9-1-2013

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Recommended Citation

IS MANAGER GENDER IMPORTANT
IN THE PERFORMANCE OF MUTUAL FUNDS?

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Abstract

We investigate whether there are differences in characteristics and performance of mutual funds caused by the manager's gender. Through examining a large sample of U.S. domestic equity mutual fund, we find some evidence that suggests female managers have a lower risk tolerance than males. This leads to the observation that females tend to hold a higher total number of assets (stocks) and fewer assets in their top 10 holdings than do male managers. We then analyze performance within funds over time in order to evaluate the impact of changes in management's gender composition on funds' performance. We find some evidence that the percentage of female managers managing a fund is negatively related to the fund's performance over time.

JEL Classifications: C91, G11

Keywords: Mutual funds, manager characteristics, gender differences, fund performance

This version:
March 1, 2009

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I. INTRODUCTION

With recent advances in the understanding the psychology of investing, it is now commonly understood that different groups of investors have varying characteristics. Some systematic differences between male and female investors have been documented. These include that women tend not to have as much confidence as male investors, and women are generally more risk averse than men[1]. As a popular investment vehicle, mutual funds have grown tremendously over the past few decades. If these behavioral phenomena found in individual investors also prevail among mutual fund managers, there are many potential ramifications for investors. For example, if women managers are more risk averse, we should see women managing more conservative funds, such as value funds. In combination with being conservative, if women managers are less confident with their stock picks, they should have a lower turnover in their portfolios because they would be more cautious about moving money into a new security. As a result, female managers' transaction fees would be lower.

The combination of more conservative stock picks and lower turnover may imply either higher or lower returns depending upon which trait dominates. According to modern portfolio theory, taking greater investment risk should result in receiving a greater reward, so investing in less risky assets would lead to lower returns. This implies that men may have better performance in their investments since they are less risk averse than women. However, numerous empirical studies (Lakonishok et al. (1994), La Porta et al. (1997), Lee and Swaminathan (2000) and Barberis and Shleifer (2003)) find that value stocks outperform growth stocks in the long run[2]. If females tend to invest in value-oriented stocks, then their long-term performances should be

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[1] A few references regarding gender differences include Barber and Odean (2001), Estes and Hosseini (1988), Bajtelsmit and VanDerhei (1997)

[2] However, Chan et al. (2002) find evidence that growth managers outperform value managers after adjusting for style.

greater than males. Not to be forgotten, lower turnover implies lower transactions costs, and therefore higher returns on the portfolio (Barber and Odean (2001, 2000)). So, if female managers express both the lack of confidence trait and a tendency toward conservative investing, women should make higher nominal returns than men.

There are a few reasons to believe that mutual fund managers, in general, behave differently than average individual investors. First, fund managers' investment choices are often constrained by limits set forth in the fund prospectus. With some exceptions, such as sector funds, prospectuses typically have diversification requirements that do not allow fund managers to invest large portions of the funds in individual stocks, sectors, or other high-risk investments. Second, education makes a difference. Almost all fund managers have college degrees, whereas only 28% of adults in the United States had attained bachelor's degrees.[3] Additionally, more than 50% of mutual fund managers hold MBAs and more than 35% hold CFAs (Atkinson et al. (2003) and Chevalier and Ellison (1999)). Third, female mutual fund managers have chosen a career path in portfolio management, a male-dominating field. Not like average individual female investors who may not willingly participate in trading activities, female fund managers have the knowledge and expertise in investment and managing risk and may be more confident and competitive in order to establish themselves in the field. Because of these reasons, investment behaviors of male and female fund managers may not be as different as might be observed in the general investing public.

It is important to investigate the gender issue in mutual fund management, because if gender does matter then it should be a factor for investors to consider when choosing funds. So far, a few gender studies have been conducted on mutual funds. However, the results have not been consistent: some researchers find that female fund managers are more risk averse, trade less

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[3] U.S. Department of Education (2005)

and shy away from competition (Beckmann and Menkhoff (2008)) while others do not identify any significant gender differences (Atkinson, et al (2003). This implies that further examination on the issue is necessary. Our study is an extension of the existing ones. First, our sample includes over two thousand fund managers among which over 10% are female and covers the time period From March 1984 to February 2004. It is among the most recent and includes the largest sample in the similar studies. Atkinson, et al (2003) include only 72 female fund managers (5.6% of the overall sample), and Beckmann and Menkhoff (2008) only have total 148 U.S. fund managers participating their survey. We also match a male manager to each female manager using three different criteria including one with a control for self-selection bias. Using these various filters allows us to be more focused and better identify the gender differences, if any exist. Second, we examine changes in gender compositions of fund management and investigate whether the change in composition has a significant impact on the mutual fund performance. To the best of our knowledge, this study is the first such investigation of this issue.

Specifically, we focus on U.S. domestic stock mutual fund managers and assess the gender differences in performance and investment behaviors. Our sample includes 2,217 fund managers of which 223 are female managers. Our empirical results suggest that female mutual fund managers have a lower risk tolerance (standard deviation) than male managers and they spread their risk out over more stocks and hold a lower percentage of assets in their top 10 holdings. Compared to male managers, females tend to manage no-load funds in the value category. We also find that the gender difference is not a source of abnormal returns.

When we examine performance within funds over time, we identify the relationship between changes in the gender composition of a fund's management and its performance. There is strong evidence that a fund experiences better returns when there is a major change in the

gender composition of its management. There is weak evidence that although both increasing and decreasing the percentage of female managers will result in better future returns in the fund, a larger increase in performance is usually associated with a major <u>decrease</u> in the percentage of its female management.

The rest of this paper is organized as follows. The next section covers previous literature relevant to the ideas presented in this paper. The third section gives a description of the data and data sources. We present our hypotheses and models in the fourth section. Section V. enumerates the empirical results, and the last section summarizes and concludes.

II. LITERATURE REVIEW

Our review begins with the existing research which focuses on the differences between males and females in the general public making financial decisions. Using a psychology survey experiment conducted among shareholders, security analysts, institutional investors and general business persons, Estes and Hosseini (1988) find that women have considerably less confidence than men when it comes to investment decisions. Through a behavioral finance experiment run among undergraduate and graduate business students, Powell and Ansic (1997) also find that females were less confident in their predictions than males with a similar level of prior experience and education. Sundén and Surette (1998) use the Survey of Consumer Finance sponsored by the Federal Reserve Board to study defined contribution retirement plans. They observe that gender and marital status significantly affect allocation decisions, i.e., women, especially married women, tend to allocate their investments more conservatively than men.

Single men tend to choose mostly stocks in their portfolios while married women choose mostly bonds.[4]

In contrast, Schubert et al. (1999) believe that survey data may not be a reliable source to identify the gender difference in risk-taking behavior and previous studies that amplify gender stereotyping may be erroneous. Rather, they conduct an experiment that brings out the risk tendencies of each gender in financial situations. [5] They find that men and women's risk-taking behavior depends significantly on the financial decision setting. In a controlled setting, they find that even though women exhibit more risk-aversion to losses in abstract gambles, there are no differences in risk-taking behavior between gender when facing investment and insurance-related decisions. While all the literature provides useful insights upon the gender issue, Powell and Ansic and Schubert et al. used students as their primary subject for their surveys and experiments. Due to the captive nature and the age and education level of their subjects plus the relatively small sample sizes, their results may be more difficult to extrapolate to the general public.

Using account data from a large brokerage firm, Barber and Odean (2001) find that men trade 45 percent more than women, which leads to a greater annual reduction in their net returns. They attribute the performance and trading activity of men to overconfidence in their investment abilities.

The second half of the review focuses on literature that deals more directly with manager-specific characteristics that may influence mutual fund returns. Golec (1996) analyzes whether non-gender manager characteristics explain fund performance, risk and fees. He examines 530

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[4] Bajtelsmit and VanDerhei (1997), Hinz, McCarthy, and Turner (1997) and Jianakoplos and Bernasek (1998) have also used surveys and other economic data and similarly discover that women invest more conservatively than men.
[5] The instructions and procedures for the experiment conducted in Schubert et al. (1999) may be found (in English) at http://www.wif.ethz.ch/gruppe_schubert/people/srenate/srenate/papers/aea99

mutual funds over the time period of 1988 to 1990. The manager characteristics being investigated include age, tenure with the fund, years of education, whether or not the manager has an MBA degree, management team size, fund age, fund assets, load charge, and fund objective. He reveals that manager age, tenure and education are important factors in determining a fund's performance, risk and fees.[6] Chevalier and Ellison (1999) conduct a similar study over a time frame of 1988 to 1995 during which stocks were in the midst of a significant bull market in the United States. They examine the characteristics of fund managers such as age, the average composite SAT score at the manager's undergraduate institution, and whether the manager has an MBA. Although they find that only the undergraduate college attended by the manager turns out to be relevant, this finding may be due to the sample that they used. Some of their data was back-filled. Other data they used was manually entered based on assumptions about the manager's age when graduating college or about the schools attended by these managers. These assumptions may introduce biases that lead the authors to incorrect conclusions.

Atkinson, Baird, and Frye (2003) fully analyze the gender issue in mutual fund managementThey look at fixed-income mutual fund managers and compare male and female managers to see if there is a difference in performance, risk, or other characteristics. According to their results, there are no significant gender differences in mutual fund management. This suggests to them that differences found in the literature may be attributed to investor knowledge and wealth constraints. However, they do find that the manager's gender influences the *investors'* decision on whether to invest in a fund. Female fund managers receive lower fund inflows in the first year managing a particular fund.

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[6] Gottesman and Morey (2006) emphasize the significance of manager education as an important determinant in fund performance. They find that mutual fund managers that received MBAs from a top school achieved significantly greater performance than other managers.

Beckmann and Menkhoff (2008) conduct a survey among 649 fund managers in US, Germany, Thailand, and Italy. There are 148 response from US in which 11.4% is female. While examining the risk behavior in U.S, they find that female professionals are more risk averse that the males. They find no evidence of gender difference in overconfidence.

III. DATA

All data were obtained from the Morningstar Principia Advanced Mutual Funds Module dated February 29, 2004. From this CD, the following variables were obtained: monthly returns, net assets, expense ratio, standard deviation, total number of holdings, percentage of assets in top 10 holdings, P/E ratio, turnover, the starting date for the current management, and whether the fund was a no-load fund or not.

The CD includes total 9,327 U.S. domestic stock mutual funds. The following criteria are used to select the funds for this paper: (1) Funds that are closed to new investment, "Bear Market" and "Convertible Bond" funds are eliminated because their performance characteristics are different from other types of mutual funds . (2) Exchange-traded funds (ETFs), unmanaged, and team-managed funds are eliminated because there is no discernable manager. (3) To assure enough of a performance track record for the monthly analysis, a minimum three-year performance measure is required.[7] (4) When multiple classes exist for the same fund, the class with the longest history is selected (Carhart (1997)).[8] If two or more classes have identical inception dates, the one with larger net assets is selected. The filtered sample has 2,217 total funds of which 233 are primarily managed by women (10.51%). Where there is missing data, the

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[7] The three-year time frame is the same that Morningstar uses to provide their first "Morningstar Rating."
[8] The classes represent a common pool of assets but differ in term of how distribution-related fees are paid.

most recent fund report (prospectus, annual, and/or semi-annual reports) was used to correct this deficiency.

Manager information is also available on the disk including the names of all current and prior fund managers and a short biography of most current managers. Out of the 2,217 fund managers selected, only 909 of them (41.0%) have education background information available on the Morningstar CD. We find that the availability of the education-related material was largely dependent upon the fund family to which the mutual fund belonged. It appears that many of the larger fund families do report managers' education data (such as Fidelity and Vanguard) and many smaller families do not. We would expect the education statistics to be biased toward higher education than the industry average because presumably the larger groups have the ability to select top candidates at premium salaries. Therefore, we choose not to introduce education variables into our paper.

Among the filtered sample of 2,217 funds, two categories of sub-samples are created. In the first categories, each of 233 female managers are matched to a male counterpart based upon size and tenure, standard deviation (risk) and tenure, and the percent of assets in the top 10 holdings and tenure with their closest male counterparts. The size-tenure matched sample attempts to alleviate bias based on diseconomies of scale and manager experience. This matching is similar to Atkinson, et al. (2003). The standard-deviation-tenure matched sample attempts to alleviate a potential self-selection bias as well as control for manager experience. The self-selection bias occurs because mutual fund managers self-select to highly competitive and risky field. They may be less risk-averse in nature compared to the rest of general population regardless of gender. We attempt to assure a comparable level of risk aversion among paired sample by using the standard deviation. The asset-holding-tenure matched sample is created in

order to control for a potential bias in asset concentration between the matched sample and the full sample of male domestic equity fund managers. In short, each matched sub-sample consists of the 233 female managers and their 233 male counterparts.

In the second category of sub-samples, we select funds that had (since March 1984) a major change in management gender composition, either from female to male or male to female. A major change is defined as a gender change of at least 50% of the management composition of a fund at a specific time. For example, a fund managed by one male manager (100% male and 0% female) changes to one female manager (0% male and 100% female). Or a fund managed by three female managers (100% female and 0% male) switches to one female manger and two males (33% female and 67% male). Additionally, the same management composition must remain in control of the fund for at least 12 months both before and after the changing date. As a result, the changing composition sub-sample includes 102 funds with a total of 150 gender composition changes (90 are male to female changes and the remainder are female to male changes).

IV. HYPOTHESES AND MODELS

Hypothesis one: within styles of mutual funds, fund characteristics do not vary due to fund managers' gender.

The majority of academic research agrees that, in general, men and women have systematic behavioral differences in the way that they invest: women tend to be more risk averse than men. Beckmann and Menkhoff (2008) observe the same risk aversion different between genders in fund managers using a survey data. Unfortunately, their sample size is rather small. Additionally, Schubert et al. (1999) point out that conclusions drawn from a survey may be

erroneous since survey data lack adequate controls for individual risk-taking behavior. Using non-survey data, Atkinson, et al. (2003) are unable to find a significant difference in performance between male and female domestic fixed-income mutual fund managers It is reasonable to believe that given their superior training and knowledge of investments relative to the general public, it is likely that performance differences between male and female fund managers are insignificant. Therefore, we expect that there are no differences in fund characteristics between genders.

To test this hypothesis, paired t-tests that compare the means of female and male managers are performed on the following well-known fund characteristics using the three matched sub-samples: expense ratio, standard deviation (proxy for risk), number of holdings (proxy for diversification), percentage of assets in top 10 holdings (proxy for concentration and diversification), P/E ratio (proxy for value), turnover defined by purchases or sales (whichever is less) divided by the average monthly net assets, whether the fund was a no-load fund or not, net assets (fund size) and manager's tenure (to control for experience). If the results of paired t-tests are insignificant, hypothesis one holds, i.e., there are no gender differences in fund characteristics. If the t-test results are significant, the hypothesis is rejected. This means that mutual fund managers invest differently due to gender. Compared to their male counterparts, female managers more likely have lower turnover (due to less overconfidence) and invest more in conservative stocks (due to more risk aversion), which leads to higher long-term returns.

Hypothesis Two: Returns vary in a systematic way due to fund managers' gender.

We expect that the similarities in the education and experience of fund managers will outweigh the differences in gender, which means that there should not be significant differences

in fund performance due to gender. However, if data tell us otherwise, it will inform investors how to increase returns based upon the gender characteristics of mutual fund management. Further, it will inform the mutual funds, themselves, how to adjust their management gender compositions to increase performance.

A one-index model and two multi-factor models are applied to examine the performance of the male- and female-managed mutual funds. Specifically,

$$r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p \text{Gender}_p + \varepsilon_{p,t} \tag{1}$$

$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \gamma_p \text{Gender}_p + \varepsilon_{p,t} \tag{2}$$

$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \beta_p^3 \text{UMD}_p + \gamma_p \text{Gender}_p + \varepsilon_{p,t} \tag{3}$$

where $r_{p,t}$ is the excess return on the pth fund during month t, α_p is the abnormal excess return on the portfolio, β_p is the standard market-model risk measure, I_t is the excess return on a market index, β_p^1, β_p^2, and β_p^3 are the sensitivities of the excess returns on factors SMB, HML, and UMD, respectively, and Gender_p is a dummy variable equal to one if the manager is female and zero if male.

We use the Russell 1000 index and the S&P 500 index as a proxy for the market. The Russell 1000 is chosen because it is the best-fit index for all domestic equity funds according to Morningstar. The S&P 500 is chosen because some of our funds go back as far as March 1984, while the Russell 1000 is not available until January 1993. As a much more widely used proxy for the market in the literature, we also use the S&P 500 for robustness comparisons.

SMB (Small Minus Big) is the average return on three small portfolios minus the average return on three big portfolios. It encapsulates the idea that small company stocks outperform large company stocks over time. HML (High Minus Low) is the average return on two value

portfolios minus the average return on two growth portfolios. HML encompasses the assertion that value stocks (high book-to-market) outperform growth stocks (low book-to-market) over time. UMD (Up Minus Down) is the momentum factor, defined as the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios from six value-weighted portfolios formed on size and prior returns.[9]

Pooled-OLS regression results are obtained for all three models using the full sample of 2,217 funds. The focus is on the dummy variable, Gender_p. If the coefficient of the gender dummy is insignificant, it indicates that there is no evidence of the difference in fund performance due to gender. However, if the dummy is positive and significant, the hypothesis is rejected. This result will imply that female managers produce better returns than male managers.

We take our analysis one step further. Within a given fund, we examine whether there is any performance change due to the gender composition change in the management using the changing composition sub-sample. The one-index model and two multi-factor models along with a new dummy variable are used. Specifically,

$$r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p \text{Change}_p + \varepsilon_{p,t} \tag{4}$$

$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \gamma_p \text{Change}_p + \varepsilon_{p,t} \tag{5}$$

$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \beta_p^3 \text{UMD}_p + \gamma_p \text{Change}_p + \varepsilon_{p,t} \tag{6}$$

where Change_p is equal to one when there is a higher percentage of female managers between the two periods, and zero denotes a relatively higher percentage of male managers between the two periods. We are directly comparing two time periods within the management of a single

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[9] The UMD factor and the Fama-French factors are available to the public from Kenneth French's web site at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

mutual fund. As shown in the following diagram, in order to allow new management to be fully in control of the fund's assets (and therefore, return), we skip a six-month window right after every change in the gender composition in the management. We use both 12- and 24-month periods for robustness and to be sure that we are using enough data.

Old Management Period		New Management Period
12- or 24-month tested period	6-month window (not tested)	12- or 24-month tested period

A panel regression is run on the three models to determine if the change in gender is significant. The changing composition sub-sample is used here. We further separate the sample into male-to-female changes and the female-to-male changes in management composition. Since in all cases, the change dummy is equal to one for an increase in female management, a positive and significant result for this dummy will indicate that female management outperforms male management over time within a fund.

Finally, we analyze changes in manager gender uses the actual percentage of female managers for each month of the fund's existence, or as far back as March 1984, whichever is less. The models used are as follows:

$$r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p \text{Female}_p + \varepsilon_{p,t} \qquad (7)$$
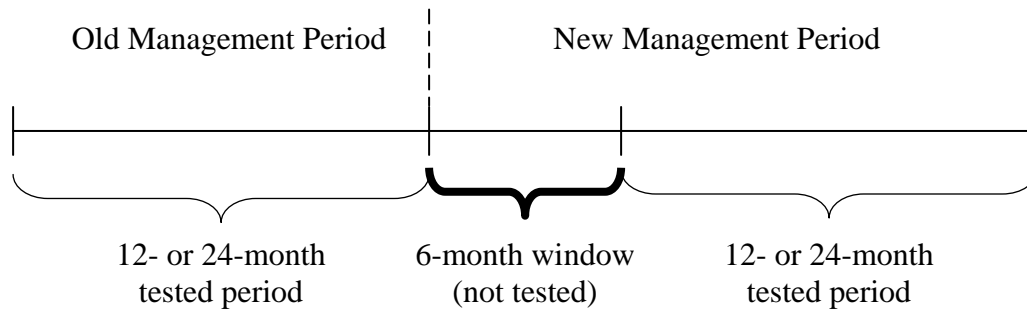
$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \gamma_p \text{Female}_p + \varepsilon_{p,t} \qquad (8)$$

$$r_{p,t} = \alpha_p + \beta_p I_t + \beta_p^1 \text{SMB}_t + \beta_p^2 \text{HML}_t + \beta_p^3 \text{UMD}_p + \gamma_p \text{Female}_p + \varepsilon_{p,t} \qquad (9)$$

where Female_p is equal to the percentage of female managers managing the fund in any given month t. If the coefficient for Female_p is positive and significant, then the percentage of female management is positively related to the performance of the fund over time.

V. EMPIRICAL RESULTS

A description of female domestic equity mutual fund managers relative to total funds in our sample is illustrated in Table 1. All funds are separated into four categories: value, blend, growth and other. Panel A shows that female managers comprise about 10.5% of the selected domestic equity mutual fund managers. Additionally, among the four fund categories females are slightly over-represented in the blend category and under-represented in the value category: almost 12% of blend managers are female, while only a little over 9% of value managers are female.

Panel B of Table 1 compares the percentage allocation of selected female fund managers in the four categories to the percentage of the overall sample. The number and percentage of female managers in value funds is lowest. Also, 29% of female mangers run blend funds. This is somewhat higher than the proportion of blend fund managers to the overall sample (26%). The proportions of female managers in growth and other categories are almost identical to the proportion of female managers to total funds. These two panels taken together suggest that there is a tendency for females to manage blend funds and not to manage value funds.

Comparisons of 10 fund characteristics between male and female fund managers related to hypothesis one are presented in Tables 2, 3 and 4. The funds were separated into the value, blend, growth, and other style categories.

The comparison results for the size-tenure matched sample are shown in Table 2. The results indicate that female value fund managers have a higher turnover ratio and a higher propensity to manage a no-load fund. The higher turnover is contrary to the finding that females in the general population tend to trade less. Female blend fund managers tend to have a slightly higher P/E ratio than matched males. Female growth fund managers have a lower propensity to manage a no-load fund. And, female managers managing the other funds invest significantly less assets in their top ten holdings. Comparisons between male and female managers across all four categories show that male fund managers have a higher standard deviation in returns and tend to concentrate their assets more in their top ten holdings suggesting they may be less diversified than female managers. Additionally, male managers have a significantly higher turnover ratio.

Table 3 reveals the comparison results using the standard-deviation-tenure sub-sample. For the value funds, the gender difference on turnover disappears but female managers are still more likely to manage a no-load fund then male ones. Moreover, there is a significant difference in the total number of holdings, which implies that female value fund managers under the current match hold more stocks than male managers. The results also show that female managers in the blend, growth and other categories hold less assets in their top 10 holdings. Furthermore, female blend fund managers have a higher turnover ratio, female growth fund managers have a higher P/E ratio, and, females in the "other" category hold more stocks than their male counterparts. When we look at comparisons across all four categories, evidence shows that females hold more

stocks, have a lower concentration in their top 10 holdings and a higher P/E ratio than male managers.

The results of gender comparisons among the holding-tenure match sub-sample are presented in Table 4. The gender differences of the fund characteristics in value funds are consistent with the standard-deviation-tenure matched sample: females hold more stocks and are more likely to manage a no-load fund than males. There are no significant differences between male and female blend fund managers. In the growth category, males are more likely than females to manage a no-load fund, which is same as shown in size-tenure sub-sample. In the "other" category, female managers have somewhat lower standard deviation in the fund returns. When look at the gender differences for all categories combined, female managers have slightly lower standard deviations in returns and trade much less than male managers.

Hypothesis one is rejected because we do observe certain gender difference in fund characteristics within styles of mutual funds. However, when reviewing and analyzing Tables 2, 3, and 4 together, it is difficult to draw an unambiguous conclusion based upon the paired t-test results. The gender differences in fund characteristics often tend not to retain among all three sub-samples with different matching criteria. The most robust result in all three sub-samples is that females are more likely to manage a no-load fund in the value category than are males. Also, the following gender differences are shown in any two out of three matched samples: standard deviation is significant in both tables that are not matched by standard deviation. Female managers typically achieve less standard deviation in returns, have a significantly lower percentage of assets in their top 10 holdings, and have more holdings than males. Each of these findings seems to be consistent with the findings in the *general public* (see Barber and Odean (2001) among others) that females have a lower risk tolerance, which means that female

managers try to spread their risk out over many stocks and hold few assets in their top 10 holdings. Finally, it is worth pointing out that net assets and expense ratio are never significantly different between the genders in all sub-samples.

The remaining discussion of the empirical results is focused on the fund performance differences due to managers' gender. We analyze panel data of managers currently in control of all 2,217 funds using equations (1) to (3). The results presented in Table 5 show that the gender dummy is not statistically significant in all three models. This implies that under current management, fund manager's gender does not affect fund performance. Additionally, one-index and three-factor models show that mutual funds outperform the market regardless under male or female managers. However, after considering the momentum factor, the significant positive abnormal returns disappear.

Now, we turn our analysis to gender differences in performance when there is a major change in the gender of fund management within a single mutual fund. We apply the changing composition sub-sample to equations (4) to (6). We analyze the concluding 12-month period for previous management, skip a six-month window so that new management can adjust the fund's portfolio according to its preferred method of investing, and analyze the following 12-month period for new management.[10] The results of pooled regressions are shown in Table 6.[11] Panel A displays the results from all 129 changes in management gender. The coefficients of dummy variable for changing composition in management are negative but insignificant in all equations. The abnormal return (alpha) is not significant in the single index equations, but it is in the multi-factor equations. We further explore the assumption that the direction of changes in the

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[10] To run a robustness check, the same analysis was conducted using 24-month testing period. There are no fundamental changes in the results. Therefore, they are not presented in the paper.
[11] We perform SBIC test for pooled and fixed effects. All of the SBIC results favor using the pooled regression. Further, none of the fixed-effects results were materially different from the pooled regressions.

management gender composition may affect the fund performance. Panel B shows the results of a change from a lower percentage of female managers to a higher percentage of female managers (i.e. male-to-female). The coefficients of dummy for changing composition are now positive but again insignificant. The abnormal returns are negative and significant in all equations. In Panel C, changes in management gender from a higher percentage of female mangers to a lower percentage of female managers (i.e. female-to-male) are shown. The coefficients of dummy for change are now significant and negative in all equations while the abnormal returns are no longer significant. In short, hypothesis two is rejected under certain conditions. It appears that abnormal returns are significant only when management changes from a lower percentage to a higher percentage of female managers, suggesting that, in this case, all managers have significantly negative returns and there is no significant difference in the gender of the manager. However, when management changes from a higher percentage to a lower percentage of female managers, the gender of the manager is significant. The results show that fund returns become better after new management with lower percentage of females is in place.

Finally, we examine the impact of gender composition change in management through the percentage of female manager in a given fund using the same changing composition sub-sample. Rather than looking only at the manager tenures immediately before and after a major change in manager gender composition, we assign a percentage of female managers to each month of a fund's existence or as far back as 20 years (March 1984), whichever is less. As an example, this number is equal to 1 if the only managers of a fund are female or 0.25 if there are four managers of a particular fund and one of them is female. The variable, Female in equations (7) to (9), picks up changes in gender composition of fund management regardless whether it is a major or minor change.

The results of pooled regressions are shown in Table 7. The coefficient of Female is negative but insignificant in the single-index models. However, it becomes negative and significant in the multi-factor models. The multi-factor models may be better since they consistently have higher adjusted R-squareds, indicating that these models can explain a higher percentage of the excess returns in the funds. So, the regression results suggest that the percentage of female managers of a particular fund is inversely related to its performance.

VI. CONCLUSION

Literature in recent years suggests that females are more conservative investors than males. But fund managers typically have more investment education than the average person. So, the question of whether or not female fund managers exhibit more conservative tendencies is an interesting one. Along with this question, we explore whether or not the investment decisions of female fund managers affect the performance of the funds that they manage in a different way than do the investment decisions of male managers.

We find a few differences in the matched comparison that suggest that female managers have a lower risk tolerance. They tend to spread their risk out over many stocks and hold few assets in their top 10 holdings. Also, females managing value funds manage no-load funds significantly more than males.

When examining current managers for all 2,217 domestic equity funds, we find that there are no significant differences in performance of mutual funds due to management gender. This is consistent with Atkinson et al. (2003) where they examine fixed-income funds.

We then analyze performance within funds over time in order to examine the impact of changes in management's gender composition on the fund performance. When considering all

funds with major gender composition changes, there is no evidence shown that the composition changes lead to a corresponding performance change. However, after we break down the issue, it is rather clear that the performance improves after a reduction in the percentage of female management in a given fund. We also find that using the multi-factor models the percentage of female managers in a fund is negatively related to the fund's performance over time.

Finally, even though we show evidence here that an inverse relationship exists between the percentage of female managers in a fund and its performance, there are three reasons why one should be cautioned in interpreting and applying our empirical results. First, although significant, the absolute value of the differences between funds with male managers and funds with female managers is small. So, an investor may not benefit simply by seeking a male mutual fund manager. Second, the results should not be blindly applied to any individual fund manager. Many female managers outperform male managers. Third, all of our results are based upon historical data. If mutual fund managers' abilities have evolved over the last twenty years, results may be different for today's managers.

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TABLE 1. Female Domestic Equity Mutual Fund Managers

Panel A. Female Managers as a Percentage of Funds by Category

Category	# of Female Managers	Total Funds	Percentage
Value	35	373	9.38%
Blend	68	576	11.81%
Growth	75	732	10.25%
Other	55	536	10.26%
Total	**233**	**2,217**	**10.51%**

Panel B. Female Managers by Category as a Percentage of All Female Managers and Total Funds by Category as a Percentage of All Funds

Category	# of Female Managers	Percentage	Total Funds	Percentage
Value	35	15.02%	373	16.82%
Blend	68	29.18%	576	25.98%
Growth	75	32.19%	732	33.02%
Other	55	23.61%	536	24.18%
Total	**233**	**100.00%**	**2,217**	**100.00%**

Note: This table illustrates the relative proportion of domestic equity fund managers that are female. Only funds actively managed primarily by a single male or female manager were considered when compiling this table. All data was obtained from the Morningstar Principia Advanced Mutual Funds Module dated February 29, 2004.

TABLE 2. Male and Female Mutual Fund Manager Comparison of Means (Matched by Net Assets and Tenure)

Category (Observations)	Expense Ratio	Standard Deviation	Total Number of Holdings	% Assets in Top 10 Holdings	P/E Ratio	Turnover Ratio	No-load	Net Assets	Tenure (Days)
Value (35 pairs)									
Male	1.268	17.549	107.9	26.269	16.091	53.914	0.457	1959.89	1461
Female	1.142	17.938	125.3	29.344	16.166	71.829	0.800	2028.78	1477
p-value	0.205	0.575	0.486	0.124	0.861	0.050**	0.003***	0.430	0.873
Blend (68 pairs)									
Male	1.212	18.452	277.5	26.457	18.193	87.851	0.588	529.72	1497
Female	1.159	18.240	254.0	24.515	18.803	78.235	0.691	532.08	1496
p-value	0.544	0.702	0.804	0.407	0.096*	0.440	0.211	0.821	0.997
Growth (75 pairs)									
Male	1.399	22.027	99.0	25.665	23.597	128.797	0.640	501.17	1341
Female	1.380	20.877	111.9	23.844	24.613	112.160	0.480	490.37	1378
p-value	0.775	0.108	0.391	0.193	0.165	0.263	0.045**	0.437	0.567
Other Funds (55 pairs)									
Male	1.496	19.012	197.5	40.577	22.113	193.891	0.418	437.11	1312
Female	1.400	16.339	272.8	29.828	20.351	114.145	0.545	382.37	1240
p-value	0.398	0.220	0.146	0.006***	0.311	0.135	0.164	0.470	0.159
All Funds (233 pairs)									
Male	1.348	19.599	176.4	29.507	20.519	121.074	0.545	713.500	1398
Female	1.286	18.595	193.1	26.279	20.653	96.670	0.605	708.140	1395
p-value	0.160	0.089*	0.479	0.011**	0.794	0.086*	0.151	0.813	0.931

Note: This table shows a comparison of means and p-values (to report the significance of the difference between the two paired sample means) for several important variables that are related to a fund's investment objective or to its management style. In each category, a portfolio of fund returns is averaged and the means are compared with those of the opposite gender. The number in parentheses next to each category name is the number of distinct female fund managers that exist in that category. These were matched by total assets and tenure to the list of funds managed by male managers, and the closest matches were selected for the male portfolio. All data was obtained from the Morningstar Principia Advanced Mutual Funds Module dated February 29, 2004.
* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

TABLE 3. Male and Female Mutual Fund Manager Comparison of Means (Matched by Standard Deviation and Tenure)

Category (Observations)	Expense Ratio	Standard Deviation	Total Number of Holdings	% Assets in Top 10 Holdings	P/E Ratio	Turnover Ratio	No-load	Net Assets	Tenure (Days)
Value (35 pairs)									
Male	1.261	18.177	86.3	30.474	16.803	59.743	0.629	1490.847	1393
Female	1.142	17.938	125.3	29.344	16.166	71.829	0.800	2028.775	1477
p-value	0.205	0.237	0.057*	0.740	0.479	0.219	0.057*	0.748	0.291
Blend (68 pairs)									
Male	1.155	18.199	166.2	34.240	18.494	57.358	0.647	676.981	1451
Female	1.159	18.240	254.0	24.515	18.803	78.235	0.691	532.081	1497
p-value	0.867	0.460	0.122	0.005***	0.447	0.044**	0.568	0.463	0.326
Growth (75 pairs)									
Male	1.458	20.818	95.4	29.011	23.266	125.360	0.613	328.468	1337
Female	1.380	20.877	111.9	23.844	24.613	112.160	0.480	490.370	1379
p-value	0.356	0.333	0.408	0.004***	0.045**	0.317	0.105	0.291	0.383
Other Funds (55 pairs)									
Male	1.377	16.299	159.9	39.346	19.364	143.800	0.473	1039.182	1223
Female	1.400	16.339	272.8	29.828	20.351	114.145	0.545	382.367	1240
p-value	0.819	0.564	0.077*	0.019**	0.407	0.456	0.455	0.248	0.680
All Funds (233 pairs)									
Male	1.320	18.590	130.4	33.197	19.942	100.194	0.592	772.551	1362
Female	1.286	18.595	193.1	26.279	20.653	96.670	0.605	708.140	1395
p-value	0.376	0.913	0.007***	0.000***	0.082*	0.747	0.768	0.825	0.220

Note: This table shows a comparison of means and p-values (to report the significance of the difference between the two paired sample means) for several important variables that are related to a fund's investment objective or to its management style. In each category, a portfolio of fund returns is averaged and the means are compared with those of the opposite gender. The number in parentheses next to each category name is the number of distinct female fund managers that exist in that category. These were matched by total assets and tenure to the list of funds managed by male managers, and the closest matches were selected for the male portfolio. All data was obtained from the Morningstar Principia Advanced Mutual Funds Module dated February 29, 2004.
* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

TABLE 4. Male and Female Mutual Fund Manager Comparison of Means (Matched by % Assets in Top 10 Holdings and Tenure)

Category (Observations)	Expense Ratio	Standard Deviation	Total Number of Holdings	% Assets in Top 10 Holdings	P/E Ratio	Turnover Ratio	No-load	Net Assets	Tenure (Days)
Value (35 pairs)									
Male	1.293	18.208	94.743	29.318	15.863	103.735	0.514	379.711	1355
Female	1.142	17.938	125.257	29.344	16.166	71.829	0.800	2028.775	1477
p-value	0.170	0.733	0.056*	0.961	0.516	0.268	0.010***	0.307	0.175
Blend (68 pairs)									
Male	1.135	18.530	278.926	24.770	18.902	62.897	0.647	775.361	1456
Female	1.159	18.240	254.000	24.515	18.803	78.235	0.691	532.081	1497
p-value	0.770	0.478	0.486	0.192	0.877	0.106	0.594	0.460	0.284
Growth (75 pairs)									
Male	1.327	21.634	122.836	23.860	23.897	190.493	0.627	609.366	1335
Female	1.380	20.877	111.907	23.844	24.613	112.160	0.480	490.370	1379
p-value	0.517	0.201	0.506	0.777	0.258	0.148	0.078*	0.485	0.176
Other Funds (55 pairs)									
Male	1.465	19.711	289.164	30.119	21.318	162.964	0.600	1440.923	1286
Female	1.400	16.339	272.818	29.828	20.351	114.145	0.545	382.367	1240
p-value	0.567	0.063*	0.795	0.273	0.483	0.309	0.606	0.152	0.284
All Funds (233 pairs)									
Male	1.299	19.760	204.130	26.423	20.610	133.853	0.609	819.604	1356
Female	1.286	18.595	193.103	26.319	20.653	96.670	0.605	708.140	1395
p-value	0.736	0.019**	0.587	0.228	0.962	0.083*	0.927	0.724	0.174

Note: This table shows a comparison of means and p-values (to report the significance of the difference between the two paired sample means) for several important variables that are related to a fund's investment objective or to its management style. In each category, a portfolio of fund returns is averaged and the means are compared with those of the opposite gender. The number in parentheses next to each category name is the number of distinct female fund managers that exist in that category. These were matched by total assets and tenure to the list of funds managed by male managers, and the closest matches were selected for the male portfolio. All data was obtained from the Morningstar Principia Advanced Mutual Funds Module dated February 29, 2004.
* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

TABLE 5. Gender Significance in Current Mutual Fund Managers

One-index Regression				3-Factor Regression		4-Factor Regression	
Russell 1000		**S&P 500**					
Factor	**Est. Coeff**	**Factor**	**Est. Coeff**	**Factor**	**Est. Coeff**	**Factor**	**Est. Coeff**
ALPHA	0.2237 ***	ALPHA	0.23787 ***	ALPHA	0.01686 **	ALPHA	-0.03821 ***
	0.009		*0.00782*		*0.01686*		*0.00788*
GENDER	-0.03632	GENDER	-0.01896	GENDER	-0.01665	GENDER	-0.01673
	0.02745		*0.02382*		*0.02217*		*0.02215*
Russell 1000	0.91665 ***	S&P 500	0.9 ***	RMRF	0.89059 ***	RMRF	0.90847 ***
	0.00182		*0.00159*		*0.00151*		*0.00177*
				SMB	0.16464 ***	SMB	0.17518 ***
					0.002		*0.00207*
				HML	0.00734 ***	HML	0.04316 ***
					0.00169		*0.0025*
						UMD	0.03606 ***
							0.00185
Adjusted R-squared	0.54101		0.54581		0.60688		0.60743

Pooled regressions were performed on returns from all 2,217 current domestic equity managers using the equations:

$$r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p Gender_p + \varepsilon_{p,t} \text{ and } r_{p,t} = \alpha_p + \sum_{i=1}^{J} \beta_{p,i} I_{i,t} + \gamma_p Gender_p + \varepsilon_{p,t}$$, where *GENDER* is a dummy equal to 1 if the

current manager is female for all returns in months of the current manager's tenure and 0 if the current manager is male. Standard errors are below coefficients.   * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

TABLE 6. Dynamic Change in Manager Gender (12-Months Before and After)

PANEL A: All Major Changes in Management Gender

	RUSSELL 1000		S&P 500		Fama-French 3 Factors		Carhart 4 Factors	
	Factor	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**
	Alpha	-0.12753	Alpha	-0.14402	Alpha	-0.27145 ***	Alpha	-0.36572 ***
		0.09292		*0.09019*		*0.08177*		*0.08523*
	CHANGE12	-0.0223	CHANGE12	-0.02134	CHANGE12	-0.0693	CHANGE12	-0.06616
		0.13151		*0.12729*		*0.11503*		*0.11478*
	RUS1000EX	0.91612 ***	SP500EX	0.89566 ***	RMRF	0.87405 ***	RMRF	0.90678 ***
		0.01377		*0.01361*		*0.01279*		*0.01537*
					SMB	0.12788 ***	SMB	0.14829 ***
						0.01536		*0.01623*
					HML	-0.02893 **	HML	0.03161
						0.01288		*0.02038*
							UMD	0.05714 ***
								0.01493
Adjusted R-squared	0.6105		0.5830		0.6596		0.6611	
Fixed-Effects F-Test	1.2141		1.1858		1.3023		1.3151	
Fixed-Effects P-Value	0.0587		0.0794		0.0141		0.0114	
SBIC - Pooled OLS	7547.5		8318.5		8011.2		8007.9	
SBIC - Fixed Effects	7956.8		8755.7		8440.9		8436.8	
No. Observations	123		129		129		129	

TABLE 6. Dynamic Change in Manager Gender (12-Months Before and After) (continued)

PANEL B: Major Changes in Management Gender from Male-to-Female

RUSSELL 1000		S&P 500		Fama-French 3 Factors		Carhart 4 Factors	
Factor	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**
Alpha	-0.31054 **	Alpha	-0.3141 ***	Alpha	-0.41988 ***	Alpha	-0.52682 ***
	0.12242		*0.11742*		*0.10699*		*0.11065*
CHANGE12	0.26951	CHANGE12	0.25741	CHANGE12	0.16981	CHANGE12	0.16363
	0.17116		*0.16545*		*0.15067*		*0.1502*
RUS1000EX	0.92518 ***	SP500EX	0.91417 ***	RMRF	0.89463 ***	RMRF	0.93688 ***
	0.01766		*0.01749*		*0.01642*		*0.02009*
				SMB	0.13868 ***	SMB	0.16479 ***
					0.01983		*0.02104*
				HML	-0.0067793	HML	0.06944 ***
					-0.40821		*0.02674*
						UMD	0.07122 ***
							0.01963
Adjusted R-squared	0.6128		0.5904		0.6610		0.6632
Fixed-Effects F-Test	1.3015		1.3430		1.4266		1.4293
Fixed-Effects P-Value	0.0462		0.0264		0.0095		0.0092
SBIC - Pooled OLS	4671.6		5127.5		4954.7		4951.9
SBIC - Fixed Effects	4898.6		5368.7		5192.6		5189.6
No. Observations	75		79		79		79

TABLE 6. Dynamic Change in Manager Gender (12-Months Before and After) (continued)

PANEL C: Major Changes in Management Gender from Female-to-Male

RUSSELL 1000		S&P 500		Fama-French 3 Factors		Carhart 4 Factors	
Factor	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**
Alpha	0.13969	Alpha	0.10593	Alpha	-0.01952	Alpha	-0.08809
	0.14197		*0.14046*		*0.12642*		*0.13349*
CHANGE12	-0.46752 **	CHANGE12	-0.42732 **	CHANGE12	-0.4696 ***	CHANGE12	-0.45889 ***
	0.20572		*0.19943*		*0.17858*		*0.17859*
RUS1000EX	0.90713 ***	SP500EX	0.87095 ***	RMRF	0.83969 ***	RMRF	0.8591 ***
	0.02205		*0.02174*		*0.0204*		*0.02376*
				SMB	0.09927 ***	SMB	0.11173 ***
					0.0243		*0.02551*
				HML	-0.07438 ***	HML	-0.03653
					0.0204		*0.03133*
						UMD	0.03635
							0.02285
Adjusted R-squared	0.6087		0.5724		0.6605		0.6609
Fixed-Effects F-Test	1.0772		0.9435		1.0536		1.0716
Fixed-Effects P-Value	0.3371		0.5855		0.3753		0.3440
SBIC - Pooled OLS	2879.6		3194.5		3062.2		3064.5
SBIC - Fixed Effects	3018		3344.6		3209.5		3211.3
No. Observations	48		50		50		50

Panel regressions are performed on 129 instances of a change in the gender of a manager either from male-to-female (79) or female-to-male (50) among 102 funds using equations $r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p Change12_{p,t} + \varepsilon_{p,t}$ and $r_{p,t} = \alpha_p + \sum_{i=1}^{J} \beta_{p,i} I_{i,t} + \gamma_p Change12_{p,t} + \varepsilon_{p,t}$. Only time periods that are identifiable as changes in gender where the prior-manager and the post-manager were in control of the fund for at least 12 and 18 consecutive months, respectively are considered (so that there is a 6-month window between analyses). *CHANGE12* = 1 for the manager period with a higher female concentration whether or not this tenure preceded or was immediately following the period with a lower female concentration. Only changes to or from a concentration of female managers of 50% or more are considered. *Panel A* shows all major gender changes, while *Panel B* shows only male-to-female changes and *Panel C* shows only female-to-male changes. Standard errors are below the coefficients. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

TABLE 7. Percentage Change in Management Gender Composition

	Russell 1000		SP500		Fama-French 3 Factors		Carhart 4 Factors	
Factor	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**	**Factor**	**Est. Coeff.**
Alpha	0.19785 ***	Alpha	0.24161 ***	Alpha	0.05921 *	Alpha	-0.00714
	0.04175		*0.03381*		*0.03062*		*0.03195*
FEMALE	-0.07954	FEMALE	-0.09087	FEMALE	-0.12715 **	FEMALE	-0.13198 **
	0.07148		*0.06101*		*0.05499*		*0.05490*
RUS1000	0.90926 ***	SP500	0.89482 ***	RMRF	0.88380 ***	RMRF	0.90442 ***
	0.00679		*0.00577*		*0.00535*		*0.00607*
				SMB	0.16983 ***	SMB	0.18356 ***
					0.00717		*0.00741*
				HML	-0.02276 ***	HML	0.02238 **
					0.00617		*0.00881*
						UMD	0.04696 ***
							0.00656
Adjusted R-squared	0.6012		0.6035		0.6785		0.6795
Fixed Effects F-Test	0.7271		0.8469		0.9874		0.9880
Fixed Effects P-Value	0.9819		0.8640		0.5173		0.5155

Panel regressions were performed using all cases where there was at one time (since March 1984) a major change in management gender composition, either from female to male or male to female. The following equations were tested: $r_{p,t} = \alpha_p + \beta_p I_t + \gamma_p Female_{p,t} + \varepsilon_{p,t}$ and

$r_{p,t} = \alpha_p + \sum_{i=1}^{J} \beta_{p,i} I_{i,t} + \gamma_p Female_{p,t} + \varepsilon_{p,t}$, where *Female* is equal to the percentage of female managers managing a fund for a given month. All

months of the fund for which data is available are included. So, the following must hold for all months: $0 <= Female <= 1$. A major change is defined as at least 50% of the managers of a fund at a specific time must be female (male) and change to at least 50% male (female). The same manager composition must remain in control of the fund for at least 12 months both before and after the date of change in gender composition. This resulted in a sample of 102 funds with a total of 150 gender composition changes. Standard errors are below coefficients. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.