2018 Diverse Asset Management Enhanced Performance Analysis

Final Report
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I. Executive Summary

In our *2018 Diverse Asset Management Firm Assessment* we examined the state of diversity in the U.S. asset management industry. Our study found strikingly low levels of diverse ownership for mutual funds, hedge funds, private equity (PE) funds, and real estate funds. Interestingly, we found little support for the claim that diverse-owned asset managers underperform (or overperform) their non-diverse peers. In this study, we extend our original analysis and use enhanced methodologies to test for performance differences between diverse-owned and non-diverse-owned asset managers. In particular, we include "better" measures of financial risk (for mutual funds and hedge funds) and incorporate public market benchmarks (for PE funds). More detailed discussions of our methodological enhancements can be found in our **Methodology and Results** and **Appendix** sections.

The results of our study mostly confirm the findings of our original performance analysis. There were however, a few notable exceptions. In this summary, we briefly highlight the major conclusions of our study by asset class:

Mutual Funds:

- **Using eVestment data from 2011-2017, we find no evidence that women- or minority-ownership impacts the returns of U.S. mutual funds.**
- **Our mutual fund results hold using different equity thresholds for defining diverse-ownership.**

Hedge Funds:

- **We analyze Hedge Fund Research (HFR) data from 2005-2018 and find little evidence that women- or minority-ownership has any effect on fund performance.**
- **We obtain similar results after restricting our original sample period (2005-2018) to the period used in our mutual fund analysis (2011-2017).**

Private Equity:

- **We examine the performance of PE funds with vintage years 2006-2015 using public market equivalents (PMEs) from Preqin.**
- **We find no convincing evidence that women-ownership significantly impacts PE returns. Interestingly, however, there is some mixed evidence that minority-ownership increases PE returns in two out of three models. On average, we find that minority-ownership increases a fund's Kaplan-Schoar PME by 0.137, but the effect is only weakly statistically significant.[1]**
- **Of the three asset classes we examine, PE has the smallest sample size. Therefore, care should be taken when interpreting our PE findings.**

[1] The estimated effect of minority-ownership on PE performance is significant at the 10% level (p-value < 0.10).

II. Introduction

In our *2018 Diverse Asset Management Firm Assessment* we document surprisingly low levels of representation for women and minorities in asset management firms. An important question is whether this lack of diversity stems from differences in the performance of diverse and non-diverse managers. That is, do investors avoid women- or minority-owned funds because they produce lower returns than their non-diverse peers? In our original performance analysis, we examine diversity-related performance differences for four asset classes: mutual funds, hedge funds, private equity (PE), and real estate, using straightforward and widely accepted analytical techniques. With the exception of real estate, our results suggest that ownership by women and minorities has no effect on performance.[2] It is possible, however, that performance differences may be uncovered using enhanced methodologies. Therefore, in this study, we extend our original analysis by accounting for multiple sources of financial risk (for mutual funds and hedge funds) and incorporating public market benchmarks of fund performance (for private equity).[3]

For mutual funds and hedge funds, we extend our investigation of returns by considering risk. Because diverse and non-diverse funds may differ in their exposure to financial market risk, failure to appropriately control for risk may yield biased estimates. For example, suppose that, on average, women-owned funds are less risky than men-owned funds and there are no gender differences in unadjusted returns. It is reasonable to expect that women would *outperform* men if they owned funds with the same level of risk. We therefore explore the impact of women and minority ownership on multi-factor risk-adjusted returns.

For PE, the measurement of fund performance remains a controversial issue. While many investment funds produce returns on a monthly basis, PE investors typically receive a stream of cashflows over a period of 10 - 12 years. To the extent that the size and timing of cashflows differ between funds, the use of simple return measures (e.g. multiples and internal rates of return) may offer misleading views of fund performance.[4] As a result, researchers have proposed public market equivalents (PMEs) as a method of benchmarking PE returns. PMEs compare the performance of a PE fund to the returns an investor would have earned by making equivalent contributions to a public equity index. To explore this comparison, we enhance our original PE performance analysis by using three well-known PME metrics: Kaplan-Schoar PME, Long-Nickels PME, and Capital Dynamics PME+.

The remainder of our paper proceeds as follows. **Section III** describes the data. **Section IV** presents our methodology and estimation results by asset class. **Section V** concludes. Technical descriptions of our statistical models and PMEs are provided in the **Appendix**.

[2] In our original PE analysis, we find no statistically significant effects for women or minority ownership at the 5% significance level. For real estate, there is weak evidence that minority ownership is associated with lower returns; however, we interpret this result cautiously because of the small number of real estate firms in our dataset.
[3] Public benchmark data are extremely limited for real estate funds. Therefore, we focus exclusively on private equity funds for our enhanced performance analysis.
[4] For example, using net multiples completely ignores the timing of cashflows. Although funds A and B may have a net multiple of 2.5x, if fund A has relatively early distributions it will be preferred to fund B—holding all else constant.

III. Data

Our *Enhanced Performance Analysis* relies on the same commercial data providers used in our *2018 Diverse Asset Management Firm Assessment*—Hedge Fund Research (HFR), eVestment, and Preqin. We should note, however, that the data used in this study differ in a few important respects. For hedge funds and mutual funds, we obtain data on Fama-French research factors to control for financial risk, described in greater detail in the **Methodology and Results** and **Appendix** sections. For PE, we measure fund performance using PME metrics from Preqin. In this section, we briefly review the datasets utilized for each asset class and discuss our new data in more detail.

A. Mutual Funds

We gather mutual fund data from eVestment, a leading commercial data provider for institutional investors frequently used in academic research.[5] eVestment's Traditional Database covers more than 40,000 investment vehicles including mutual funds, separately managed accounts (SMAs), comingled trust funds, and exchange-traded funds (ETFs); together, mutual funds and SMAs comprise the vast majority of database observations. We use data from both active and inactive vehicles. Inactive vehicles are those which have been taken off the market, for example due to a liquidation, merger, restructuring or the product no longer provides data. eVestment collects quarterly data on firms and funds, including assets under management (AUM), fund performance, fund strategy, and firm location. Starting in Q1 2011, eVestment provides firm-reported diversity information on the share of firm ownership held by women and the following minority groups: African-American, Asian, and Hispanic.

We use eVestment data from Q1 2011 through Q4 2017 and restrict our sample to U.S.-based mutual funds. The full sample contains approximately 2,500 firms and their 20,000 corresponding funds. Our sample includes a limited number of firms based in Puerto Rico, which we consider part of the U.S. in our analysis. We make several other sample restrictions:

- 99.94% of mutual funds are listed as Equity, Fixed Income, or Balanced/Multi-Asset. The remaining 0.06% of funds are listed as Alternatives or Real Estate. We drop Alternatives and Real Estate funds as they make up a small fraction of the eVestment universe and operate using different fund structures.
- We drop mutual funds listed as fund-of-funds (FoFs).[6]
- We sort firms into four regional categories: Northeast, South, Midwest, and West. The regional categories are based on the office address of the firm, using the U.S. Census Bureau state regional categories and grouping Puerto Rico and the Virgin Islands with the South.[7]

[5] See, for example: Jennifer Bender, P. Brett Hammond, and William Mok, "Can Alpha Be Captured by Risk Premia?" *Journal of Portfolio Management* 40(2): 18-29, Winter 2014.
[6] Funds-of-funds (FoFs) are investment funds that build portfolios of other investment funds. Consequently, including FoFs in our analysis would double count the underlying funds if they are included in our final dataset.
[7] The regions are defined as follows. **Northeast**: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont. **South**: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee,

After these restrictions, our sample of current U.S.-based asset managers for mutual funds includes approximately 1,400 firms and 12,000 funds. From this universe, we have identified subsets of women- and minority-owned firms with substantial (25-49%) or majority ownership (50%+) in Q4 2017. For some analyses, we combine the substantial and majority ownership categories and examine all women-owned firms with 25%+ ownership (n = 136 firms in Q4 2017) or all minority-owned firms with 25%+ ownership (n = 119 firms in Q4 2017). It is worth noting that there may be some overlap between the subsets of women- and minority-owned firms, since firms can be owned by both women and minorities.

For mutual funds and hedge funds, we estimate financial risk using a market model and the Fama-French three-factor model. Both models specify the relationship between a fund's return and "research factors" that measure different types of market risk: market premium, size risk, and value risk. We download data on the three research factors from the Kenneth R. French Data Library. Technical details on the market models can be found in the **Appendix**.

B. Hedge Funds

For hedge funds, we use HFR, a leading provider of hedge fund data. Our final dataset includes 2,980 firms and 6,932 funds reporting between January 2005 and May 2018. These data include information on strategy, geographic focus, geographic location, fund size, reporting status, and performance. A common issue in hedge fund research is the overestimation of returns caused by excluding failed hedge funds, commonly known as "survivorship bias." Our HFR data allow us to include both active and dead hedge funds in our analysis. HFR defines a dead fund as a fund that has been liquidated or no longer reports performance.

The standard commercial database also includes a diversity variable to indicate whether the fund is substantially owned by women or minorities. HFR has provided supplemental proprietary data for this project, including diverse ownership type (women vs. minority) and level of ownership (substantial vs. majority). The HFR range for substantial ownership is 25-50% ownership, and the threshold for majority ownership is 50%+ ownership. Firm-level diversity indicators for hedge fund managers do not change over time, unlike our mutual fund data, which are updated on a quarterly basis. Consequently, we are forced to assume that any firm identified as diverse in the HFR database has always been diverse. While this may appear to be a strong assumption, it is unlikely that diverse ownership changes frequently over time.

HFR has good coverage of hedge funds relative to other commercial databases and is frequently used for academic research on the hedge fund industry.[8] It does not, however, capture the entire population of hedge funds.[9] Although it would be preferable to combine multiple hedge fund databases for our analysis, we use the HFR database exclusively because it provides identifiers

Texas, Virgin Islands, Virginia, Washington, DC, West Virginia. **Midwest**: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, North Dakota, Wisconsin. **West**: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

[8] See for example: Juha Joenväärä, Robert Kosowski, and Pekka Tolonen, "Hedge Fund Performance: What Do We Know?" *SSRN working paper*, March 2016.

[9] See, for example: (1) Andrew J. Patton, Tarun Ramadorai, and Michael Streatfield, "Change You Can Believe In? Hedge Fund Data Revisions," *SSRN working paper*, March 2013; (2) Juha Joenväärä, Robert Kosowski, and Pekka Tolonen, "Hedge Fund Performance: What Do We Know?" *SSRN working paper*, March 2016.

for diverse-owned firms. To our knowledge, no other hedge fund database provides similar diversity information.

We make several adjustments to prepare the HFR data for analysis:

- HFR separates fund characteristics, performance, and assets into active and dead databases, with funds grouped by their reporting status. We utilize data for both **active and dead** funds when evaluating fund performance.
- We restrict our sample to U.S.-based firms (including U.S. territories).
- As with mutual funds, we drop any hedge funds listed as FoFs.
- While all firms are U.S.-based, some report assets denominated in foreign currencies. We use exchange rates from S&P Capital IQ to convert assets denominated in foreign currencies to USD.
- Because most diverse firms are classified as majority-diverse-owned (50%+) and few firms are classified as substantially-diverse-owned (25%-50%), we combine substantial and majority categories to create variables denoting women and minority ownership.
- For a fund to be included in our analysis, it must have data available on its characteristics, the diversity of its ownership, and monthly returns.

As discussed above, we extend our original hedge fund analysis using multi-factor, risk-adjusted returns based on data from the Kenneth R. French Data Library. Unlike our mutual fund analysis, however, we use monthly rather than quarterly returns data.

C. Private Equity

Our research on PE relies on data from Preqin, a commercial data provider for the alternative asset industry. Preqin is among the top sources of data for the alternative assets industry and is one of the two databases most often used in PE research.[10] Preqin's databases provide access to a number of variables of interest and boast coverage over a relatively long time period, with particularly strong coverage from 2000 onward.

We use PMEs as our preferred measures of PE fund performance. Specifically, we use the Kaplan-Schoar PME, Long-Nickels PME, and Capital Dynamics PME+ to compare PE fund investments to alternative investments in the S&P 500 index. Preqin's performance database provides PMEs when appropriate cashflow data are available. We obtain PMEs for U.S.-headquartered PE funds covering vintage years 2006-2015, excluding real estate and FoFs. We use each fund's most recently reported PME, measuring fund performance since inception. If a fund has not reported performance after Q3 2016, it is not included in our study. While our full PE dataset contains 6,585 funds, most PE firms do not report cashflow information. Hence, our final PE dataset merged with fund-level PMEs contains 990 observations. Because of the relatively small number of observations available for PE funds, our results should be interpreted carefully.

[10] Robinson, David and Berk Sensoy, "Private Equity in the 21st Century: Liquidity, Cash Flows, and Performance 1984-2010," *NBER Working Paper*, July 15, 2011.

We use Preqin's diverse ownership indicators to identify women- and minority-owned PE funds. It should be noted, however, that data collection on diversity is a recent development. As a result, we cannot guarantee that our study has identified every diverse-owned PE manager. We do, however, supplement Preqin's diversity variables with our own hand-compiled lists of diverse asset managers. These lists were gathered by searching through publicly available records from pension funds, government agencies, and non-profit organizations. The table below summarizes the public sources for lists of diverse-owned PE firms. In some cases, the public sources provide diversity information over multiple years.

Public Sources on PE Fund Diversity
Association of Black Foundation Executives (ABFE) Directory of Minority and Women-Owned Investment Management Firms
Dow Jones Private Equity Analyst Report, 2012
Illinois Municipal Retirement Fund
Maryland Governor's Office of Minority Affairs
Office of the New York State Comptroller

The lists of diverse PE firms from the sources above are matched to demographic and fundraising data from Preqin using firm names. We make a number of adjustments to the PE data from Preqin before merging them with our list of diverse-owned firms:

- FoFs are dropped from our datasets, for the reasons discussed in previous sections.
- Managers based outside the U.S. are dropped.
- For PE, the data are limited to funds with vintage years 2006 to 2017, allowing us to construct a sample of funds that should be currently operating based on the typical life of funds with a limited partnership structure.
- Regional locations of firms are assigned based on the office address and follow the same state/territory groupings as in the hedge fund analysis.
- The AUM for each firm is calculated as the sum of the final size for each of a firm's funds raised from January 2006 through December 2017. Fund size and firm AUM calculations are reported in 2009 U.S. dollars.
- Preqin classifies fund types into a number of different categories. We regroup PE funds into two broad groups: PE and VC.[11]

[11] **PE** includes Buyout, Growth, Mezzanine, Co-Investment Multi-Manager, Co-Investment, Balanced, Direct Secondaries, Distressed Debt, Hybrid, PIPE, Natural Resources, Timber, Special Situations, Turnaround, Secondaries, Infrastructure, Infrastructure Fund of Funds, Infrastructure Secondaries, Fund of Funds, and Hybrid Fund of Funds. **VC** includes Early Stage, Early Stage: Seed, Early Stage: Start-Up, Expansion/Late State, Venture (General), and Venture Debt.

IV. Methodology and Estimation Results

A. Mutual Funds

We begin our analysis by examining whether diverse ownership, defined as ownership of the firm by women or minorities, affects mutual fund performance. In our *2018 Diverse Asset Management Firm Assessment*, we use quarterly mutual fund data and regression analysis to estimate the impact of diverse ownership on returns. While our original study provides a useful starting point, it only controls for a rudimentary measure of mutual funds' exposure to overall public equity market risk—known as market beta.[12] In our enhanced performance analysis, we extend this methodology by accounting for multiple sources of risk using the Fama-French three-factor model. For ease of comparison, we include our original findings alongside our new estimation results.

Researchers face many challenges when attempting to compare the returns of diverse and non-diverse investment funds. One of the greatest obstacles is the possibility that diverse-owned funds may be more or less risky than their non-diverse peers. As a result, comparing the investment returns of diverse and non-diverse funds, without accounting for exposure to various types of risk, may produce severely misleading results. On average, we would expect riskier mutual funds to generate higher returns, regardless of their diversity status. Therefore, a key motivation for extending our original study is to better account for the various sources of financial risk facing mutual funds.

For mutual funds, we measure performance using market-adjusted and three-factor risk-adjusted returns, allowing us to compare funds after removing the influence of risk on returns. The market-adjusted regression replicates the results in our original study; and the three-factor model accounts for two additional sources of risk. In particular, the Fama-French three-factor model adds size and value risk factors to the market beta used in our original study. The size risk factor accounts for the degree to which small cap stocks outperform large cap stocks. The value risk factor captures the performance difference between stocks with high and low book-to-market ratios. The market model and three-factor models are widely accepted methods used to calculate risk-adjusted returns.[13] A more technical discussion of the Fama-French model and the methodological differences between this report and the original is included in the **Appendix.**

Before turning to our econometric analysis, we provide summary statistics on mutual fund performance in **Table 1** below. This information gives a more complete picture of our data, and tests for statistical differences between diverse and non-diverse funds in our regression analysis.

[12] Market "beta" refers to the relationship between an asset's excess return (over the risk-free interest rate) and the stock market's excess return. On average, beta reflects the change in an asset's excess return caused by a one percentage point increase in the stock market's excess return. Market beta is a commonly used measure of an asset's (or portfolio's) volatility relative to the public market.

[13] The CAPM was developed by William Sharpe and John Lintner in 1964, and William Sharpe was awarded the 1990 Nobel Prize for his work on the model. Eugene Fama and Kenneth French later developed the Three-Factor Model, and their 1993 seminal paper "Common Risk Factors in the Returns on Stocks and Bonds" has been cited over 22,000 times according to Google Scholar.

Table 1. Mutual Fund Descriptive Statistics

	(1) Women-Owned	(2) Minority-Owned	(3) Non-Diverse Owned
Unadjusted Quarterly Returns	2.33%	2.37%	2.21%
	(5.903)	(6.275)	(5.684)
Observations	*17,893*	*12,485*	*155,427*
Market-Adjusted Returns	-0.89%	-0.91%	-1.00%
	(5.175)	(5.223)	(6.264)
Observations	*15,516*	*10,259*	*134,826*
Three-Factor Risk-Returns	0.43%	0.35%	0.31%
	(4.021)	(4.479)	(4.005)
Observations	*17,142*	*11,889*	*150,963*

*means of group performance; standard deviations in parentheses.

The first row of **Table 1** shows the average unadjusted quarterly returns for women-owned (2.33%), minority-owned (2.37%), and non-diverse-owned mutual funds (2.21%). It appears that there are no economically meaningful differences among mutual funds across different ownership types. The last row reports the averages for our new three-factor risk-adjusted returns. The average risk-adjusted returns for women-, minority-, and non-diverse-owned funds are 0.43%, 0.35%, and 0.31%. While the average risk-adjusted return for women-owned mutual funds is 12 basis points higher than non-diverse funds, the difference is small both economically and relative to the standard deviations of returns (reported in parentheses).

Mutual fund performance, however, is influenced by a host of factors—many of which are correlated with diverse-ownership. As a result, comparisons of average performance by gender or minority status are likely to be misleading. To formally examine the impact of women- and minority-ownership on fund returns, we follow an approach similar to that used in our original performance analysis. Specifically, we use OLS regression models to control for fund characteristics such as size, strategy, and location that are likely to impact returns. Unlike in our original analysis, however, we adjust our dependent variables in non-base regression models to account for financial risk. A more technical discussion of our methodology can be found in the **Appendix**.

Summaries of the six regressions we estimate are listed below.

1. *Base Regression*
   In this base model, we investigate the effect of women and minority ownership on unadjusted monthly returns, controlling for fund assets in the previous month and several fund-specific characteristics, such as region, strategy, and time fixed effects.

2. *Market-Adjusted Regression*
   The Market-Adjusted Regression makes two changes to the Base Regression. First, we use market-adjusted monthly returns as the dependent variable.[14] Second, we include an additional control indicating whether the fund is active or inactive (as of May 2018).

3. *Three-Factor Risk-Adjusted Regression*
   The Three-Factor Risk-Adjusted Regression makes two changes to the Base Regression. First, we use three-factor risk-adjusted monthly returns as the dependent variable.[15] Second, we include an additional control indicating whether the fund is active or inactive (as of May 2018).

4. *Capital-Weighted Base Regression*
   This version of the Base Regression weights the observations by the previous month's fund assets. We exclude fund assets as an independent variable. This gives larger firms more weight in the model's calculations.

5. *Capital-Weighted Market-Adjusted Regression*
   This model is the capital-weighted version of the Market-Adjusted Regression (Model 2).

6. *Capital-Weighted Three-Factor Regression*
   This model is the capital-weighted version of the Three-Factor Risk-Adjusted Regression (Model 3).

Each model is estimated twice; first using indicators for 25%+ diverse ownership (i.e. not distinguishing between substantial and majority ownership) and then with separate indicators for 25%-49% (substantial) ownership and 50%+ (majority) ownership.

In **Table 2** below, we summarize the estimated effects of women- and minority-ownership on mutual fund returns using indicators for 25%+ ownership, and in **Table 3** we do the same with indicators for substantial and majority ownership. Each column displays estimated coefficients from one of our six regression models. Each coefficient represents the estimated effect of either women- or minority-ownership on fund returns. Standard errors measure the amount of statistical uncertainty associated with each estimate, and are reported in parentheses. We include asterisks showing the level of statistical significance—lower p-values give us more confidence that women- or minority-ownership affects returns. We should note that although we include control variables in all regressions, their coefficients are not reported. Instead, we provide our complete regression output in the **Appendix.**

[14] See Appendix for an in-depth discussion of dependent variable construction.
[15] *Ibid.*

Table 2. Selected Mutual Fund Regression Estimates (25%+ ownership indicators)

VARIABLES	(1) Unadjusted Qtr. Returns	(2) Market-Adjusted Qtr. Returns	(3) Three-Factor Risk-Adjusted Qtr. Returns	(4) Capital-Weighted Unadjusted Qtr. Returns	(5) Capital-Weighted Market-Adjusted Qtr. Returns	(6) Capital-Weighted Three-Factor Risk-Adjusted Qtr. Returns
Women-Owned	-0.0114	0.0346	-0.0269	-0.00610	0.0223	-0.0335
	(0.0513)	(0.120)	(0.0622)	(0.0518)	(0.131)	(0.0583)
Minority-Owned	0.00421	-0.228**	0.0192	0.0155	-0.214	0.0480
	(0.0452)	(0.114)	(0.0650)	(0.0484)	(0.134)	(0.0624)
Observations	135,350	122,013	131,474	132,129	119,880	128,486
R-squared	0.714	0.072	0.119	0.714	0.076	0.115

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Table 3. Selected Mutual Fund Regression Estimates (substantial and majority ownership indicators)

VARIABLES	(1) Unadjusted Qtr. Returns	(2) Market-Adjusted Qtr. Returns	(3) Three-Factor Risk-Adjusted Qtr. Returns	(4) Capital-Weighted Unadjusted Qtr. Returns	(5) Capital-Weighted Market-Adjusted Qtr. Returns	(6) Capital-Weighted Three-Factor Risk-Adjusted Qtr. Returns
Substantially Women-Owned	-0.0752	0.0835	-0.127	-0.0516	0.0701	-0.0994
	(0.0815)	(0.195)	(0.0905)	(0.0873)	(0.190)	(0.0823)
Majority Women-Owned	0.0344	-0.0153	0.0522	0.0248	-0.0341	0.0160
	(0.0583)	(0.146)	(0.0721)	(0.0555)	(0.182)	(0.0701)
Substantially Minority-Owned	0.176	0.0237	0.103	0.257*	0.202	0.268**
	(0.127)	(0.225)	(0.138)	(0.143)	(0.234)	(0.127)
Majority Minority-Owned	-0.0152	-0.262**	0.0121	-0.0153	-0.273*	0.0206
	(0.0462)	(0.122)	(0.0687)	(0.0482)	(0.144)	(0.0646)
Observations	135,350	122,013	131,474	132,129	119,880	128,486
R-squared	0.714	0.072	0.119	0.714	0.076	0.115

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Note: All regressions include the controls outlined in our model description above. Detailed regression results can be found in the Appendix.

In **Table 2**, all specifications yield small impacts of women- and minority-ownership on returns. More notably, all of the coefficients are insignificant with only a single exception. Minority-ownership appears to have a significant (at the 5% level) negative effect on market-adjusted returns, with a coefficient of -0.228. This suggests that minority-ownership reduces market-adjusted quarterly returns by 0.228 percentage points. However, this relationship is not consistently negative nor significant as we refine our model with three-factor risk adjustment or capital-weightings. A similar picture emerges from **Table 3.** While all coefficients for women-

ownership (substantial and majority) are small and insignificant, there are a few significant coefficients for minority-ownership. There are negative coefficients for 50%+ minority-ownership in both the unweighted and the capital-weighted risk-adjusted regressions—with significance at the 5% and 10% levels. However, substantial minority-ownership yields positive and significant effects for both capital weighted unadjusted returns and capital weighted three-factor risk-adjusted returns. **Our findings suggest that there is no conclusive evidence that women- or minority-ownership affects fund returns—risk-adjusted or otherwise.**

In **Table C.1 and C.2** in the **Appendix,** we display all estimated coefficients from our regression models. Beyond the effects of diverse-ownership, a few additional conclusions can be drawn from our regressions. We find that larger firms are generally associated with higher returns, though this does not hold for the risk-adjusted specifications. Furthermore, smaller funds seem to be associated with higher returns. In terms of asset class, equity products significantly outperform balanced/multi-asset products, until we apply the three-factor adjusted returns – at this point the coefficients become significant and negative. Fixed-income products appear to have significantly worse returns than balanced/multi-asset products in all specifications except in the risk-adjusted specifications.

As in the original performance analysis, we perform a number of robustness checks that reinforce our findings. First, we include firms without data on diverse ownership in the regressions. We assume that these firms do not belong to any diverse category. Second, we estimate the same models using just the subset of equity and balanced/multi-asset funds, to see if the inclusion of fixed income products is skewing our results. Third, we include firm age as an explanatory variable since diverse firms tend to be younger, and firm age may be correlated with survival, capital inflows, and performance. Finally, we drop the top 5% of firms by assets under management from the dataset to diminish the influence of large, publicly-traded companies, and we re-estimate the regression models. The results from each robustness check are generally consistent with the initial analysis, pointing to similar performance between diverse and non-diverse firms.

In summary, our results after including multi-factor risk adjustments are largely in line with the performance assessment in the original analysis. These findings strengthen the conclusion that there is no convincing evidence for differences in performance between diverse- and non-diverse-owned funds.

B. Hedge Funds

In this section, we study the relationship between diversity and hedge fund performance after accounting for multiple sources of financial risk. We generally follow the same methodology used for our analysis of mutual funds; with a few notable differences. First, our hedge fund data cover a longer time horizon (January 2005 to May 2018) relative to mutual funds (January 2011 to December 2017). Therefore, we run the hedge fund regressions over the full period, and then to facilitate comparisons to our mutual fund results, we estimate additional regressions over the shorter period corresponding to mutual funds. Second, hedge fund returns are reported on a monthly basis, requiring a slight modification to our procedure for estimating risk-adjusted returns.

As with mutual funds, we calculate each fund's unadjusted returns, market-adjusted returns, and three-factor risk-adjusted returns. A more detailed discussion of the methodology used to calculate the risk-adjusted returns can be found in the **Appendix**.

We start by examining descriptive statistics on hedge fund performance across different ownership categories. We define diverse-owned hedge funds as those with at least 25% women- or minority-ownership. **Table 4** displays the average performance for women-owned, minority-owned and non-diverse funds. The unadjusted monthly average returns for each ownership group are calculated from January 2005 to May 2018. The average market-adjusted and three-factor adjusted returns are calculated from December 2007 to May 2018 because of the 36-month lag required to calculate the risk-adjusted returns.

Table 4. Hedge Fund Descriptive Statistics

	(1) Women-Owned	(2) Minority-Owned	(3) Non-Diverse Owned
Unadjusted Monthly Returns	0.59%	0.72%	0.54%
	(4.427)	(4.716)	(4.792)
Observations	*10,361*	*17,019*	*412,886*
Market-Adjusted Returns	0.02%	0.10%	0.10%
	(3.567)	(4.046)	(3.71)
Observations	*5,871*	*8,691*	*223,442*
Three-Factor Risk-Returns	-0.02%	0.09%	0.04%
	(3.331)	(3.79)	(3.484)
Observations	*5,871*	*8,691*	*223,442*

*means of group performance; standard deviations in parentheses.

We find that minority-owned funds outperform women-owned funds when comparing the average unadjusted and risk-adjusted returns. However, the differences in performance are relatively small. The first row of **Table 4** shows the average unadjusted monthly returns for women-owned (0.59%), minority-owned (0.72%), and non-diverse-owned hedge funds (0.54%). The last row of **Table 4** reports average three-factor risk-adjusted monthly returns for women-owned (-0.02%), minority-owned (0.09%), and non-diverse-owned funds (0.04%). Interestingly, we find that women-owned (minority-owned) funds have lower (higher) average returns compared to non-diverse-owned funds.

It should be noted that simple averages do not provide conclusive results since they do not account for factors that might influence hedge fund returns. Therefore, we estimate six regressions of the same form used in our mutual fund analysis:

1. *Base Regression.*
   In this base model, we investigate the effect of women and minority ownership on unadjusted monthly returns, controlling for fund assets in the previous month and several fund-specific fixed characteristics, such as region, strategy, and time.

2. *Market-Adjusted Regression.*
   The Market-Adjusted Regression makes two changes to the Base Regression. First, we use market-adjusted monthly returns as the dependent variable.[16] Second, we include an additional control indicating whether the fund is active or inactive (as of May 2018).

3. *Three-Factor Risk-Adjusted Regression.*
   The Three-Factor Risk-Adjusted Regression makes two changes to the Base Regression. First, we use three-factor risk-adjusted monthly returns as the dependent variable.[17] Second, we include an additional control indicating whether the fund is active or inactive (as of May 2018).

4. *Capital-Weighted Base Regression.*
   This version of the Base Regression weights the observations by the previous month's fund assets. We exclude fund assets as an independent variable. This gives larger firms more weight in the model's calculations.

5. *Capital-Weighted Market-Adjusted Regression.*
   This model is the capital-weighted version of the Market-Adjusted Regression (Model 2).

6. *Capital-Weighted Three-Factor Regression.*
   This model is the capital-weighted version of the Three-Factor Risk-Adjusted Regression (Model 3).

To stay consistent with the *2018 Diverse Asset Management Firm Assessment* performance analysis, our data are restricted to January 2005 to May 2018 for the two base regressions, columns (1) and (4); and from January 2007 to May 2018 for the risk-adjusted regressions, columns (2-3) and (5-6).[18] Results for the six regressions are displayed in **Table 5** below**.**

[16] See appendix for an in-depth discussion of how the variable is calculated.
[17] *Ibid.*
[18] The risk-adjusted regressions cover a shorter time period because a 36-month lag period is needed to estimate the betas used in the risk-adjusted return calculations.

Table 5. Selected Hedge Fund Regression Estimates (all years)

VARIABLES	(1) Unadjusted Monthly Returns	(2) Market-Adjusted Monthly Returns	(3) Three-Factor Risk-Adjusted Monthly Returns	(4) Capital Weighted Unadjusted Monthly Returns	(5) Capital Weighted Market-Adjusted Monthly Returns	(6) Capital Weighted Three-Factor Risk-Adjusted Monthly Returns
Women-Owned	-0.0403	-0.0862	-0.0941*	-0.0466	-0.0827	-0.0706
	(0.0607)	(0.0571)	(0.0544)	(0.0638)	(0.0935)	(0.105)
Minority-Owned	0.179***	0.111	0.102	0.0291	0.0181	0.0341
	(0.0579)	(0.0677)	(0.0635)	(0.0450)	(0.0641)	(0.0635)
Observations	421,343	231,378	231,378	421,343	231,378	231,378
R-squared	0.170	0.091	0.085	0.299	0.222	0.211

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.1

Note: All regressions include the controls outlined in our model description above. Detailed regression results can be found in the Appendix.

The results are largely consistent with those of the original report. For women-owned funds, all coefficients are negative, suggesting underperformance in comparison to non-diverse owned funds. Interestingly, column (3) shows that women-owned funds underperform relative to non-women-owned funds by 0.09 percentage points when accounting for risk. However, this relationship is not conclusive because of the small size and low statistical significance (10% significance level) of the coefficient.

Turning to minority-owned funds, the estimated coefficient in column (1) of 0.179 is highly significant at the 1% level. This coefficient suggests that minority-owned funds outperform non-diverse-owned funds, but the result does not persist in the risk-adjusted models. The estimated effects from columns (2) – (6) are positive, but none are statistically significant at conventional levels. **As with women-owned funds, there is no conclusive evidence showing minority-owned fund under or overperform relative to non-diverse funds when adjusting returns for risk.**

As a further robustness check, we narrowed the time period under consideration to January 2011 to December 2017, corresponding to that of the mutual funds. As **Table 6** below shows, the estimation results do not demonstrate any statistically significant differences in performance between diverse-owned funds and non-diverse-owned funds.

Table 6. Selected Hedge Fund Regression Estimates (2011-2017)

VARIABLES	(1) Unadjusted Monthly Returns	(2) Market-Adjusted Monthly Returns	(3) Three-Factor Risk-Adjusted Monthly Returns	(4) Capital Weighted Unadjusted Monthly Returns	(5) Capital Weighted Market-Adjusted Monthly Returns	(6) Capital Weighted Three-Factor Risk-Adjusted Monthly Returns
Women-Owned	-0.0907	-0.0859	-0.0796	-0.0517	-0.0174	-0.00757
	(0.0609)	(0.0735)	(0.0716)	(0.0783)	(0.126)	(0.140)
Minority-Owned	0.104	0.0843	0.0623	0.0241	0.0329	0.0438
	(0.0634)	(0.0753)	(0.0660)	(0.0644)	(0.0803)	(0.0786)
Observations	206,845	155,201	155,201	206,845	155,201	155,201
R-squared	0.147	0.061	0.059	0.281	0.200	0.199

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Note: All regressions include the controls outlined in our model description above. Detailed regression results can be found in the Appendix.

In conclusion, our results are largely consistent with the original performance assessment carried out in the 2018 *Diverse Asset Manager Firm Assessment.* When adjusting for risk, using either market-adjusted or three-factor models, **we find no conclusive evidence of performance differences between diverse and non-diverse funds.**

C. Private Equity

For PE, we examine whether women or minority ownership affects fund performance as measured by PMEs. PMEs are highly-respected benchmarks that compare the performance of a PE fund against the returns that an investor would earn by making equivalent investments in a public market index. In our original performance analysis, we compared the performance of diverse and non-diverse funds using net multiples and net internal rates of return (IRRs). While net multiples and net IRRs serve as a useful starting point, they may offer a misleading view of performance as they do not explicitly account for investors' alternative investments.[19]

In this section, we use three common PMEs to benchmark fund performance: Long-Nickels PME, Capital Dynamics PME+, and Kaplan-Schoar PME. The Long-Nickels and Capital Dynamics PMEs reflect the IRR an investor would receive by making a similar public market investment. In contrast, the Kaplan-Schoar PME is a multiple that takes a value greater (less) than one if a PE fund outperforms (underperforms) the public markets. For all metrics, we use the S&P 500 as our public market index. A more detailed discussion of PMEs can be found in the **Appendix**.

In **Table 7** below, we report average PMEs for diverse and non-diverse PE funds. For all three PME metrics, women-owned funds tend to slightly underperform the public markets. According

[19] For example, while a PE manager may provide a high multiple for their investors, the return may be less than what an investor could have earned from an S&P index fund during good times.

to the Kaplan-Schoar PME, the value of the average women-owned PE fund is about 97% of a comparable S&P 500 portfolio. For the Long-Nickels PME and Capital Dynamics PME+ we report the average spread between a fund's IRR and the fund's PME. A positive (negative) value indicates that the PE fund is outperforming (underperforming) the public markets. For minority-owned PE funds, PME values suggest a slight overperformance relative to public market investments.

Table 7. Private Equity Descriptive Statistics

	Kaplan-Schoar PME	**Long-Nickels PME Spread**	**Capital Dynamics PME+ Spread**
Women-Owned	0.970	-2.8	-1.8
Std. Dev.	0.551	13.1	12.5
Observations	*44*	*31*	*33*
Minority-Owned	1.068	0.8	1.5
Std. Dev.	0.508	12.2	11.0
Observations	*49*	*33*	*34*
Non-Diverse	1.010	0.2	-0.4
Std. Dev.	0.336	13.4	13.0
Observations	*920*	*724*	*732*

As with other asset classes, PE performance is influenced by several factors—many of which are correlated with diverse-ownership. For example, women-owned funds tend to be smaller than men-owned funds, and fund size may affect returns. Hence, the averages reported in **Table 7** are potentially affected by other fund characteristics in addition to diverse-ownership.

To isolate the effect of women- and minority-ownership on fund performance, we estimate models that control for relevant fund characteristics such as size, type, geographic focus, firm location, vintage year, and industry. The size of each fund is measured as the natural logarithm of final fund size in millions of 2009 US dollars. We briefly describe our statistical models below. A more technical discussion of our methodology is provided in the **Appendix**.

We estimate the following six regressions:

1. *Kaplan-Schoar PME Base Model*
   Our dependent variable is the Kaplan-Schoar PME. This model includes indicators for women and minority ownership in addition to controls for fund size, fund type, vintage year, and vintage year-asset class interactions.

2. *Kaplan-Schoar PME Additional Controls Model*
   Here we extend the first model by including additional control variables for firm location, industry, and geographic focus.

3. *Long-Nickels PME Spread Base Model*
   Our dependent variable, the Long-Nickels PME spread, is a fund's net IRR minus the Long-Nickels PME. This model includes indicators for women and minority ownership in addition to controls for fund size, fund type, vintage year, and vintage year-asset class interactions.

4. *Long-Nickels PME Spread Additional Controls Model*
   Here we extend the previous model by including additional control variables for firm location, industry, and geographic focus.

5. *Capital Dynamics PME+ Spread Base Model*
   Our dependent variable, the Capital Dynamics PME+ spread, is a fund's net IRR minus the Capital Dynamics PME+. This model includes indicators for women and minority ownership in addition to controls for fund size, fund type, vintage year, and vintage year-asset class interactions.

6. *Capital Dynamics PME+ Spread Additional Controls Model*
   Here we extend the previous model by including additional control variables for firm location, industry, and geographic focus.

We present the coefficient estimates for women- and minority-ownership from our six models in **Table 8** below. Regression estimates for all variables can be found in the **Appendix**. The estimates from our preferred specification, using the Kaplan-Schoar PME, are shown in columns (1) and (2). In column (1), the average effects of women and minority ownership on the Kaplan-Schoar PME are -0.07 and 0.09; however, these estimates are not statistically significant at conventional levels.[20] In column (2), which includes controls for location, industry, and geographic focus, the effects of women and minority ownership are -0.06 and 0.14. However, only the effect of minority ownership is statistically significant at the 10% significance level. **Our findings suggest that there is some mixed evidence that minority-owned PE funds outperform relative to public markets.**

[20] It is conventional to reject the null hypothesis of no difference in performance with p-values of 0.01, 0.05, or 0.1.

Table 8. Selected Private Equity Regression Estimates

VARIABLES	(1) Kaplan-Schoar PME	(2) Kaplan-Schoar PME	(3) Long-Nickels PME Spread	(4) Long-Nickels PME Spread	(5) Capital Dynamics PME+ Spread	(6) Capital Dynamics PME+ Spread
Women-Owned	-0.0681	-0.0575	-4.553*	-3.262	-3.407	-2.698
	(0.0739)	(0.0700)	(2.541)	(2.207)	(2.495)	(2.189)
Minority-Owned	0.0924	0.137*	2.462	3.313	3.741	4.909**
	(0.0690)	(0.0709)	(2.450)	(2.237)	(2.302)	(2.116)
Observations	983	983	767	767	776	776
R-squared	0.056	0.105	0.053	0.113	0.031	0.085

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.1

Note: All regressions include the controls outlined in our model description above. Detailed regression results can be found in the Appendix.

In columns (3) and (4), we show results from the Long-Nickels PME models. Here, the dependent variable is the difference between a fund's net IRR and a fund's PME and is interpreted as a measure of excess performance over the public markets. In column (4), our preferred Long-Nickel specification, the coefficients on women-owned and minority-owned are -3.3 and 3.3. On average, the performance of a women-owned (minority-owned) PE fund is 3.3 percentage points lower (higher) than a non-women-owned (non-minority-owned) fund. These results, however, are not statistically significant.

Our last two regressions, using the Capital Dynamics PME+, are presented in columns (5) and (6). Once again, the dependent variable is the difference between a fund's net IRR and its respective Capital Dynamics PME+. In column (6), the coefficients on women-owned and minority-owned are -2.7 and 4.9. On average, the performance of a women-owned PE fund is 2.7 percentage points lower than a non-women-owned fund. In contrast, the performance of a minority-owned fund is 4.9 percentage points higher relative to a non-minority-owned fund. The coefficient on minority-owned fund performance is statistically significant at the 5% level, but the coefficient on women-owned fund performance is insignificant.

In conclusion, we have tested whether fund ownership by women and minorities has any impact on PE fund performance using three well-known PME calculations. **Across all specifications, we find little evidence for performance differences between women-owned and non-women-owned funds, and we find mixed evidence that minority-owned funds outperform non-minority-owned funds.** We should note that this finding is only significant at the 5% level in our Capital Dynamics PME+ model. Overall, our results are mostly consistent with our original performance analysis.

V. Conclusions

This study extends the original performance analysis in our *2018 Diverse Asset Management Firm Assessment* using several methodological enhancements. For mutual funds and hedge funds, we use Fama-French three-factor risk-adjusted returns to better account for differences in financial risk associated with different funds. Because our enhanced analysis accounts for multiple sources of risk, it is unlikely that our results are driven by underlying differences between the portfolios of diverse and non-diverse funds. For PE funds, we use highly-respected PMEs to benchmark the performance of asset managers. PMEs provide a more complete measure of PE performance as they compare the returns of a PE fund against the results of an equivalent investment in a public index fund.

In our original performance analysis, we found little evidence of a relationship between diverse-ownership and financial returns. Our empirical results largely confirm the findings of our original study; however, there are some notable exceptions. We find no evidence of performance differences between diverse-owned and non-diverse-owned mutual funds. For hedge funds, there is weak evidence that women-ownership negatively impacts returns; however, the magnitude of the effect is economically small and is only significant at the 10% level. For PE, we find some limited evidence that minority-ownership has a positive impact on returns. On average, we find that minority-ownership increases a fund's Kaplan-Schoar PME metric by 0.137, but the effect is only significant at the 10% level. Finally, we find no evidence that women-ownership significantly impacts PE performance.

VI. Appendix

A. Mutual Funds and Hedge Funds

For mutual funds and hedge funds, we extend our investigation of returns by considering risk. Because diverse and non-diverse funds may differ in their exposure to financial market risk, failing to appropriately control for risk may yield biased estimates. For example, suppose that, on average, women-owned funds are less risky than men-owned funds and there are no gender differences in unadjusted returns. It is reasonable to expect that women would *outperform* men if they owned funds with the same level of risk.

To address this issue, we use Fama-French market models to estimate each fund's expected return as predicted by its portfolio's sensitivity to public market fluctuations. We then compute risk-adjusted returns by subtracting a fund's expected return from its actual return. Hence, a positive (negative) risk-adjusted return indicates that a fund is outperforming (underperforming) relative to the return expected for a given level of risk. As a final step, we estimate regressions to isolate the effect of women and minority ownership on risk-adjusted returns, after controlling for fund characteristics such as size, location, and strategy.

In our original performance analysis, we only include market "beta", measuring a fund's sensitivity to changes in overall public equity returns, to control for financial risk. The financial literature has identified at least two other research "factors" that help explain asset returns, size and value. The first, small-minus-big, or SMB, is the return on a diversified portfolio of small cap stocks minus the return on a diversified portfolio of large cap stocks. Some stocks may exhibit higher (or lower) returns when there is a change in the SMB premium. The second, high-minus-low, or HML, is the return on a diversified portfolio of stocks with high book-to-market value minus the return on a diversified portfolio of stocks with low book-to-market value. The HML premium helps account for changes in returns caused by fluctuations in the value premium. Therefore, we extend our original analysis by estimating a three-factor market model that includes the SMB and HML premia.

Our procedure amounts to comparing the performance of diverse and non-diverse funds while "holding constant" other portfolio characteristics likely to impact returns. Any remaining performance gaps, therefore, should reflect differences in manager skill. Formally, we estimate each fund's sensitivity to financial risk using the market model given by equation (1). For completeness, we also report market-adjusted returns that omit the last two factors, SMB_t and HML_t.

$$(R_t - r_{f,t}) = \alpha + \beta\left(r_{m,t} - r_{f,t}\right) + b_s SMB_t + b_v HML_t + \varepsilon_t. \qquad (1)$$

Where,

R_t is the fund's rate-of-return in period *t*.

$r_{f,t}$ is the risk-free rate-of-return in period *t*.

$r_{m,t}$ is the rate-of-return for a public market index in period *t*.

SMB_t is the rate-of-return on a diversified portfolio of small cap stocks minus the rate-of-return on a diversified portfolio of large cap stocks. I.e. the small cap premium.

HML_t is the rate-of-return on a diversified portfolio of stocks with high book-to-market value minus the rate-of-return on a diversified portfolio of stocks with low book-to-market value, i.e. the value premium.

ε_t is a stochastic innovation.

Each fund's risk-adjusted return is calculated as,

$$Adjusted\ Return_t = \left(R_t - r_{f,t}\right) - \left(\hat{\beta}\left(r_{m,t} - r_{f,t}\right) + \hat{b}_s SMB_t + \hat{b}_v HML_t\right). \qquad (2)$$

The risk-adjusted return reflects a fund's excess return after subtracting the variation explained by the Fama-French research factors. Put differently, the adjusted return reflects a fund's performance after removing the premium associated with financial risk. This procedure is particularly important if we expect differences in risk profiles between diverse and non-diverse funds.

Finally, we estimate the impact of women and minority ownership on mutual fund and hedge fund returns, regressing risk-adjusted returns on diversity indicators along with other variables known to influence performance such as location, strategy, and fund size. Formally, we estimate regression models of the following form,

$$Adjusted\ Return_{i,t} = \delta_0 + \delta_1 Women_{i,t} + \delta_2 Minority_{i,t} + \boldsymbol{\theta}' \boldsymbol{x_{i,t}} + \epsilon_{i,t}. \qquad (3)$$

Where,

$Women_{i,t}$ is an indicator that takes a value of one if fund *i* is women-owned, and zero otherwise.

$Minority_{i,t}$ is an indicator that takes a value of one if fund *i* is minority-owned, and zero otherwise.

$\boldsymbol{x_{i,t}}$ is a vector of fund-specific characteristics such as location, strategy, and fund size.

$\epsilon_{i,t}$ is a stochastic disturbance term.

B. Private Equity (PE) Funds

For PE, we examine whether women or minority ownership impacts fund performance. In our original performance analysis, we measure performance using net multiples and net IRRs. While net multiples and net IRRs are commonly used measures of fund performance, they ignore the returns an investor could have earned by investing in public markets. To address this issue, we use Public Market Equivalents (PMEs) to benchmark PE investments against equivalent public market investments. First developed by Austin Long and Craig Nickels, this methodology compares the proceeds generated by investing in the private equity fund with those generated by investing the same amount in a chosen public market index. If the proceeds from the private equity investments exceed the reference return from the public investment, private equity was the superior investment; if not, one reaches the opposite conclusion. In recent years, PME has become a common industry tool for assessing performance by major limited partners (see the discussions, for instance, in practitioner-authored handbooks such as Cornelius, 2011, and Kochis, et al., 2009).

This methodology can best be illustrated with a couple of examples.[21] For instance, consider a case where a buyout fund draws down $100 million in June 2004, and returns a distribution of $200 million in April 2007. An investor could have alternatively invested the $100 million in the public market, but the same investment in June 2004 in the S&P 500 would have yielded $139.52 million if sold in April 2007. The PME multiple of this investment of 1.43 (or 200/139.52) indicates that the private equity investment was superior. Put another way, the private equity investment yielded 43% more than the comparable public investment.

On the other hand, a $10 million investment in a venture fund in January 1993 which was liquidated in December 1999 for $40 million looks pretty spectacular. But since an investment in the S&P 500 at the same time would have yielded $39.16 million in December 1999, the PME is only 1.03 (40/39.16). This calculation indicates that the investment yielded barely more than the public market securities, which have the benefit of liquidity.[22]

In this study, we enhance our original performance analysis by measuring PE fund performance using three well known PMEs: Kaplan-Schoar PME, Long-Nickels PME, and Capital Dynamics PME+.[23] In this section, we briefly describe our three PME metrics and discuss our methodology to test for performance differences between diverse and non-diverse funds.

Our preferred measure of PE performance, the Kaplan-Schoar PME, compares the value of a PE investment against the value of the public index portfolio resulting from making equivalent contributions. Kaplan and Schoar (2005) implemented their PME by, "investing (or discounting) all cash outflows of the fund at the total return to the S&P 500 and comparing the resulting value to the value of the cash inflows (all net of fees) to the fund invested (discounted) using the total return to the S&P 500. Formally, the Kaplan-Schoar PME is calculated as:

[21] These examples are drawn from Kaplan and Schoar (2005).
[22] These calculations can get more complex, not surprisingly, when there are many flows in and out of the fund.
[23] Different types of PME have been developed over time to address various challenges that the calculation presents.

$$KS - PME = \frac{\sum_{t=0}^{T} DIST_t\left(\frac{I_T}{I_t}\right)}{\sum_{t=0}^{T} CALL_t\left(\frac{I_T}{I_t}\right)} \qquad (4)$$

Where,

$DIST_t$ is a net distribution in period *t*.
$CALL_t$ is a net contribution (or call) in period *t*.
I_T is the value of the S&P 500 index in the final calculation period, *T*.
I_t is the value of the S&P 500 index in period *t*.

In the calculation above, one can think of the numerator as the future value of PE distributions assuming they are invested in the S&P 500. The denominator represents the future value of a hypothetical public index portfolio resulting from investing the calls in the S&P 500. If the value of the numerator exceeds the denominator (KS-PME greater than one), the PE investment outperforms the public markets. If the value of the denominator exceeds the numerator (KS-PME less than one), the PE investment underperforms relative to the public markets. Because the KS-PME takes the form of a multiple, it avoids mathematical difficulties associated with IRR-based PMEs.

The Long-Nickels PME—proposed by Long and Nickels in 1996—is the earliest PME and serves as our second measure of PE performance. The Long-Nickels PME is an IRR on the investor's forgone public market investment that can be directly compared to a PE fund's actual IRR. Formally, the Long-Nickels PME is computed as,

$$LN - PME = IRR(\boldsymbol{c}, NAV_T) \qquad (5)$$

$$NAV_T = \sum_{t=0}^{T} c_t \left(\frac{I_T}{I_t}\right) \qquad (6)$$

Where,

$\boldsymbol{c}$ is a vector of PE fund cashflows.
c_t is a PE fund cashflow in period *t,* an element of $\boldsymbol{c}$**.**
I_T is the value of the S&P 500 index in the final calculation period, *T*.
I_t is the value of the S&P 500 index in period *t*.

In other words, the Long-Nickels PME is an IRR on all the PE fund cashflows and the hypothetical net asset value (NAV) resulting from redirecting the PE fund cashflows into an S&P 500 index fund. In our study, we measure PE fund performance by subtracting the Long-Nickels

PME from a fund's net IRR—resulting in a PME "spread" that captures excess performance relative to the public markets.

One issue affecting the Long-Nickels PME is that large distributions can cause a negative NAV in the final period—making the PME calculation mathematically impossible. As a result, we estimate an additional model using the Capital Dynamics PME+. The Capital Dynamics PME+, an extension of the Long-Nickels PME, avoids negative NAVS by rescaling each distribution using a constant such that the NAV is equal to the FE fund's remaining value.[24]

[24] More details on the three PME metrics can be found at http://docs.preqin.com/reports/Preqin-Special-Report-PME-July-2015.pdf

C. Detailed Regression Tables

Table C.1 Mutual Fund Regression Estimates

Performance regressions using indicators for firms with 25%+ ownership held by women and/or minorities. The sample includes fund-quarter observations for U.S.-based asset managers from the eVestment Traditional Database from Q1 2011 through Q4 2017 (excluding all FoFs). For equity and fixed income asset classes, the coefficients represent the difference in performance compared to the balanced/multi-asset category. We control for quarter, strategy, and geographic focus fixed effects. We also control for quarter-asset class fixed effects in specifications with unadjusted returns.

VARIABLES	(1) Unadjusted Qtr. Returns	(2) Market-Adjusted Qtr. Returns	(3) Three-Factor Risk-Adjusted Qtr. Returns	(4) Capital-Weighted Unadjusted Qtr. Returns	(5) Capital-Weighted Market-Adjusted Qtr. Returns	(6) Capital-Weighted Three-Factor Risk-Adjusted Qtr. Returns
Women-Owned	-0.0114	0.0346	-0.0269	-0.00610	0.0223	-0.0335
	(0.0513)	(0.120)	(0.0622)	(0.0518)	(0.131)	(0.0583)
Minority-Owned	0.00421	-0.228**	0.0192	0.0155	-0.214	0.0480
	(0.0452)	(0.114)	(0.0650)	(0.0484)	(0.134)	(0.0624)
Lagged Firm Assets (log)	0.0299***	-0.0263	0.0151*	0.0159**	-0.0414**	-0.00701
	(0.00693)	(0.0178)	(0.00831)	(0.00645)	(0.0177)	(0.00855)
Lagged Fund Assets (log)	-0.0354***	-0.0124	-0.0559***			
	(0.00624)	(0.0127)	(0.00667)			
Asset Class = Equity	1.550***	1.155***	-1.422***	1.483***	1.095***	-1.571***
	(0.183)	(0.0920)	(0.0832)	(0.162)	(0.0968)	(0.0850)
Asset Class = Fixed Income	-3.373***	0.285*	-0.794***	-3.435***	0.240	-0.877***
	(0.179)	(0.146)	(0.0916)	(0.155)	(0.164)	(0.0902)
Product Status = Active		0.344***	-1.149***		0.300***	-1.095***
		(0.0806)	(0.0864)		(0.0931)	(0.105)
Constant	2.048*	-3.153*	3.160***	2.392***	-2.787*	2.773***
	(1.054)	(1.854)	(0.338)	(0.811)	(1.455)	(0.305)
Observations	135,350	122,013	131,474	132,129	119,880	128,486
R-squared	0.714	0.072	0.119	0.714	0.076	0.115

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.1

Table C.2 Mutual Fund Regression Estimates

Performance regressions using indicators for substantial women ownership (25-49%), majority women ownership (50%+), substantial minority ownership (25-49%), and majority minority ownership (50%+). The sample includes fund-quarter observations for U.S.-based asset managers from the eVestment Traditional Database for Q1 2011 through Q4 2017 (excluding all FoFs). For equity and fixed income asset classes, the coefficients represent the difference in performance compared to the balanced/multi-asset category. We control for quarter, strategy and geographic focus fixed effects. We also control for quarter-asset class fixed effects in specifications with unadjusted returns.

VARIABLES	(1) Unadjusted Qtr. Returns	(2) Market-Adjusted Qtr. Returns	(3) Three-Factor Risk-Adjusted Qtr. Returns	(4) Capital-Weighted Unadjusted Qtr. Returns	(5) Capital-Weighted Market-Adjusted Qtr. Returns	(6) Capital-Weighted Three-Factor Risk-Adjusted Qtr. Returns
Substantially Women-Owned	-0.0752	0.0835	-0.127	-0.0516	0.0701	-0.0994
	(0.0815)	(0.195)	(0.0905)	(0.0873)	(0.190)	(0.0823)
Majority Women-Owned	0.0344	-0.0153	0.0522	0.0248	-0.0341	0.0160
	(0.0583)	(0.146)	(0.0721)	(0.0555)	(0.182)	(0.0701)
Substantially Minority-Owned	0.176	0.0237	0.103	0.257*	0.202	0.268**
	(0.127)	(0.225)	(0.138)	(0.143)	(0.234)	(0.127)
Majority Minority-Owned	-0.0152	-0.262**	0.0121	-0.0153	-0.273*	0.0206
	(0.0462)	(0.122)	(0.0687)	(0.0482)	(0.144)	(0.0646)
Firm Assets (mn USD)	0.0300***	-0.0268	0.0154*	0.0157**	-0.0422**	-0.00719
Lagged 1 period	(0.00693)	(0.0178)	(0.00831)	(0.00642)	(0.0177)	(0.00855)
Fund Assets (mn USD)	-0.0354***	-0.0124	-0.0559***			
Lagged 1 period	(0.00623)	(0.0127)	(0.00664)			
Asset Class = Equity	1.549***	1.158***	-1.427***	1.482***	1.098***	-1.571***
	(0.183)	(0.0929)	(0.0833)	(0.162)	(0.0973)	(0.0848)
Asset Class = Fixed Income	-3.371***	0.289**	-0.797***	-3.434***	0.245	-0.876***
	(0.179)	(0.147)	(0.0915)	(0.155)	(0.165)	(0.0900)
Product Status = Active		0.343***	-1.149***		0.297***	-1.095***
		(0.0807)	(0.0865)		(0.0932)	(0.105)
Constant	2.048*	-3.145*	3.158***	2.397***	-2.772*	2.775***
	(1.058)	(1.854)	(0.338)	(0.813)	(1.456)	(0.305)
Observations	135,350	122,013	131,474	132,129	119,880	128,486
R-squared	0.714	0.072	0.119	0.714	0.076	0.115

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Table C.3 Hedge Fund Regression Estimates

Performance regressions using fund-month observations for U.S.-based hedge funds from HFR (excluding funds of hedge funds) from all available years. Each regression controlled for region, strategy, month, and strategy-month fixed effects. Additional information on explanatory variables can be found in the **Data** section.

VARIABLES	(1) Unadjusted Monthly Returns	(2) Market-Adjusted Monthly Returns	(3) Three-Factor Risk-Adjusted Monthly Returns	(4) Capital Weighted Unadjusted Monthly Returns	(5) Capital Weighted Market-Adjusted Monthly Returns	(6) Capital Weighted Three-Factor Risk-Adjusted Monthly Returns
Women-Owned	-0.0403	-0.0862	-0.0941*	-0.0466	-0.0827	-0.0706
	(0.0607)	(0.0571)	(0.0544)	(0.0638)	(0.0935)	(0.105)
Minority-Owned	0.179***	0.111	0.102	0.0291	0.0181	0.0341
	(0.0579)	(0.0677)	(0.0635)	(0.0450)	(0.0641)	(0.0635)
Fund Assets (mn USD) Lagged 1 Period	-0.0639***	-0.00945	-0.00338			
	(0.00794)	(0.00901)	(0.00880)			
Product Status = Active		0.419***	0.392***		0.284***	0.249***
		(0.0318)	(0.0310)		(0.0541)	(0.0516)
Constant	4.126***	-1.002***	-1.305***	4.026***	-1.669***	-1.694***
	(0.193)	(0.214)	(0.200)	(0.330)	(0.347)	(0.307)
Observations	421,343	231,378	231,378	421,343	231,378	231,378
R-squared	0.170	0.091	0.085	0.299	0.222	0.211

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Table C.4 Hedge Fund Regression Estimates

Performance regressions for U.S.-based hedge funds (excluding funds of hedge funds). The sample includes fund-month observations from January 2011 through December 2017. Each regression controls for region, strategy, month, and strategy-month fixed effects. Additional information on explanatory variables can be found in the **Data** section.

VARIABLES	(1) Unadjusted Monthly Returns	(2) Market-Adjusted Monthly Returns	(3) Three-Factor Risk-Adjusted Monthly Returns	(4) Capital Weighted Unadjusted Monthly Returns	(5) Capital Weighted Market-Adjusted Monthly Returns	(6) Capital Weighted Three-Factor Risk-Adjusted Monthly Returns
Women-Owned	-0.0907	-0.0859	-0.0796	-0.0517	-0.0174	-0.00757
	(0.0609)	(0.0735)	(0.0716)	(0.0783)	(0.126)	(0.140)
Minority-Owned	0.104	0.0843	0.0623	0.0241	0.0329	0.0438
	(0.0634)	(0.0753)	(0.0660)	(0.0644)	(0.0803)	(0.0786)
Fund Assets (mn USD)	-0.0519***	0.00408	0.00582			
Lagged 1 Period	(0.0108)	(0.00986)	(0.00969)			
Product Status = Active		0.415***	0.397***		0.277***	0.251***
		(0.0363)	(0.0355)		(0.0707)	(0.0660)
Constant	3.218***	0.433*	0.204	2.349***	-0.114	-0.381
	(0.218)	(0.259)	(0.258)	(0.393)	(0.392)	(0.378)
Observations	206,845	155,201	155,201	206,845	155,201	155,201
R-squared	0.147	0.061	0.059	0.281	0.200	0.199

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10

Table C.5 Private Equity Regression Estimates

Performance regressions for U.S.-based PE funds (excluding funds of funds). The sample includes fund-level observations from vintage years 2006 through 2015 for the Kaplan-Schoar regressions. For the Long-Nickels and Capital Dynamics regressions, we use vintage years 2006 through 2014 because of limited data. Additional information on dependent variable construction can be found in the **Data** and **Appendix** sections.

VARIABLES	(1) Kaplan-Schoar PME	(2) Kaplan-Schoar PME	(3) Long-Nickels PME Spread	(4) Long-Nickels PME Spread	(5) Capital Dynamics PME+ Spread	(6) Capital Dynamics PME+ Spread
Women-Owned	-0.0681	-0.0575	-4.553*	-3.262	-3.407	-2.698
	(0.0739)	(0.0700)	(2.541)	(2.207)	(2.495)	(2.189)
Minority-Owned	0.0924	0.137*	2.462	3.313	3.741	4.909**
	(0.0690)	(0.0709)	(2.450)	(2.237)	(2.302)	(2.116)
ln(Final Fund Size)	-0.00782	-0.00371	-0.0314	0.179	0.0177	0.112
	(0.00960)	(0.00989)	(0.435)	(0.457)	(0.401)	(0.420)
VC	-0.296***	-0.330***	-7.216***	-8.009***	-6.492***	-6.610***
	(0.0748)	(0.0762)	(2.373)	(2.601)	(2.064)	(2.276)
West		0.0217		0.470		1.202
		(0.0295)		(1.433)		(1.356)
Midwest		0.0563		2.007		0.818
		(0.0343)		(1.627)		(1.621)
South		-0.0380		-0.630		0.657
		(0.0335)		(1.534)		(1.363)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Asset FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Focus FE	No	Yes	No	Yes	No	Yes
Constant	1.054***	0.994***	-0.507	-5.441	-0.620	-5.954*
	(0.0760)	(0.0860)	(3.355)	(4.017)	(3.099)	(3.573)
Observations	983	983	767	767	776	776
R-squared	0.056	0.105	0.053	0.113	0.031	0.085

Robust standard errors in parentheses (clustered by firm)
*** p<0.01, ** p<0.05, * p<0.10