	1.143	0.643	0.457	0.719	1.043	1.443	1.939
β_{Dimson}	1.254	1.461	-0.195	0.481	1.163	1.939	2.848
Ln(Size)	7.932	1.369	6.442	6.929	7.677	8.700	9.844
Ln(BEME)	-1.053	0.837	-2.071	-1.492	-0.972	-0.502	-0.115
12-month Momentum	0.217	0.581	-0.220	-0.056	0.128	0.355	0.670
Excess return (%)	0.988	10.896	-10.468	-4.628	0.685	6.158	12.416

Table 2. Stock managerial ownership and the beta anomaly

The table shows the monthly CAPM alpha (in percent) of the beta portfolios from an independent double portfolio sort based on stock managerial ownership (*Ownership rank*) and market beta (β_{FP}) for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on β_{FP}. All stocks are then independently sorted in ascending order into three (Panel A) or five (Panel B) portfolios based on managerial ownership. Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The first row in Panel A reports the results for the five beta portfolios, and the subsequent rows report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

		β_{FP}					
		Low	2	3	4	High	High-Low
		(1)	(2)	(3)	(4)	(5)	(6)
		Panel A: 5-by-3 sort					
Managerial ownership	All	0.35***	0.17*	-0.07	-0.01	-0.29	-0.64**
		(0.10)	(0.09)	(0.10)	(0.16)	(0.24)	(0.32)
	Low	0.28**	0.01	-0.41**	-0.28	-0.70***	-0.98***
		(0.11)	(0.11)	(0.18)	(0.20)	(0.25)	(0.29)
	2	0.32**	0.06	-0.13	0.12	-0.55**	-0.87***
		(0.13)	(0.12)	(0.13)	(0.20)	(0.27)	(0.33)
	High	0.33***	0.28**	0.04	-0.12	0.09	-0.25
		(0.12)	(0.12)	(0.13)	(0.21)	(0.29)	(0.35)
	High-Low	0.06	0.27	0.46*	0.16	0.79***	0.73***
		(0.15)	(0.18)	(0.24)	(0.25)	(0.27)	(0.27)
		Panel B: 5-by-5 sort					
Managerial ownership	Low	0.41***	0.18	-0.43**	-0.30	-0.79***	-1.21***
		(0.14)	(0.15)	(0.18)	(0.26)	(0.25)	(0.27)
	2	0.12	-0.12	-0.07	-0.38**	-0.69**	-0.81**
		(0.14)	(0.18)	(0.21)	(0.19)	(0.30)	(0.36)
	3	0.25**	-0.01	-0.08	0.26	-0.51*	-0.76**
		(0.12)	(0.17)	(0.11)	(0.27)	(0.29)	(0.35)
	4	0.47***	0.16	-0.12	-0.03	-0.27	-0.74**
		(0.14)	(0.17)	(0.16)	(0.28)	(0.32)	(0.37)
	High	0.34***	0.26**	0.06	-0.11	-0.09	-0.42
		(0.13)	(0.13)	(0.15)	(0.25)	(0.34)	(0.41)
	High-Low	-0.08	0.08	0.49**	0.19	0.71**	0.78**
		(0.20)	(0.20)	(0.22)	(0.34)	(0.35)	(0.39)

Table 3. Other stock managerial ownership measures and the beta anomaly
The table shows the monthly CAPM alpha (in percent) of the beta portfolios from independent double portfolio sorts based on two alternative measures of stock managerial ownership and market beta (β_{FP}) for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on β_{FP}. All stocks are then independently sorted in ascending order into three portfolios based on either *Ownership indicator* (Panel A) and *LN(Ownership dollar)* (Panel B). Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The rows in each panel report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

		β_{FP}					
		Low	2	3	4	High	High-Low
		Panel A: Ownership indicator					
Managerial ownership	Low	0.43***	-0.04	-0.26	-0.30	-0.64***	-1.07***
		(0.11)	(0.11)	(0.18)	(0.20)	(0.23)	(0.26)
	2	0.31**	0.03	-0.22**	0.09	-0.51*	-0.82**
		(0.12)	(0.15)	(0.11)	(0.20)	(0.29)	(0.36)
	High	0.33**	0.34**	0.06	-0.13	0.00	-0.34
		(0.13)	(0.14)	(0.15)	(0.20)	(0.33)	(0.39)
	High-Low	-0.10	0.38**	0.31	0.17	0.63**	0.73**
		(0.15)	(0.18)	(0.26)	(0.24)	(0.31)	(0.32)
		Panel B: Ownership dollar					
Managerial ownership	Low	0.41***	-0.04	-0.36*	-0.28	-0.74***	-1.15***
		(0.10)	(0.12)	(0.18)	(0.21)	(0.23)	(0.27)
	2	0.29**	0.07	-0.15	0.10	-0.50*	-0.79**
		(0.12)	(0.15)	(0.13)	(0.19)	(0.30)	(0.37)
	High	0.35**	0.30**	0.05	-0.11	0.00	-0.35
		(0.13)	(0.13)	(0.14)	(0.20)	(0.30)	(0.36)
	High-Low	-0.06	0.34*	0.41	0.17	0.74**	0.80**
		(0.15)	(0.18)	(0.26)	(0.25)	(0.30)	(0.31)

Table 4. Stock managerial ownership measures and other beta measures
The table shows the monthly CAPM alpha (in percent) of the beta portfolios from independent double portfolio sorts based on stock managerial ownership and two alternative measures of market beta for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on either β_{mkt} (Panel A) or β_{Dimson} (Panel B). All stocks are then independently sorted in ascending order into three portfolios based on *Ownership rank*. Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The first rows in each panel report the results for the five beta portfolios, and the subsequent rows report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

		β					
		Low	2	3	4	High	High-Low
		Panel A: β_{mkt}					
Managerial ownership	All	0.27***	0.23**	0.09	-0.23	-0.35	-0.62*
		(0.09)	(0.11)	(0.12)	(0.19)	(0.27)	(0.33)
	Low	0.11	-0.05	-0.05	-0.36*	-0.72**	-0.83**
		(0.13)	(0.15)	(0.20)	(0.21)	(0.28)	(0.33)
	2	0.20	0.26*	-0.03	-0.29	-0.38	-0.59
		(0.13)	(0.14)	(0.13)	(0.22)	(0.32)	(0.38)
	High	0.30**	0.26*	0.12	-0.10	-0.09	-0.39
		(0.13)	(0.16)	(0.20)	(0.25)	(0.26)	(0.34)
	High-Low	0.19	0.31	0.17	0.26	0.63***	0.44
		(0.19)	(0.25)	(0.28)	(0.23)	(0.24)	(0.32)
		Panel B: β_{Dimson}					
Managerial ownership	All	0.33***	0.19**	-0.01	0.01	-0.38	-0.71**
		(0.10)	(0.09)	(0.10)	(0.16)	(0.23)	(0.31)
	Low	0.19*	0.01	-0.21	-0.36*	-0.62***	-0.81***
		(0.11)	(0.12)	(0.19)	(0.20)	(0.23)	(0.25)
	2	0.35***	0.03	-0.01	0.10	-0.57*	-0.92**
		(0.13)	(0.14)	(0.13)	(0.19)	(0.29)	(0.36)
	High	0.38***	0.28**	0.02	-0.03	0.14	-0.24
		(0.13)	(0.12)	(0.14)	(0.17)	(0.34)	(0.40)
	High-Low	0.19	0.27	0.23	0.33	0.75**	0.57
		(0.18)	(0.18)	(0.27)	(0.23)	(0.33)	(0.34)

Table 5. Adjusted stock managerial ownership measures and the beta anomaly
The table shows the monthly CAPM alpha (in percent) of the beta portfolios from an independent double portfolio sort based on residual stock managerial ownership and market beta (β_{FP}) for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on β_{FP}. I then regress (*Ownership rank*) on other firm characteristics, and obtain the residuals from this panel regression. All stocks are then independently sorted in ascending order into three portfolios based on the residual managerial ownership. For brevity, I only show the results for the lowest and highest terciles. Panel A uses size, value, and momentum as firm characteristics. Panel B adds mutual fund ownership, and Panel C adds idiosyncratic risk, mispricing score, and skewness. Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The rows in each panel report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	β_{FP}					
	Low	2	3	4	High	High-Low
	Panel A: Size, Value and Momentum					
Low	0.22*	0.12	-0.28	-0.17	-0.68***	-0.90***
	(0.12)	(0.17)	(0.17)	(0.18)	(0.25)	(0.32)
High	0.44***	0.04	0.04	0.03	0.08	-0.36
	(0.14)	(0.12)	(0.13)	(0.32)	(0.34)	(0.39)
High-Low	0.22	-0.07	0.32	0.20	0.76**	0.54
	(0.18)	(0.20)	(0.20)	(0.32)	(0.35)	(0.39)
	Panel B: Size, Value, Momentum, and Fund Ownership					
Low	0.27**	0.16	-0.25	-0.15	-0.59**	-0.86***
	(0.11)	(0.13)	(0.16)	(0.20)	(0.26)	(0.29)
High	0.36***	0.06	-0.03	-0.04	-0.08	-0.44
	(0.13)	(0.14)	(0.12)	(0.28)	(0.34)	(0.41)
High-Low	0.08	-0.10	0.22	0.11	0.51	0.43
	(0.16)	(0.17)	(0.20)	(0.27)	(0.35)	(0.39)
	Panel C: All characteristics					
Low	0.34***	0.15	-0.21	-0.14	-0.62**	-0.96***
	(0.10)	(0.14)	(0.16)	(0.21)	(0.28)	(0.31)
High	0.41***	-0.04	0.09	0.06	-0.07	-0.48
	(0.14)	(0.14)	(0.13)	(0.28)	(0.35)	(0.41)
High-Low	0.07	-0.19	0.30	0.20	0.55	0.48
	(0.15)	(0.18)	(0.21)	(0.28)	(0.39)	(0.43)

Table 6. Stock managerial ownership measures and low-risk anomalies
The table shows the monthly CAPM alpha (in percent) of the beta portfolios from independent double portfolio sorts based on stock managerial ownership and two alternative measures of risk for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on either idiosyncratic risk (Panel A) or distress risk (Panel B). Idiosyncratic risk is estimated as the standard deviation of the daily residual returns with respect to the Fama-French 3-factor model. Distress risk is estimated as the failure probability based on the stocks' fundamentals. All stocks are then independently sorted in ascending order into three portfolios based on *Ownership rank*. Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The first rows in each panel report the results for the five portfolios sorted on the risk measures, and the subsequent rows report the results for the portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-risk stocks and sell the low-risk stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

		Low	2	3	4	High	High-Low
				Panel A: Idiosyncratic risk			
Managerial ownership	All	0.30***	0.14*	0.02	-0.22	-0.10	-0.40*
		(0.09)	(0.08)	(0.11)	(0.16)	(0.16)	(0.22)
	Low	0.40***	-0.24*	0.03	-0.33*	-0.61***	-1.01***
		(0.15)	(0.14)	(0.18)	(0.18)	(0.22)	(0.26)
	2	0.27**	0.29***	-0.04	-0.40*	-0.08	-0.34
		(0.12)	(0.11)	(0.15)	(0.21)	(0.22)	(0.26)
	High	0.32***	0.00	0.19	0.12	0.11	-0.22
		(0.12)	(0.14)	(0.17)	(0.29)	(0.27)	(0.33)
	High-Low	-0.08	0.24	0.16	0.45	0.71**	0.79**
		(0.18)	(0.22)	(0.21)	(0.32)	(0.33)	(0.34)
				Panel B: Distress risk			
Managerial ownership	All	0.34***	0.02	-0.14	-0.24	-0.17	-0.51*
		(0.09)	(0.08)	(0.12)	(0.18)	(0.23)	(0.28)
	Low	0.39***	-0.16	-0.26*	-0.50**	-0.45*	-0.84***
		(0.12)	(0.16)	(0.14)	(0.22)	(0.26)	(0.31)
	2	0.35***	-0.05	-0.23	-0.19	-0.14	-0.48
		(0.11)	(0.11)	(0.15)	(0.20)	(0.26)	(0.32)
	High	0.20	0.32**	0.06	0.07	-0.10	-0.30
		(0.12)	(0.13)	(0.17)	(0.32)	(0.31)	(0.34)
	High-Low	-0.20	0.48**	0.31	0.57*	0.34	0.54*
		(0.14)	(0.22)	(0.22)	(0.33)	(0.30)	(0.32)

Table 7. Stock managerial ownership and beta tilting

The table presents the results from the test of portfolio tilt toward high-beta stocks. I classify each fund into four groups based on fund-level *Ownership rank*, in which the last group contains funds whose *Ownership rank* is 6 and 7 (i.e., ownership is greater than $500,000). For each group, I aggregate their portfolio holdings each period to construct stacked panel where the dependent variable is the deviation of each holding from its market weight. I then perform the stacked panel regression

$$\omega_{p,i,t} - \omega_{m,i,t} = \gamma_{j,t-1} \times \beta_{i,t-1} + \delta_{j,t} \times \beta_{i,t} \times \text{Ownership}_{p,t-1} + \text{Ownership}_{p,t-1} + \lambda_{k,t-1} + \varepsilon_{p,i,t-1},$$

where $\text{Ownership}_{p,t-1}$ is an indicator equal to 1 for the highest group. Columns (1) and (4), (2) and (5) and (3) and (6) report the results for β_{FP}, β_{mkt}, β_{Dimson}, respectively. Panel A reports the results using panel regressions that include industry by time fixed effects, and standard errors are double clustered at the stock and time level and shown in brackets. Panel B reports the results using Fama-MacBeth regressions, and standard errors are Newey-West adjusted and shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.The sample period is from 2006 to 2021.

	Dependent variable: $\omega_{p,i,t} - \omega_{i,t}^{\text{mkt}}$					
	Panel A: Panel regressions			Panel B: Fama-MacBeth regressions		
	(1)	(2)	(3)	(4)	(5)	(6)
$\beta_{i,t-1}^{mkt}$	0.090***			0.093***		
	(0.022)			(0.006)		
$\beta_{i,t-1}^{mkt} \times \text{Ownership}_{p,t-1}$	-0.049***			-0.051***		
	(0.012)			(0.006)		
$\beta_{i,t-1}^{Dimson}$		0.041***			0.071***	
		(0.010)			(0.011)	
$\beta_{i,t-1}^{Dimson} \times \text{Ownership}_{p,t-1}$		-0.014**			-0.025***	
		(0.006)			(0.009)	
$\beta_{i,t-1}^{FP}$			0.121***			0.117***
			(0.027)			(0.027)
$\beta_{i,t-1}^{FP} \times \text{Ownership}_{p,t-1}$			-0.034***			-0.034***
			(0.011)			(0.010)
$\text{Ownership}_{p,t-1}$	0.000	0.000	0.000	-0.001	0.004*	0.001
	(0.016)	(0.016)	(0.016)	(0.002)	(0.003)	(0.004)
Industry × Time FE	✓	✓	✓			
# obs. (Avg. # obs./quarter)	305,617	305,617	305,617	4775	4775	4775
R-squared (Avg. R-squared)	0.05	0.04	0.05	0.01	0.01	0.01

Table 8. Managerial ownership and fund-level beta tilting

The table presents the results from the test of fund-level tilt toward high-beta stocks. For each year, I estimate each fund's tilt toward high-beta stocks using the regression

$$\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1} = \gamma_{j,t} \times \beta_{\text{mkt},i,t} + \lambda_t + \varepsilon_{j,i,t+1}, \tag{3}$$

where $\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1}$ is the deviation of fund j for stock i from its market weight, and λ_t is the quarter fixed effect. I then regress the estimated $\gamma_{j,t}$ on three measures of portfolio manager ownership: *Ownership rank* is the ownership rank from one to seven used by the SEC (Columns (1) and (2)), *Ownership indicator* is an indicator equal to 1 if managers have ownership in the fund and 0 otherwise (Columns (3) and (4)), and *LN(Ownership dollar)* is the natural logarithm of the total dollar amount of ownership (Columns (5) and (6)). Control variables include fund size, past performance, past flow, fund age, expense ratio, turnover ratio, family size, fund activeness, and funds' stock characteristics that include size, value, and momentum. The regressions include style by year fixed effects and family fixed effect. Standard errors are clustered at the fund level and shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.The sample period is from 2006 to 2021.

	Dependent variable: $\gamma_{j,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership rank$_{j,t-1}$	-0.018***	-0.014**				
	(0.006)	(0.006)				
Ownership indicator$_{j,t-1}$			-0.073***	-0.062**		
			(0.028)	(0.028)		
Ownership dollar$_{j,t-1}$					-0.038***	-0.031**
					(0.013)	(0.014)
Controls		✓		✓		✓
Style x Year FE	✓	✓	✓	✓	✓	✓
Family FE	✓	✓	✓	✓	✓	✓
# obs.	17,961	17,961	17,961	17,961	17,961	17,961
Adjusted R-squared	0.12	0.13	0.12	0.13	0.12	0.13

Table 9. Managerial ownership, market risk, and fund-level beta tilting
The table tests the mechanisms of portfolio manager ownership on the tilt toward high-beta stocks. For each year, I estimate each fund's tilt toward high-beta stocks using the regression

$$\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1} = \gamma_{j,t} \times \beta_{\text{mkt},i,t} + \lambda_t + \varepsilon_{j,i,t+1}, \tag{4}$$

where $\omega_{j,i,t+1} - \omega_{\text{mkt},i,t+1}$ is the deviation of fund j for stock i from its market weight, and λ_t is the quarter fixed effect. I then regress the estimated $\gamma_{j,t}$ on three measures of portfolio manager ownership: *Ownership rank* is the ownership rank from one to seven used by the SEC (Columns (1) and (4)), *Ownership indicator* is an indicator equal to 1 if managers have ownership in the fund and 0 otherwise (Columns (2) and (5)), and *LN(Ownership dollar)* is the natural logarithm of the total dollar amount of ownership (Columns (3) and (6)). The regressions include variables that indicate bad economic times and their interaction with the ownership variables. Panel A reports the results in which the bad times are *Pessimistic market*, which is an indicator equal to 1 for years that the cumulative 12-month market return is in the lowest tercile of the sample period. Panel B uses *Volatile market*, which is equal to 1 for years that the annualized weekly market volatility is in the highest tercile of the sample period. The table also reports the difference between the interacted coefficient estimates in the bad times and other times and p-value associated with the $F-$test of the difference. Control variables include fund size, past performance, past flow, fund age, expense ratio, turnover ratio, family size, fund activeness, and funds' stock characteristics that include size, value, and momentum. The regressions include style by year fixed effects and family fixed effect. Standard errors are clustered at the fund level and shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.The sample period is from 2006 to 2021.

	Dependent variable: $\gamma_{j,t}$					
	Panel A: Pessimistic market			Panel B: Volatile market		
	(1)	(2)	(3)	(4)	(5)	(6)
Ownership rank × Bad times	-0.025***			-0.023***		
	(0.008)			(0.008)		
Ownership rank × Other times	-0.008			-0.007		
	(0.007)			(0.007)		
Ownership indicator × Bad times		-0.097***			-0.090***	
		(0.033)			(0.034)	
Ownership indicator × Other times		-0.042			-0.041	
		(0.029)			(0.032)	
Ownership dollar × Bad times			-0.052***			-0.048***
			(0.016)			(0.016)
Ownership dollar × Other times			-0.020			-0.019
			(0.014)			(0.015)
Difference	-0.017	-0.055	-0.031	-0.016	-0.049	-0.028
p-value (F-test)	0.002	0.023	0.005	0.037	0.140	0.073
Controls	✓	✓	✓	✓	✓	✓
Style x Year FE	✓	✓	✓	✓	✓	✓
Family FE	✓	✓	✓	✓	✓	✓
# obs.	17,961	17,961	17,961	17,961	17,961	17,961
Adjusted R-squared	0.13	0.13	0.13	0.13	0.13	0.13

Appendix

Table A1. Stock managerial ownership and beta anomaly: Alternative alpha measures
The table repeats the baseline test from Table 2 but uses three alternative asset pricing models to estimate abnormal returns (in percent) of the beta portfolios from an independent double portfolio sort based on stock managerial ownership (*Ownership rank*) and market beta (β_{FP}) for the period 2006-2021. Panel A, B and C uses the Fama-French 3-factor model, the 3-factor model agumented with the momentum and liquidity factor and the Fama-French 5-factor model augmented with the momentum factor, respectively. The first row in each panel reports the results for the five beta portfolios, and the subsequent rows report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	β_{FP}					
	Low	2	3	4	High	High-Low
			Panel A: 3-factor model			
All	0.28***	0.09	-0.10	0.04	-0.19	-0.47
	(0.10)	(0.08)	(0.09)	(0.13)	(0.26)	(0.34)
Low	0.29**	0.06	-0.29	-0.09	-0.48**	-0.76***
	(0.12)	(0.12)	(0.20)	(0.19)	(0.24)	(0.28)
High	0.23*	0.17*	-0.01	-0.09	0.18	-0.05
	(0.12)	(0.09)	(0.11)	(0.17)	(0.30)	(0.36)
High-Low	-0.05	0.11	0.28	0.00	0.66**	0.71**
	(0.15)	(0.14)	(0.24)	(0.25)	(0.27)	(0.29)
			Panel B: 5-factor model			
All	0.27***	0.09	-0.10	0.05	-0.15	-0.42
	(0.10)	(0.08)	(0.08)	(0.13)	(0.25)	(0.32)
Low	0.26**	0.07	-0.30	-0.07	-0.44*	-0.70**
	(0.12)	(0.11)	(0.20)	(0.19)	(0.23)	(0.28)
High	0.23*	0.17*	-0.02	-0.09	0.20	-0.03
	(0.12)	(0.09)	(0.12)	(0.17)	(0.29)	(0.34)
High-Low	-0.03	0.10	0.28	-0.02	0.64**	0.67**
	(0.15)	(0.14)	(0.24)	(0.25)	(0.27)	(0.30)
			Panel C: 6-factor model			
All	0.15	0.00	-0.09	0.03	-0.07	-0.22
	(0.09)	(0.08)	(0.10)	(0.12)	(0.27)	(0.33)
Low	0.20*	0.04	-0.26	-0.01	-0.38*	-0.58**
	(0.11)	(0.11)	(0.18)	(0.18)	(0.22)	(0.27)
High	0.12	0.15	0.04	-0.14	0.35	0.23
	(0.11)	(0.10)	(0.13)	(0.18)	(0.30)	(0.36)
High-Low	-0.08	0.11	0.30	-0.13	0.73***	0.81***
	(0.14)	(0.15)	(0.24)	(0.27)	(0.26)	(0.29)

Table A2. Stock managerial ownership and the beta anomaly: Triple sorts on characteristics

The table repeats the baseline test from Table 2 but employs another portfolio sort based on firm characteristics before the main double portfolio sort. I first use the median value of a firm characteristic to sort all stocks in ascending order into two portfolios. Then within each portfolio, I re-perform the independent double portfolio sort ased on stock managerial ownership (*Ownership rank*) and market beta (β_{FP}) for the period 2006-2021. The panel headings show the name of the characteristic used for the first sort, and the seven characteristics are size, value, mutual fund ownership, idiosyncratic risk, maximum returns, mispricing score, and skewness. The rows in each panel report the monthly CAPM alpha (in percent) for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	All	Low	2	3	High	High-Low
			Panel A: Size			
Small						
Low	0.02	-0.46**	-0.01	-0.56**	-0.82**	-0.84**
	(0.18)	(0.21)	(0.26)	(0.23)	(0.35)	(0.36)
High	0.21	-0.17	0.11	-0.16	-0.43	-0.63
	(0.20)	(0.20)	(0.21)	(0.26)	(0.43)	(0.39)
High-Low	0.18	0.30	0.12	0.40	0.39	0.20
	(0.19)	(0.20)	(0.24)	(0.28)	(0.35)	(0.40)
Big						
Low	0.22	0.11	-0.22	-0.37	-0.58**	-0.79**
	(0.15)	(0.16)	(0.17)	(0.24)	(0.27)	(0.36)
High	0.26	0.21	0.22*	-0.07	0.12	-0.14
	(0.16)	(0.14)	(0.12)	(0.20)	(0.30)	(0.39)
High-Low	0.04	0.10	0.44*	0.30	0.70**	0.65**
	(0.15)	(0.22)	(0.23)	(0.35)	(0.29)	(0.32)

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Table A2 (*continued*)

	All	Low	2	3	High	High-Low
			Panel B: Value			
Growth						
Low	0.41***	0.22	-0.08	-0.37	-0.67**	-1.09***
	(0.15)	(0.15)	(0.17)	(0.27)	(0.29)	(0.35)
High	0.37**	0.28*	0.15	0.01	0.01	-0.35
	(0.16)	(0.15)	(0.14)	(0.25)	(0.34)	(0.38)
High-Low	-0.05	0.06	0.23	0.39	0.69**	0.73**
	(0.18)	(0.22)	(0.21)	(0.41)	(0.30)	(0.31)
Value						
Low	0.25	-0.24	-0.34	-0.46	-0.59	-0.84**
	(0.20)	(0.22)	(0.26)	(0.28)	(0.37)	(0.40)
High	0.03	-0.22	0.01	-0.80**	-0.15	-0.18
	(0.19)	(0.20)	(0.25)	(0.36)	(0.44)	(0.48)
High-Low	-0.22	0.02	0.35	-0.35	0.44	0.66
	(0.21)	(0.26)	(0.27)	(0.38)	(0.38)	(0.45)
			Panel C: Mutual fund ownership			
Low						
Low	0.34**	-0.06	0.08	-0.26	-0.65**	-0.99***
	(0.15)	(0.18)	(0.20)	(0.22)	(0.32)	(0.37)
High	0.27**	0.37**	0.06	-0.08	-0.17	-0.44
	(0.12)	(0.16)	(0.20)	(0.26)	(0.31)	(0.37)
High-Low	-0.07	0.43	-0.03	0.18	0.48	0.55
	(0.18)	(0.28)	(0.31)	(0.26)	(0.31)	(0.36)
High						
Low	0.08	-0.01	-0.11	-0.19	-0.81**	-0.89**
	(0.17)	(0.21)	(0.17)	(0.28)	(0.34)	(0.36)
High	0.22	0.39*	-0.31	-0.46	-0.09	-0.32
	(0.20)	(0.20)	(0.29)	(0.28)	(0.42)	(0.51)
High-Low	0.14	0.41*	-0.20	-0.27	0.72*	0.57
	(0.27)	(0.24)	(0.34)	(0.24)	(0.40)	(0.50)

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Table A2 (*continued*)

	All	Low	2	3	High	High-Low
			Panel D: Idiosyncratic risk			
Low						
Low	0.51***	0.19	0.00	-0.14	-0.31	-0.82***
	(0.15)	(0.17)	(0.16)	(0.21)	(0.22)	(0.30)
High	0.35**	0.29**	0.41**	0.13	-0.13	-0.47
	(0.17)	(0.13)	(0.18)	(0.19)	(0.25)	(0.33)
High-Low	-0.16	0.10	0.40	0.27	0.18	0.34
	(0.19)	(0.21)	(0.25)	(0.29)	(0.27)	(0.32)
High						
Low	0.13	-0.65**	-0.38	-0.38	-0.84**	-0.97**
	(0.18)	(0.25)	(0.26)	(0.30)	(0.37)	(0.38)
High	0.31	-0.23	0.12	-0.54	0.12	-0.19
	(0.24)	(0.19)	(0.33)	(0.34)	(0.43)	(0.47)
High-Low	0.17	0.43	0.51	-0.16	0.96**	0.78
	(0.29)	(0.34)	(0.33)	(0.39)	(0.40)	(0.48)
			Panel E: Maximum			
Low						
Low	0.51***	0.12	-0.14	-0.16	-0.18	-0.69**
	(0.14)	(0.18)	(0.16)	(0.21)	(0.24)	(0.30)
High	0.36**	0.20	0.40**	0.07	-0.04	-0.41
	(0.18)	(0.12)	(0.16)	(0.19)	(0.26)	(0.35)
High-Low	-0.15	0.08	0.54**	0.24	0.14	0.29
	(0.17)	(0.21)	(0.21)	(0.29)	(0.31)	(0.36)
High						
Low	0.19	-0.13	-0.52**	-0.54**	-0.96***	-1.15***
	(0.20)	(0.25)	(0.24)	(0.27)	(0.35)	(0.36)
High	0.12	0.10	0.29	-0.52	-0.05	-0.18
	(0.16)	(0.19)	(0.32)	(0.34)	(0.41)	(0.45)
High-Low	-0.07	0.23	0.81**	0.02	0.90**	0.97**
	(0.26)	(0.31)	(0.33)	(0.35)	(0.40)	(0.49)

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Table A2 (*continued*)

	All	Low	2	3	High	High-Low
			Panel F: Mispricing score			
Low						
Low	0.31*	0.16	-0.08	-0.33	-0.39	-0.70**
	(0.16)	(0.16)	(0.19)	(0.23)	(0.25)	(0.35)
High	0.28*	0.24*	0.24*	0.20	0.32	0.04
	(0.16)	(0.13)	(0.13)	(0.20)	(0.23)	(0.32)
High-Low	-0.03	0.08	0.32	0.53*	0.71**	0.74**
	(0.19)	(0.20)	(0.23)	(0.30)	(0.29)	(0.36)
High						
Low	0.29	-0.20	-0.25	-0.75***	-0.79**	-1.08***
	(0.18)	(0.23)	(0.27)	(0.27)	(0.37)	(0.37)
High	0.25	0.06	-0.06	-0.08	-0.25	-0.50
	(0.17)	(0.22)	(0.29)	(0.31)	(0.44)	(0.50)
High-Low	-0.04	0.26	0.19	0.67**	0.54	0.58
	(0.20)	(0.33)	(0.36)	(0.32)	(0.38)	(0.44)
			Panel G: Skewness			
Low						
Low	0.19	-0.15	-0.26	-0.21	-0.55*	-0.74**
	(0.15)	(0.19)	(0.22)	(0.25)	(0.29)	(0.35)
High	0.37**	0.54***	-0.29	-0.23	0.16	-0.21
	(0.16)	(0.17)	(0.18)	(0.27)	(0.38)	(0.44)
High-Low	0.18	0.69***	-0.03	-0.02	0.71*	0.53
	(0.21)	(0.24)	(0.29)	(0.40)	(0.38)	(0.43)
High						
Low	0.26	0.09	-0.56**	-0.35	-0.65**	-0.91**
	(0.18)	(0.17)	(0.22)	(0.27)	(0.30)	(0.36)
High	0.33**	0.12	0.24	0.07	-0.21	-0.54
	(0.16)	(0.17)	(0.19)	(0.27)	(0.34)	(0.42)
High-Low	0.07	0.02	0.80***	0.42	0.44	0.37
	(0.21)	(0.24)	(0.30)	(0.30)	(0.34)	(0.39)

Table A3. Adjusted stock managerial ownership and beta anomaly: Alternative ownership measures

The table shows the monthly CAPM alpha (in percent) of the beta portfolios from an independent double portfolio sort based on residual stock managerial ownership and market beta (β_{FP}) for the period 2006-2021. At the beginning of each quarter, all stocks are sorted in ascending order into quintile portfolios based on β_{FP}. I then regress the ownership measure on seven firm characteristics (i.e., size, value, momentum, mutual fund ownership, idiosyncratic risk, mispricing score, skewness), and obtain the residuals from this panel regression. All stocks are then independently sorted in ascending order into three portfolios based on the residual managerial ownership. For brevity, I only show the results for the lowest and highest terciles. Panel A (B) uses *Ownership indicator* (*Ownership rank*) as the measure of ownership. Each portfolio's returns are calculated as the weighted average returns of the stocks in the portfolio, where the weight is the market value of the stocks. The portfolios are rebalanced every three months. The rows in each panel report the results for the beta portfolios at different levels of managerial ownership. The last column in each panel shows the results for the strategies that buy the high-beta stocks and sell the low-beta stocks. Newey-West adjusted standard errors are shown in brackets. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	β_{FP}					
	Low	2	3	4	High	High-Low
	Panel A: Ownership indicator					
Low	0.39***	0.05	-0.28*	-0.10	-0.27	-0.66**
	(0.12)	(0.13)	(0.15)	(0.20)	(0.27)	(0.33)
High	0.37***	0.04	0.02	-0.19	-0.02	-0.39
	(0.13)	(0.12)	(0.13)	(0.26)	(0.31)	(0.38)
High-Low	-0.02	-0.02	0.31*	-0.09	0.25	0.27
	(0.17)	(0.16)	(0.18)	(0.27)	(0.31)	(0.38)
	Panel B: Ownership dollar					
Low	0.36***	0.21	-0.20	-0.09	-0.51**	-0.87***
	(0.12)	(0.14)	(0.14)	(0.23)	(0.25)	(0.29)
High	0.31**	0.05	-0.02	-0.01	-0.05	-0.36
	(0.12)	(0.13)	(0.13)	(0.28)	(0.34)	(0.42)
High-Low	-0.05	-0.16	0.18	0.09	0.46	0.51
	(0.14)	(0.19)	(0.18)	(0.27)	(0.34)	(0.39)