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# The demographics of fund turnover ☆

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ABSTRACT

This article documents various demographic factors which influence mutual fund turnover including managerial experience, location, education, and gender. On average, funds in financial centers trade more but this excess turnover declines with experience. While most extra trading is concentrated among less experienced managers in financial centers, they do not outperform inexperienced managers located in smaller towns. Furthermore, managers in financial centers increase trading after good performance. This result is particularly strong for inexperienced, more educated male fund managers investing in growth stocks and located in New York. Our results provide strong evidence that demographic factors influence fund manager trading behavior.



## 1. Introduction

Several studies link mutual fund trading to returns. For example, Edelen (1999) estimates that trading caused by investor purchases and sales can significantly reduce performance, and Edelen

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et al. (2008) try to back out the cost of trading on portfolio returns from holdings data. Other papers such as Wermers (2000), Kacperczyk et al. (2005, 2008), Kacperczyk and Seru (2007) consider how changes in holdings of portfolio managers can be used to predict future returns of mutual funds and evaluate the informativeness of fund trades. However, little research is focused on identifying those factors that influence turnover in mutual funds. Christoffersen et al. (2008) consider the fund-specific characteristics which explain trading costs but do not consider cross-sectional explanations for differences in trading levels across mutual funds. Hong et al. (2005) show that mutual fund trades within cities are correlated, but they do not compare overall turnover levels across cities.

In contrast to previous literature, our study provides novel evidence linking demographic determinants to fund trading. We observe that turnover is much higher among fund managers in financially prominent cities, and relate this higher level of trading to overconfident behavior. Our subsequent analysis explores whether managers' education, location, experience, and gender contribute to their assessment of their own abilities and affect how they react to information and trade.

Overconfidence among investors is likely to be pervasive in locations where professional traders have some reason to believe that they are more skillful and/or have access to private or more precise information. Higher average wages, education level, and productivity in larger and more densely populated cities, especially among professionals dealing with imprecise tasks, may all contribute to their feeling of being more knowledgeable than their peers from smaller towns.[3] Heath and Tversky (1991) develop the concept of competence, in which people are willing to bet on their own judgments about ambiguous outcomes when they feel knowledgeable about them. In this respect, portfolio managers who believe they are smarter in making investment decisions will act more aggressively on their judgments, which may often be incorrect. The potential existence of rich information sources in financial centers can make investors in those places think that their signals can be traded on, although this is not always the case. Daniel et al. (1998, 2001) note that investors are overconfident about their private information, rather than general public information.

Our data includes all diversified domestic equity mutual funds in the US that existed between 1992 and 2002, i.e., funds that hold information-sensitive securities. The equity funds belong to four investment objectives: aggressive growth, growth and income, income, and large growth.

Funds in financial centers trade more and perform better than other funds on average. The difference in turnover is 6% per year while the difference in abnormal returns (adjusted for fund size and investment objective) is 0.6% per year and both are statistically significant. One explanation for higher levels of turnover in financial centers is the availability of more information, while the alternative is related to overconfidence bias. This paper distinguishes between these two explanations by relying on the predictions of Gervais and Odean (2001) and Daniel et al. (1998) models of overconfidence. Accordingly, if overconfident trading is more prevalent in financial centers, excessive trading should decrease over time as managers realize their true ability. In addition, an overconfident manager is likely to trade more aggressively after performing well since they attribute too much of their success to their own investing skills.

Both predictions of overconfident trading in financial centers are borne out in the data. First, excess turnover is significantly higher for young managers in financial centers than elsewhere (almost 11% higher), but the difference across locations is negligible when we compare managers with more than five years of experience. Second, managers in financial centers trade more aggressively after good performance, especially less experienced managers. This relation is particularly strong for funds investing in hard-to-value, growth-oriented stocks and those that are located in New York and is present even after controlling for other fund characteristics such as size, age, expense ratio, and volatility. In spite of

[3] For instance, Glaeser (1999) finds that workers in New York, Chicago, and Los Angeles are 10% more likely to be college graduates than in other US cities. Wheeler (2001) shows that increase in the size of a city increases the wage return to education and proportion of college graduates. Ciccone and Hall (1996) compute that doubling of employment density increases productivity by 6%.

more aggressive trading in financial centers, we do not find that the extra turnover improves future returns. We therefore conclude that trading in financial centers is excessive, especially since many other studies have documented that higher turnover hurts current performance.[4] As further evidence of overconfidence, we also find that aggressive trading is more prevalent among male fund managers, consistent with Barber and Odean (2001). Finally, managers with better education (proxied by manager-specific SAT scores) trade less overall but are more likely to trade aggressively after experiencing good past performance.

Our results suggest that managers in financial centers exhibit more overconfident trading behavior which diminishes over time.[5] The existence of a positive relation between prior fund performance and current turnover, as well as the reduction in turnover over time support the models of Gervais and Odean (2001) and Daniel et al. (1998). Therefore, we show that various demographic factors influence fund managers' assessment of their investing ability, and, as a result, affect their trading behavior and performance.

This study is most closely related to Christoffersen and Sarkissian (2009), but examines different economic questions. Christoffersen and Sarkissian (2009) focus on fund returns and find that mutual funds located in financial centers tend to outperform funds located in other places over time. The main explanation behind their results is better learning opportunities in large cities.

The current study investigates the differences in the trading behavior of funds across geographic locations and such managerial characteristics as experience, education, and gender. The main hypothesis which motivates this study is that fund managers in larger centers are more likely to believe they have more precise information and better ability because they are located in places with a greater supply of private information and skilled managers. The overestimation of information precision and ability results in overconfident behavior in financial centers across managers with different experience and education levels, and between genders. Consistent with theoretical models, we observe that detrimental overconfident trading disappears with experience. While performance gains among fund managers in financial centers relate to improved investing skills over time, as shown in Christoffersen and Sarkissian (2009), some early improvements may also come from learning to be less overconfident. To make our findings compatible with those in Christoffersen and Sarkissian (2009), we use the same data set.

The rest of the paper is organized as follows. Section 2 motivates our study discussing two types of learning experiences in financial centers. Section 3 describes the data while Section 4 discusses the impact of demographic variables on fund turnover. Section 5 documents the differences in turnover and performance across various fund and manager characteristics depending on location as well as examines the relation between prior fund performance and current trading activity. It provides the first evidence of overconfident trading in financial centers. Section 6 is devoted to the analysis of the relation between past fund turnover and current performance. In this section, to control for manager job changes, we perform our analysis using manager tenure instead of using the total time spent by a manager in a given city. Section 7 presents an alternative hypothesis for our main results. Finally, Section 8 concludes.

[4] The negative relation between overconfidence and average performance is well documented in the literature. For example, Odean (1998) and Daniel et al. (1998) argue that investor overconfidence leads to more frequent trading which may not offset on average the costs of trading. Odean (1999) and Barber and Odean (2000, 2001) document that more frequent trading results in underperformance for individual investors. See Hirshleifer's (2001) for an excellent review of the literature. Note that if overconfident investors have access to private signals, their profits can exceed those of fully rational investors. For example, Kyle and Wang (1997) and Hirshleifer and Luo (2001) show that by trading more aggressively on accurate (private) information, overconfident traders are likely to outperform those who trade less frequently. However, even these studies generally find that if there is too much overconfidence it will decrease trading profits.

[5] For the remainder of the paper, we maintain a very generic definition of overconfidence. It may result from (i) the overestimation of the precision of information about the value of a financial security, (ii) the better-than-average effect (i.e., if investors think that they have superior skills), or (iii) the illusion-of-control effect (when investors bias upward their estimates of own success probability). Glaser and Weber (2007) argue, for example, that only better-than-average effect leads to more frequent trading.

## 2. Motivation

While numerous papers have been written about cross-sectional and time-series variations in mutual fund returns, there are none that we are aware of that explain differences in turnover across funds. This paper provides a unique look at determinants of mutual fund turnover by focusing on demographic differences across managers, such as managerial experience, location, education, and gender.

Christoffersen and Sarkissian (2009) report that portfolio turnover in financial centers is higher than in smaller cities. This extra trading activity may be due to better access to information in large cities. It may also reflect overconfident trading among fund managers. Fund managers in financial centers are at a higher risk of being more overconfident than their peers in smaller cities for two reasons. First, large cities are associated with more information generation and dissemination, so it is likely that fund managers in these locations trade more aggressively by believing that their information is private and not yet priced by the market. Second, large cities have a better educated pool of people (see the SAT scores and average level of education in Table 1) who earn on average higher wages.

**Table 1**
Summary statistics.

| | | Number of funds | | | | | Companies |
|---|---|---|---|---|---|---|---|
| | Obs. | All | AG | GI | IN | LG | |
| *Panel A: distribution of funds* | | | | | | | |
| Financial centers | 7093 | 1136 | 341 | 269 | 60 | 466 | 141 |
| Other places | 5084 | 781 | 233 | 175 | 56 | 317 | 130 |
| Total | 12177 | 1917 | 574 | 444 | 116 | 783 | 271 |

| | Location | Obs. | Mean | SD | Median | F–O |
|---|---|---|---|---|---|---|
| *Panel B: fund and manager characteristics* | | | | | | |
| Fund age | F | 7379 | 11.560 | 14.071 | 6.000 | 1.061*** |
| | O | 5267 | 10.499 | 12.882 | 6.000 | (4.33) |
| Size (bln $) | F | 7119 | 1.522 | 5.417 | 0.207 | 0.814*** |
| | O | 5122 | 0.708 | 2.236 | 0.141 | (10.15) |
| Turnover | F | 6509 | 0.893 | 1.143 | 0.667 | 0.059*** |
| | O | 4678 | 0.834 | 0.914 | 0.600 | (2.91) |
| Expenses (%/y) | F | 7074 | 1.246 | 0.656 | 1.210 | −0.050*** |
| | O | 5082 | 1.296 | 1.002 | 1.119 | (−3.34) |
| Volatility (%/m) | F | 7058 | 0.050 | 0.026 | 0.046 | 0.001 |
| | O | 5066 | 0.049 | 0.027 | 0.045 | (0.96) |
| Abnormal return (%/m) | F | 7093 | 0.022 | 1.149 | 0.006 | 0.050** |
| | O | 5084 | −0.028 | 1.122 | −0.032 | (2.41) |
| Four-factor alpha (%/m) | F | 861 | 0.057 | 0.354 | 0.044 | 0.041** |
| | O | 633 | 0.016 | 0.353 | 0.016 | (2.01) |
| Conditional alpha (%/m) | F | 861 | 0.147 | 0.452 | 0.105 | 0.083** |
| | O | 633 | 0.064 | 0.414 | 0.034 | (3.15) |
| Manager tenure | F | 7180 | 4.900 | 5.520 | 3.000 | 0.202** |
| | O | 5158 | 4.698 | 5.175 | 3.000 | (2.05) |
| Manager city experience | F | 6245 | 6.474 | 5.926 | 5.000 | 0.398*** |
| | O | 4223 | 6.076 | 6.218 | 4.000 | (3.30) |
| SAT score | F | 4383 | 1179 | 133.471 | 1185 | 49.706*** |
| | O | 2962 | 1129 | 141.465 | 1110 | (15.28) |
| *Panel C: demographic characteristics* | | | | | | |
| Population (mln) | F | 6 | 7.355 | 2.951 | 6.535 | 6.146*** |
| | O | 69 | 1.209 | 1.052 | 0.949 | (11.31) |
| Education (%) | F | 6 | 31.350 | 7.652 | 28.200 | 4.471 |
| | O | 69 | 26.879 | 8.114 | 26.510 | (1.30) |

(*continued on next page*)

**Table 1** (*continued*)

| | | Number of funds | | | | | Companies |
|---|---|---|---|---|---|---|---|
| | Obs. | All | AG | GI | IN | LG | |
| Financial density (%) | F | 6 | 0.410 | 0.124 | 0.393 | 0.147*** | |
| | O | 69 | 0.263 | 0.076 | 0.255 | (4.30) | |

This table gives the summary statistics of domestic equity mutual funds in the United States. The sample period is January 1992 to December 2002. The fund types are aggressive growth (AG), growth and income (GI), income (IN), and large growth (LG). Panel A shows the distribution of funds by location and investment objective. Panel B shows differences in fund and manager characteristics between financial centers (F) and other places (O). The following six cities are defined to be financial centers: Boston, Chicago, Los Angeles, New York, Philadelphia, and San Francisco. The fund is in a financial center if its headquarters are within 50 miles of one of the six cities defined as financial centers. Fund age is the difference in years between the current year and the year of organization of the fund. The size of the fund is its total net assets. Turnover is the annual turnover of the fund defined as the maximum dollar value of sales or buys in a year as a portion of the total net assets of the fund. Expenses are the annual total expense ratio of the fund in percent per year. Volatility is the standard deviation of monthly gross fund returns (in percent not adjusted for expenses) in a given year. The abnormal return is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. The size quartiles are determined for all funds in each year and fund investment objective. The two measures of risk-adjusted returns (fund alphas) are from two performance evaluation models: the four-factor model of Carhart (1997) and conditional alpha–beta model of Christopherson et al. (1998). For each fund, the models are estimated using all return data conditional on the fund having at least 36 months of observations, so the table only reports cross-sectional averages. All three return measures are shown in percent per month. The manager tenure is the difference in years between the current year and the year when the manager was assigned to the fund. The manager city experience is the difference in years between the current year and the first year on record that a fund manager started working in a given city. The SAT score is the average SAT for the incoming 1992 class of a manager' undergraduate university. All demographic variables are from the 1990 US Census. Panel C reports the statistics for 75 cities in the sample. City population is the number of people in a MSA (Metropolitan Statistical Area) or PMSA (Primary Metropolitan Statistical Area). When a city is defined as a CMSA (Consolidated Metropolitan Statistical Area), only counties within 50 miles of the core city are counted. Education level is measured by the percent of people 25 years of age or older who hold at least a bachelor's degree. Financial density is the percent of finance professionals working in a given city, where the number of people working in finance sector comes from a special survey provided by the US Census on employment in 1990.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

Third, overconfident managers might also be more likely to move to financial centers which tend to offer more competitive environments.[6]

Overconfidence among fund managers is likely to be more pervasive in locations when they have a good reason to believe that they are more educated or skillful. In this study, we test whether overconfidence is more prevalent in financial centers using the predictions of the Gervais and Odean (2001) and Daniel et al. (1998) models. There are several hypotheses of overconfident trading that we test and for each we compare and contrast the predictions of rational information based trading versus overconfident trading.

H1: Overconfident trading declines with manager experience in the long run.

Traders who suffer from behavioral biases will initially overestimate the precision of their information and their ability. As a result, they react too aggressively on information and trade excessively. However, over time, traders realize their ability and the precision of their information, so we expect excess trading to predominate among inexperienced managers. In contrast, if trading is purely informative and fund managers learn from their trades, we would expect, if anything, an increase in turnover over time as managers gain more investing experience (see Seru et al., 2009). The different predictions allow us to distinguish rational from behavioral trading.

H2: The extent of overconfident trading is an increasing function of past performance.

If investors overestimate precision, they will attribute recent high performance to their own ability and not to general market conditions. Consequently, an overconfident trader should trade more

[6] We thank an anonymous referee for pointing out this possibility.

aggressively after high performance than otherwise. This prediction is also consistent with a rational learning model (see Seru et al., 2009) where managers learn about their ability and respond to high performance by trading more. Even so, a trader's performance is an extremely noisy signal about his/her investing ability because stock returns are close to being unpredictable. Therefore, any effect of rational learning from trading should be quite weak.

H3: Overconfident trading is more prevalent among male rather than female managers.

Barber and Odean (2001) find that males suffer more from behavioral biases related to overconfidence than do females. Meehan and Overton (1986), Beyer (1990), and Sapienza et al. (2009) show that these biases come from innate and persistent differences between men and women that are determined not only by stereotypes and social norms which may vary over time. Since our dataset allows us to identify the name of the mutual fund manager, we can use this to test if the earlier results on differences in overconfidence by gender also hold in the mutual fund industry across various fund locations. If overconfident trading is present more in financial centers we expect it to be concentrated among male managers. Our sample of fund managers better controls for cross-gender differences in training and investing skills than other studies that use individual investor trades since skill levels are presumably more homogeneous across portfolio managers. Similar skill and knowledge acquisition across all fund managers implies that differences in trading between men and women are more likely related to behavioral biases, such as overconfidence, rather than differences in competencies.

H4: Overconfident trading does not positively predict future performance.

Higher levels of turnover for overconfident traders should not result in better future performance since the managers are overweighting the precision of their information. In contrast to this prediction, in a rational trading model higher levels of trading predict better future performance. Therefore, hypothesis H4 helps us differentiate rational trading from overconfidence.

The strength of all relations may be different across various subgroups of fund managers because demographics can affect managers' beliefs, biases, and trading. First, since overconfidence decreases over time, we expect more evidence of a positive relation between lagged performance and current trading activity among less experienced managers in financial centers. Second, overconfidence may manifest itself more among fund managers who invest in "hard-to-value" securities, such as growth stocks, since information on growth firms is particularly scarce and valuable. Third, based on the work of Griffin and Tversky (1992) and following Schrand and Zechman (2010) and Puri and Robinson (2005), we use education quality as a proxy of overconfidence. This literature shows that skill provided by education is usually dominated by the effects of overconfidence when individuals have to make judgments based on ambiguous outcomes as in portfolio management. Therefore, a fund manager who attends a more reputable university may regard this as a proof of being more knowledgeable and skillful in investing matters as well, even though attending a better school does not by itself imply better investing skills. Consequently, such a manager will exhibit more overconfident trading after good performance. Finally, prior research shows more overconfident behavior among men than women, so combining the third hypothesis with the first one we expect more overconfident trading among inexperienced male managers in financial centers.

## 3. Data

We use the following demographic variables from the 1990 US Census. The first is the size of the city in terms of its total population. For population, we use the MSA (Metropolitan Statistical Area) or PMSA (Primary Metropolitan Statistical Area) definition of a city from the census data. When a city is defined as a CMSA (Consolidated Metropolitan Statistical Area) we only include those counties within 50 miles of the core city (or within about an hour commute). The second demographic variable is the education level per city as measured by the proportion of people 25 years of age or older, who hold at least a bachelor's degree. In addition, we also consider the third demographic variable – the number of

finance professionals working in a given city. This originates from a special survey provided by the US Census on employment in 1990. This survey did not exist in the 2002 Census. We use these data and create the financial density variable as the ratio of the total number of finance professionals (not only mutual funds managers) in a given city to the city's total population in the same year. There are 75 distinct cities or agglomerations hosting mutual fund headquarters. The following six cities are defined to be financial centers: Boston, Chicago, Los Angeles, New York, Philadelphia, and San Francisco.[7]

The data on equity mutual funds come from CRSP. We use information not only on fund returns and total net assets but also on fund's year of organization, the name of its managers, as well as its annual turnover. Our sample covers the period from January 1992 to December 2002. We select all diversified US domestic equity funds that have the following investment objectives: aggressive growth, growth and income, and large growth. To determine each fund's location we use the data from Lipper Analytical which provide the headquarter location for fund companies in 1996. We assume these headquarters stay fixed for the duration of our sample 1992–2002 and hand match the headquarter information from Lipper with CRSP. A fund is classified to be in a given city, including a financial center if the distance of its headquarters from the city is no more than 50 miles.[8]

Since fund management may be outsourced to unaffiliated third parties away from a reported headquarter location, we remove all funds that outsource their management activities.[9] We also exclude all funds recorded as "team managed" which do not identify individual manager names. However, some funds are team managed but their manager names are given. In these cases, we associate fund management with a manager whose name appears first in the team list.

Table 1 shows the summary statistics of our mutual fund data. Panel A reports the fund distribution across locations and investment objectives. The total number of funds is 2182 resulting in 12,177 fund-year observations. There are more funds in financial centers than in other places, 1136 versus 781. Among investment objectives, large growth funds constitute the largest proportion of all funds followed by aggressive growth funds, 783 and 574, respectively. The panel also shows the number of fund management companies for each location. The sample contains 271 management companies out of which 141 are located in financial centers and 130 are located in other places.

Panel B of Table 1 shows fund and manager characteristics in and outside of financial centers along with the number of respective observations. The fund-related data are: turnover, size, age, expenses, volatility, as well as three fund performance measures. The fund turnover is defined as the maximum of total sales or total purchases as a percent of the average net asset size of the fund over the year. The fund size is measured in terms of its total net assets (TNA). The fund age is the difference in years between the current year and the year of organization of the fund. Expenses are defined as the annual total expense ratio of the fund in percentage points. Volatility is the standard deviation of monthly gross fund returns (in percent not adjusted for expenses) in a given year.

The first fund performance measure is the gross abnormal return (not adjusted for expenses or risk). The abnormal return is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. The size quartiles are determined for all funds in each year and fund investment objective. The other two measures are the risk-adjusted returns (fund alphas) from two performance evaluation models: the unconditional four-factor model (see Carhart, 1997) and conditional alpha–beta model (see Christopherson et al., 1998). These models are:

$$r_{i,t} = \alpha_i + \beta_i r_{M,t} + s_i \mathrm{SMB}_t + h_i \mathrm{HML}_t + m_i \mathrm{UMD}_t + e_{i,t}, \quad (1)$$

[7] For a definition of a financial center we follow Hong et al. (2005) and Christoffersen and Sarkissian (2008) who point out that the above six cities have the largest number of mutual funds.

[8] CRSP reports fund returns for each shareclass rather than for each fund. We account for the duplication of return histories by asset-weighting each shareclass return and creating one return history for each fund. Fund returns, expenses, turnover etc. are similarly asset-weighted averages so that each observation is a fund/year.

[9] Our method of determining outsourced funds uses data from the N-SAR, N-30D, and 485BPOS files available on Electronic Data-Gathering, Analysis, and Retrieval (EDGAR) database of the US Securities and Exchange Commission. From the N-SAR files, we identified all funds that report a sub-advisory arrangement. Then, we searched the N-30D and 485BPOS files to determine whether the sub-advisor of the fund was unaffiliated, and if so, we identified these funds as being outsourced.

and

$$r_{i,t} = \alpha_i + A_i^{\text{Tbill}} Z_{\text{Tbill},t-1} + A_i^{\text{Term}} Z_{\text{Term},t-1} + \beta_i r_{M,t} + B_i^{\text{Tbill}} \left(Z_{\text{Tbill},t-1} r_{M,t}\right) + B_i^{\text{Term}} \left(Z_{\text{Term},t-1} r_{M,t}\right) + e_{i,t}, \tag{2}$$

respectively. Here, $r_i$ and $r_M$ are the returns on fund $i$ and the US market portfolio less the one-month US Tbill rate, respectively, SMB and HML are the Fama–French book-to-market and size factors (see Fama and French, 1993, 1996), and UMD is the momentum factor. The variables $Z_{\text{Tbill},t-1}$ and $Z_{\text{Term},t-1}$ are the demeaned instruments available to investors at time $t-1$, the one-month US Treasury bill rate and the term-structure spread, respectively. We show the average alphas for the entire fund history in a given location. All return measures are in percent per month.

We report three manager characteristics across locations: tenure, city experience, and the SAT score. The manager tenure with the fund is the difference in years between the current year and the year when a fund manager is first assigned to a given fund. The manager city experience is the difference in years between the current year and the first year on record that a fund manager starts working in a given city. We use these two variables to proxy for the manager experience with the fund and the city, respectively. The last manager variable, the average SAT score, following Chevalier and Ellison (1999), is the average score for the 1992 incoming undergraduate class for each manager's university of graduation.[10]

We see that the average annual turnover of funds in financial centers is significantly higher than those of funds in other places (89.3% versus 83.4%). Financial center funds are also significantly larger. Yet, in spite of more trading and larger size, financial center funds on average outperform other funds across all three measures of performance. The mean (median) annual abnormal return of funds in financial centers is 60 basis points higher than that of funds in smaller cities. The performance differential in the unconditional four-factor and conditional alphas is also significant and positive for financial center funds standing at about 50 and 100 basis points per annum, respectively. The average expenses of funds in financial centers are significantly lower than in other places but the medians in both location groups are almost the same. The average fund age, manager tenure, manager city experience, and the SAT scores are significantly higher among managers of funds in financial centers.

The statistics provided in Panel B are simple difference-in-means tests assuming each observation is independent. However since turnover, size, and expenses are autocorrelated, the reported $t$-statistics may overstate significance. We therefore compute a more conservative difference statistic which accounts for this autocorrelation.[11] Our results in Panel B are robust even using this more conservative difference measure.

Panel C of Table 1 reports the main statistics of the three demographic variables for the 75 cities. All of them, not surprisingly, based on the means or medians are larger in financial centers. The mean financial city population is 7.3 mln people, while that outside financial centers is 1.2 mln people. The average education level in financial centers is about 4.5% higher than in smaller cities, but due to relatively high standard deviation, not significant. Financial density variable shows that there are 41 people per 10,000 of population working in finance industry in financial centers versus 26 in smaller cities.

## 4. Fund turnover and demography

We begin with the general relations between our demographic variables and mutual fund turnover. Fig. 1 shows the relation between fund turnover and three demographic variables: city population (Plot A), city education level (Plot B), and financial density (Plot C). For each of our 75 cities, "city-level turnover" is calculated by averaging turnover for all funds in each city. Each plot reports the median city-level turnover for each demographic cohort.

[10] We match a manager's undergraduate university from Morningstar with the university's average SAT score for the incoming 1992 undergraduate class as reported by the College Board. Since not all managers report their education background and not all schools report SAT scores, the SAT scores are defined over a smaller sample, but this reduction does not alter the proportion of funds in financial centers versus other locations.

[11] Our alternative test regresses the variable of interest (turnover, size, or expenses) on a dummy variable which is assigned unity if a fund is located in a financial center and zero otherwise. The standard errors on the dummy variable coefficient in each regression are clustered by fund. Hence the size and significance of the dummy variable in this regression provides a difference in means test which adjusts for autocorrelation.

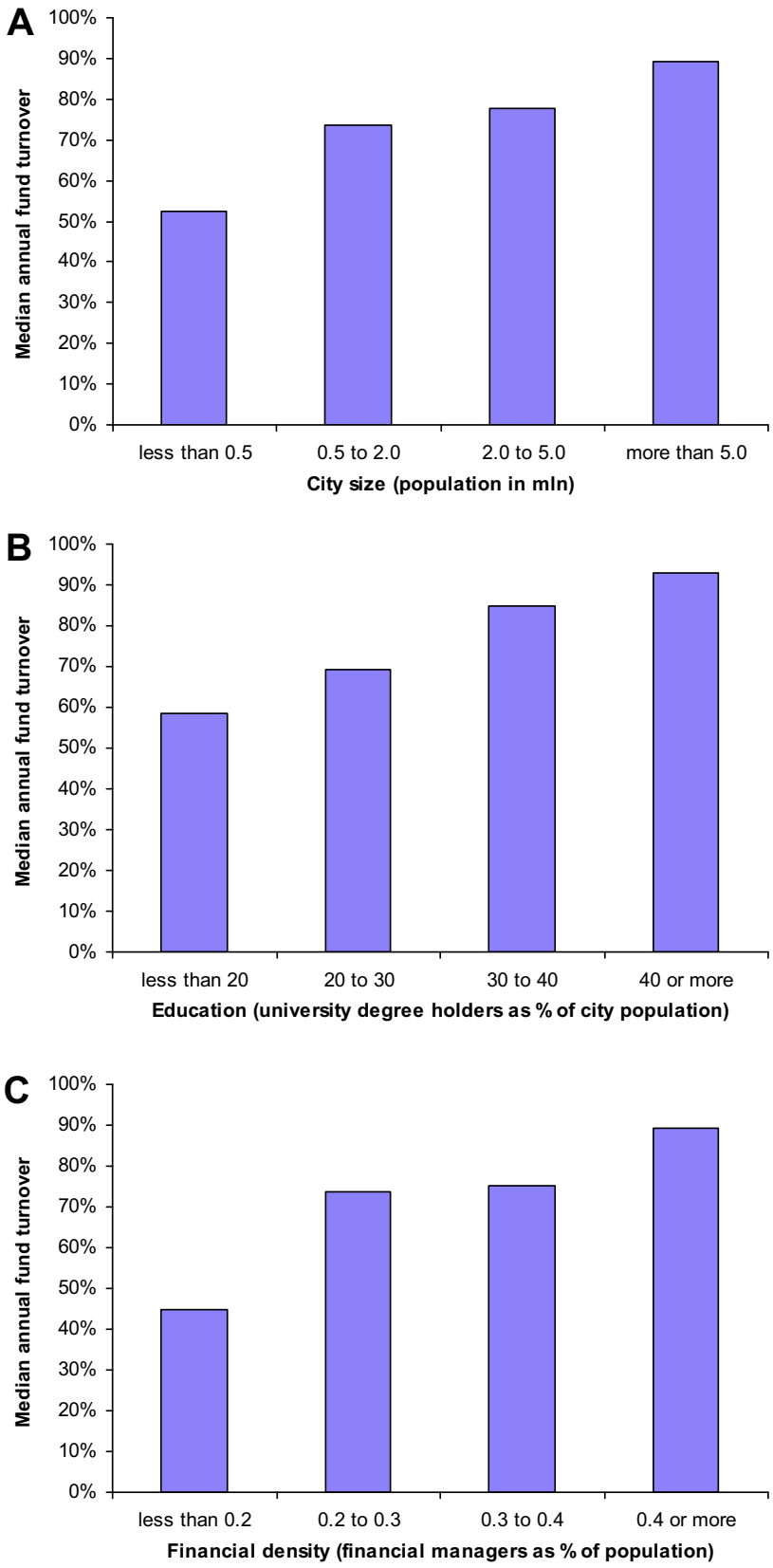


**Fig. 1.** Relation between fund turnover and demographic characteristics. The figure shows the median annual turnover for US domestic equity funds located in cities with different population size, education level, and financial density. All data are from the 1990 US Census and are defined as in Table 1. The sample consists of 75 US cities and covers a period from January 1992 to December 2002. For each of our 75 cities, city-level turnover is calculated by averaging turnover for all funds in each city. The graph reports the median city-level turnover for each of the demographic cohorts.

In Plot A, we divide cities into four population cohorts: less than 0.5 million, between 0.5 and 2 million, between 2 and 5 million, and more than 5 million inhabitants. In Plot B, we divide our city sample into four education cohorts: less than 20%, between 20% and 30%, between 30% and 40%, and more than 40% of people with a university degree. In Plot C, the city sample is divided into four financial density cohorts: less than 0.2%, between 0.2% and 0.3%, between 0.3% and 0.4%, and more than 0.4% of people working in the financial sector. Across all three plots, we observe a sizable increase in the median fund turnover with the city size. For instance, the difference in turnover between the first and the forth cohorts of population is 37%, and for education and financial density cohorts the difference is 35% and 45%, respectively.

Thus, Fig. 1 clearly illustrates that on average fund managers trade substantially more in larger cities, cities with a better educated population, and cities with more developed finance sectors. However, Table 1 shows that financial centers also have a larger number of large growth and aggressive growth funds. Since turnover is usually larger among growth funds, the higher turnover observed among funds in financial centers may simply result from heavier investing by growth funds during most of our sample period.[12] To alleviate this problem, we prefer to deal with excess turnover rather than raw turnover measure in all our empirical tests. The excess turnover for each fund is defined as the difference between the log of fund turnover in a given year and the log of median turnover for all funds with the same fund investment objective in that year.

To examine the patterns from Fig. 1 in statistical terms while controlling for the investment objective, we regress the excess fund turnover on the set of demographic variables. We use the following general panel regression model:

$$\begin{aligned} Turnover^{ex}_{i,t} = {} & c_0 + c_1 Population_i + c_2 Education_i + c_3 FinancialDensity_i + c_4 Experience^{ex}_{i,t} \\ & + c_5 AvgSAT_i + {+}c_6 FundAge_{i,t} + c_7 FundSize_{i,t} + c_8 Expenses_{i,t} + c_9 Volatility_{i,t} \\ & + c_{10} RiskControls_{i,t} + c_{11} D_t(Year) + e_{i,t}. \end{aligned} \tag{3}$$

In this model, $Turnover^{ex}_{i,t}$ is the excess turnover of fund $i$ in year $t$ as defined above. The three demographic variables, population (number of people in a metropolitan area), education (percent of population holding a bachelor's degree), and financial density (a proportion of people working in the financial sector in a metropolitan area), are transformed logarithmically. The variables $FundAge_{i,t}$, $FundSize_{i,t}$, and $Expenses_{i,t}$ are the logarithmic transformations of fund $i$ age (years), size ($mln), and expense ratio (a portion of fund size) in year $t$, respectively. The fund manager-specific variable $Experience^{ex}_{i,t}$ is the "excess" measure of manager city experience for fund $i$ at the beginning of year $t$. It is computed as the difference between the log of manager experience in a given city in a given year and the log of the median city experience of all managers of funds with similar investment objective that year. Experience is measured at the beginning of each calendar year. $AvgSAT_i$ is the average SAT score of a manager's graduating university divided by 100. We use several variables to control for the risk of fund $i$ in year $t$: the logarithm of monthly fund return volatility (decimal), $Volatility_{i,t}$, and either the loadings on the market, size, book-to-market, and momentum portfolios from the Carhart (1997) model or the loadings on the unconditional and conditional parts of the market beta from the conditional alpha–beta model. We estimate risk-adjusted returns using 12-month regressions rolling from one calendar year to another.

Table 2 shows the estimation results where we add more controls as we move from left to right. Since all independent variables in (3) are the same for all funds in a given city, in all estimation we use the Huber–White robust standard errors and cluster standard errors by city.[13] Regressions 1 to 3 report the coefficient estimates from univariate regressions of fund turnover on each of the demographic variables individually. We observe a positive relation between fund performance and all three variables. However, only the coefficient on financial density variable is statistically significant. Regression (4) includes all demographic variables at once. The outcome is the same – the city's financial

[12] In our sample, the average annual turnover of aggressive growth and large growth funds is 98%, while that of other funds is only 62%.

[13] Such clustering is also consistent with findings in Hong et al. (2004, 2005), who show that social interaction leads to similar investing preferences among people from the same location.

**Table 2**
Fund turnover and demographics.

| | Dependent variable: excess turnover | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Observations | 11161 | 11161 | 11161 | 11161 | 11005 | 6130 | 4253 | 4253 |
| Population | 0.042 | | | −0.023 | −0.020 | 0.016 | 0.010 | 0.008 |
| | (1.25) | | | (−0.57) | (−0.45) | (0.35) | (0.22) | (0.17) |
| Education | | 0.193 | | 0.025 | 0.054 | 0.185 | 0.057 | 0.107 |
| | | (0.84) | | (0.10) | (0.25) | (0.76) | (0.23) | (0.42) |
| Financial density | | | 0.333*** | 0.368*** | 0.348** | 0.253* | 0.276** | 0.263* |
| | | | (3.03) | (2.60) | (2.26) | (1.74) | (2.03) | (1.86) |
| Experience$^{ex}$ | | | | | | −0.219*** | −0.241*** | −0.233*** |
| | | | | | | (−7.27) | (−7.99) | (−7.55) |
| Average SAT | | | | | | −0.032* | −0.043** | −0.046** |
| | | | | | | (−1.40) | (−2.03) | (−2.10) |
| Fund age | | | | | −0.007 | 0.019 | 0.028 | 0.030 |
| | | | | | (−0.19) | (0.60) | (0.61) | (0.63) |
| Fund size | | | | | −0.007 | −0.003 | −0.010 | −0.015 |
| | | | | | (−0.23) | (−0.11) | (−0.38) | (−0.55) |
| Expenses | | | | | 0.515*** | 0.573*** | 0.523*** | 0.584*** |
| | | | | | (11.32) | (12.62) | (10.37) | (10.03) |
| Volatility | | | | | 0.496*** | 0.501*** | 0.059 | 0.196** |
| | | | | | (8.24) | (6.41) | (0.68) | (2.48) |
| Beta (4F or C) | | | | | | | 0.182** | 0.510*** |
| | | | | | | | (2.49) | (7.65) |
| $b_{SMB}/B^{Tbill}$ | | | | | | | 0.589*** | 0.028*** |
| | | | | | | | (6.81) | (3.86) |
| $b_{HML}/B^{Term}$ | | | | | | | −0.473*** | 0.001 |
| | | | | | | | (−7.02) | (0.15) |
| $b_{UMD}$ | | | | | | | 0.524*** | |
| | | | | | | | (7.71) | |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ (%) | 0.52 | 0.58 | 1.38 | 1.43 | 11.36 | 16.67 | 24.16 | 21.23 |

This table shows the estimates from a regression of fund excess turnover on demographic characteristics as well as control variables. Fund excess turnover is defined as the log of turnover less the median turnover for a fund's investment category each year. Population is defined as the logarithm of the number of people in a city. Education is the logarithm of the percent of people holding a bachelor's degree. Financial density is the logarithm of the portion of people working in the financial sector of a city. Experience$^{ex}$ is measured at the beginning of each year and computed as the difference between the log of manager experience (years) in a given city and the log of the median city experience of all managers of funds with similar investment objective that year. Average SAT is the average incoming SAT score for a manager's university dividend by 100. Fund age, fund size, expenses, volatility are the logarithmic transformations of fund age (years), size ($mln), expense ratio (a portion of fund size), and monthly volatility (decimal). Beta is the unconditional market risk from the four-factor or the conditional alpha–beta models. The slopes $b_{SMB}$, $b_{HML}$, and $b_{UMD}$ are the loadings on the size, book-to-market, and momentum portfolios from the four-factor model. The slopes $B^{Tbill}$ and $B^{Term}$ are the loadings on the demeaned Treasury bill return and term-structure spread interacted with market returns in the conditional alpha–beta model. We estimate the risk-adjusted return models as 12-month regressions rolling over calendar years. All other variables are defined as in Table 1 but are taken in logs. The intercept, fund objective, and year fixed effects are included in all regressions but their coefficients are not shown. The *t*-statistics shown in parentheses are based on the Huber–White robust standard errors clustered by city. The table also shows the adjusted $R^2$ for each regression.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

concentration retains its positive and significant (at the 5% level) relation to fund turnover. This result implies that managers of funds in large and financially prominent cities tend to trade more. In economic terms, adjusted for the logarithmic transformation, an increase in financial density from 0.28% to 0.29% increases the average excess fund turnover by about 1.29% a year.[14]

Regression (5) of Table 2 reports the results from a version of model (1) that controls for common fund characteristics, age, size, expenses, and volatility. We find that in spite of the addition of these

[14] From regression 4, 1.29% = 0.368 × [log(0.29) − log(0.28)].

control variables, the slope coefficient on financial density still keeps its statistical significance although at the 5% level. In regression (6) we add two fund manager characteristics: the overall experience of portfolio management in a specific city and the SAT score. The slope on the financial density variable loses some importance but still remains significant at the 10% level. There is a strongly negative relation between manager experience and turnover, implying that fund managers trade less as they gain more experience. The relation between the average SAT score and turnover is also negative although significant only at the 10% level. Nevertheless, this result seems to suggest that more educated fund managers tend to trade less. Given that excessive trading is costly to portfolio returns, the negative loadings on $c_4$ and $c_5$ suggest that more knowledgeable and experienced managers in general try to lower turnover. Not surprisingly, funds with higher expenses and higher return volatilities correspond to ones with higher turnover.

Finally, in regression (7) and (8) of Table 2 we estimate the full specification of Eq. (3) with the four-factor and conditional performance evaluation model estimates, respectively. We see that in these regressions, the coefficient on financial density is significant at the 5% level. Its magnitude is also higher than in the earlier regression. Likewise, the slope on manager skill, the average SAT score, is negative and significant at the 5% level. These last two regressions show positive and highly significant relation between the four-factor and conditional betas again suggesting that riskier funds trade more frequently.

Thus, Fig. 1 and Table 2 show that trading activity is significantly higher among funds in financially important cities. Knowing that larger cities tend to generate more information (e.g., Jacobs, 1969), the observed phenomenon can be simply explained by the existence of more informed trading in these locations. However, it could also result from overconfident trading that is more prevalent in financial centers. In the next section, we test the hypotheses of overconfident trading outlined in Section 2 by exploring the link between fund turnover and returns across different locations for different fund and manager characteristics.

## 5. Fund turnover and performance

### 5.1. Turnover and performance across fund and manager characteristics

We observe in Table 1 that funds in financial centers exhibit more active trading and achieve higher performance in spite of having larger size than funds located in other places. The next set of tests identifies the reasons for higher turnover in financial centers.

Table 3 shows average fund turnover and three performance measures in financial centers and other places for managers with different levels of experience, funds with different investment objectives, and different manager SAT scores. It also shows the differences in all measures with their respective *t*-statistics (in parentheses). The risk-adjusted returns (alphas) here are based on the four-factor or conditional alpha–beta models, respectively. They are estimated over 12-month regressions rolling over calendar years.

The first section of Table 3 depicts differences in turnover and performance between two levels of manager city experience, less than five years and more than five years, respectively. The difference tests provided in Table 3 are simple difference-in-mean tests but we also run a more conservative test of differences as described in Footnote 9 to account for possible autocorrelation in turnover and returns. The alternative difference test provides similar results as those in Table 3 so is unreported.

Consistent with H1, only less experienced managers in financial centers trade significantly more (approximately 11% higher) than their peers in smaller places, yet they do not achieve any gains from this extra trading, irrespective of whether abnormal, four-factor, or conditional risk-adjusted returns are used. In comparison, there is only marginal difference in turnover for more experienced managers between the two locations, and all the outperformance of funds in financial centers is concentrated among more experienced managers as shown in Christoffersen and Sarkissian (2009). This finding is consistent with Gervais and Odean (2001) and Daniel et al. (1998) since the signs of overconfident trading are present only among inexperienced investors, and as managers learn their true ability the turnover differential disappears. The decline in turnover with experience is, however, observed across all locations which could reflect either the additional skills gained with experience or learning. Even

**Table 3**
Turnover and performance by fund investment objective and manager experience and SAT score.

| | | | Returns (%/m) | | |
|---|---|---|---|---|---|
| | Location | Turnover | $r_{i,t}^{abn}$ | $\hat{\alpha}_{i,t}$ (4F) | $\hat{\alpha}_{i,t}$ (C) |
| *City experience* | | | | | |
| ⩽5 years | F | 1.048 | 0.004 | 0.071 | 0.081 |
| | O | 0.943 | −0.007 | 0.066 | 0.056 |
| | F–O | 0.105*** | 0.011 | 0.005 | 0.025 |
| | *t*-statistics | (3.22) | (0.35) | (0.26) | (0.95) |
| > 5 years | F | 0.769 | 0.054 | 0.117 | 0.120 |
| | O | 0.710 | −0.044 | 0.121 | 0.110 |
| | F–O | 0.059* | 0.098*** | −0.004 | 0.010 |
| | *t*-statistics | (1.77) | (2.83) | (−0.25) | (0.40) |
| *Investment objective* | | | | | |
| Growth-oriented | F | 1.018 | 0.026 | 0.107 | 0.134 |
| | O | 0.915 | −0.032 | 0.115 | 0.109 |
| | F–O | 0.103*** | 0.058** | −0.008 | 0.025 |
| | *t*-statistics | (3.85) | (2.03) | (−0.51) | (1.14) |
| Income-oriented | F | 0.586 | 0.013 | 0.082 | 0.053 |
| | O | 0.656 | −0.021 | 0.040 | 0.012 |
| | F–O | −0.070*** | 0.034 | 0.042*** | 0.041** |
| | *t*-statistics | (−3.00) | (1.47) | (2.89) | (2.48) |
| *SAT score* | | | | | |
| High SAT | F | 0.856 | 0.107 | 0.130 | 0.144 |
| | O | 0.759 | 0.073 | 0.198 | 0.188 |
| | F–O | 0.097*** | 0.033 | −0.068*** | 0.044 |
| | *t*-statistics | (3.22) | (0.75) | (−2.74) | (−1.38) |
| Low SAT | F | 0.932 | 0.015 | 0.079 | 0.067 |
| | O | 0.834 | −0.052 | 0.040 | 0.036 |
| | F–O | 0.098*** | 0.067* | 0.039* | 0.031 |
| | *t*-statistics | (2.95) | (1.82) | (1.94) | (1.11) |

This table shows fund turnover and three performance measures in financial centers (F) and other places (O) for funds with different investment objective and managers with different experience level and SAT scores. It also shows the differences in all measures between financial centers and other places with their respective *t*-statistics (in parentheses). The turnover is the annual turnover of the fund defined as the maximum dollar value of sales or buys in a year as a portion of the total net assets of the fund. Average monthly abnormal returns for each year, $r_{i,t}^{abn}$, are defined in Table 1. The risk-adjusted returns, $\hat{\alpha}_{i,t}$, are based on the four-factor (4F) or conditional alpha–beta models (C). All returns are expressed as a percent per month. They are estimated over 12-month regressions rolling over calendar years. Manager city experience is also defined in Table 1. Growth-oriented funds include aggressive growth and large growth funds; income-oriented – growth and income, and income funds. High SAT and Low SAT funds are those whose managers attended universities with incoming SAT scores greater than (High) or less than or equal to (Low) the median SAT of 1165. The returns are averaged for each fund and year and are shown in percent per month.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

after controlling for fund size, we see later in Table 4 that more managerial experience significantly reduces turnover levels irrespective of location.[15]

The second section of Table 3 shows differences in turnover and performance between growth- and income-oriented funds. Growth-oriented funds include aggressive growth and large growth funds, while income-oriented funds consist of growth and income, and income funds. Because of the ambiguity in outcomes associated with selecting growth stock, behavioral biases related to skill and/or information quality are more likely to play a more important role in trading these types of assets. Consistent with this, we observe higher turnover among growth funds in financial centers despite their larger average fund size of $1.1 bln versus $0.7 bln in other places. For income funds, where behavioral

[15] This negative relation is robust to all specifications. In unreported results we observe a slight, temporary increase in turnover for managers in financial centers with one year of experience. This can be explained by the short-lived self-attribution bias, as described in Gervais and Odean (2001) and Daniel et al. (1998). These results are available on request.

**Table 4**
Fund turnover and lagged returns.

| | Dependent variable: excess turnover | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Non-financial center funds | | | Financial center funds | | | New York funds | | |
| City experience | All | ⩽5 | >5 | All | ⩽5 | >5 | All | ⩽5 | >5 |
| Observations | 3436 | 1894 | 1542 | 5032 | 2445 | 2587 | 2377 | 1150 | 1227 |
| $r^{abn}_{i,t-1}$ | −0.025** | −0.038** | −0.008 | 0.016 | 0.033** | 0.004 | 0.043** | 0.054*** | 0.029 |
| | (−2.00) | (−2.20) | (−0.43) | (1.30) | (2.30) | (0.21) | (2.46) | (2.79) | (0.96) |
| Experience$^{ex}$ | −0.213*** | −0.177*** | −0.212** | −0.205*** | −0.169*** | −0.213* | −0.160*** | −0.173*** | −0.131 |
| | (−6.21) | (−3.83) | (−2.06) | (−5.73) | (−4.16) | (−1.90) | (−3.32) | (−3.00) | (−1.11) |
| Fund age | 0.008 | 0.046 | −0.045 | 0.071*** | 0.130*** | 0.009 | 0.155*** | 0.237*** | 0.049 |
| | (0.18) | (1.33) | (−0.57) | (2.34) | (4.21) | (0.20) | (3.65) | (5.32) | (0.77) |
| Fund size | 0.058** | 0.042* | 0.066 | −0.066*** | −0.068*** | −0.067*** | −0.108*** | −0.116*** | −0.106*** |
| | (2.12) | (1.70) | (1.45) | (−3.77) | (−3.85) | (−2.59) | (−4.11) | (−4.07) | (−2.75) |
| Expenses | 0.635*** | 0.695*** | 0.432*** | 0.457*** | 0.408*** | 0.493*** | 0.481*** | 0.545*** | 0.441*** |
| | (4.92) | (5.23) | (2.68) | (8.25) | (5.91) | (6.40) | (4.85) | (6.01) | (3.05) |
| Volatility | 0.391** | 0.398** | 0.125 | 0.442*** | 0.505*** | 0.361*** | 0.326** | 0.531*** | 0.180 |
| | (3.85) | (3.17) | (1.13) | (5.48) | (5.29) | (3.13) | (2.37) | (3.88) | (0.90) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *F*-test (F–O) | | | | 0.74 | 4.22** | 0.14 | 1.96 | 5.27** | 0.03 |
| *p*-Value | | | | [0.389] | [0.040] | [0.710] | [0.162] | [0.022] | [0.866] |

This table shows the estimates of a regression explaining fund excess turnover with various fund characteristics. The abnormal return, $r^{abn}_{i,t-1}$, is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. All remaining variables are defined in Table 2. The intercept, city-specific, fund objective, and year fixed effects are included in all regressions but their coefficients are not shown. The *t*-statistics shown in parentheses are based on the Huber–White robust standard errors clustered by fund manager. The *F*-test is based on the same regression including all observations but allows lagged abnormal monthly returns to enter separately for financial centers and other places and tests the difference between these two coefficients.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

biases are less apparent, we find that larger fund sizes in financial centers ($2.6 bln versus $0.6 bln in other locations) significantly reduce fund turnover.

The third section of Table 3 splits the sample by managers with SAT scores above and below the median SAT score of 1165. Irrespective of the SAT score, fund managers in financial centers trade more. However, we only observe a detrimental impact of this excessive trading on performance among high SAT managers in financial centers. This is consistent with the notion that more educated people are more prone to overconfidence biases. Thus, Table 3 shows there are distinct differences in turnover by managerial characteristics. We explore these differences in the next section while controlling for other influencing factors.

### 5.2. Relation between lagged performance and turnover

Many authors (e.g., see Odean, 1998; Daniel et al., 1998; Gervais and Odean, 2001) argue that trading among investors increases following prior gains.[16] If managers of funds in larger and financially more prominent cities are more prone to an overconfidence bias then, for these funds, we expect past performance to positively predict turnover. We investigate this idea using a model in which current turnover is regressed on the fund's last year performance, while controlling for other fund and manager characteristics. We depart from the framework which relates differences in turnover across cities with different size and financial density, and move to a setting which directly differentiates between financial centers and smaller towns. The regression model is as follows:

[16] Statman et al. (2007) document that share turnover is positively related to lagged returns for many months.

$$Turnover_{i,t}^{ex} = c_0 + c_1 r_{i,t-1}^{abn} + c_2 Experience_{i,t}^{ex} + c_3 FundSize_{i,t} + c_4 FundAge_{i,t} + c_5 Expenses_{i,t} + c_6 Volatility_{i,t} + c_7 D_t(Year) + c_8 D_i(City) + e_{i,t}, \quad (4)$$

where $r_{i,t-1}^{abn}$ is the average monthly abnormal return (in percent) of fund $i$ in year $t-1$, while $D(City)$ is a dummy for city fixed effects that allow us to adjust for differences in managers' trading behavior across locations.[17] All other variables are defined as in Eq. (3). According to our earlier predictions of overconfidence, we expect the sign on the coefficient relating past performance to turnover, $c_1$, to be positive under H2. In these and subsequent regressions, the turnover data from the same fund manager over time or across funds in a given city cannot be treated as independent. Therefore, we again use the Huber–White robust standard errors but cluster observations by the same manager rather than by the same city.

Table 4 presents the estimation outcomes for funds located in and outside of financial centers, as well as for funds located in the New York area. We also report the test results not only per location but also separately for less experienced fund managers with city experience of five years or less and with city experience of more than five years. The coefficient of particular interest to us is the slope $c_1$. We observe that among funds located outside financial centers (columns one to three), the relation between current turnover and lagged performance is negative but insignificant for any manager experience. The situation is quite different among funds located in financial centers (columns four to six). On average and consistent with overconfident trading being more concentrated in financial centers, the turnover-lagged performance relation is positive in financial centers, although insignificant when not conditioning on manager experience.

Consistent with hypothesis H1, we observe a general negative relation between manager experience and turnover. However, this pattern may reflect both acquired trading skills as well as changes in beliefs about information precision. To distinguish between these two possibilities, we combine the predictions of H1 and H2. Therefore, we split the sample into those managers with less than and more than five years experience in the city and test whether the return–turnover relation is more positive among less experienced managers in financial centers. As predicted, it is only the inexperienced managers in financial centers who increase turnover significantly after good performance. In contrast, more experienced managers in financial centers do not trade more in response to lagged positive performance.

When looking at New York funds alone (columns seven to nine of Table 4), we observe that the positive relation between turnover and lagged abnormal returns strengthens for the entire sample of managers, and that this effect comes from the sub-sample of managers with less than five year experience. It is important to note that the relation improves in both statistical and economic terms: the increase in the magnitude of coefficient on $r_{i,t}^{abn}$ is almost 2.5 times bigger, increasing from 0.018 to 0.044. In economic terms, an increase in the past year's average monthly abnormal return by 1% increases next year excess turnover of funds in New York by almost 5%. The last row of Table 4 shows the results of the $F$-test, which compares slopes $c_1$ between funds located in financial centers and other places. The $F$-test is based on the regression outlined in Eq. (4) but includes all observations and allows lagged returns to enter separately for financial centers and other places. Consistent with previous results, the slope coefficient on lagged returns is significantly higher in financial centers and New York for fund managers with less than five years of city experience.

Thus, we observe that prior gains indeed may induce fund managers to increase their subsequent trading activity, as predicted by Odean (1998), Gervais and Odean (2001), Daniel et al. (1998), and others.[18] We find however that this reaction to past performance is present largely among funds in financial centers, especially in New York. These findings provide the first piece of evidence of overconfident

[17] Due to a substantial sample size reduction, we omit the manager SAT score and fund flows from our set of control variables. However, our overall results remain intact with both fund flows and the SAT variable included. Note that we experimented with two alternative definitions of fund flows, namely, (i) $\ln(TNA_t) - \ln(TNA_{t-1}(1+R_t))$ and (ii) $(TNA_t - TNA_{t-1}(1+R_t))/(TNA_{t-1}(1+R_t))$ as in Zheng (1999), where $R_t$ is the gross fund return in period $t$, but neither of the alternatives change statistical inference in our tests.

[18] A similar relation between prior performance and subsequent actions is found in other empirical studies of managerial behavior. For example, Billett and Qian (2008) examine sequential takeovers and find that CEOs are more likely to acquire again after positive experience from earlier acquisitions, even if their future deals are value destroying.

trading in financial centers. Since financial centers are associated with more generation and dissemination of information, it appears that locating in a financial center may contribute to more trading.

### 5.3. Relation between lagged performance and turnover across investment objectives

From Table 3, we observe that trading in growth-oriented funds is significantly higher in financial centers. Therefore, we expect that overconfident trading will be more profound in these fund categories since growth funds hold securities with more uncertain valuations. To test the validity of this prediction, we augment model (4) with two dummies that split the sample of funds into two groups based on the fund investment objective, growth or income. Growth funds, GR, contain aggressive growth and large growth funds as defined by their ICDI objective category. Income funds, IN, are those that have a sizable income component: they correspond to growth and income funds and income ICDI objective categories. The new regression framework is:

$$\begin{aligned} Turnover^{ex}_{i,t} = {} & c_0 + c_1 r^{abn}_{i,t-1} * D_i(IN) + c_2 r^{abn}_{i,t-1} * D_i(GR) + c_3 Experience^{ex}_{i,t} + c_3 FundSize_{i,t} \\ & + c_4 FundAge_{i,t} + c_5 Expenses_{i,t} + c_6 Volatility_{i,t} + c_7 D_t(Year) + c_8 D_i(City) + e_{i,t}, \end{aligned} \quad (5)$$

where $D_i(GR)$ and $D_i(IN)$ are the dummies for growth- and income-oriented funds, respectively. All other variables are defined as before and robust Huber–White standard errors are clustered by fund manager. This regression specification allows us to understand whether there are differences in how trading in growth versus income funds is affected by lagged performance. We expect the coefficient $c_2$ to be positive and significantly larger than the coefficient $c_1$ for funds in financial centers.

Table 5 presents the estimation of model (4) across different locations. The structure of the table is identical to that of Table 4. As before, the first three columns of the table show the test outcomes for mutual funds located outside financial centers. For this fund location, the slope $c_2$ is not positive for any manager experience group. In fact, the coefficient $c_1$ on income funds is negative and significant. However, when we look at funds in financial centers, we indeed observe that the slope $c_2$ is now positive. It is insignificantly different from $c_1$ for the whole sample of funds in financial centers, but is significantly larger than $c_1$ for the sub-sample of less experienced managers. Therefore, the positive relation between lagged performance and current turnover observed in Table 4 is present among growth funds with managers with less than five years of city experience. The last three columns of the table show the regression results for the New York area funds. Once again, we observe that the largest positive impact of past performance on current turnover, which occurs among New York funds, is limited to funds investing in growth-oriented stocks and in particular those with less experienced managers.

Thus, Tables 4 and 5 show that the influence of past fund returns on current turnover has a distinct geographic as well as investment objective pattern. We are able to detect a positive and significant link only among managers of funds in financial centers, especially in New York, and only among funds with an investment focus on growth-oriented stocks. An increase in the fund turnover following prior outperformance among fund managers in financial centers who invest in stocks with more ambiguous and difficult valuations is consistent with standard patterns of overconfident behavior.

### 5.4. Further evidence across managers with different SAT scores and gender

Our previous analysis shows that the largest influence of past performance on the current trading activity is observed only among less experienced fund managers working in financial centers. In this sub-section, we investigate whether there are more signs of overconfident trading among those who graduate from high SAT universities and among male investors.

Table 6 shows the estimation results for managers who attended low and high SAT universities. There are numerous factors which can influence how individuals develop their beliefs about their ability and the quality of their education is one important factor. Based on research from Griffin and Tversky (1992), we posit that those from higher SAT universities will be more certain about their ability and, as a result, attribute too much of their past success to their own knowledge. Hence, the relation between past performance and turnover should be significantly more positive in this cohort of managers.

As before, high or low SAT scores are defined as those above or below the median SAT score of 1,165 across all locations. Panel A reports the results for all fund managers, Panel B – for those with

**Table 5**
Fund turnover and lagged returns for different fund investment objectives.

| | Dependent variable: excess turnover | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Non-financial center funds | | | Financial center funds | | | New York funds | | |
| Experience | All | ⩽5 | >5 | All | ⩽5 | >5 | All | ⩽5 | >5 |
| Observations | 3436 | 1894 | 1542 | 5032 | 2445 | 2587 | 2377 | 1150 | 1227 |
| $r^{abn}_{i,t-1} * D(IN)$ | −0.121*** | −0.160*** | −0.050 | 0.016 | 0.037 | 0.009 | 0.007 | 0.026 | 0.018 |
| | (−3.43) | (−3.74) | (−1.10) | (0.55) | (0.69) | (0.25) | (0.24) | (0.45) | (0.47) |
| $r^{abn}_{i,t-1} * D(GR)$ | −0.011 | −0.018 | −0.009 | 0.017 | 0.033** | 0.003 | 0.050** | 0.056*** | 0.032 |
| | (−0.81) | (−1.07) | (−0.44) | (1.19) | (2.20) | (0.14) | (2.55) | (2.77) | (0.89) |
| $\text{Experience}^{ex}$ | −0.211*** | −0.176*** | −0.130 | −0.205*** | −0.167*** | −0.213* | −0.160*** | −0.172*** | −0.132 |
| | (−6.19) | (−3.82) | (−1.34) | (−5.73) | (−4.16) | (−1.90) | (−3.33) | (−2.99) | (−1.11) |
| Fund age | 0.005 | 0.042 | −0.083 | 0.071** | 0.130*** | 0.009 | 0.155*** | 0.236*** | 0.049 |
| | (0.13) | (1.23) | (−1.04) | (2.34) | (4.21) | (0.19) | (3.67) | (5.30) | (0.77) |
| Fund size | 0.058** | 0.041* | 0.071 | −0.066*** | −0.068*** | −0.067*** | −0.108*** | −0.115*** | −0.106*** |
| | (2.12) | (1.71) | (1.60) | (−3.77) | (−3.85) | (−2.59) | (−4.11) | (−4.04) | (−2.75) |
| Expenses | 0.629*** | 0.682*** | 0.461*** | 0.457*** | 0.408*** | 0.493*** | 0.482*** | 0.545*** | 0.441*** |
| | (4.94) | (5.18) | (2.74) | (8.25) | (5.91) | (6.40) | (4.87) | (6.01) | (3.04) |
| Volatility | 0.384*** | 0.378** | 0.301** | 0.441*** | 0.505*** | 0.362*** | 0.322** | 0.529*** | 0.178 |
| | (3.81) | (3.05) | (2.41) | (5.46) | (5.29) | (3.11) | (2.35) | (3.86) | (0.90) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

This table shows the estimates of a regression explaining fund excess turnover for different fund investment objectives. The variables $D(IN)$ and $D(GR)$ are the dummies for income- versus growth-oriented funds, respectively. $D(IN)$ is defined as one if the fund is identified as either income or growth/income by its ICDI objective category. $D(GR)$ is one if the fund is identified as either aggressive growth or large-cap growth by its ICDI objective category. The lagged abnormal return, $r^{abn}_{i,t-1}$, is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. All other variables are defined in Table 2. The intercept, fund objective, city-specific, and year fixed effects are included in all regressions but their coefficients are not shown. The $t$-statistics shown in parentheses are based on the Huber–White robust standard errors clustered by fund manager.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

less or equal to five years of experience in their respective cities. We observe that the positive relation between lagged abnormal returns and current turnover is concentrated among better educated managers in financial centers, especially New York. This result becomes stronger for the subset of inexperienced managers in financial centers in Panel B. In contrast, the slope on lagged abnormal returns for managers of funds outside of financial centers who attended more prestigious universities is statistically zero. Moreover, it appears that inexperienced managers in smaller cities who graduated from universities with low SAT scores significantly decrease their trading following good performance in the previous year. Therefore, this table shows that better educated fund managers in financial centers show signs of overconfident trading.

Table 7 reports the estimation results from the regression of fund excess turnover on lagged abnormal returns for fund managers by gender. From Barber and Odean (2001) we know that men exhibit more overconfident trading compared to women. If location influences managers' priors about their ability, we expect this to show up particularly among less experienced, male fund managers in financial centers according to H1 and H3. Similar to Table 6, Panel A shows the estimates for the entire sample of fund managers, while Panel B provides only the results for the sub-sample of less experienced managers and variables are defined as before. About 8% of the overall sample is female. Since the gender-based sample sizes are different, we focus on both changes in the magnitudes as well as significance levels of the coefficients. For example, in Table 4 the slope on lagged return for the subset of all managers in financial centers is 0.021 and insignificant, but after excluding about 10% of observations coming from female portfolio managers, this slope in Panel A of Table 7 increases to 0.028 and reaches almost the 5% significance level. There are similar increases among all slope

**Table 6**
Fund turnover and lagged returns for managers with different SAT scores.

| | Dependent variable: excess turnover | | | | | |
|---|---|---|---|---|---|---|
| | Non-financial center funds | | Financial center funds | | New York funds | |
| SAT score | Low SAT | High SAT | Low SAT | High SAT | Low SAT | High SAT |
| *Panel A: all fund managers* | | | | | | |
| Observations | 1519 | 1917 | 1619 | 3413 | 612 | 1765 |
| $r^{abn}_{i,t-1}$ | −0.026 | −0.014 | 0.007 | 0.019 | 0.001 | 0.049** |
| | (−1.62) | (−0.85) | (0.39) | (1.23) | (−0.04) | (2.47) |
| Experience$^{ex}$ | −0.186*** | −0.230*** | −0.120** | −0.248*** | −0.125 | −0.155*** |
| | (−4.24) | (−3.94) | (−2.22) | (−5.40) | (−1.52) | (−2.76) |
| Fund age | 0.051 | 0.001 | 0.024 | 0.078** | 0.164** | 0.130*** |
| | (1.12) | (0.01) | (0.54) | (2.08) | (2.32) | (2.74) |
| Fund size | 0.039 | 0.056 | −0.040* | −0.072*** | −0.058 | −0.125*** |
| | (1.33) | (1.35) | (−1.69) | (−3.28) | (−1.44) | (−4.01) |
| Expenses | 0.761*** | 0.535*** | 0.682*** | 0.354*** | 0.788*** | 0.358*** |
| | (5.77) | (2.94) | (7.85) | (5.69) | (6.72) | (3.41) |
| Volatility | 0.381** | 0.368** | 0.397*** | 0.422*** | 0.256 | 0.250** |
| | (2.35) | (2.90) | (3.32) | (3.92) | (1.60) | (2.11) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| *Panel B: less experienced fund managers* | | | | | | |
| Observations | 980 | 1310 | 1021 | 2234 | 409 | 1145 |
| $r^{abn}_{i,t-1}$ | −0.046** | −0.006 | 0.020 | 0.036** | −0.014 | 0.054** |
| | (−2.39) | (−0.33) | (1.01) | (2.12) | (−0.39) | (2.42) |
| Experience$^{ex}$ | −0.202*** | −0.128*** | −0.069 | −0.178*** | −0.001 | −0.083 |
| | (−3.96) | (−2.72) | (−1.24) | (−3.82) | (−0.01) | (−1.54) |
| Fund age | 0.055 | 0.080* | 0.073 | 0.128*** | 0.192*** | 0.193*** |
| | (1.13) | (1.90) | (1.53) | (3.43) | (3.09) | (3.99) |
| Fund size | 0.052 | 0.006 | −0.054*** | −0.079*** | −0.047 | −0.136*** |
| | (1.41) | (0.21) | (−2.20) | (−3.51) | (−1.44) | (−4.49) |
| Expenses | 0.857*** | 0.480*** | 0.606*** | 0.401*** | 0.715*** | 0.476*** |
| | (5.72) | (3.22) | (6.42) | (6.00) | (5.74) | (4.41) |
| Volatility | 0.503*** | 0.384 | 0.483*** | 0.425*** | 0.370** | 0.460*** |
| | (2.80) | (2.98) | (3.46) | (3.57) | (2.22) | (2.76) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |

This table shows the estimates of a regression explaining fund excess turnover for managers who attended universities with different average incoming SAT scores. High SAT and Low SAT funds are those whose managers attended universities with incoming SAT scores greater than (High) or less than or equal to (Low) the median SAT of 1165. The lagged abnormal return, $r^{abn}_{i,t-1}$, is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. All other variables are defined in Table 2. The intercept, fund objective, city-specific, and year fixed effects are included in all regressions but their coefficients are not shown. Panel B restricts the sample to those managers with less than or equal to five years of city experience. The *t*-statistics shown in parentheses are based on the Huber–White robust standard errors clustered by fund manager.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

coefficients on the lagged turnover, as well as their statistical significance relative to corresponding results in Table 5. As predicted by H1, we again observe a significant increase in the magnitude of the slope when we isolate less experienced managers: the coefficient increases from 0.028 in Panel A to 0.054 in Panel B.

In general, there is no relation between past performance and turnover for female fund managers in any location. In contrast, there is a very strong positive relation between performance and turnover for male fund managers in financial centers and a significant negative relation for male fund managers in other places. Therefore, while the proportion of female managers is small, the striking result is how different male managers trade in response to past returns and location.

**Table 7**
Fund turnover and lagged returns for managers with different gender.

| | Dependent variable: excess turnover | | | | | |
|---|---|---|---|---|---|---|
| | Non-financial center funds | | Financial center funds | | New York funds | |
| Gender | Male | Female | Male | Female | Male | Female |
| *Panel A: all fund managers* | | | | | | |
| Observations | 3199 | 237 | 4550 | 482 | 2081 | 296 |
| $r^{abn}_{i,t-1}$ | −0.031** | −0.009 | 0.024 | −0.009 | 0.062*** | −0.018 |
| | (−2.22) | (−0.30) | (1.61) | (−0.33) | (2.65) | (−0.74) |
| Experience$^{ex}$ | −0.204*** | −0.270** | −0.219*** | −0.012 | −0.179*** | 0.034 |
| | (−5.82) | (−2.47) | (−5.79) | (−0.13) | (−3.47) | (0.32) |
| Fund age | −0.015 | 0.159 | 0.077** | 0.017 | 0.179*** | −0.053 |
| | (−0.34) | (1.40) | (2.35) | (0.23) | (3.88) | (−0.67) |
| Fund size | 0.057** | −0.009 | −0.071*** | −0.024 | −0.126*** | 0.016 |
| | (1.99) | (−0.14) | (−3.90) | (−0.52) | (−4.61) | (0.26) |
| Expenses | 0.631*** | −0.065 | 0.446*** | 0.545*** | 0.478*** | 0.241* |
| | (4.75) | (−0.25) | (7.61) | (3.24) | (4.43) | (1.90) |
| Volatility | 0.363*** | 0.519 | 0.433*** | 0.533** | 0.256* | 0.904*** |
| | (3.46) | (1.35) | (5.07) | (2.11) | (1.70) | (3.10) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| *Panel B: less experienced fund managers* | | | | | | |
| Observations | 1748 | 146 | 2142 | 303 | 981 | 169 |
| $r^{abn}_{i,t-1}$ | −0.048** | 0.001 | 0.045** | −0.004 | 0.082*** | −0.006 |
| | (−2.28) | (0.01) | (2.34) | (−0.15) | (2.70) | (−0.27) |
| Experience$^{ex}$ | −0.166*** | −0.230* | −0.176*** | −0.130 | −0.188*** | −0.100 |
| | (−3.41) | (−1.67) | (−3.93) | (−1.62) | (−2.89) | (−1.20) |
| Fund age | 0.038 | 0.094 | 0.140*** | 0.038 | 0.268*** | 0.001 |
| | (1.00) | (0.87) | (4.18) | (0.60) | (5.51) | (0.01) |
| Fund size | 0.048* | 0.005 | −0.068*** | −0.048 | −0.127*** | −0.023 |
| | (1.81) | (0.13) | (−3.51) | (−1.38) | (−3.95) | (−0.57) |
| Expenses | 0.710*** | 0.386 | 0.403*** | 0.451*** | 0.577 | 0.274* |
| | (5.09) | (1.32) | (5.40) | (2.28) | (5.67) | (1.98) |
| Volatility | 0.394*** | 0.408 | 0.493*** | 0.605** | 0.441*** | 0.998*** |
| | (2.98) | (1.40) | (4.86) | (1.21) | (2.92) | (3.82) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |

This table shows the estimates of a regression explaining fund excess turnover for male and female managers. The lagged abnormal return, $r^{abn}_{i,t-1}$, is the difference between the average monthly gross return of the fund and the mean monthly return across all funds for a given year, fund investment objective, and size quartile. All variables are defined as in Table 2. The intercept, fund objective, city-specific, and year fixed effects are included in all regressions but their coefficients are not shown. Panel B restricts the sample to those managers with less than or equal to five years of city experience. The *t*-statistics shown in parentheses are based on the Huber–White robust standard errors clustered by fund manager.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

Thus, Table 7 confirms the results of previous studies and finds more overconfident trading among males. It also highlights the importance of location in terms of influencing a manager's belief about his/her own ability as we see a very different relation between turnover and past performance for managers in financial centers versus elsewhere.

## 6. Fund performance, manager tenure, and lagged turnover

In this section, we test our last hypothesis, H4, that links lagged turnover to fund performance. We also provide robustness checks on our earlier analysis by replacing manager city experience with manager tenure with the same fund. The previous sections use the cumulative experience of a manager

working in a city, so a manager will be considered experienced even if he/she changes funds within the same city. However, one may also consider that the knowledge gained in trading is job-specific, so when managers change jobs they need to reassess how to respond and trade on information specific to their fund. Using manager tenure allows us to control for job market turnover and to observe how trading changes while managers stay at the same fund.

### 6.1. Fund turnover and manager tenure

Table 8 presents the relation between fund turnover and our performance measures for three manager *tenure* cohorts: less than five years, between 5 and 10 years, and more than 10 years. We observe that the group of least experienced managers (with less than five years of tenure in a given city fund) in financial centers trade significantly more but are unable to outperform their peers from other places irrespective of the fund performance. This result is similar to that using manager city experience variable reported in Table 3.

Managers of funds in financial centers with tenures between 5 and 10 years trade the same as those in smaller towns but are able to post superior performance already in terms of abnormal returns not adjusted for risk. The last row of the table confirms and further strengthens the results reported in Table 3. The most experienced fund managers in financial centers trade less than those in other places but are able to significantly outperform their peers from smaller towns based on any performance measure.

As a more conservative difference test to account for autocorrelation in fund turnover, we regress fund turnover on the financial center dummy and cluster errors by fund for each of the tenure cohorts. The coefficient on the dummy variable is similar in size and statistical significance to the difference-in-means tests reported in Table 8 across all three manager tenure cohorts.

Thus better returns of more experienced fund managers in financial centers are driven by better investing skills and learning provided by living in financial centers, as discussed in Christoffersen and Sarkissian (2009). Our findings using manager tenure instead of manager city experience are again consistent with Gervais and Odean (2001) since we still observe the signs of overconfident trading

**Table 8**
Fund turnover and performance for different manager tenure cohorts.

| Manager tenure | Location | Turnover | Returns (%/m) | | |
|---|---|---|---|---|---|
| | | | $r^{abn}_{i,t}$ | $\hat{\alpha}_{i,t}$ (4F) | $\hat{\alpha}_{i,t}$ (C) |
| ⩽5 years | F | 0.994 | 0.017 | 0.094 | 0.109 |
| | O | 0.898 | −0.009 | 0.091 | 0.083 |
| | F–O | 0.096*** | 0.026 | 0.003 | 0.026 |
| | *t*-statistics | (3.46) | (0.26) | (0.18) | (1.23) |
| >5 and ⩽10 years | F | 0.739 | 0.038 | 0.114 | 0.117 |
| | O | 0.709 | −0.063 | 0.134 | 0.118 |
| | F–O | 0.030 | 0.101** | −0.020 | −0.001 |
| | *t*-statistics | (0.94) | (2.37) | (−0.091) | (−0.01) |
| >10 years | F | 0.604 | 0.044 | 0.115 | 0.126 |
| | O | 0.661 | −0.073 | 0.018 | −0.004 |
| | F–O | −0.057 | 0.117** | 0.097*** | 0.130*** |
| | *t*-statistics | (−1.50) | (2.13) | (3.25) | (3.33) |

This table shows the average turnover and three performance measures of funds located in financial centers (F) and other places (O) for three manager tenure cohorts. Turnover is the annual turnover of the fund defined as the maximum dollar value of sales or buys in a year as a portion of the total net assets of the fund. $r^{abn}_{i,t}$ and $\hat{\alpha}_{i,t}$ are average monthly abnormal or risk-adjusted returns in percent per month. The risk-adjusted returns are based on the four-factor (4F) or conditional alpha–beta models (C) estimated using 12-month regressions rolling over calendar years. It also shows the differences in all measures with their respective *t*-statistics (in parentheses).

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

only among inexperienced investors even when experience is measured by the manager's time on the job rather than in the city.

### 6.2. Impact of lagged turnover on fund performance

The extra trading activity following prior gains among fund managers in financial centers that we observed in the previous section may nevertheless indicate that managers rationally learn from trading, where informed trading leads to superior returns in the next period. Ultimately it is the impact of turnover on subsequent fund returns that determines whether the extra trading activity in financial centers is on average beneficial. To examine this relation, we use a model in which abnormal fund returns are regressed on the logarithm of lagged excess turnover and the same set of control variables used earlier, namely:

$$v_{i,t} = c_0 + c_1 Turnover^{ex}_{i,t-1} + c_2 Tenure^{ex}_{i,t} + c_3 FundSize^{ex}_{i,t-1} + c_4 FundAge_{i,t} + c_5 Expenses_{i,t} + c_6 Volatility_{i,t} + c_7 D_t(Year) + c_8 D_i(City) + e_{i,t}, \quad (6)$$

where $v_{i,t}$ denotes one of the three possible returns of fund $i$ in year $t$: average monthly abnormal returns in year $t$, $r^{abn}_{i,t}$, and risk-adjusted returns (fund alphas) for the four-factor and conditional models, $\hat{\alpha}_{i,t}$ (4F) and $\hat{\alpha}_{i,t}$ (C), respectively. We estimate the risk-adjusted returns over 12-month regressions rolling over calendar years. Like city experience, $Tenure^{ex}_{i,t}$ is the "excess" measure of manager tenure with the same fund $i$ at the beginning of year $t$. It is computed as the difference between the log of manager tenure at a fund and the log of the median tenure of all managers of funds with similar investment objective that year. Also, since fund size increases by definition with contemporaneous fund returns, we use lagged excess fund size as a control variable in Eq. (6). The excess size for each fund is the difference between the log fund TNA in a given year and the log median TNA of all funds with the same fund investment objective in that year. If excess trading benefits fund performance, it must imply a positive coefficient $c_1$.

Table 9 shows the estimation outcomes from model (6) across different locations and different performance measures. Panel A reports the outcomes for abnormal returns. Recall from our previous

**Table 9**
Relation between fund performance and lagged turnover.

| | Non-financial center funds | | | | Financial center funds | | | |
|---|---|---|---|---|---|---|---|---|
| | | Shorter manager tenure | | | | Shorter manager tenure | | |
| | All | All | High SAT | Growth | All | All | High SAT | Growth |
| *Panel A: dependent variable: abnormal return* | | | | | | | | |
| Observations | 2870 | 1808 | 1052 | 1223 | 4110 | 2490 | 1687 | 1813 |
| Turnover$^{ex}$ (−1) | 0.062** | 0.105*** | 0.104** | 0.161*** | 0.008 | 0.048* | 0.049 | 0.066* |
| | (2.47) | (2.90) | (2.14) | (3.02) | (0.33) | (1.84) | (1.49) | (1.68) |
| Tenure$^{ex}$ | −0.009 | 0.018 | 0.051 | 0.021 | 0.024 | −0.014 | 0.015 | 0.014 |
| | (−0.32) | (0.35) | (0.72) | (0.27) | (0.99) | (−0.29) | (0.25) | (0.24) |
| Fund age | −0.015 | −0.003 | 0.033 | 0.033 | 0.002 | 0.001 | 0.001 | −0.033 |
| | (−0.50) | (−0.08) | (0.65) | (0.67) | (0.10) | (0.05) | (−0.02) | (−0.92) |
| Fund size$^{ex}$ (−1) | −0.043** | −0.068*** | −0.073** | −0.098 | −0.037*** | −0.042*** | −0.049*** | −0.050** |
| | (−2.44) | (−3.05) | (−2.18) | (−3.23) | (−3.25) | (−2.83) | (−2.71) | (−2.51) |
| Expenses | −0.225*** | −0.330** | −0.331 | −0.418* | −0.098*** | −0.067 | −0.122** | −0.081 |
| | (−2.57) | (−2.52) | (−1.56) | (−2.04) | (−2.91) | (−1.40) | (−2.46) | (−1.14) |
| Volatility | −0.100 | −0.098 | 0.163 | −0.189 | −0.062 | −0.089 | −0.037 | −0.036 |
| | (−0.99) | (−0.71) | (0.90) | (−1.20) | (−0.67) | (−0.69) | (−0.28) | (−0.28) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 9** (*continued*)

| | Non-financial center funds | | | | Financial center funds | | | |
|---|---|---|---|---|---|---|---|---|
| | | Shorter manager tenure | | | | Shorter manager tenure | | |
| | All | All | High SAT | Growth | All | All | High SAT | Growth |
| *Panel B: dependent variable: four-factor alpha* | | | | | | | | |
| Observations | 2356 | 1406 | 828 | 943 | 3388 | 1930 | 1291 | 1404 |
| Turnover$^{ex}$ (−1) | −0.008 | 0.028 | 0.068** | 0.060* | −0.024 | 0.017 | 0.009 | 0.030 |
| | (−0.38) | (1.00) | (2.06) | (1.65) | (−1.30) | (0.86) | (0.35) | (0.95) |
| Tenure$^{ex}$ | 0.016 | 0.040 | 0.095** | 0.089* | 0.040** | 0.101*** | 0.104*** | 0.116*** |
| | (0.79) | (1.03) | (2.11) | (1.81) | (2.30) | (3.56) | (2.82) | (3.20) |
| Fund age | −0.116*** | −0.114*** | −0.061 | −0.092*** | −0.082*** | −0.092*** | −0.091*** | −0.122*** |
| | (−3.66) | (−3.14) | (−1.59) | (−2.66) | (−4.06) | (−4.68) | (−3.64) | (−4.49) |
| Fund size$^{ex}$ (−1) | 0.024** | 0.035** | 0.032 | 0.019 | 0.003 | 0.010 | 0.007 | 0.017 |
| | (2.04) | (2.09) | (1.62) | (1.06) | (0.40) | (0.97) | (0.49) | (1.22) |
| Expenses | −0.104* | −0.168* | −0.124 | −0.077 | 0.008 | 0.039 | 0.057 | 0.048 |
| | (−1.81) | (−1.93) | (−1.00) | (−0.55) | (0.32) | (1.32) | (1.53) | (0.94) |
| Volatility | 0.159 | 0.131 | 0.182 | 0.251* | 0.039 | 0.066 | 0.012 | 0.025 |
| | (1.38) | (0.99) | (1.40) | (1.82) | (0.66) | (0.79) | (0.11) | (0.26) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Panel C: dependent variable: conditional alpha* | | | | | | | | |
| Observations | 2356 | 1406 | 828 | 943 | 3388 | 1930 | 1291 | 1404 |
| Turnover$^{ex}$ (−1) | 0.039* | 0.071** | 0.107** | 0.122*** | −0.008 | 0.040* | 0.033 | 0.061* |
| | (1.68) | (2.24) | (2.49) | (2.89) | (−0.41) | (1.83) | (1.12) | (1.77) |
| Tenure$^{ex}$ | 0.003 | 0.021 | 0.069 | 0.055 | 0.017 | 0.055 | 0.039 | 0.060 |
| | (0.11) | (0.44) | (1.13) | (0.86) | (0.87) | (1.55) | (0.86) | (1.34) |
| Fund age | −0.088*** | −0.088** | −0.077 | −0.036 | −0.055*** | −0.067*** | −0.058** | −0.115*** |
| | (−2.96) | (−2.39) | (−1.58) | (−0.78) | (−2.73) | (−2.90) | (−2.01) | (−3.71) |
| Fund size$^{ex}$ (−1) | 0.026** | 0.038** | 0.058** | 0.008 | 0.005 | 0.009 | 0.001 | 0.016 |
| | (2.16) | (2.22) | (2.39) | (0.37) | (0.50) | (0.65) | (0.02) | (0.89) |
| Expenses | −0.139** | −0.165 | −0.127 | −0.158 | −0.013 | −0.009 | 0.006 | −0.021 |
| | (−1.99) | (−1.53) | (−0.75) | (−0.86) | (−0.44) | (−0.25) | (0.12) | (−0.34) |
| Volatility | 0.142 | 0.145 | 0.268 | 0.292* | 0.040 | 0.107 | 0.023 | 0.121 |
| | (1.16) | (1.01) | (1.51) | (1.91) | (0.56) | (1.05) | (0.16) | (1.02) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

This table shows the estimates from a regression of abnormal fund returns on lagged excess turnover across different locations. Turnover$^{ex}$ is defined as the log of turnover less the median turnover for a fund's investment category each year. Tenure$^{ex}$ is computed as the difference between the log of manager tenure at a fund (years) and the log of the median tenure of all managers with similar investment objective each year. Shorter tenure denotes manager tenure of five years or less. Fund size$^{ex}$ is the difference between the log fund TNA and the log of the median TNA of all funds with the same fund investment objective in a given year. Notation (−1) denotes a lagged variable. All other variables are defined as in Table 2. The intercept, city-specific, and year fixed effects are included in all regressions but their coefficients are not shown. The *t*-statistics shown in parentheses are based on the Huber–White robust standard errors with clustering of observations from the same fund manager.

* Statistical significance at the 10% level.

** Statistical significance at the 5% level.

*** Statistical significance at the 1% level.

results in Tables 4–6 that managers in financial centers who are relatively inexperienced, graduate from high SAT score universities, and invest in "hard-to-value" stocks show more signs of overconfident trading following good prior year returns. Therefore, for each location, Table 9 gives the regression estimates not only across all fund managers but also for less experienced managers with tenures of five years of less. In addition, for the sample of less experienced managers, it reports the results for the sub-samples of managers who attended universities with above median SAT scores and managers of growth funds. What we find consistently is that within financial centers there is no evidence that excess trading results in an increase in future performance.

Hence, we conclude that given the short-term costs of trading, excess trading in financial centers is not beneficial. This does not suggest however that all trades of fund managers in financial centers are uninformative. They may do well at stock-picking and hold these stocks, leading to low turnover and good performance. Christoffersen and Sarkissian (2009) in fact find that returns are significantly higher for more experienced managers in cities as a result of learning they gain from being in a financial center. The main point is whether extra trading is associated with better future performance which would justify the excess turnover we observe in financial centers. We find no evidence of this.

We observe that funds in smaller cities exhibit a positive relation between lagged turnover and current year returns. Among funds outside financial centers, the slope $c_1$ is significant at the 5% level for funds managed by inexperienced managers. Both the magnitude (almost twofold) and statistical significance (to 1% level) of coefficient $c_1$ increase in the sub-samples of fund managers graduating from high SAT score universities and investing in growth stocks. In contrast, coefficient $c_1$ is barely significant in some sub-samples of funds in financial centers. This result shows evidence that excess trading is rewarded in smaller cities but less so in large ones.

Panels B and C of Table 9 show the test results for the four-factor and conditional alphas, respectively. As in Panel A, we observe that funds outside of financial centers have a stronger positive relation between lagged trading and current performance. When the four-factor alpha is used as a dependent variable, the slope $c_1$ is positive and significant at the 5% and 10% for the sub-samples of fund managers that attended high SAT score universities and investing in growth stocks, respectively. This slope is insignificant for any sub-sample of managers of funds in financial centers. When the conditional alpha is used as a dependent variable, $c_1$ is positive and significant at the 5% or 1% levels across all sub-samples of funds outside of financial centers managed by inexperienced managers. As for funds located in financial centers, as with abnormal returns, we find only marginal significance of coefficient $c_1$.

Thus, Table 9 shows that the excessive turnover of funds in financial centers does not increase subsequent performance in terms of either abnormal or risk-adjusted returns and has less predictability than for funds in other places. This holds for the sub-sample of those funds which are overseen by less experienced managers who attended universities with high SAT scores and/or invest in "hard-to-value" growth stocks. Our findings therefore support the fourth hypothesis, H4, that for less experienced managers in financial centers, the excess turnover reported previously does not improve performance.

### 6.3. Trading, returns, and learning

In this sub-section, we show that the effects of learning in financial centers documented in Christoffersen and Sarkissian (2009) do not result from the excessive turnover early on in a fund manager's career. Table 10 reports the estimates from the panel regression of average monthly abnormal or risk-adjusted fund returns on lagged excess fund turnover and excess *manager city experience* across various locations for fund managers who stayed more than five year in the same city. We observe that across all locations, the relation between lagged turnover and fund returns is essentially zero as shown earlier. More importantly, the table shows that more investing experience among fund managers benefits gross and risk-adjusted returns of funds located only in financial centers, especially in New York. Indeed longer experience of fund managers in financial centers helps their funds post better performance over time, as argued by Christoffersen and Sarkissian (2009).

The lower performance of inexperienced managers in financial centers may be related, at least in part, to overconfident trading. However, among more experienced fund managers, who show no evidence of overconfident trading, we still observe a strong positive relation between experience and returns (after five years). Hence, the outperformance of experienced managers in financial centers vis-à-vis those from other places is related to various learning mechanisms present in large cities, unrelated to overconfidence.

**Table 10**
Fund performance of experienced fund managers.

| | Non-financial center funds | | | Financial center funds | | | New York funds | | |
|---|---|---|---|---|---|---|---|---|---|
| | $r_{i,t}^{abn}$ | $\hat{\alpha}_{i,t}$ (4F) | $\hat{\alpha}_{i,t}$ (C) | $r_{i,t}^{abn}$ | $\hat{\alpha}_{i,t}$ (4F) | $\hat{\alpha}_{i,t}$ (C) | $r_{i,t}^{abn}$ | $\hat{\alpha}_{i,t}$ (4F) | $\hat{\alpha}_{i,t}$ (C) |
| Observations | 811 | 727 | 727 | 1239 | 1105 | 1105 | 538 | 486 | 486 |
| Turnover$^{ex}$ (−1) | −0.041 | −0.040 | 0.016 | 0.022 | −0.032 | −0.011 | 0.060 | −0.015 | 0.004 |
| | (−0.79) | (−1.17) | (0.40) | (0.62) | (−1.57) | (−0.39) | (1.17) | (−0.54) | (0.10) |
| Experience$^{ex}$ | 0.040 | −0.157** | −0.148* | 0.061 | 0.068 | 0.123** | 0.138* | 0.099** | 0.156** |
| | (0.34) | (−2.32) | (−1.71) | (0.98) | (1.60) | (2.42) | (1.78) | (2.02) | (2.50) |
| Average SAT | 0.040 | 0.044* | 0.060* | 0.045** | 0.011 | 0.038** | 0.027 | 0.006 | 0.038 |
| | (1.17) | (1.81) | (1.91) | (2.08) | (0.80) | (2.15) | (0.78) | (0.24) | (1.36) |
| Fund age | 0.056 | −0.064 | −0.044 | −0.005 | −0.013 | −0.029 | 0.008 | 0.022 | −0.012 |
| | (0.74) | (−1.40) | (−0.70) | (−0.13) | (−0.51) | (−0.99) | (0.17) | (0.57) | (−0.26) |
| Fund size$^{ex}$ (−1) | −0.029 | 0.016 | 0.002 | −0.050** | −0.009 | −0.012 | −0.106*** | −0.032* | −0.037 |
| | (−0.64) | (0.83) | (0.08) | (−2.34) | (−0.77) | (−0.77) | (−3.90) | (−1.71) | (−1.57) |
| Expenses | −0.096 | −0.120 | −0.206 | −0.117 | −0.001 | −0.017 | −0.506*** | −0.047 | −0.046 |
| | (−0.44) | (−1.16) | (−1.63) | (−1.54) | (−0.03) | (−0.28) | (−4.69) | (−0.44) | (−0.32) |
| Volatility | −0.314 | 0.131 | 0.140 | 0.055 | 0.064 | 0.018 | −0.467** | −0.124 | −0.073 |
| | (−1.18) | (0.87) | (0.92) | (0.38) | (1.04) | (0.21) | (−2.53) | (−1.50) | (−0.63) |
| Objective dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| City dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

This table shows the estimates from the panel regression of average monthly abnormal returns in year $t$ ($r_{i,t}^{abn}$) or risk-adjusted fund returns ($\hat{\alpha}_{i,t}$) on lagged excess fund turnover and manager city experience across various locations for fund managers with more than five years experience in the same city. The risk-adjusted returns are based on the four-factor (4F) or conditional alpha–beta models (C). All variables are defined as in Tables 1 and 2, except fund size is lagged and included as an excess variable. Excess fund size is the difference between the log fund TNA in a given year and the log of the median TNA of all funds with the same fund investment objective in that year. The intercept, fund objective, city-specific, and year fixed effects are included in all regressions but their coefficients are not shown. The $t$-statistics shown in parentheses are based on the Huber–White robust standard errors with clustering of observations from the same fund manager.

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

## 7. Overconfidence versus pressure to perform

Large cities have more competitive labor markets than smaller towns.[19] This implies that the process of evaluation, retention, and promotion of fund managers may be more stringent in financial centers than elsewhere. This increased "pressure to perform" in big cities may create an incentive for fund managers in financial centers, especially among relatively inexperienced ones, to trade excessively compared to their counterparts in smaller cities. Therefore, one of our observed empirical predictions – that less experienced fund managers in financial centers trade more – could stem from the pressure to perform rather than overconfidence. By the same token, more experienced managers could feel more secure in their positions and might not face the same pressure to perform as their inexperienced counterparts.

Thus, trading might decline not because overconfidence has abated over time, but because with more experience comes less professional scrutiny and the freedom to make fewer, yet more effective trades. These considerations apply regardless of location but may be more magnified in financial centers.

Table 11 tests whether job-market pressures influence our results. We examine a relation between the average job turnover levels among fund managers in different locations and the lagged ranked turnover levels. If performance pressure has anything to do with fund turnover, then high fund turnover in financial centers could be associated with significantly higher or lower job turnover in those places. For example, fund managers may increase trading to simply show that they work hard (see

[19] See Edward L. Glaeser, "How Competition Saved New York," *The New York Times*, April 7, 2009.

**Table 11**
Relation between fund turnover and job turnover.

| | Low lag turnover | High lag turnover | All | Difference (L–H) |
|---|---|---|---|---|
| *Panel A: all manager tenures* | | | | |
| Financial centers | 0.132 | 0.143 | 0.138 | −0.011 |
| | | | | (−1.14) |
| Other places | 0.125 | 0.135 | 0.130 | −0.010 |
| | | | | (−0.91) |
| Difference (F–O) | 0.007 | 0.008 | 0.008 | |
| | (0.74) | (0.74) | (0.74) | |
| *Panel B: less experienced managers* | | | | |
| Financial centers | 0.1634 | 0.1561 | 0.1593 | 0.0073 |
| | | | | (0.54) |
| Other places | 0.1496 | 0.1450 | 0.1472 | 0.0046 |
| | | | | (0.31) |
| Difference (F–O) | 0.0138 | 0.0111 | 0.01217 | |
| | (0.91) | (0.81) | (1.20) | |
| *Panel C: more experienced managers* | | | | |
| Financial centers | 0.101 | 0.117 | 0.107 | −0.016 |
| | | | | (−1.08) |
| Other places | 0.093 | 0.114 | 0.102 | −0.021 |
| | | | | (−1.29) |
| Difference (F–O) | 0.008 | 0.003 | 0.005 | |
| | (0.60) | (0.12) | (0.45) | |

This table shows the relation between job turnover and lagged portfolio turnover in financial centers and other places. The job turnover variable, *Jobturn*, takes the value one when a manager is replaced. The sample is divided into those funds which have turnover levels above (High) or below (Low) the median fund in the ICDI objective category in the year prior to the observed job turnover dummy variable. Panel A shows the average job turnover for all fund managers, Panel B – for less experienced managers with tenures between one and five years, and Panel C – for more experienced managers with tenures greater than five years. The *t*-statistics are shown in parentheses.

Dow and Gorton, 1997), or in an attempt to catch up with industry leaders in terms of portfolio composition. However, in these cases, high turnover is unlikely to lead to better performance, and, as a result, these managers will be forced to quit their funds, thus, increasing the job turnover rate. On the other hand, if higher fund turnover is successful in improving performance, then we expect job turnover to decrease as a result of more trading. The main goal of Table 11 is to determine whether there is any link, positive or negative, between fund trading and job turnover to ensure the results are not driven by labor market pressures in large cities.

Panel A shows the test results for all managers, while Panels B and C report the results for less experienced and more experienced managers, respectively, where, as before, the cut-off experience level is being five years with the same fund. Across all panels, we observe no significant differences between job turnover and lagged fund turnover. Therefore, we conclude that fund turnover differences across locations are unlikely to be spurred by the differences in labor market competition.

## 8. Conclusions

While there are numerous studies on factors influencing mutual funds returns, there are few which examine the cross-sectional patterns in turnover. Our study provides the first look at the demographic determinants of mutual fund turnover where a managers' education, location, experience, and gender may all contribute to their assessment of their own abilities and affect how they react to information and trade. Managers located in financial centers are surrounded by individuals who, on average, earn higher wages and are better educated than their peers in smaller cities. Being a part of this demographic location may cause managers to believe more in their own investing ability. We document that funds in financial centers trade more frequently than funds elsewhere even after controlling for various fund characteristics.

The basis of our tests rely on the predictions of Gervais and Odean (2001) and Daniel et al. (1998) models of overconfident trading where overconfidence is measured as an overestimate of the precision of ability or information. Our main test of overconfidence measures how managers react to past performance. We find a strong relation between lagged performance and turnover but only among managers located in financial centers with limited experience. We also break the sample into other subgroups and find that the lagged performance–turnover relation is particularly strong for less experienced males in financial centers and those coming from high SAT universities. To determine whether there are any benefits to funds in financial centers resulting from their excess trading, we examine how their prior turnover affects current performance and find no evidence that excess trading is beneficial.

Our results suggest that portfolio managers in financial centers, especially in New York, feel more competent in investing than managers from smaller towns at the beginning of their careers. This feeling of being more knowledgeable and skillful, as argued by Heath and Tversky (1991), may induce them to act more aggressively on imprecise information. As a result, fund managers in large cities engage in more overconfident trading, but, over time, they realize their true ability as shown in Gervais and Odean (2001) and Daniel et al. (1998) and reduce their turnover as we do not observe signs of overconfident trading beyond five years in managers' tenure with their respective funds.

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