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# Competition among mutual funds ☆

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ABSTRACT

We examine the impact of the entry of new mutual funds on incumbents using the overlap in their portfolio holdings as a measure of competitive intensity. This simple metric delivers powerful economic results. Incumbents that have a high overlap with entrants subsequently engage in price competition by reducing management fees. Distribution fees, however, rise so that investors do not benefit as much from price competition. Funds with high overlap also experience quantity competition through lower investor flows, have lower alphas, and higher attrition rates. These effects only appear after the late 1990s, at which point there appears to be an endogenous structural shift in the competitive environment. We conclude that the mutual fund market has evolved into one that displays the hallmark features of a competitive market.


## 1. Introduction

The assets of active, domestic equity mutual funds grew at a compounded annual growth rate of 16% per year between 1980 and 2008 (Investment Company Fact Book, 2009).[2] Despite this tremendous growth, with the exceptions noted below, there is precious little direct evidence on the competitive forces at work in this industry. The first exception is Khorana and Servaes (2004), who find that price competition is important but with a caveat: families that charge lower fees gain market share but only if these fees were initially above average. The second exception is a tour de force of the industrial organization of this area by Coates and Hubbard (2007). Coates and Hubbard (2007) make the observation that the number of class action lawsuits against mutual funds has increased dramatically since 2003, and that several prominent industry and regulatory participants assert that mutual fund advisory fees do not reflect the workings of a competitive marketplace.[3] They go on to argue that much of the anti-competitive criticism is ill-founded and easily

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[2] 2009 Investment Company Fact Book is available at the following URL: http://www.icifactbook.org/pdf/2009_factbook.pdf.

[3] Coates and Hubbard (2007) cite public pronouncements of John Bogle, founder of The Vanguard Group, David Swensen, Chief Investment Officer of Yale University, and former New York Governor Eliot Spitzer as arguing that fees charged by mutual funds do not reflect a competitive environment. They also cite two academics (Freeman and Brown, 2001;Trzcinka, 1998), and the Chief Economist of the Securities and Exchange Commission (Spatt, 2006) as drawing similar conclusions. Wallison and Litan (2007) also argue that competition among mutual funds is inadequate. A rebuttal of Coates and Hubbard's criticism of Freeman and Brown (2001) can be found in Freeman (2008).

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refuted using simple economic logic.[4] Lastly, Gil-Bazo and Ruiz-Verdu (2009) find that between 1961 and 2003, funds with worse before-fee performance charge higher fees, concluding that competition "has not been able to prevent funds that cater to performance-insensitive investors from setting high fees nor to quickly drive them out of the market."

Two key elements of a competitive marketplace are that, (a) new entry take place, and (b) that entry affect the economic circumstances and behavior of incumbents. Evidence on the magnitude and determinants of entry is provided by Khorana and Servaes (1999). Trade journals also report large increases in the number of funds over time, implying widespread entry. Surprisingly, there is no empirical evidence on the second element of competition: the consequences of entry for prices, revenues, costs, performance, and survival. We perform precisely such an analysis, which can be viewed as a litmus test for a competitive marketplace.

Establishing a connection between entrants and incumbents requires us to measure the degree to which an entrant competes with incumbents. This is a notoriously difficult problem in industrial organization and falls under the rubric of product heterogeneity and differentiation (see Berry and Reiss, 2007, for a review). There are two aspects to this problem. The first difficulty is in identification of the cohort group with which an entrant competes. Consider, for example, the entry of a second baseball team in a city. Does this entrant compete with the incumbent baseball team, or all the other professional sports teams in the city? Or, should one also consider non-professional teams as incumbents. Perhaps one might consider all other leisure activities as potentially affected by the entrant. Mutual funds are not immune from this identification problem. Suppose, for example, that a new small cap growth fund enters the marketplace. This entrant could compete with other small cap growth funds, other small cap funds, other growth funds, or even all mutual funds. The second aspect of this problem is that even if homogeneous groups can somehow be identified, product differentiation mechanisms can generate heterogeneity, allowing firms to compete on different dimensions and charge different prices. Even in an extremely homogeneous group of Standard & Poor's 500 index funds, Elton, Gruber, and Busse (2004) show large variation in fees and performance, and attribute it, at least in part, to investor irrationality. For the same group, Hortaçsu and Syverson (2004) show that extra-portfolio product differentiation can account for variation in fees. Li (2005) develops and tests a structural model in which fund managers increase fees by differentiating products over different states of nature. He suggests, rather startlingly, that funds can increase their profits by almost 30% through differentiation.

If we regard the mutual fund portfolio as the "product," then it is appropriate to think of fund fees as "prices" charged for that product and stock holdings as key "inputs." Therein lies the advantage to working with mutual funds—the unique nature of mutual fund disclosures allows us to bypass the problems described above, at least to some degree. Knowledge of quarterly stock holdings allows us to create parsimonious metrics with which to measure the overlap between each incumbent and entrant pair. Even though we cannot measure the degree to which a marginal investor considers a portfolio delivered by an entrant fund to be substitutable with a portfolio provided by an incumbent, we can measure one way in which the investor could think about substitutability—the degree to which incumbent and entrant holdings overlap. To the extent that we cannot measure other product differentiation mechanisms (e.g., the bundling of cash management services), such a measure is imperfect, but at least unbiased.

To implement this idea, we calculate the ratio of the market value of an overlapping security's holdings in the entrant's portfolio to the market value of the same security in the incumbent's portfolio. We then multiply this ratio by the weight of that security in the incumbent's portfolio to reflect its importance to the incumbent, and use this product to compute two measures of incumbent-level overlap: $MVO_{i,t}$ (market value of overlap) and $TruncMVO_{i,t}$ (truncated market value of overlap). Intuitively, both measures capture the degree to which entrants and incumbents compete in their inputs (stock holdings) and therefore, the degree to which their products (portfolios) are substitutable.

The null hypotheses in a competitive market are almost elemental: entry should cause incumbents that have higher overlap with entrants to reduce prices, experience reduced quantities' sold, higher costs, and performance declines. In the extreme case, entry may cause or accelerate exit for incumbents with higher overlap. But before proceeding to tests of these hypotheses, we take stock of the nature of entry between 1980 and 2005. We do so because we expect entry to be endogenous to expected profitability. The number of entrants rises over the early part of the sample period and peaks in the late 1990s. By the end of 2005, entry of active mutual funds declines substantially. A formal Chow Test indicates a structural break in the time-series of entry in 1998. Therefore, data permitting, we perform our tests for the entire sample, as well as pre- and post-1998 subperiods.

Our first set of tests focus on Bertrand competition and consist of regressions of post-entry changes in expense ratios, and its components, management fees, non-management fees, and distribution costs, on lagged

[4] Their opinion was influential in a court ruling issued by Judge Frank Easterbrook that rejected claims by a plaintiff that mutual fund advisory fees are excessive. The case was brought against Harris Associates, manager of the Oakmark Funds, alleging that Oakmark charges higher fees to retail mutual fund investors than institutional investors (plan sponsors). The Easterbrook opinion, as it has become known, relied heavily on Coates and Hubbard (2007). A dissent written by Judge Richard Posner argues that the Easterbrook opinion (a) implicitly rejects the Gartenberg precedent in which a fee is deemed excessive if it bears no resemblance to the services rendered and could not have been the product of an arms-length transaction, and (b) ignores evidence such as Kuhnen (2007) which shows that connections between fund directors and managers can hurt investors. The case has now proceeded to the US Supreme Court for deliberations.

measures of the overlap between incumbents and entrants. We find that after 1998, changes in management fees are negatively related to prior measures of overlap. In addition, incumbents with higher overlap are more likely to employ (ostensibly) temporary fee waivers, and those that do, use larger waivers. Waivers are frequently continued in the years following introduction, thereby becoming de facto permanent changes in prices. And, when waivers are discontinued, roughly half the time the discontinuation is because there is a permanent reduction in management fees. This suggests that, at least on the basis of prices over which fund managers have direct control (management fees), price competition is strong. Interestingly, non-management fees are unrelated to overlap measures; summing up management fees and non-management fees, we find no relation between changes in expense ratios and overlap.[5] Thus, while price competition appears to be working, we are less sanguine on the issue of whether all the benefits of competition directly accrue to consumers. It is interesting to ask why that might be the case. The largest observable component of non-management fees is distribution cost, comprising loads and 12b-1 fees. We find that changes in loads are negatively related to overlap measures. However, since the advent of 12b-1 legislation, there has been a movement away from the use of loads to the use of 12b-1 fees in defraying fund distribution costs. Our regressions show that changes in 12b-1 fees are positively correlated with overlap. This could be because, as funds lose market share (due to competition), they attempt to attract new investors by increasing distribution activities. Since there are a limited number of distribution channels, the consequence is that 12b-1 fees rise. This is consistent with Walsh (2004) who finds that funds with 12b-1 plans grow faster but do not have lower expense ratios, and with Casavecchia and Scotti (2009) who report intriguing evidence that changes in distribution fees are negatively related to changes in management fees. Ultimately, the benefits of competition to consumers are tempered by such compensating differentials.

To investigate the role of supply-side quantity-based competition, we regress flows on lagged measures of the overlap. Incumbents with higher measures of overlap have lower future flows. This negative correlation is especially strong for poorly performing incumbents. For a fund in the bottom quintile of past one-year performance, an one-standard-deviation increase in $MVO_{i,t}$ decreases the subsequent year's fund flows by 6.1%. These effects are only present after 1998; in the early part of our sample period, there is no discernible correlation between measures of incumbent-entrant overlap and future asset flows.

Although one can imagine a channel by which entry could increase incumbent operating costs (such as raising fund manager wages, auditing fees, custodial charges, etc.), the data simply do not exist to measure such effects cleanly. The effects of entry on trading costs, however, are measurable, at least to a degree. To the extent that entrants and incumbents compete for the same set of securities, entry should raise incumbent trading costs. We use a measure of net total costs proposed by Kacperczyk, Sialm, and Zheng (2008), the difference between a fund's reported return and the return on a portfolio that invests in disclosed holdings, to investigate this. This return gap represents the benefits of trading, net of costs. We find that the size of the return gap in years one and two after entry is weakly negatively correlated with our overlap measures. But again, these effects only occur after 1998.

Ceteris paribus, if trading costs are higher, then the net portfolio returns delivered by incumbent funds should be lower. We regress individual fund alphas estimated over the 36 months after entry on lagged measures of incumbent-entrant overlap and control variables. After 1998, post-entry alphas of incumbents with large overlap are lower; a one-standard-deviation increase in $MVO_{i,t}$ decreases subsequent alphas by five basis points per month. We also estimate post-entry incumbent excess returns using the characteristics-based approach of Daniel, Grinblatt, Titman, and Wermers (1997). This serves as a robustness check and permits us to measure excess returns in closer proximity to entry. In addition, it allows us to decompose the holding-based return into three components: characteristic selectivity, characteristic timing, and average style effects. If lower alphas are due to competition for the underlying securities, then our overlap measures should be negatively correlated with the characteristic selectivity component of returns. That is precisely what we find.

Finally, incumbents with high overlap have significantly higher attrition rates than those with low overlap. In the five-year period following entry, the attrition rate of incumbents in the highest decile of ($MVO_{i,t}$) overlap is 22.1%, compared to only 7.1% for those in the lowest decile. In multivariate settings, in the post-1998 period, a-one-standard deviation increase in $MVO_{i,t}$ increases the implied probability of exit from a baseline level of 10% to 12.1%.

Two particular aspects of our results deserve further discussion. First, the effects of competition described above are ameliorated (but not eliminated) for incumbents that are larger and that belong to larger families. This is not surprising—size brings with it scale economies and the ability to defend one's turf. Second, for the dependent variables that we consider (fees and waivers, flows, costs, alphas, and attrition rates), entry only influences incumbents after 1998. There is nothing magical about 1998 per se; if we use 1997 or 1999 as breakpoints, we obtain largely similar results. But, one might ask why we do not observe these effects in the early part of the sample period. The answer, we believe, lies in the fact that entry is endogenous. Summarizing a voluminous literature, Geroski (1995, p. 425) concludes that entry comes in waves which often "peak early in the life of many markets", and which in a traditional industrial organization framework, drive profitability and price to their long-run competitive levels. In mutual funds, entry increased until the late 1990s, probably because it was attractive. As the industry became saturated, the profitability of

[5] Nonetheless, the negative relation between before-expense alpha and expense ratios shown by Gil-Bazo and Ruiz-Verdu (2009) does not exist in the post-1998 sample period, suggesting that price competition is far from dead.

entry also declined, and entrants began to compete more aggressively with incumbents for revenues (flows times fees), and inputs (driving up costs). This ''threshold entry'' effect is shown in other places by Bresnahan and Reiss (1991), who use it as an alternative to directly measuring price-cost margins. We too cannot directly measure price-cost margins but can confirm endogenous entry with a simple calculation: the correlation between industry revenue in year $t-1$ (measured as the aggregate dollar value of net flows in year $t-1$ times the expense ratio) and the total number of entrants in year $t$, is 0.96 in the pre-1998 period and 0.55 in the post-1998 period. This large decline is consistent with the saturation and threshold argument. Endogenous entry is also consistent with Kosowski, Timmermann, Wermers, and White (2006) and Fama and French (2010). The former conclude that outperforming managers became scarce after 1990, and speculate that ''either markets have become more efficient, or competition among the large number of new funds has reduced the gains from trading'' (p. 2575). The latter note a marked decline in the persistence of alphas after 1992, and speculate that this is caused either by diseconomies of scale, or that ''perhaps the entry of hordes of mediocre funds posturing as informed managers makes it impossible to uncover the tracks of truly informed managers.''

Overall, our results point to a competitive market for mutual funds after 1998—one characterized by free entry that influences incumbent prices, revenues, costs, alphas, and ultimately, survival. To some this may be an obvious conclusion, especially based on the casual observation that there are almost 4,000 domestic equity funds competing for investors' capital. But it is clearly not obvious to others. More importantly, regardless of one's a priori beliefs, it is important to bring evidence to bear on the competitiveness of a market that managed \$2.8 trillion in domestic equity in 2008 (Investment Company Fact Book, 2009).

The remainder of the paper is organized as follows. Section 2 describes the data, our sample, and the metrics we use to measure incumbent-entrant overlap. Section 3 contains our results. Section 4 discusses robustness issues and Section 5 concludes.

## 2. Sample and methods

### 2.1. Sample construction

We start with all active (non-index) equity mutual funds in the Center for Research in Security Prices (CRSP) mutual fund database in the following investment styles: aggressive growth, growth and small growth, income, growth and income, special sector, and others.[6] This eliminates balanced, bond, money market, and international equity funds. Since we require portfolio holdings to construct our measures of incumbent-entrant overlap, we merge this initial sample with holdings information in the Thomson Financial CDA/Spectrum holdings database. This holdings database is, in turn, linked with the CRSP mutual fund files using the MFLINKS file provided by Wharton Research Data Services. We start our sample in 1981 because the holdings database starts in 1980 and we need one prior year's worth of data to calculate incumbent-entrant overlap. We end our sample in 2005 because several of our dependent variables require two or three years of post-entry data.

To create a sample of entrants and incumbents, we first identify entrants based on their appearance in the CRSP Mutual Fund database. We then impose a sequence of filters. First, we disregard incumbent-entrant pairs in which both the incumbent and entrant belong to the same fund family. Intra-family competition is likely to be endogenously small because of cannibalization concerns. Moreover, intra-family entry is endogenous, causing inference problems for our tests. In contrast, entry of funds from rival families is an exogenous shock to incumbents. Second, we require that an entrant exist for at least one year before it can be regarded as an incumbent. This allows for sufficient time for the competitive process to take effect on incumbent activities and behavior. Third, we require that holdings information be available in reasonable proximity to the birth date of the fund so that we can accurately calculate overlap measures. It is sometimes the case that the first reported quarter of a mutual fund on the CRSP database is not the same as that reported by CDA/Spectrum.[7] If the difference between the inception dates in the two databases is larger than two quarters, we exclude that entry observation. For example, if the CRSP database shows the first return of a fund in January 1993 but the first holdings observation is in December 1993, we do not record this fund as an entrant on either date. We do, however, regard this fund as an incumbent, starting January 1994. The consequence of this filter is that the number of entrants in our sample is smaller than one would obtain by a simple tabulation of birth dates from the CRSP database. This filter ensures accurate measurement of the overlap in event time but our conclusions are not sensitive to it.

Most of the data (returns, expenses, assets, loads, turnover, etc.) required for our analysis are provided by the CRSP Mutual Fund database and are available for the entire time-series. However, CRSP only provides information about management fees starting in 1998; these fees are reported net of waivers.[8] Since waivers are of interest in their own right, we purchase from Lipper Analytical Services a database that contains the name of each fund that waived fees, as well as the magnitude of the fee waiver. These data start from 1998 and are first matched to our sample using CUSIP numbers and then hand-matched by fund name.

[6] In Section 3.3.7 of the paper, we provide a brief analysis of the impact of entry on pure index funds and closet indexers.

[7] Consistent with this, Wermers (2000) finds that CDA's reporting of holdings sometimes lags return information in other data sources.

[8] See CRSP Survivorship-Bias Free U.S. Mutual Fund Guide, p.8, which can be found at the following URL (http://www.crsp.com/documentation/pdfs/MFDB_Guide.pdf).

These sample selection criteria result in a final sample of 4,116 unique funds between 1981 and 2005. Our analysis is conducted at the fund-level because holdings are for each fund, not share classes. Since several of our dependent variables are different for each share class, we use Total-Net-Assets (TNA)-weighted averages of these variables at the fund-level in our analyses.

## 2.2. Measuring the effects of entry on incumbents

To study the effects of entry on incumbents, it is necessary to identify the "market" in which entrant and incumbents compete. One obvious approach would be to use style information. One might suppose that an entrant in a small cap value style, for example, would compete with incumbents in the same style. But this approach faces two difficulties. First, at a conceptual level, style (or, equivalently, "market") identification is ad hoc. That is, it is not obvious why an entrant fund identified with a small cap value strategy would not compete with incumbents in, say, small cap growth.[9] Second, at a more practical level, style identification is idiosyncratic. For instance, the CRSP Mutual Fund and the Thomson Financial CDA/Spectrum databases use different style definitions and it is not clear which one is more appropriate.

We construct measures of competition between incumbents and entrants that are agnostic to style classifications by using security holdings. Effectively, we are inferring something about competition in the product market (the mutual funds' portfolios) from overlap in the inputs of the production process (the securities comprising the portfolios). Given the commodity nature of the inputs, we expect the correlation between the two to be high. Philosophically, we rely on the Friedman (1953) argument that from the outcomes, we can presume that investors behave "as if" they observe and understand substitutability between funds. In other words, in this positivist stance, it does not matter if investors observe the complete set of mutual fund holdings, but only that they behave "as if" they do. For readers uncomfortable with this reliance and concerned that holdings are not observable to the marginal investor, we offer other sources of comfort. First, funds regularly report their top holdings in prospectuses and annual reports. Thus, even if all holdings are not observable, most of the important ones are. Second, a cottage industry of firms (such as Morningstar and Lipper) regularly evaluates this information and provides distilled versions to investors. The results in Wermers, Yao, and Zhao (2007) suggest that holdings contain information of some value, suggesting that our overlap measures are not just noise. Third, if our overlap measures are in fact pure noise, as would be the case under the alternative hypothesis, then we should not find any connection between them and our dependent variables.

[9] In addition, Sensoy (2009) reports that one-third of actively managed US mutual funds specify a size and value/growth benchmark index in the fund's prospectus that does not match the fund's style.

### 2.2.1. Overlap measures

Assume there are $i$ incumbent funds at the beginning of quarter $t$, $i=1, \ldots, M$, and $j$ new funds enter during the quarter where $j=1, \ldots, N$. Let $\tau$ represent an overlapping security that appears in both the incumbent and entrant's portfolio, where $\tau=1, \ldots, \theta_{i,j,t}$. Also, $\gamma$ represents all (overlapping and non-overlapping) securities in an incumbent's portfolio, where $\gamma=1, \ldots, NS_{i,t}$ . By definition, $\tau \le \gamma$ and $\theta_{i,j,t} \le NS_{i,t}$. For each overlapping security within an incumbent-entrant pair, we define a pseudo portfolio weight as

$$w_{\tau,t} = \left(\frac{P_{\tau,t}S^E_{\tau,t}}{P_{\tau,t-1}S^I_{\tau,t-1}}\right)\left(\frac{P_{\tau,t-1}S^I_{\tau,t-1}}{\sum_{\gamma=1}^{NS_{i,t}} P_{\gamma,t-1}S^I_{\gamma,t-1}}\right), \tag{1}$$

where $P_{\tau,t-1}(P_{\tau,t})$ is the price of overlapping security $\tau$ at the beginning (end) of quarter $t$, $S^E_{\tau,t}(S^I_{\tau,t-1})$ is the number of shares of that security in the entrant (incumbent's) portfolio, $P_{\gamma,t-1}$ is the price of security $\gamma$ in the incumbent's portfolio, and $S^I_{\gamma,t-1}$ is the number of shares of security $\gamma$ in the incumbent's portfolio. We use a different time convention ("$t$" for entrants and "$t-1$" for incumbents) because in the absence of detailed timing information about entry, we assume it takes place at the end of the quarter.[10] Intuitively, the first term in Eq. (1) is the ratio of the dollar value of the overlap between entrant and incumbent holdings in each overlapping security. For example, if an entrant (incumbent) has a \$2 million (\$10 million) position in a security XYZ, the ratio is 0.2. The second term represents the importance (weight) of this security in the incumbent's portfolio. In the above example, if the incumbent's total portfolio value is \$200 million, the \$10 million position in XYZ has a weight of 0.05, implying that $w_{\tau,t}=0.01$.

The above pseudo portfolio weight, $w_{\tau,t}$, is defined for each overlapping security in an entrant-incumbent pair. To create an incumbent-level measure of overlap ($MVO_{i,t}$), we sum these weights across all overlapping securities and then average across entrant-incumbent pairs.

$$MVO_{i,t} = \frac{1}{N}\sum_{j=1}^{N}\sum_{\tau=1}^{\theta_{i,j,t}} w_{\tau,t}. \tag{2}$$

This relatively simple measure aggregates the effect of all entrants on each incumbent. However, it has one potential drawback, best illustrated by way of example. Consider, a situation in which the overlap in holdings between incumbent $i$ and entrant $j=1$ is 100%, but that the overlap between the same incumbent and entrants $j=2$ and 3 is zero. By averaging across all incumbent-entrant pairs, $MVO_{i,t}$ takes on a value of 0.33, even though the effect of the entry of $j=1$ could be significant in economic terms by reducing incumbent revenues and increasing costs. This averaging could obfuscate the effects that we are interested in. Therefore, we also compute a truncated version of this overlap measure ($TruncMVO_{i,t}$) in which we

[10] Since the numerator and denominator of the first term in Eq. (1) are based on different prices, one might be concerned that the weight is influenced by momentum trading in the same sense as Grinblatt, Titman, and Wermers (1995). We also calculate weights using the average of beginning and end-of-quarter prices and find similar results.

**Table 1**
Time-series of entry of new mutual funds.

The table shows the number of incumbent mutual funds at the end of each calendar year and the number of new mutual funds created (entrants) during the year. The sample is constructed from the intersection of the CDA/Spectrum mutual fund holdings database with the CRSP Mutual Fund database. It includes all active (non-index) equity mutual funds with returns data and in the following CDA/Spectrum categories: aggressive growth, growth, growth & income, metals, and unclassified. The number of entrants in each style (except "others" and "special sector") is also shown. The style categories correspond to the CRSP style codes. $R_{VW}$ is the compounded value-weighted market return from January 1, 1981. The ratio of the number of entrants to incumbents is reported in percent. The last column shows *p*-values from a Chow *F*-test for structural breaks based on the number of entrants.

| Year | # Incumb. | # Entrants | # Entrants in CRSP fund styles | | | | $R_{VW}$ | Entrants/Incumb. | Chow *p*-val |
|---|---|---|---|---|---|---|---|---|---|
| | | | Agg. growth | Growth & sml gr. | Income | Growth & inc. | | | |
| 1981 | 354 | 1 | 0 | 1 | 0 | 0 | 0.96 | 0.28 | – |
| 1982 | 351 | 1 | 1 | 0 | 0 | 0 | 1.16 | 0.28 | – |
| 1983 | 376 | 18 | 11 | 4 | 1 | 1 | 1.42 | 4.79 | – |
| 1984 | 403 | 8 | 1 | 4 | 1 | 2 | 1.46 | 1.99 | – |
| 1985 | 423 | 7 | 3 | 2 | 2 | 0 | 1.92 | 1.65 | – |
| 1986 | 488 | 23 | 4 | 13 | 3 | 3 | 2.22 | 4.71 | – |
| 1987 | 556 | 30 | 6 | 11 | 6 | 6 | 2.26 | 5.40 | – |
| 1988 | 612 | 17 | 4 | 3 | 3 | 7 | 2.66 | 2.78 | – |
| 1989 | 681 | 16 | 1 | 5 | 2 | 1 | 3.42 | 2.35 | – |
| 1990 | 724 | 19 | 4 | 7 | 2 | 2 | 3.21 | 2.62 | 0.60 |
| 1991 | 879 | 35 | 5 | 12 | 2 | 8 | 4.29 | 3.98 | 0.41 |
| 1992 | 969 | 62 | 9 | 21 | 3 | 8 | 4.68 | 6.40 | 0.29 |
| 1993 | 1,285 | 157 | 30 | 45 | 5 | 23 | 5.22 | 12.22 | 0.17 |
| 1994 | 1,556 | 197 | 28 | 55 | 9 | 15 | 5.18 | 12.66 | 0.10 |
| 1995 | 1,774 | 145 | 20 | 49 | 5 | 14 | 7.02 | 8.17 | 0.06 |
| 1996 | 2,004 | 170 | 40 | 69 | 10 | 18 | 8.51 | 8.48 | 0.04 |
| 1997 | 2,249 | 201 | 45 | 61 | 8 | 21 | 11.09 | 8.94 | 0.02 |
| 1998 | 2,487 | 278 | 50 | 111 | 3 | 37 | 13.56 | 11.18 | 0.01 |
| 1999 | 2,577 | 140 | 34 | 58 | 2 | 22 | 16.99 | 5.43 | 0.04 |
| 2000 | 2,526 | 198 | 47 | 80 | 1 | 20 | 15.11 | 7.84 | 0.09 |
| 2001 | 2,610 | 117 | 27 | 56 | 1 | 8 | 13.41 | 4.48 | 0.17 |
| 2002 | 2,582 | 54 | 15 | 26 | 0 | 6 | 10.62 | 2.09 | 0.26 |
| 2003 | 2,482 | 38 | 3 | 25 | 1 | 5 | 14.13 | 1.53 | – |
| 2004 | 2,386 | 19 | 0 | 7 | 0 | 2 | 15.97 | 0.80 | – |
| 2005 | 2,201 | 19 | 1 | 10 | 0 | 7 | 17.14 | 0.86 | – |

only sum across incumbent-entrant pairs with non-zero overlap in holdings.

$$TruncMVO_{i,t} = \frac{1}{K}\sum_{j=1}^{K}\sum_{\tau=1}^{\theta_{i,j,t}} w_{\tau,t}. \tag{3}$$

By definition, $TruncMVO_{i,t}$ is larger in magnitude than $MVO_{i,t}$ but has the same basic properties. All our subsequent tests are conducted with both measures of overlap.

## 3. Results

### 3.1. Patterns of entry

Table 1 shows the time-series pattern in entry of new mutual funds and of incumbents over the sample period. The number of incumbents at the end of each calendar year (shown in column 2) increases from 354 in 1981 to more than 2000 by the late 1990s, after which it stabilizes somewhat. The number of entrants grows from one to 278 by the end of 1998. After 1998, there is a precipitous decline in the number of entrants, to the extent that there are only 19 entrants in our sample in 2005.[11] We also report the compounded value-weighted return starting from January 1, 1981 in the last column of the table. The correlation between the number of entrants per year and the aggregate market return is 0.56.

What appears to be a permanent decline in entry starting in the late 1990s is suggestive of an industry reaching capacity. That is, the first part of the sample period appears to be one in which funds find it profitable to enter. By the late 1990s, however, the decline in entry suggests that entry is no longer as profitable. This is perhaps best seen in the ratio of the number of entrants to incumbents, shown in the second-to-last column of the table. This ratio peaks in the early 1990s, after which it starts to decline. These changes in entry patterns are important because they suggest that entry's effect on incumbents' is likely to be larger in the latter part of the sample. To determine the appropriate place to split our sample, we calculate Chow F-statistics for each year after

[11] As discussed in Section 2.1, the number of entrants in Table 1 is smaller than what would be obtained by simply calculating entrants from the CRSP Mutual Fund database because of the holdings filter that we impose. However, the time-series pattern of entry is almost identical to that reported in Table 1. In both cases, the peak occurs in 1998. The correlation between the number of entrants in our sample and one without the holdings filter is 0.88. We verify that this filter does not create some sort of selection bias by checking the distribution of key variables (returns, management fees, loads, turnover, etc.) between the filtered and unconstrained samples. The differences in means and medians of these variables between the two samples are not statistically significant.

**Table 2**
Distribution and characteristics of incumbent-entrant overlap.
The sample includes 4116 unique funds between 1981 and 2005. In Panel A, median $\sigma$ is the time-series median of the cross-sectional standard deviation of $MVO_{i,t}$ and $TruncMVO_{i,t}$. Panel B shows time-series means of $MVO_{i,t}$ or $TruncMVO_{i,t}$ when incumbents are within the same Morningstar style and when they are across different styles. In Panels C and D, incumbents are sorted into deciles based on breakpoints for $MVO_{i,t}$ or $TruncMVO_{i,t}$ in each quarter. Fund characteristics are then averaged across funds in each portfolio. TNA is $ millions. Return is the quarterly net return. Flow is the net percentage quarterly flow, truncated at the top 1% level. Exp is the expense ratio (in percent) of incumbents during the year of entry. Turnover is the minimum of aggregate purchases or sales, divided by TNA during the year of entry. Load is the sum of front-end load and redemption charges (in percent). Age is in years.

***Panel A: Distribution of overlap measures***

| | 10th Percentile | Mean | Median | 90th Percentile | Median σ |
|---|---|---|---|---|---|
| $MVO_{i,t}$ | 0.0003 | 0.0537 | 0.0053 | 0.0869 | 0.1771 |
| $TruncMVO_{i,t}$ | 0.0011 | 0.2204 | 0.0179 | 0.2820 | 0.6295 |

***Panel B: Average overlaps within and across Morningstar style boxes***

| | $MVO_{i,t}$ | | | $TruncMVO_{i,t}$ | | |
|---|---|---|---|---|---|---|
| *Across* | Large | Mid | Small | Large | Mid | Small |
| Growth | 0.059 | 0.009 | 0.004 | 0.720 | 0.087 | 0.027 |
| Core | 0.010 | 0.011 | 0.006 | 0.086 | 0.072 | 0.037 |
| Value | 0.031 | 0.027 | 0.003 | 0.391 | 0.323 | 0.030 |
| *Within* | | | | | | |
| Growth | 0.092 | 0.003 | 0.001 | 1.153 | 0.146 | 0.058 |
| Core | 0.048 | 0.005 | 0.004 | 0.166 | 0.144 | 0.106 |
| Value | 0.047 | 0.013 | 0.001 | 0.864 | 0.522 | 0.055 |

***Panel C: $MVO_{i,t}$ deciles***

| | TNA | Return | Flow | Exp | Turnover | Load | Age |
|---|---|---|---|---|---|---|---|
| 1 (Low) | 3,131 | 1.90 | 3.92 | 1.22 | 0.67 | 2.32 | 14.93 |
| 2 | 1,507 | 2.61 | 6.91 | 1.14 | 0.79 | 2.59 | 15.19 |
| 3 | 853 | 2.97 | 7.16 | 1.16 | 0.87 | 2.50 | 14.41 |
| 4 | 513 | 2.68 | 2.71 | 1.19 | 0.94 | 2.48 | 13.54 |
| 5 | 347 | 2.83 | 3.86 | 1.20 | 0.91 | 2.42 | 12.73 |
| 6 | 221 | 2.97 | 4.07 | 1.24 | 0.95 | 2.32 | 11.80 |
| 7 | 147 | 2.78 | 11.62 | 1.26 | 0.96 | 2.29 | 10.95 |
| 8 | 92 | 2.72 | 8.34 | 1.31 | 0.98 | 2.11 | 10.00 |
| 9 | 56 | 2.68 | 48.78 | 1.39 | 0.99 | 2.00 | 9.17 |
| 10 (High) | 30 | 2.69 | 38.69 | 1.58 | 1.13 | 1.69 | 7.94 |

***Panel D: $TruncMVO_{i,t}$ deciles***

| | TNA | Return | Flow | Exp | Turnover | Load | Age |
|---|---|---|---|---|---|---|---|
| 1 (Low) | 3,522 | 2.00 | 3.33 | 1.16 | 0.69 | 2.40 | 16.11 |
| 2 | 1,389 | 2.66 | 11.32 | 1.10 | 0.80 | 2.65 | 15.58 |
| 3 | 742 | 2.91 | 2.11 | 1.14 | 0.87 | 2.46 | 14.32 |
| 4 | 450 | 2.70 | 2.94 | 1.20 | 0.91 | 2.46 | 13.23 |
| 5 | 307 | 2.91 | 3.70 | 1.21 | 0.92 | 2.38 | 12.29 |
| 6 | 195 | 2.84 | 4.39 | 1.24 | 0.93 | 2.35 | 11.59 |
| 7 | 134 | 2.81 | 11.29 | 1.26 | 0.96 | 2.22 | 10.68 |
| 8 | 85 | 2.67 | 44.90 | 1.32 | 0.99 | 2.10 | 9.77 |
| 9 | 51 | 2.67 | 15.55 | 1.41 | 0.99 | 2.05 | 9.10 |
| 10 (High) | 28 | 2.66 | 35.78 | 1.65 | 1.14 | 1.67 | 8.05 |

1990 and report $p$-values from this statistic in the last column of Table 1. This test indicates a structural break in the time-series in 1998 and as a result, we conduct our tests on the pre- and post-1998 subperiods, as well as the entire sample.

### 3.2. Overlap statistics

Before we proceed to our tests of competition, we provide some basic descriptive statistics on the overlap measures. Panel A of Table 2 shows the distribution of $MVO_{i,t}$ and $TruncMVO_{i,t}$ over the entire sample period. The median $MVO_{i,t}$ and $TruncMVO_{i,t}$ are 0.0053 and 0.0179, respectively, and in both cases, the means are much larger (0.0537 and 0.2204, respectively). In the last column we report the (time-series) median of the cross-sectional standard deviation of each variable in the quarter. In both cases, the median standard deviation is over three times the mean. This variation is important since it implies that for some incumbents, the overlap is very large; it is those incumbents for whom we expect the effects of competition to be important. Accordingly, in our main tests to follow, we use the median standard deviation of $MVO_{i,t}$ and $TruncMVO_{i,t}$ to gauge the economic significance of regression coefficients.

As described earlier, our overlap measures are indifferent to mutual fund investment style classifications. Nonetheless, to the extent that styles are (coarse) descriptors of expected competition between incumbents and entrants, one would expect our measures of overlap to be larger (smaller) for incumbents and entrants in the same (different) style. To check if this is the case, we calculate average values of $MVO_{i,t}$ and $TruncMVO_{i,t}$ within and across Morningstar styles. Panel B shows that in most cases, the average overlaps are indeed larger within, rather than across, styles. The results are stronger for $TruncMVO_{i,t}$ because zero-overlap holdings are excluded from the calculation.

In Panels C and D of Table 2, we sort incumbents into deciles based on the distribution of $MVO_{i,t}$ and $TruncMVO_{i,t}$, respectively, in each quarter. For each decile, we show the distribution of variables that we expect to be correlated with the overlap measures. For instance, we expect a mechanical correlation between both overlap measures and TNA; ceteris paribus, smaller incumbents are likely to have larger overlaps with entrants because they hold fewer securities. This is indeed the case as TNA decreases monotonically across deciles. Other variables are naturally correlated with fund size and therefore are correlated with $MVO_{i,t}$ and $TruncMVO_{i,t}$. Large funds are also typically older, have lower expense ratios because of economies of scale, and generally have lower turnover. As a result, funds with high measures of overlap display the exact opposite patterns—they are generally younger with higher expense ratios and turnover. Since many of these variables are jointly determined, it is important to know these systematic correlations and control for them in multivariate settings.

### 3.3. *The effects of competition*

Standard economic theory suggests that competitive entry should influence incumbent prices, revenues, costs, profitability, and potentially even survival. In this section, we explore each of these possible outcomes.

#### 3.3.1. *Price competition: changes in incumbent fees*

The revenue stream of a fund consists of assets under management multiplied by fees, analogous to quantity sold multiplied by price in industrial firms. It is well-known that competitive outcomes can be realized by Bertrand (price) or Cournot (quantity) mechanisms. The existing evidence of price competition between mutual funds generally examines average or aggregate expense ratios, and is mixed at best. For example, Sirri and Tufano (1998) report a decrease in the expense ratio (plus amortized loads) from 1.66% in 1971 to 1.37% in 1990. Similarly, Khorana and Servaes (2004) report a decrease in their sample from 1.4% in 1979 to 1.19% in 1998. But Barber, Odean, and Zheng (2005) report that asset-weighted average expense ratios increase from 0.54% in 1962 to 0.90% in 1999. Such diverse results could be because of sampling and methodological variations across these papers. But these are also general statements about the average or aggregate level of fees in the industry, rather than fees charged by individual funds. In contrast, our empirical approach to determining whether fee changes are related to competition directly goes after the intensity of competition (as measured by overlap). We regress post-entry changes in various measures of fees on lagged measures of overlap and control variables. As control variables, we include the size of the fund, the size of the family, fund age, turnover, and the standard deviation of the prior 12 month returns. Fund and family size are included to account for scale effects, and age picks up the effects of experience (Khorana, Servaes, and Tufano, 2005). We estimate these regressions using a Fama-MacBeth approach each quarter and present the time-series averages of the coefficients. *t*-Statistics are adjusted for serial correlation.[12]

We use the change in the management fee from quarter $t+1$ to quarter $t+8$ (i.e., the two-year change in the fee measured in basis points after entry takes place in quarter $t$) as the dependent variable. We use two-year changes because entry is determined relatively imprecisely, because we do not have strong priors on how quickly incumbents should respond, and because fee reductions require board approval and are therefore typically annual. The management fee is paid to the fund's advisor who has the latitude to increase or decrease the fee—thus, it represents a clean measure of the price of the services provided by the advisor.[13] These regressions are estimated for the post-1998 sample period because CRSP only reports management fees after 1998. Focusing on our variables of interest ($MVO_{i,t}$ and $TruncMVO_{i,t}$), the regressions in Panel A of Table 3 show a significant negative relation between our measures of overlap and future changes in fees. The regression estimates suggest that an one-standard-deviation change in the $MVO_{i,t}$ ($TruncMVO_{i,t}$) is related to a 3.2 (3.6) basis-point reduction in the management fee. The average management fee in our sample is 48 basis points so, in our view, this represents a meaningful change in fees.

For the post-1998 period, we can also calculate non-management fees by subtracting management fees from the expense ratio. Non-management fees include advertising costs, auditing and accounting costs, 12b-1 fees, custodial expenses, legal expenses, transfer agent expenses, and other administrative expenses. Ex ante, the effects of competition on the components of non-management fees are hard to sign. If entry increases demand for these ancillary services, one could imagine this causing an increase in non-management fees. On the other hand, if there is a commensurate increase in the supply of such ancillary services, non-management fees may remain the same (or perhaps drop). At an aggregate level, the data show neither: the regressions show no relation between changes in non-management fees and our measures of overlap.

[12] The alternative is to estimate regressions using panel data and control for fund-specific fixed effects. But our interest is in cross-sectional variation across funds due to overlap in inputs, rather than within-fund variation over time.

[13] Nominal fee increases require board and shareholder vote. Of course, a fund can effectively raise fees by not lowering them in response to competition, not having Asset Under Management (AUM) break-points, or in the case of multi-manager funds, receiving Securities Exchange Commission (SEC) exemptions.

**Table 3**
The effect of entry on changes in incumbent mutual fund fees.
In Panel A, Δ Mgmt fee, Δ Non-mgmt fee, Δ 12b-1 fees, Δ Load, and Δ Expense ratio (in basis points) are calculated from quarter $t+1$ to quarter $t+8$ after entry takes place in quarter $t$. Non-mgmt fee is calculated by subtracting management fees from the expense ratio. Loads are defined as the sum of maximum front- and back-end sales charges. Panel B shows logistic regressions predicting the probability that a fund uses a fee waiver, and Ordinary Least Square (OLS) regressions of the magnitude of fee waivers (in percent and winsorized at the 99th percentile). Log(family)$_t$ is the size of the family to which the fund belongs. Standard deviation of returns is based on the monthly returns during the prior year of entry. Pre-waiver expense$_t$ is the expense ratio in the year prior to the waiver. The Waiver dummy$_t$ is a dummy variable equal to one if the fund used a waiver in the prior year. With the exception of the logistic regressions (which use year dummies), all specifications are estimated using Fama-MacBeth procedures. $t$-Statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates.

***Panel A: Changes in various fee measures***

| | Δ Mgmt fee | | Δ Non-mgmt fee | | Δ 12b-1 fee | | Δ Load | | Δ Expense ratio | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Pre-1998 | | Post-1998 | |
| Intercept | −19.126 | −17.562 | −54.168 | −53.635 | 1.145 | −2.346 | 7.771 | 7.208 | −9.174 | −9.206 | −7.008 | −7.035 |
| | (−2.78) | (−2.57) | (−3.98) | (−3.91) | (3.06) | (−5.02) | (3.51) | (3.31) | (−2.98) | (−2.99) | (−3.84) | (−3.83) |
| $MVO_{i,t}$ | −17.921 | – | −8.925 | – | 4.546 | – | −13.343 | – | −13.282 | – | −13.280 | – |
| | (−2.21) | | (−0.89) | | (3.23) | | (−1.96) | | (−0.65) | | (−1.17) | |
| $TruncMVO_{i,t}$ | – | −6.026 | – | −4.303 | – | 2.129 | – | −4.805 | – | −8.243 | – | −6.024 |
| | | (−1.95) | | (−1.03) | | (2.64) | | (−1.84) | | (−0.91) | | (−0.97) |
| Log (TNA)$_t$ | 0.037 | −0.226 | 6.009 | 5.927 | 0.032 | −0.059 | −1.467 | −1.403 | 0.540 | 0.551 | 1.269 | 1.255 |
| | (0.05) | (−0.28) | (4.76) | (4.59) | (0.41) | (−1.08) | (−5.82) | (−5.81) | (1.54) | (1.56) | (4.74) | (4.72) |
| Log (family)$_t$ | −0.929 | −0.911 | −1.411 | −1.442 | −0.154 | −0.077 | −0.501 | −0.508 | −0.262 | −0.260 | −0.917 | −0.917 |
| | (−1.89) | (−1.86) | (−3.27) | (−3.41) | (−3.37) | (−2.91) | (−1.99) | (−2.01) | (−1.33) | (−1.32) | (−6.56) | (−6.58) |
| Log (age)$_t$ | 7.662 | 7.721 | 14.078 | 14.129 | 0.272 | 0.399 | −2.087 | −2.066 | −2.164 | −2.118 | −0.160 | −0.132 |
| | (2.16) | (2.18) | (3.62) | (3.63) | (4.67) | (6.31) | (−9.52) | (−9.42) | (−3.97) | (−4.03) | (−0.22) | (−0.18) |
| Turnover$_t$ | 2.787 | 2.785 | 0.712 | 0.679 | 0.122 | 0.204 | 0.858 | 0.835 | 0.123 | 0.128 | −0.986 | −0.992 |
| | (3.48) | (3.48) | (0.36) | (0.34) | (1.92) | (2.69) | (3.12) | (3.09) | (0.27) | (0.28) | (−1.31) | (−1.32) |
| Std. dev. of returns$_t$ | 8.051 | 8.291 | −43.834 | −43.664 | −4.784 | −4.852 | 50.304 | 52.584 | 50.815 | 48.876 | −110.43 | −110.90 |
| | (0.35) | (0.37) | (−1.82) | (−1.79) | (−3.05) | (−4.04) | (4.61) | (4.77) | (2.45) | (2.42) | (−3.45) | (−3.46) |

***Panel B: Fee waivers***

| | Prob (waiver) | | Magnitude of fee waiver | |
|---|---|---|---|---|
| Intercept | 20.229 | 20.249 | 0.266 | 0.263 |
| | (0.21) | (0.23) | (10.64) | (10.74) |
| $MVO_{i,t}$ | 0.568 | – | 1.221 | – |
| | (2.89) | | (3.03) | |
| $TruncMVO_{i,t}$ | – | 0.232 | – | 0.357 |
| | | (2.46) | | (5.83) |
| Pre-waiver expense$_t$ | 0.062 | 0.062 | 0.061 | 0.059 |
| | (2.58) | (2.59) | (6.07) | (6.08) |
| Waiver Dummy$_t$ | 0.436 | 0.443 | 0.054 | 0.054 |
| | (5.91) | (5.93) | (5.49) | (5.51) |
| Return$_t$ | −0.198 | −0.194 | −0.087 | −0.086 |
| | (−2.63) | (−2.58) | (−5.31) | (−5.29) |
| Log (TNA)$_t$ | −0.089 | −0.092 | −0.028 | −0.028 |
| | (−6.51) | (−6.91) | (−5.05) | (−5.29) |
| Log (age)$_t$ | −2.231 | −2.233 | −0.002 | −0.002 |
| | (−8.24) | (−8.30) | (−0.72) | (−0.65) |
| Log(family)$_t$ | −0.598 | −0.584 | −0.008 | −0.007 |
| | (−10.92) | (−10.02) | (−4.07) | (−3.76) |
| Front-end load$_t$ | −0.595 | −0.615 | −0.035 | −0.035 |
| | (−3.16) | (−3.20) | (−3.54) | (−4.55) |

Ideally, one would like separate data on each of the components of non-management fees. While such data are not available, we can examine distribution costs, arguably the largest component of non-management fees. Distribution costs show up in loads or 12b-1 fees. The former are not included in non-management fees (and hence, the expense ratio) but the latter are. To investigate whether competition has affected distribution costs, we report similar regressions for changes in 12b-1 fees and changes in loads. These regressions show that changes in loads are negatively related to overlap while 12b-1 fees are positively related.[14] In unreported regressions, total distribution costs (12b-1 fees plus loads) are positively related to our overlap measures, indicating that the effect

[14] As in Sirri and Tufano (1998), we use the sum of front- and back-end loads, amortized over a seven-year holding period. We also estimate (but do not report), Tobit regressions. Results are similar to those reported.

of competition between funds is an increase in distribution costs, which appear to be passed on to the consumer.

The last four columns in Panel A of Table 3 show regressions of changes in expense ratios on our measures of overlap. Since these data are available for the full-time series, we show regressions for the pre- and post-1998 sample period. The regressions show no relation between changes in expense ratios and $MVO_{i,t}$ or $TruncMVO_{i,t}$ in either subperiod. This is not surprising for at least two reasons. First, the expense ratio is the sum of management and non-management fees, and the latter adds noise to the measurement of the dependent variable as a measure of prices. Second, as an empirical matter, the unconditional correlation between two-year changes in the management fee and non-management fees is $-0.84$ for the entire panel, and the average fund-by-fund correlation across all funds is $-0.30$. This implies that in the regressions, increases in non-management fees (mostly distribution costs) offset decreases in management fees, so that expense-ratio regressions show no statistical relation with overlaps.

The management fees and expense ratios reported by CRSP are reported net of fee waivers and reimbursements. But waivers are interesting in and of themselves. Consider, for example, a fund that has a gross management fee of 100 basis points in quarters $t$ and $t+4$, and waivers of 20 basis points in both years. The change in the net management fee reported by CRSP between these two years is zero, implying no change in prices. But the fact that the fund employed a waiver in both years can be viewed as a reduction in price and may reflect the effects of competition. To get at these issues, we also examine waivers separately.[15] In Panel B of Table 3, we estimate logistic regressions that predict whether a fund employs a fee waiver. The dependent variable is equal to one if a fund claims a fee waiver in that year, and zero otherwise. For control variables, we follow Christoffersen (2001) and include fund size, age, prior year return, family fund size, and a dummy variable equal to one if a fund has a front-end load. We also include year dummies but do not report them. The coefficient on $MVO_{i,t}$ is 0.568 with a $Z$-statistic of 2.89. The coefficient on $TruncMVO_{i,t}$ is smaller (0.232) and has a $z$-statistic of 2.46. Converting the coefficient on $MVO_{i,t}$ to an implied probability with all variables set equal to their means, an one-standard-deviation increase in $MVO_{i,t}$ ($TruncMVO_{i,t}$) increases the implied probability of using a fee waiver from the baseline level of 20% to 24% (26%). In the last two columns of the panel, we estimate Fama-MacBeth cross-sectional regressions of the magnitude of the fee waiver on the same set of variables. For these regressions, only funds with positive waivers are included since we wish to capture the cross-sectional variation in the magnitude of fee waivers. Once again, $MVO_{i,t}$ and $TruncMVO_{i,t}$ are positively related to the magnitude of the fee waiver; the coefficients are large and highly statistically significant. An one-standard-deviation increase in $MVO_{i,t}$ ($TruncMVO_{i,t}$) leads to a 21 (22) basis-point increase in the fee waiver.[16]

Waivers, like coupons or rebates used in consumer and durable goods industries, could be temporary reductions in price (ubiquitous examples include coupons for cereals and rebates for automobiles). To determine if this is the case, we examine the dynamics of fee changes. Fig. 1 separates the expense ratio into management and non-management fees and tabulates the percentage of funds in which fees increase, decrease, or stay the same relative to the prior year. Since the separation requires data on management fees, the figure is only generated from data after 1998. The data show that there is an increase (decrease) in the management fee in 45% (38%) of the cases (it is unchanged in the remaining 17%). Of the cases in which management fees decline relative to the prior year, 80% of those declines are due to permanent (contractual) changes to the management fee. The remainders (20%) are affected via a fee waiver.[17] Of these, the vast majority, 85% and 78%, respectively, are continued in the next one or two years. Our sample shrinks as we move forward in time, but if we look four years after the introduction of the waiver, 50% are continued. Thus, to the extent that the waiver is reapplied year-after-year, it represents a de facto permanent change in fees, albeit one with some flexibility. Even in cases where the waiver is reversed in the following year, in 44% of those cases, the management fee is permanently reduced. In other words, when the waiver is reversed, it is frequently because the management fee has been permanently (contractually) reduced.

Our last set of tests of price competition consists of regressions of before-expense performance on expense ratios. Gil-Bazo and Ruiz-Verdu (2009) argue that in equilibrium, after-fee performance should be equalized across funds so that a regression of before-fee performance on fees should have a slope of one. They find a negative relation for funds between 1961 and 2003, and argue that this is because a fraction of investors do not respond to differences in after-fee performance, and because funds take advantage of this sluggishness by charging higher fees. The conclusion that they draw from these results is that mutual fund markets are less than competitive. We replicate their regressions and find that

[15] As a preliminary exercise, we first sort incumbents into deciles based on either $MVO_{i,t}$ or $TruncMVO_{i,t}$ and then calculate the percentage of funds in each decile that waive some portion of their fees, as well as the median fee waiver. When deciles are formed based on $MVO_{i,t}$, the percentage of funds using fee waivers increases from 12.22% in decile 1 to 24.54% in decile 10. The increase is monotonic across all deciles but the vast majority of the increase occurs between deciles 1 and 2. This is because decile 1 contains large funds, and fund size is negatively correlated with the propensity to waive fees. The median fee waiver also increases across deciles, from a low of 5.6 basis points in decile 1 to a high of 50.3 basis points in decile 10. We do not report the above decile-based results in a table but they are available upon request.

[16] Another alternative is to include all funds in the regression and use a Tobit model to account for censoring. Although we do not report the full set of results, such regressions also have positive coefficients on $MVO_{i,t}$ and $TruncMVO_{i,t}$. The coefficient on the former (latter) is 1.3 (0.4) with a $t$-statistic of 2.7 (2.3).

[17] This is lower than the rates reported by Christoffersen (2001) and Coates and Hubbard (2007). There are two reasons for the differences. First, the samples across all three studies are quite different. Second, since our analysis is at the fund-level, we combine funds with different share classes (which means that if all three classes waiver fees, we only count that as one waiver).

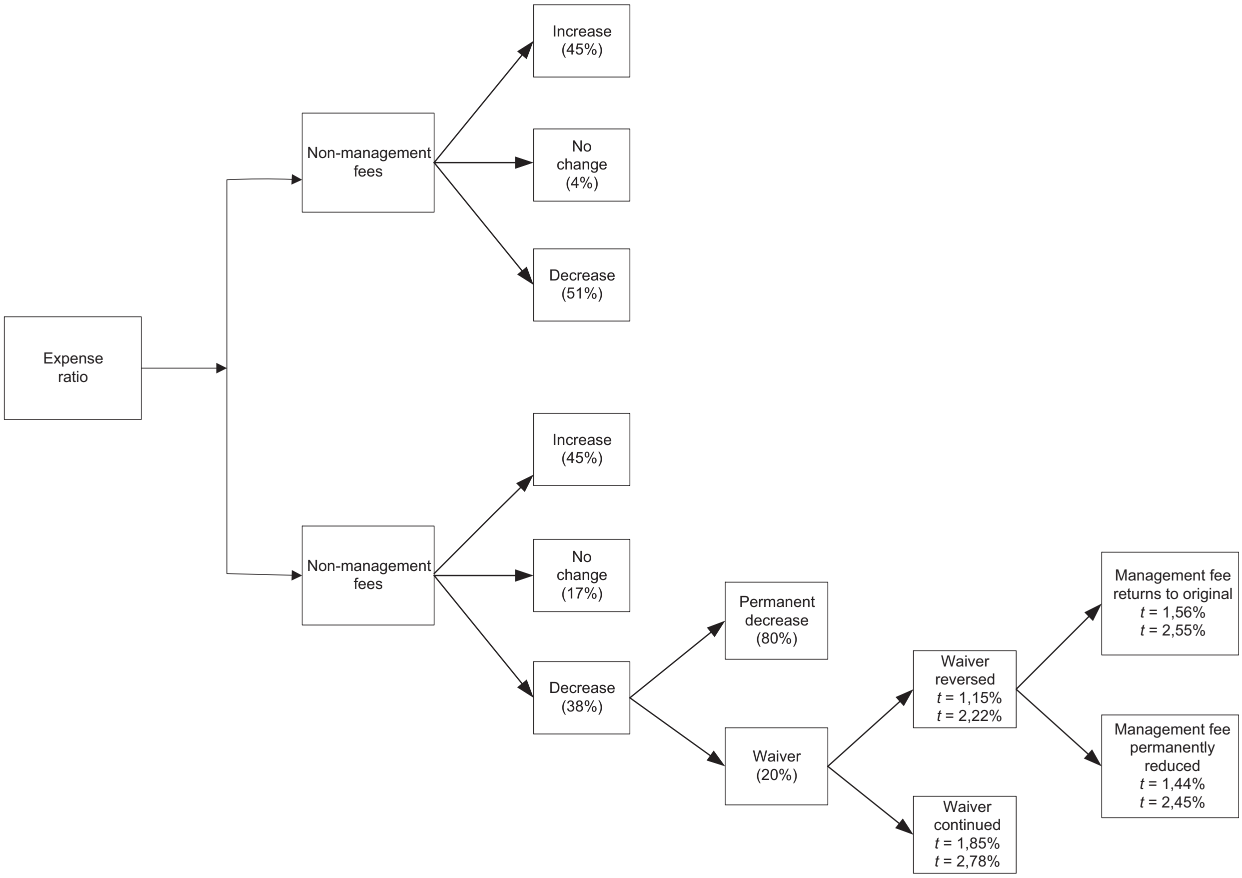


**Fig. 1.** Evolution of changes in fees for mutual funds in the post-1998 period. Non-management fees are calculated by subtracting management fees from the expense ratio. Each cell shows the percentage of incumbent funds for which fees are increased, decreased, or stayed the same after the entry. In the case of management fees decreases, we separate funds into whether the fees are reduced permanently or the fees are reduced through waivers. If the waiver is used, we look ahead to examine whether the waiver is reversed or continued one and two years after the entry. If the waiver is reversed, we examine whether the management fees after the reversion are permanently reduced or return to the same level before the entry. Fund-level fees are calculated as the average of share-class level fees. *t* presents the number of years after the entry.

the coefficients on expense ratios are indeed negative in the pre-1998 period. Using the four-factor model, the regression coefficient on fees is $-0.750$ with a $p$-value of 0.08. However, in the post-1998 period, the coefficients are small (and positive) with large standard errors; using the four-factor model, the coefficient on the expense ratio is 0.079 with a $p$-value of 0.89. What does one conclude from all these tests? On the prices over which managers have direct control (management fees and waivers), the effects of competition appear to be strong. Non-management fees, on the other hand, are not as responsive, mostly because distribution costs (bundled in 12b-1 fees) are positively correlated with overlap. Thus, while there is evidence of competition at work, it is less clear that the benefits have been passed on to consumers.

### 3.3.2. *Quantity competition: flows*

We measure net flows using the Sirri and Tufano (1998) approach, except that we cumulate four quarterly flows in the year after entry to obtain annual flows. As before, we estimate regressions of net flows on our measures of overlap and control variables each quarter, and report the time-series average of the coefficients. Because of the correlations shown in Table 2, we include prior-year measures of size (TNA), age, expenses, turnover, front-end loads, and the standard deviation of the prior 12 monthly returns as control variables.

Table 4 presents the results of these regressions for the full sample, as well as for the pre- and post-1998 subperiods. Under supply-side competition, we expect incumbent funds with high measures of overlap to have lower future flows. But this relation is likely to be influenced by the well-known asymmetry between flows and past returns. For incumbents with high prior-period returns and high overlap with entrants, it is entirely possible that higher flows due to improved performance offset lower flows due to increased competition. Because of this asymmetry, we include an interaction term between our overlap measures and the return quintile ranking of the fund. Following Sirri and Tufano (1998), the return rank variable is defined as zero for funds in the bottom quintile of performance (over the prior 12 months), one for funds in the middle 60%, and two for funds in the top 20%. In the pre-1998 period, our measures of overlap are unrelated to

**Table 4**
The effect of entry on incumbent mutual fund flows.
This table presents regressions of incumbent mutual fund flows in the year after entry on measures of overlap between incumbents and entrants, as well as control variables. Regressions are estimated quarterly and the table presents the time-series averages of the coefficients. Return_rank is equal to zero for funds in the bottom 20% of performance (over the prior 12 months), one for funds in the middle 60%, and two for funds in the top 20%. The definitions of control variables are the same as in earlier tables. Fama-MacBeth $t$-statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates.

| | Full sample | | Pre-1998 | | Post-1998 | |
|---|---|---|---|---|---|---|
| Intercept | 0.145 | 0.165 | 0.136 | 0.133 | 0.163 | 0.168 |
| | (5.17) | (5.23) | (3.69) | (3.65) | (3.83) | (4.02) |
| $MVO_{i,t}$ | 1.255 | – | 1.945 | – | −0.345 | – |
| | (0.97) | | (0.98) | | (−2.29) | |
| $TruncMVO_{i,t}$ | – | 0.852 | – | 1.311 | – | −0.153 |
| | | (0.99) | | (0.99) | | (−2.04) |
| Return_rank$_t$ | 0.148 | 0.154 | 0.147 | 0.153 | 0.155 | 0.157 |
| | (12.06) | (12.64) | (9.21) | (9.84) | (7.83) | (7.87) |
| $MVO_{i,t}$*Return_rank$_t$ | −6.031 | – | −9.423 | – | 0.201 | – |
| | (−0.94) | | (−0.95) | | (2.14) | |
| $TruncMVO_{i,t}$*return_rank$_t$ | – | −4.273 | | −6.552 | – | 0.058 |
| | | (−0.99) | | (−0.98) | | (2.16) |
| Log (TNA)$_t$ | −0.025 | −0.025 | −0.027 | −0.028 | −0.021 | −0.021 |
| | (−13.65) | (−13.58) | (−10.58) | (−10.33) | (−11.27) | (−12.14) |
| Log (age)$_t$ | −0.065 | −0.065 | −0.057 | −0.057 | −0.079 | −0.080 |
| | (−14.51) | (−14.55) | (−9.92) | (−9.97) | (−12.62) | (−12.62) |
| Expense ratio$_t$ | −0.284 | −0.401 | −0.023 | −0.154 | −0.771 | −0.861 |
| | (−0.48) | (−0.68) | (−0.03) | (−0.18) | (−1.65) | (−1.83) |
| Turnover$_t$ | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.014 |
| | (3.75) | (3.84) | (2.68) | (2.74) | (3.15) | (3.25) |
| Front-end load$_t$ | 0.192 | 0.194 | 0.067 | 0.065 | 0.424 | 0.431 |
| | (2.18) | (2.20) | (0.56) | (0.57) | (3.89) | (3.93) |
| Std. deviation of returns$_t$ | 0.373 | 0.354 | 0.365 | 0.345 | 0.387 | 0.372 |
| | (0.96) | (0.92) | (0.69) | (0.65) | (0.76) | (0.73) |
| Adjusted $R^2$ | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.08 |

post-entry incumbent flows. In the post-1998 subperiod, however, there is a negative relation between flows and overlap. The coefficient on $MVO_{i,t}$ ($TruncMVO_{i,t}$) is −0.345 (−0.153) with a $t$-statistic of −2.29 (−2.04). For a fund in the bottom quintile of performance, a-one-standard deviation increase in $MVO_{i,t}$ is associated with flows that are lower by 6.1%.

Our results thus far show some evidence of price competition as well as some evidence of quantity competition. But quantity-based equilibration could occur with a lag because investors face transaction costs in moving capital from one fund to another. For instance, loads create switching costs for investors. Without instantaneous equilibration, the interaction between price and quantity could be important such that the effects of competition reveal themselves in changes in incumbents' sensitivity of flows to fees. In other words, in providing capital, investors may be more sensitive to price (fees) if they can find close substitutes (funds with high overlap). To test this hypothesis, we estimate regressions analogous to those in Table 4 but include an interaction term between $MVO_{i,t}$ and $TruncMVO_{i,t}$ and the expense ratio. We expect that funds with high overlap and high fees should have lower flows (i.e., a negative coefficient on the interaction). We do not display the results in a separate table to conserve space, but consistent with our expectation, the coefficient on the interaction term between $MVO_{i,t}$ ($TruncMVO_{i,t}$) and the expense ratio is −20.05 (−2.83) with a $t$-statistic of −3.15 (−2.48).

### 3.3.3. Incumbent costs

Earlier tables show that incumbent non-management expenses are not influenced by entry. However, trading costs could be influenced by competition as entrants vie for the same set of securities as incumbents. Without proprietary data, we have no direct way of measuring post-entry incumbent trading costs. But, we can obtain an estimate of net total costs via an approach proposed by Kacperczyk, Sialm, and Zheng (2008). They calculate a return gap as the difference between the return delivered by the mutual fund and the return of a buy-and-hold portfolio that invests in the same securities as the fund. Naturally, this return gap includes both benefits and costs. As examples of benefits, Kacperczyk, Sialm, and Zheng (2008) cite positive returns from intra-quarter trading, securities lending, and preferential allocations of underpriced Initial Public Offerings (IPOs). Costs consist largely of trade execution (price impact) costs, commissions, as well as (potentially) agency costs. It is impossible to disentangle each of these costs and benefits but the only component of the return gap that is likely to change because of entry is trading costs.[18] Assuming that the return gap is an unbiased albeit noisy proxy for trading costs, if trading costs of incumbents' rise after entry, our overlap measures may be negatively correlated with future return gaps.

[18] Consistent with this, Kacperczyk, Sialm, and Zheng (2008) report that the return gap is persistent for up to five years.

**Table 5**
The effect of entry on incumbent return gaps.
The return gap is the difference between the reported return and the return on a portfolio that invests in disclosed holdings Kacperczyk, Sialm, and Zheng (2008). $RG_{t+4}$ is measured from quarter $t$+1 to quarter $t$+4 after entry takes place in quarter $t$. $RG_{t+8}$ is measured from quarter $t$+5 to quarter $t$+8. Regressions are estimated quarterly and the table presents the time-series averages of the coefficients. The definitions of control variables are the same as in earlier tables. Fama-MacBeth $t$-statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates.

| | Full sample | | Pre-1998 | | Post-1998 | |
|---|---|---|---|---|---|---|
| | $RG_{t+4}$ | $RG_{t+8}$ | $RG_{t+4}$ | $RG_{t+8}$ | $RG_{t+4}$ | $RG_{t+8}$ |
| ***Panel A: Overlap measured using $MVO_{i,t}$*** | | | | | | |
| Intercept | −0.029 | −0.025 | −0.036 | −0.033 | −0.015 | −0.008 |
| | (−5.35) | (−5.29) | (−4.83) | (−5.74) | (−2.55) | (−1.15) |
| $MVO_{i,t}$ | −0.049 | −0.045 | −0.044 | −0.040 | −0.058 | −0.053 |
| | (−2.20) | (−1.88) | (−1.60) | (−1.18) | (−1.52) | (−2.12) |
| $Flows_t$ | −0.002 | −0.002 | −0.002 | −0.005 | −0.001 | 0.003 |
| | (−1.73) | (−1.16) | (−1.46) | (−2.02) | (−2.02) | (1.47) |
| Log $(TNA)_t$ | −0.002 | −0.002 | −0.002 | −0.002 | −0.003 | −0.002 |
| | (−5.54) | (−4.87) | (−3.48) | (−4.63) | (−5.21) | (−2.00) |
| Log $(age)_t$ | 0.000 | −0.001 | 0.001 | 0.000 | −0.002 | −0.002 |
| | (0.20) | (−1.29) | (0.97) | (0.19) | (−2.45) | (−3.11) |
| $Expenses_t$ | −0.103 | 0.098 | 0.012 | −0.001 | −0.331 | 0.292 |
| | (−0.72) | (0.61) | (0.06) | (−0.01) | (−1.46) | (1.02) |
| $Turnover_t$ | −0.001 | −0.002 | −0.001 | −0.003 | −0.001 | −0.001 |
| | (−1.99) | (−3.27) | (−1.54) | (−3.66) | (−1.28) | (−0.83) |
| $Log(family)_t$ | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | (5.92) | (6.24) | (3.46) | (4.77) | (8.07) | (4.25) |
| Std. deviation of $returns_t$ | 0.483 | 0.416 | 0.538 | 0.592 | 0.378 | 0.070 |
| | (6.20) | (6.47) | (5.22) | (7.56) | (3.37) | (0.86) |
| Adjusted $R^2$ | 0.071 | 0.070 | 0.082 | 0.081 | 0.049 | 0.046 |
| ***Panel B: Overlap measured using $TruncMVO_{i,t}$*** | | | | | | |
| Intercept | −0.028 | −0.025 | −0.128 | −0.033 | −0.014 | −0.008 |
| | (−5.24) | (−5.22) | (−4.77) | (−5.62) | (−2.41) | (−1.14) |
| $TruncMVO_{i,t}$ | −0.037 | −0.015 | −0.04 | −0.012 | −0.027 | −0.022 |
| | (−2.09) | (−1.09) | (−1.72) | (−0.56) | (−1.32) | (−2.40) |
| $Flows_t$ | −0.001 | −0.002 | −0.002 | −0.005 | −0.001 | 0.003 |
| | (−1.69) | (−1.17) | (−1.41) | (−2.02) | (−2.05) | (1.48) |
| $Log(size)_t$ | −0.002 | −0.002 | −0.002 | −0.002 | −0.003 | −0.002 |
| | (−5.94) | (−4.88) | (−3.85) | (−4.55) | (−5.13) | (−2.09) |
| $Log(age)_t$ | 0.000 | −0.001 | 0.001 | 0.000 | −0.002 | −0.002 |
| | (0.16) | (−1.15) | (0.92) | (0.30) | (−2.48) | (−3.07) |
| $Expenses_t$ | −0.092 | 0.108 | 0.026 | 0.014 | −0.325 | 0.292 |
| | (−0.66) | (0.68) | (0.14) | (0.07) | (−1.45) | (1.03) |
| $Turnover_t$ | −0.001 | −0.002 | −0.001 | −0.003 | −0.001 | −0.001 |
| | (−2.05) | (−3.29) | (−1.60) | (−3.68) | (−1.28) | (−0.84) |
| $Log(family)_t$ | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | (5.86) | (6.22) | (3.41) | (4.71) | (8.00) | (4.31) |
| Std. deviation of $returns_t$ | 0.490 | 0.416 | 0.548 | 0.591 | 0.378 | 0.071 |
| | (6.22) | (6.40) | (5.26) | (7.43) | (3.34) | (0.87) |
| Adjusted $R^2$ | 0.072 | 0.070 | 0.084 | 0.082 | 0.049 | 0.046 |

We calculate the return gap for each incumbent in the first and second year following entry, by compounding the quarterly return gap (from quarter $t$+1 to $t$+4, and from quarter $t$+5 to $t$+8, respectively). We use this two-year period because we do not have any a priori belief about how quickly competition for securities will be realized in incumbent-level costs. Our empirical modus operandi is as before: we estimate regressions of the return gap on each of our overlap measures every quarter and adjust $t$-statistics for serial correlation. Following Kacperczyk, Sialm, and Zheng (2008), we include fund flows, size, age, expenses, turnover ratio, affiliated family size, and the standard deviation of fund returns as control variables.

The results of these regressions are reported in Table 5. Panel A (B) shows regressions in which the overlap measure is $MVO_{i,t}$ ($TruncMVO_{i,t}$). In Panel A, the return gap is negatively correlated with $MVO_{i,t}$ over the entire sample period, at least in year one following entry (and in a more marginal sense in year two as well).[19] But again, these effects are pronounced in the post-1998 subperiod. Here, both coefficients on $MVO_{i,t}$ are negative, but only statistically significant in the second year after entry. The same is true for $TruncMVO_{i,t}$. Thus, there is some weak evidence that incumbent-entrant overlap is negatively related to future return gaps.

[19] The return gap is stated as a net benefit, rather than a cost. So a negative coefficient on $MVO_{i,t}$ implies that more competition is correlated with lower net benefits (or larger costs).

**Table 6**
Regression of post – entry incumbent alpha.
We estimate the alpha of each incumbent in the 36-month period after entry quarter using the four-factor Carhart (1997) approach. Estimated alphas (in percent) are then regressed on measures of overlap between incumbents and entrants, as well as control variables. The definitions of control variables are the same as in earlier tables. Regressions are estimated quarterly and the table presents the time-series averages of the coefficients. Fama-MacBeth $t$-statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates.

| | Full sample | | Pre-1998 | | Post-1998 | |
|---|---|---|---|---|---|---|
| Intercept | 0.244 | 0.242 | 0.249 | 0.250 | 0.232 | 0.224 |
| | (12.48) | (12.54) | (10.96) | (11.07) | (6.01) | (5.97) |
| $MVO_{i,t}$ | −0.047 | – | 0.051 | – | −0.276 | – |
| | (−0.41) | | (0.32) | | (−3.85) | |
| $TruncMVO_{i,t}$ | – | −0.031 | – | −0.021 | – | −0.055 |
| | | (−0.33) | | (−0.15) | | (−2.48) |
| $\text{Flows}_t$ | −0.027 | −0.027 | −0.038 | −0.037 | −0.002 | −0.002 |
| | (−2.32) | (−2.32) | (−2.31) | (−2.31) | (−0.61) | (−0.62) |
| $\text{Log(size)}_t$ | −0.016 | −0.016 | −0.013 | −0.013 | −0.025 | −0.024 |
| | (−5.96) | (−5.77) | (−4.85) | (−4.64) | (−3.76) | (−3.62) |
| $\text{Log(age)}_t$ | −0.021 | −0.022 | −0.025 | −0.026 | −0.013 | −0.013 |
| | (−4.89) | (−4.89) | (−5.37) | (−5.39) | (−1.35) | (−1.32) |
| $\text{Expenses}_t$ | −13.339 | −13.294 | −15.420 | −15.392 | −8.484 | −8.399 |
| | (−14.66) | (−14.58) | (−14.04) | (−13.99) | (−7.50) | (−7.43) |
| $\text{Turnover}_t$ | 0.003 | 0.004 | 0.003 | 0.003 | 0.006 | 0.005 |
| | (0.60) | (0.61) | (0.37) | (0.38) | (0.55) | (0.54) |
| Adjusted $R^2$ | 0.055 | 0.057 | 0.059 | 0.062 | 0.046 | 0.045 |

### 3.3.4. Incumbent performance

If entry affects incumbent costs, then the post-entry performance of incumbent funds should be lower for those with larger overlap. To determine if that is the case, we first estimate the alpha of each incumbent in the 36-month period after entry using the Carhart (1997) four- factor model. Estimated alphas are then regressed on our measures of overlap, along with control variables. Table 6 shows the time-series averages of coefficients from these regressions estimated each quarter.[20] In the full sample period, neither measure of overlap appears to be related to future fund performance. But as with our earlier results, in the post-1998 subperiod, there is a significant negative association between the overlap measures and fund alphas. The coefficient on $MVO_{i,t}$ ($TruncMVO_{i,t}$) is $-0.276$ ($-0.055$) with a $t$-statistic of $-3.85$ ($-2.48$). In terms of economic magnitude, a-one-standard deviation increase in $MVO_{i,t}$ decreases subsequent four-factor alphas by 0.05% per month.

Although four-factor alphas are a widely accepted metric used to measure mutual fund performance, we also employ a measure of excess returns based on holdings. Following Daniel, Grinblatt, Titman, and Wermers (DGTW, 1997), we calculate the “excess” return of a fund as the difference between a fund’s hypothetical return based on its holdings and the returns of a benchmark portfolio in which each security is matched with a passive portfolio based on size, book-to-market ratio, and momentum.[21] This helps us assess the robustness of the results in Table 7 and also allows us to measure excess returns over a shorter horizon. In addition, the holding return can be decomposed into its constituent components.

$$HR_t = CS_t + CT_t + AS_t, \tag{4}$$

where $CS_t$ is a characteristic selectivity measure, $CT_t$ is a characteristic timing measure, and $AS_t$ is an average style measure. If the decline in performance is driven by competition for the underlying securities, then we expect our overlap measures to be negatively correlated with the selectivity component ($CS_t$). Table 7 presents regressions of the excess holding return ($HR_t$) and its constituent components on our overlap measures and control variables. Panel A presents results using $MVO_{i,t}$ and Panel B contains results for $TruncMVO_{i,t}$.

Consistent with the four-factor model results in Table 6, post-entry excess returns are negatively related to both overlap measures. And, as before, the effects are only statistically significant in the post-1998 subperiod. The results of regressions of the three return components show that the negative relation between the excess holding return and the overlap measures appears to be driven entirely by the selectivity component of returns. In fact, when $CT_{t+1}$ and $AS_{t+1}$ are used as dependent variables, neither overlap measure is statistically significant in any subperiod. In contrast, the relation between $CS_{t+1}$ and $MVO_{i,t}$ (or $TruncMVO_{i,t}$) is quite robust and economically large. For instance, a-one-standard deviation increase in $MVO_{i,t}$ decreases the subsequent $HR_{t+1}$ ($CS_{t+1}$) return by 0.92% (0.28%) per year.

### 3.3.5. Survival

We start our examination of exit by first sorting all incumbents into deciles based on $MVO_{i,t}$ and $TruncMVO_{i,t}$ in each quarter. We then calculate attrition rates for each decile,

[20] If higher overlap also causes future attrition (which we show in the next section), then alphas cannot be estimated for the worst performing funds that die since returns are unavailable for the entire 36-month period. This renders our results conservative since it biases us against finding any connection between post-entry alphas and measures of overlap.

[21] The DGTW benchmarks are available via http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.htm.

**Table 7**

Regressions of post-entry incumbent characteristics-based returns.

We estimate the characteristic-based return of each incumbent in the quarter after entry following Daniel, Grinblatt, Titman, and Wermers (1997). This holding based return (HR) is decomposed into three components: CS (reflecting stock selectivity), CT (reflecting timing), and AS (reflecting style). These four are then regressed on measures of overlap between incumbents and entrants, as well as control variables. Regressions are estimated quarterly and the table presents the time-series averages of the coefficients. Fama-MacBeth $t$-statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates.

| | Full sample | | | | Pre-1998 | | | | Post-1998 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $HR_{t+1}$ | $CS_{t+1}$ | $CT_{t+1}$ | $AS_{t+1}$ | $HR_{t+1}$ | $CS_{t+1}$ | $CT_{t+1}$ | $AS_{t+1}$ | $HR_{t+1}$ | $CS_{t+1}$ | $CT_{t+1}$ | $AS_{t+1}$ |
| ***Panel A: Overlap measured using $MVO_{i,t}$*** | | | | | | | | | | | | |
| Intercept | −0.010 | −0.046 | 0.009 | 0.027 | −0.021 | −0.068 | 0.014 | 0.034 | 0.010 | −0.005 | −0.002 | 0.016 |
| | (−0.29) | (−0.94) | (0.47) | (3.47) | (−0.40) | (−0.92) | (0.51) | (3.13) | (0.53) | (−0.18) | (−0.10) | (1.52) |
| $MVO_{i,t}$ | −0.048 | −0.069 | −0.002 | 0.025 | −0.067 | −0.104 | −0.002 | 0.049 | −0.013 | −0.004 | −0.001 | −0.021 |
| | (−0.81) | (−1.91) | (−0.06) | (1.33) | (−0.74) | (−0.89) | (−0.05) | (2.13) | (−3.58) | (−3.33) | (−0.05) | (−0.68) |
| $Flows_t$ | 0.004 | 0.009 | −0.005 | −0.001 | 0.006 | 0.014 | −0.007 | −0.001 | −0.000 | 0.000 | −0.001 | 0.001 |
| | (0.71) | (1.22) | (−1.82) | (−0.76) | (0.72) | (1.22) | (−1.65) | (−1.38) | (−0.00) | (0.09) | (−2.45) | (3.22) |
| $Log(size)_t$ | −0.003 | −0.004 | 0.000 | 0.001 | −0.005 | −0.005 | 0.001 | 0.001 | −0.000 | −0.001 | −0.000 | 0.001 |
| | (−1.29) | (−1.14) | (0.24) | (1.09) | (−1.27) | (−1.08) | (0.29) | (0.72) | (−0.35) | (−1.01) | (−0.37) | (1.71) |
| $Log(age)_t$ | 0.014 | 0.016 | −0.003 | −0.000 | 0.021 | 0.025 | −0.005 | −0.000 | 0.000 | −0.000 | 0.000 | −0.000 |
| | (1.11) | (0.96) | (−0.55) | (−0.29) | (1.12) | (0.96) | (−0.58) | (−0.25) | (0.02) | (−0.40) | (0.54) | (−0.29) |
| $Expenses_t$ | 2.004 | 3.112 | −0.564 | −0.622 | 3.025 | 4.693 | −0.886 | −0.904 | 0.097 | 0.161 | 0.037 | −0.096 |
| | (1.01) | (1.16) | (−0.65) | (−2.07) | (1.00) | (1.14) | (−0.66) | (−1.99) | (0.57) | (1.14) | (0.34) | (−1.22) |
| $Turnover_t$ | −0.009 | −0.005 | 0.001 | −0.005 | −0.014 | −0.009 | 0.002 | −0.006 | 0.000 | 0.002 | 0.001 | −0.003 |
| | (−1.50) | (−0.70) | (0.53) | (−3.12) | (−1.54) | (−0.82) | (0.45) | (−2.62) | (0.20) | (1.61) | (0.42) | (−2.17) |
| Adj. $R^2$ | 0.068 | 0.041 | 0.112 | 0.125 | 0.079 | 0.045 | 0.132 | 0.147 | 0.049 | 0.033 | 0.076 | 0.082 |
| ***Panel B: Overlap measured using $TruncMVO_{i,t}$*** | | | | | | | | | | | | |
| Intercept | −0.012 | −0.047 | 0.008 | 0.027 | −0.024 | −0.071 | 0.015 | 0.034 | 0.010 | −0.005 | −0.001 | 0.016 |
| | (−0.34) | (−0.97) | (0.48) | (3.49) | (−0.45) | (−0.95) | (0.53) | (3.15) | (0.55) | (−0.19) | (−0.09) | (1.53) |
| $TruncMVO_{i,t}$ | −0.020 | −0.032 | 0.001 | 0.013 | −0.027 | −0.049 | 0.003 | 0.023 | −0.008 | −0.002 | −0.003 | −0.006 |
| | (−1.54) | (−1.66) | (0.04) | (2.16) | (−0.47) | (−0.65) | (0.10) | (2.82) | (−2.98) | (−2.56) | (−2.48) | (−0.90) |
| $Flows_t$ | 0.004 | 0.010 | −0.005 | −0.001 | 0.006 | 0.015 | −0.007 | −0.001 | −0.000 | 0.000 | −0.001 | 0.001 |
| | (0.71) | (1.19) | (−1.81) | (−0.73) | (0.71) | (1.19) | (−1.64) | (−1.33) | (−0.01) | (0.09) | (−2.44) | (3.24) |
| $Log(size)_t$ | −0.003 | −0.003 | 0.000 | 0.000 | −0.005 | −0.005 | 0.001 | 0.001 | −0.000 | −0.001 | −0.000 | 0.001 |
| | (−1.20) | (−1.06) | (0.22) | (1.12) | (−1.17) | (−1.00) | (0.27) | (0.76) | (−0.43) | (−1.08) | (−0.44) | (1.73) |
| $Log(age)_t$ | 0.014 | 0.016 | −0.003 | −0.000 | 0.021 | 0.025 | −0.005 | −0.000 | 0.000 | −0.000 | 0.000 | −0.000 |
| | (1.12) | (0.96) | (−0.56) | (−0.28) | (1.12) | (0.96) | (−0.58) | (−0.23) | (0.01) | (−0.39) | (0.53) | (−0.33) |
| $Expenses_t$ | 1.949 | 3.054 | −0.555 | −0.619 | 2.936 | 4.598 | −0.871 | −0.899 | 0.108 | 0.171 | 0.035 | −0.094 |
| | (1.01) | (1.16) | (−0.65) | (−2.10) | (0.99) | (1.14) | (−0.67) | (−2.01) | (0.63) | (1.20) | (0.31) | (−1.17) |
| $Turnover_t$ | −0.009 | −0.005 | 0.001 | −0.005 | −0.014 | −0.009 | 0.002 | −0.006 | 0.000 | 0.002 | 0.001 | −0.003 |
| | (−1.48) | (−0.70) | (0.56) | (−3.17) | (−1.52) | (−0.81) | (0.48) | (−2.67) | (0.19) | (1.59) | (0.42) | (−2.17) |
| Adj. $R^2$ | 0.069 | 0.042 | 0.112 | 0.124 | 0.080 | 0.047 | 0.132 | 0.147 | 0.049 | 0.033 | 0.075 | 0.081 |

one, three, and five years after decile formation. Panel A of Table 8 shows the results of this exercise. Between 1981 and 2005, the attrition rates in the $MVO_{i,t}$—based decile 10 at three (five) years after entry is 16.3% (22.1%), compared with 5.0% (7.1%) see words below for decile 1. These differences are statistically significant. One way to assess their economic significance is to compare them to average (unconditional) attrition rates. Carhart (1997) reports annual attrition rates of 3.5% per year. Clearly, the annual attrition rates in decile 10 are significantly higher than those.

These attrition rates suggest that incumbent fund exit is correlated with the degree of post-entry incumbent-entrant overlap, but as is obvious from the earlier analysis, differences in attrition rates could be because of variation in size, turnover, and other such confounding attributes. Therefore, we also examine the relation between overlap measures and exit using a Cox proportional hazard model. This allows us to explicitly control for other covariates that may influence exit. The specific model that we estimate is

$$H_i(t) = H_{0i}(t)\exp(\beta_1 MVO_{it} + \beta_2 Log(size)_{it} + \beta_3 Log(age)_{it} + \beta_4 Expenses_{it} + \beta_5 Turnover_{it}), \quad (5)$$

$H_i(t)$ denotes the hazard, or the likelihood of exit, for incumbent $i$ at time $t$. As unobserved fund characteristics can also influence the survival rate of incumbents, we assume the baseline hazard function $H_{0i}(t)$ is fund-specific. This is equivalent to fitting separate Cox proportional hazard models under the constraint that the $\beta_i$ coefficients are equal across incumbents but not the baseline hazard functions. Panel B of Table 8 shows hazard ratios along with $Z$-scores in parentheses.

Consistent with the univariate attrition results, hazard rates are correlated with our measures of overlap. Although the coefficients on $MVO_{i,t}$ and $TruncMVO_{i,t}$ are statistically significant in the entire sample period, it appears that the results are largely generated by the post-1998 sample period. In this latter subperiod, setting all variables to their mean, the baseline probability of exit is 10%. An one-standard-deviation increase in $MVO_{i,t}$ ($TruncMVO_{i,t}$) increases the implied probability of exit to 12% (14%).

### 3.3.6. Interaction effects

Entry does not take place in a vacuum—incumbents can take strategic and other actions to protect themselves

**Table 8**
The effect of entry on incumbent mutual fund survival.
Panel A in this table presents attrition rates (in percent) of incumbent mutual funds in one-, three-, and five-years after entry on measures of overlap between incumbents and entrants. Panel B provides a Cox-model based survival analysis in the entire period, pre 1998 period and post-1998 period. Control variables for the Cox-model include fund size, age, expenses, and turnover. The incumbents that exist till the end of the sample period are marked as censored observations. The hazard ratio is reported with *Z*-score listed below.

| Decile | Full sample | | | | | |
|---|---|---|---|---|---|---|
| | $MVO_{i,t}$ | | | $TruncMVO_{i,t}$ | | |
| | One year | Three year | Five year | One year | Three year | Five year |
| ***Panel A: Attrition rates*** | | | | | | |
| 1(bottom) | 2.3 | 5.0 | 7.1 | 1.9 | 4.3 | 5.9 |
| 2 | 1.6 | 3.4 | 5.0 | 1.3 | 2.8 | 4.1 |
| 3 | 2.2 | 4.5 | 6.8 | 1.9 | 4.2 | 6.4 |
| 4 | 2.7 | 5.5 | 8.1 | 2.7 | 5.5 | 8.5 |
| 5 | 3.4 | 7.1 | 10.6 | 3.2 | 6.8 | 9.7 |
| 6 | 3.7 | 7.5 | 10.9 | 4.0 | 8.3 | 11.9 |
| 7 | 4.4 | 8.8 | 12.5 | 4.8 | 9.4 | 13.4 |
| 8 | 5.3 | 10.3 | 15.0 | 5.0 | 9.9 | 14.5 |
| 9 | 6.0 | 11.6 | 16.5 | 6.3 | 12.0 | 17.1 |
| 10(top) | 8.9 | 16.3 | 22.1 | 9.4 | 17.0 | 23.0 |
| ***Panel B: Cox proportional hazard models*** | | | | | | |
| | Full sample | | Pre-1998 | | Post-1998 | |
| $MVO_{i,t}$ | 1.035 | – | 0.983 | – | 1.077 | – |
| | (2.06) | | (−0.71) | | (4.15) | |
| $TruncMVO_{i,t}$ | – | 1.013 | – | 1.007 | – | 1.011 |
| | | (4.14) | | (0.90) | | (2.65) |
| $\text{Log(size)}_t$ | 0.806 | 0.791 | 0.828 | 0.830 | 0.742 | 0.741 |
| | (−42.82) | (−60.20) | (−31.33) | (−31.46) | (−57.38) | (−57.69) |
| $\text{Log(age)}_t$ | 0.796 | 0.800 | 0.775 | 0.775 | 0.945 | 0.946 |
| | (−13.20) | (−23.69) | (−19.69) | (−19.73) | (−4.02) | (−3.98) |
| $\text{Expenses}_t$ | 5.339 | 2.235 | 3.470 | 3.530 | 1.025 | 1.023 |
| | (14.44) | (9.73) | (20.26) | (20.26) | (4.30) | (4.36) |
| $\text{Turnover}_t$ | 1.030 | 1.027 | 0.951 | 0.951 | 1.022 | 1.023 |
| | (3.23) | (6.93) | (−4.22) | (−4.22) | (5.47) | (5.50) |

from entrants, and entrants too can endogenously and strategically choose which markets to enter. A large literature in industrial organization points to spending on advertising, investment in research, capacity expansion to achieve lower unit costs, and other such mechanisms as ways in which incumbents deter entry (see, for example, Dixit, 1980; Schmalensee, 1982, 1983). Unfortunately, our data are inadequate for precisely testing for such barriers to entry. For example, investment in capacity (via, e.g., employment of human capital), and research are unobservable in our data. Even the simplest entry deterrent, advertising, is unavailable; Gallaher, Kaniel, and Starks (2008) show that advertising is related to flows but use proprietary data to do so.

While we do not have context-rich data to address such interesting questions directly, incumbent defensive activities may be correlated with size (see, for example, Roberts and Supina, 2000; Joaquin and Khanna, 2001). In other words, the effects of competition may be ameliorated for larger incumbent funds, or those that belong to larger families; for instance, Gallaher, Kaniel, and Starks (2008) report that advertising expenditures are positively related to family size. To the extent that size serves as a proxy for more fundamental entry-deterrent characteristics, we estimate the regressions described earlier with interaction effects between our measures of overlap and fund/family size. We estimate full regression specifications of the sort described in earlier tables but report only the coefficients on the overlaps and their interaction effects in Panel A of Table 9. The interaction effects are significant for changes in management fees, waivers, flows, and survival probabilities. For these dependent variables, as a general rule, the interaction effect has the opposite sign as the overlap variable. This implies that the effects of competition for funds belonging to larger families are smaller. Fund size has similar effects, albeit slightly weaker in statistical significance.[22]

It is also potentially interesting to examine whether the impact of entry could be related to the characteristics of entrants. For example, entry by certain entrants might have a larger impact on incumbents than others. Unfortunately, here too, we face difficult data problems. Characteristics of entrants can only be measured after entry, creating

[22] In unreported results, we also explore two other interactions. Fund age generates results that are largely similar to those for size. This is not surprising since the two are correlated. In addition, for the fee waiver regressions, we also interact the overlap variables with a dummy equal to one (zero) if the management fee is above (below) the median. The results suggest that the effects of overlap are larger for high-fee funds.

**Table 9**
Interaction effects.
The table shows coefficients on $MVO_{i,t}$ and $TruncMVO_{i,t}$ from regressions in which $MVO_{i,t}$ and $TruncMVO_{i,t}$ are interacted with incumbent-level characteristics (Panel A) or entrant-family characteristics (Panel B). The dependent variables in each of the regressions are identical to those shown in earlier tables: Δ Mgmt fee from quarter $t$+1 to $t$+8, the fee waiver and flows in the year after entry, return gap in year two after entry, the four-factor alpha in 36 months post-entry, and Cox-model survival analysis. With the exception of survival analysis, the regressions are estimated with a full set of independent variables (not shown) as in prior tables for the post-1998 sample period. Fama-MacBeth $t$-statistics, corrected for serial correlation in time-series estimates (up to four lags), are reported in parentheses below the estimates. For survival analysis, the hazard ratio is reported with $Z$-score listed below.

| | Δ Mgmt fee | Waiver | Flows | $RG_{t+8}$ | Alpha | Survival |
|---|---|---|---|---|---|---|
| ***Panel A: Interaction effects with incumbent characteristics*** | | | | | | |
| $MVO_{i,t}$ | −33.413 | 4.466 | −0.326 | −0.001 | −0.267 | 1.127 |
| | (−2.63) | (2.01) | (−1.88) | (−0.06) | (−0.67) | (6.78) |
| $MVO_{i,t}$*log(TNA) | 11.387 | −0.919 | 0.012 | −0.019 | −0.061 | 0.907 |
| | (2.42) | (−1.84) | (0.29) | (−1.41) | (−1.24) | (−3.32) |
| $TruncMVO_{i,t}$ | −12.957 | 1.491 | −0.053 | 0.006 | −0.048 | 1.017 |
| | (−2.81) | (1.85) | (−2.36) | (0.71) | (−1.81) | (6.66) |
| $TruncMVO_{i,t}$*log(TNA) | 5.841 | −0.119 | 0.006 | −0.013 | 0.008 | 0.991 |
| | (2.66) | (−2.19) | (0.52) | (−0.89) | (0.78) | (−2.09) |
| $MVO_{i,t}$ | −29.783 | 2.584 | −0.609 | −0.023 | −1.714 | 1.126 |
| | (−33.01) | (3.31) | (−2.22) | (−0.27) | (−2.61) | (4.16) |
| $MVO_{i,t}$*log(Family TNA) | 9.462 | −0.166 | 0.159 | 0.006 | 0.201 | 0.927 |
| | (2.27) | (−2.21) | (1.96) | (2.03) | (2.07) | (−2.35) |
| $TruncMVO_{i,t}$ | −11.485 | 0.937 | −0.132 | −0.015 | −1.16 | 1.019 |
| | (−2.64) | (3.47) | (−2.23) | (−0.46) | (−1.79) | (4.03) |
| $TruncMVO_{i,t}$*log(Family TNA) | 2.174 | −0.269 | 0.049 | 0.003 | 0.162 | 0.946 |
| | (2.17) | (−2.65) | (2.01) | (1.89) | (1.84) | (−3.37) |
| ***Panel B: Interaction effects with entrant-family characteristics*** | | | | | | |
| $MVO_{i,t}$ | −18.299 | 3.495 | 7.419 | 1.288 | 14.625 | 1.126 |
| | (−2.01) | (2.11) | (1.01) | (0.37) | (1.24) | (2.46) |
| $MVO_{i,t}$*log (Family TNA) | −3.253 | 0.301 | −0.319 | −0.300 | −1.209 | 0.996 |
| | (−0.26) | (1.23) | (−1.76) | (−1.84) | (−1.22) | (−0.82) |
| $TruncMVO_{i,t}$ | −2.484 | 1.034 | 3.737 | 2.054 | 3.680 | 1.046 |
| | (−2.48) | (1.52) | (2.10) | (1.03) | (1.59) | (2.01) |
| $TruncMVO_{i,t}$*log(Family TNA) | −9.552 | 0.939 | −0.203 | −0.273 | −0.227 | 0.999 |
| | (−0.36) | (1.38) | (−1.74) | (−2.21) | (−1.27) | (−0.82) |

look-ahead (and possibly selection) problems with such an analysis. However, we can measure interactions with entrant family size since that is (exogenously) known at the time of entry. The results of those interactions are presented in Panel B. Here, for the most part, the interaction effects are statistically insignificant.

### 3.3.7. *Indexers and closet indexers*

We have thus far deliberately excluded index funds from our analysis because the right tail of the distribution of overlap would be comprised largely of index funds (entrant and incumbent index funds that track the same index should, by definition, have extremely high overlap and would therefore dominate the overall distribution). However, one should expect to see competitive effects in index funds as well. To investigate this, we separate out index funds and "closet indexers."[23]

We consider three types of incumbent-entrant pairs: (a) where both entrant and incumbent are pure indexers, (b) where the entrant is a pure indexer and the incumbent is a closet indexer, and (c) where the entrant is a closet indexer and the incumbent is a pure index fund. We do not consider the last combination, where the entrant and incumbent are both closet indexers since they are included in our analysis of active funds.[24] For each of these incumbent-entrant pairs, we estimate management-fee-change and flow regressions similar to those presented in earlier tables. Because sample sizes are much smaller, we cannot estimate Fama-MacBeth regressions, so instead we estimate panel regressions with dummies for each calendar year.

Panel A (B) of Table 10 shows the results from the management-fee-change (flow) regressions. When the entrant is a closet indexer and the incumbent is a pure index fund, there is no discernible effect of our measures of overlap on incumbent fees. This is probably not surprising since it is unlikely that investors can readily and immediately identify closet indexers from their purported and stated goal as an active fund. When both incumbent and entrant are pure index funds, the effects of competition force should be readily observable because such funds are

[23] To identify closet indexers, we use the active share measure of Cremers and Petajisto (2009). Active share is the extent to which an active fund's portfolio differs from a benchmark index; funds with low active shares are regarded as closet indexers. We gratefully acknowledge the data on closed indexers provided by Antti Petajisto on his Web site.

[24] Separately, we ensure that the results we report in earlier tables are not unduly influenced by closet indexers. To do this, we eliminate closet indexers from the data and re-estimate all regressions. The results are largely unchanged from those reported in the paper.

**Table 10**
Competitive effects for pure and closet indexers.
Pure index funds are identified by the CRSP Mutual Fund database. Closet indexers are identified by Cremers and Petajisto (2009). Regressions are estimated separately for entrant-incumbent pairs. The first entry in the column heading shows the incumbent, the second shows the entrant. For example, in the "closet, pure" regressions, the incumbent is a closet indexer and the entrant is a pure index fund. Panel regressions are estimated with year dummies. Robust $t$-statistics appear in parentheses.

| | (Incumbent, Entrant) pair | | | | | |
|---|---|---|---|---|---|---|
| | (Pure, Pure) | | (Closet, Pure) | | (Pure, Closet ) | |
| ***Panel A: Δ Mgmt fee regressions*** | | | | | | |
| Intercept | 6.468 | 6.275 | 2.651 | 2.479 | 1.403 | 1.253 |
| | (2.49) | (2.43) | (1.08) | (1.01) | (0.39) | (0.35) |
| $MVO_{i,t}$ | −10.545 | – | −18.745 | – | −7.886 | – |
| | (−2.05) | | (−1.85) | | (−0.68) | |
| $TruncMVO_{i,t}$ | – | −3.026 | – | −0.912 | – | −0.536 |
| | | (−1.87) | | (−1.73) | | (−0.44) |
| Log (TNA)$_t$ | 0.489 | 0.519 | 0.488 | 0.516 | 0.323 | 0.348 |
| | (1.51) | (1.62) | (1.46) | (1.55) | (0.69) | (0.48) |
| Log (family)$_t$ | −0.356 | −0.362 | 0.029 | 0.026 | −0.169 | −0.170 |
| | (−1.43) | (−1.45) | (0.13) | (0.12) | (−0.47) | (−0.47) |
| Log (age)$_t$ | −1.823 | −1.815 | −1.495 | −1.498 | −0.975 | −0.997 |
| | (−2.60) | (−2.59) | (−2.46) | (−2.47) | (−1.03) | (−1.05) |
| Turnover$_t$ | −3.142 | −3.153 | 0.181 | 0.187 | −4.667 | −4.658 |
| | (−3.39) | (−3.40) | (0.25) | (0.26) | (−3.84) | (−3.83) |
| Std. deviation of returns$_t$ | −12.825 | −12.692 | −49.148 | −49.378 | 19.198 | 19.473 |
| | (−0.49) | (−0.49) | (−1.84) | (−1.85) | (0.46) | (0.47) |
| ***Panel B: Flow regressions*** | | | | | | |
| Intercept | 0.298 | 0.279 | 0.153 | 0.165 | 0.321 | 0.323 |
| | (4.33) | (4.12) | (3.75) | (4.07) | (3.18) | (3.13) |
| $MVO_{i,t}$ | −0.353 | | −1.395 | | −0.563 | |
| | (−2.82) | | (−3.27) | | (−1.01) | |
| $TruncMVO_{i,t}$ | | −0.189 | | −0.267 | | −0.609 |
| | | (−2.09) | | (−1.80) | | (−0.93) |
| Return_rank$_t$ | 0.071 | 0.070 | 0.080 | 0.084 | 0.099 | 0.098 |
| | (3.06) | (3.04) | (6.72) | (7.11) | (2.82) | (2.80) |
| $MVO_{i,t}$*Return_rank$_t$ | 0.257 | – | 0.637 | – | 0.475 | – |
| | (0.90) | | (2.21) | | (0.75) | |
| $TruncMVO_{i,t}$*Return_rank$_t$ | | 0.326 | | 0.051 | | 0.375 |
| | | (1.27) | | (1.50) | | (0.73) |
| Log (TNA)$_t$ | −0.006 | −0.004 | −0.007 | −0.007 | −0.008 | −0.008 |
| | (−0.71) | (−0.48) | (−2.09) | (−1.91) | (−0.71) | (−0.71) |
| Log (age)$_t$ | −0.067 | −0.066 | −0.074 | −0.074 | −0.069 | −0.069 |
| | (−3.25) | (−3.40) | (−3.97) | (−3.99) | (−2.71) | (−2.69) |
| Expense ratio$_t$ | −3.483 | −3.404 | 0.632 | 0.595 | 5.317 | 5.341 |
| | (−1.21) | (−1.18) | (0.41) | (0.39) | (1.38) | (3.85) |
| Turnover$_t$ | 0.038 | 0.038 | 0.016 | 0.016 | 0.005 | 0.004 |
| | (3.31) | (3.15) | (2.29) | (2.34) | (1.14) | (1.11) |
| Front-end load$_t$ | 2.018 | 2.015 | 0.042 | 0.053 | 1.636 | 1.582 |
| | (2.09) | (2.08) | (0.14) | (0.18) | (1.17) | (1.13) |
| Std. deviation of returns$_t$ | −0.224 | −0.195 | 0.984 | 0.907 | 0.449 | 0.431 |
| | (−0.39) | (−0.34) | (2.74) | (2.52) | (0.45) | (0.43) |

transparent. Consistent with this, fees and flows for this subgroup of incumbent-entrants are negatively associated with overlaps—what should be a competitive commodity market appears to behave as one. When the entrant is a pure index fund and the incumbent is a closet indexer, the effects are modestly negative but statistically very weak. Overall, it appears that when investors can clearly identify the substitutability of passive funds, we observe competitive effects in both flows and fees.

## 4. Robustness and empirical issues

Three aspects of these results deserve special attention. First, the dependent variables in each of our tests are measured after entry. But theory provides no guidance regarding the horizon over which to measure each variable. For instance, in the case of changes in fees, it is not obvious whether we should compute changes one quarter, one year, two years, or five years after entry. In most cases, our choices are guided by data constraints and estimation concerns. For example, we need at least 36 months of monthly returns to estimate alphas, but can estimate characteristic-based returns over shorter horizons (and do so). In other cases, we make choices such that a sufficient amount of time elapses to reflect changes in the data (e.g., we measure return gaps one and two years after entry). Our basic results are unchanged by small-horizon changes to the tests.

Second, many of our regressions are estimated on a quarter-by-quarter basis using a Fama-MacBeth approach.

This is because we measure overlap every quarter. However, some of our dependent variables are measured annually. To ensure that these timing differences do not influence our results, we re-estimate the regressions annually after summing overlap measures within a year. Obviously, this reduces the number of time-series observations and in some cases, increases standard errors. But our general inferences remain the same.

Third, the relations between overlap measures and flows, costs, performance, and survival are only prevalent in the post-1998 period. This begs the obvious question: Is there anything special about 1998? The answer is no. We chose 1998 as a breakpoint in our subperiod analysis because of the Chow Test results in Table 1. But, we re-estimate all our regressions using 1997 and 1999 as breakpoints and present the results in an online appendix. Our results are robust to whether we use 1997 or 1999 to bifurcate our sample. This is not surprising. From 1981 to the early 1990s, the number of entrants and incumbents appears to be continually increasing (along with total assets under management), suggesting an expansion of the industry. A likely source of this expansion is the increased use of mutual funds by retail investors (as opposed to directly investing in stocks), but this is impossible to verify without direct flow-of-funds data. The late 1990s, however, are characterized by a decline in the number of entrants and in the entrant-to-incumbent ratio. This suggests a slowing down in the industry's expansion. While we cannot estimate price-cost margin models of endogenous entry, the time-series of entry is consistent with it being endogenous. If it is true that the profitability of entry declined in the late 1990s, then entrants must necessarily eke out an existence by competing with incumbents—that is the essence of our results.

## 5. Conclusions

A critical mechanism of competitive markets is that entrants compete for revenues and resources with incumbents. In this paper, we study the effects of the entry of new mutual funds on the prices, revenues, costs, performance, and survival of incumbent funds. A particular advantage of looking at incumbents is that they are unaffected by endogenous entry. Post-entry prices charged by entrants are endogenously related to the decision to enter, but this endogeneity does not influence incumbent behavior—instead, entry is simply a shock to which incumbents react.

We find that measures of overlap in holdings between entrants and incumbents are related to both price and quantity competition: incumbents that face stiff competition reduce management fees and experience lower flows. However, distribution costs rise so that benefits to consumers are not as large. We also find that our measures of overlap are marginally related to incumbent trading costs and to future performance. Finally, entrant-incumbent overlap is related to the future survival rates, confirming Darwinian notions embedded in the idea of competitive markets. On the whole, the picture that emerges is one of a competitive market.

## References


Barber, B., Odean, T., Zheng, L., 2005. Out of sight, out of mind: the effects of expenses on mutual fund flows. Journal of Business 78, 2095–2119.

Berry, S., Reiss, P., 2007. Empirical models of entry and market structure. In: Armstrong, M., Porter, R. (Eds.), The Handbook of Industrial Organization, vol. 3. Elsevier Science, North Holland, pp. 1845–1886 (Chapter 29).

Bresnahan, T., Reiss, P., 1991. Entry and competition in concentrated markets. Journal of Political Economy 99, 977–1009.

Carhart, M., 1997. On persistence in mutual fund performance. Journal of Finance 52, 57–82.

Casavecchia, L., Scotti, M., 2009. Dynamic setting of mutual fund fees in the US mutual fund industry. Unpublished working paper. University of Technology Sydney.

Christoffersen, S., 2001. Why do money fund managers voluntarily waive their fees? Journal of Finance 56, 1117–1140.

Coates, J., Hubbard G., 2007. Competition in the mutual fund industry: evidence and implications for policy. Unpublished working paper, Harvard Law School.

Cremers, M., Petajisto, A., 2009. How active is your fund manager? A new measure that predicts performance. The Review of Financial Studies 22, 3329–3365.

Daniel, K., Grinblatt, M., Titman, S., Wermers, R., 1997. Measuring mutual fund performance with characteristic-based benchmarks. Journal of Finance 52, 1035–1058.

Dixit, A., 1980. The role of investment in entry-deterrence. The Economic Journal 90, 95–106.

Elton, E., Gruber, M., Busse, J., 2004. Are investors rational? Choices among index funds. Journal of Finance 59, 261–288.

Fama, E., French, K., 2010. Luck versus skill in the cross-section of mutual fund returns. Journal of Finance 65.

Freeman, J., Brown, S., 2001. Mutual fund advisory fees: the cost of conflicts of interest. Journal of Corporation Law 26, 609–673.

Freeman, J., 2008. Responding to the advisory fee analysis in AEI working paper #127, "Competition and Shareholder Fees in the Mutual Fund Industry: evidence and Implications for Policy" by John Coates and R. Glenn Hubbard. Unpublished working paper, University of South Carolina.

Friedman, M., 1953. In: The Methodology of Positive Economics, in Essays in Positive Economics. University of Chicago Press, Chicago, II, pp. 2–43.

Gallaher, S., Kaniel, R., Starks, L., 2008. Advertising and mutual funds: from families to individual funds. Unpublished working paper, University of Texas at Austin.

Geroski, P.A., 1995. What do we know about entry? International Journal of Industrial Organization 13, 421–440.

Gil-Bazo, J., Ruiz-Verdu, P., 2009. Yet another puzzle? The relation between price and performance in the mutual fund industry. Journal of Finance 64, 2153–2183.

Grinblatt, M., Titman, S., Wermers, R., 1995. Momentum investment strategies, portfolio performance, and herding: a study of mutual fund behavior. American Economic Review 85, 1088–1105.

Hortaçsu, A., Syverson, C., 2004. Product differentiation, search costs, and competition in the mutual fund industry: a case study of S&P 500 index funds. Quarterly Journal of Economics 119, 403–456.

Joaquin, D., Khanna, N., 2001. Investment timing decisions under threat of potential competition: why firm size matters. The Quarterly Review of Economics and Finance 41, 1–17.

Kacperczyk, M., Sialm, C., Zheng, L., 2008. Unobserved actions of mutual funds. Review of Financial Studies 21, 2379–2416.

Khorana, A., Servaes, H., 1999. The determinants of mutual fund starts. Review of Financial Studies 58, 2033–2058.

Khorana, A., Servaes, H., 2004. Conflicts of interest and competition in the mutual fund industry. Unpublished working paper, Georgia Institute of Technology.

Khorana, A., Servaes, H., Tufano, P., 2005. Explaning the size of the mutual fund industry around the world. Journal of Financial Economics 78, 145–185.

Kosowski, R., Timmermann, A., Wermers, R., White, H., 2006. Can mutual fund "stars" really pick stocks? New evidence from a bootstrap analysis. Journal of Finance 61, 2551–2595.

Kuhnen, C., 2007. Social networks, corporate governance, and contracting in the mutual fund industry. Unpublished working paper, Northwestern University.

Li, S.J., 2005. Financial product differentiation and fee competition in the mutual fund industry, working paper, AXA Rosenberg Group.

Roberts, M., Supina, D., 2000. Output price and markup dispersion in micro data: the roles of producer heterogeneity and noise. In: Baye, M. (Ed.), Industrial Organization, Advances in Applied Microeconomics, vol. 9. JAI Press, Stamford, CT, pp. 1–36.

Schmalensee, R., 1982. Product differentiation advantages of pioneering brands. American Economic Review 72, 349–365.

Schmalensee, R., 1983. Advertising and entry deterrence: an exploratory model. Journal of Political Economy 91, 636–653.

Sensoy, B., 2009. Performance evaluation and self-designated benchmark indexes in the mutual fund industry. Journal of Financial Economics 92, 25–39.

Sirri, E., Tufano, P., 1998. Costly search and mutual fund flows. Journal of Finance 53, 1589–1622.

Spatt, C., 2006. Office of Economic Analysis Memorandum (to Investment Company File S7-03-04).

Trzcinka, C., 1998. Statement, hearing before the subcommittee on finance and hazardous materials of the committee on commerce, house of representatives, 105 Congress, 2nd Session.

Wallison, P., Litan, R., 2007. In: Competitive Equity: A Better Way to Organize Mutual Funds. AEI Press, Washington, DC.

Walsh, L., 2004. The costs and benefits to fund shareholders of 12b-1 Plans: an examination of fund flows, expenses and returns. Unpublished working paper, Securities and Exchange Commission.

Wermers, R., 2000. Mutual fund performance: an empirical decomposition into stock-picking talent, style, transactions costs, and expenses. Journal of Finance 55, 1655–1695.

Wermers, R., Tong, Yao, Jane, Zhao, 2007. The investment value of mutual fund portfolio disclosure. Unpublished working paper, University of Maryland.