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Milk or Wine: Mutual Funds' (Dis)economies of Life

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ABSTRACT

Mutual fund investors are supposed to make long-term investments instead of striving for quick fortunes. However, the dynamics of funds' ability to generate abnormal returns over their lifetime is still an unattended issue. This paper provides evidence on the liability of newness and liability of aging theory that funds' investment skill changes to the positive or negative over time. Our results find strong support for an underperformance of mature funds consistent with the liability of aging theory. Furthermore, the observed diseconomies of life result from older funds pursuing less innovative investment strategies. The lack of innovation manifests in less performance enhancing trading and fewer investments in hard-to-value stocks. Still, we provide evidence that less performance sensitive as well as non-institutional investors seek investments in mature funds and that they benefit from more stable investment styles and performance outcomes.

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Keywords: Mutual funds; Fund age; Innovation; Liability of aging; Fund performance; Fund behavior

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1. Introduction

In the U.S. millions of households delegate the management of considerable wealth to actively managed funds whose quality is represented by their competence to beat a benchmark through the generation of influential ideas (Kacperczyk et al., 2008; Cremers and Petajisto, 2009). Nonetheless, asset management companies stress the importance that fund shareholders should exercise patience and give investment strategies the time to evolve instead of hoping for large profits in the short-run. This view of sturdiness is also nicely underpinned by funds` frequent self-portrayal as trees that - just like them - portfolios do not grow over night but can reach substantial heights.[1] In the mutual fund literature tremendous efforts have been made to detect superior fund investment skills cross-sectionally, however, the dynamics of this ability over a fund's lifetime is still an unattended issue. In other words, once the investor has selected a specific fund investment, does the fund live up to its promise over time?

We address this gap in the literature and investigate whether funds' time-series capabilities to generate abnormal returns alter to the positive like wine or negative like milk. Specifically, we study the impact of a fund's age on its performance to measure the influence of the passing of time. Hence, the aim of this paper is to explore whether funds are exposed to economies or diseconomies of life.

Paralleling this view the literature on organizational ecology postulates that an organization's ability to be successful in the market is shaped by its demographic features. Specifically, the literature offers two competing hypotheses. The liability of newness theory (see, e.g., Stinchcombe, 1965; Hannan and Freeman, 1984; Cohen and Levinthal, 1989; March, 1991) suggests that mature organizations were subject to learning effects. Consequently, mature funds have constantly improved their investment strategies and make superior investment decisions compared to their earlier stage of life. In contrast, the liability of aging

[1] See Wall Street Journal (2013): Why So Many Trees in Fund Names?

theory (see, e.g., Cohen and Levinthal, 1989; Cohen and Levinthal, 1990; Barron et al., 1994; Balasubramanian and Lee, 2008) suggests that aging leads to dogmatic pursuits of proven courses of action and thus diminished innovations. Hence, mature funds find it more appealing to stick with best-practice approaches and to ignore untested strategies which results in fewer profit opportunities over time.

Along these lines we analyze in the first part of the paper whether fund performance improves or deteriorates with fund age. We use a sample of 3,489 actively managed U.S. domestic equity funds between 1991 and 2014 and find strong support for the liability of aging theory that a fund's age impacts negatively on its performance. Specifically, a doubling in a typical fund's age is associated with a performance decrease between 58 basis points and 75 basis points per year depending on the performance measure.

A natural concern with our empirical approach is that omitted factors could counteract the age effect on performance. In particular, our observation is based on the premise that fund size is held constant. Many scholars, however, argue that fund size is associated with decreasing returns to scale (see, e.g., Perold and Salomon, 1991; Berk and Green, 2004; Chen et al., 2004; Yan, 2008; Pástor et al., 2014), while an inconclusive body of work of organizational economists relate an organizations' size to innovativeness (see, e.g., Schumpeter, 1942; Aldrich and Auster, 1986; Cohen and Klepper, 1996). To rule out this explanation we control for fund size and a range of other fund and family characteristics as well as fund fixed, family fixed, manager fixed and investment segment fixed effects to account for unobservable fund, family, manager and investment segment heterogeneity.

Having established a robust negative relationship between fund age and performance, we provide supportive evidence that the observed performance effect is indeed attributable to less innovative investment strategies as suggested by the liability of aging theory. Therefore, we conduct two additional tests. First, we examine the impact of fund age on performance among index funds that fully replicate their benchmarks. For those funds, investment strategies are predefined and innovation should not really matter. In the same spirit, we also analyze the age-performance relation among more or less innovative investment segments of actively managed funds. Supporting our argument, we find no performance impact of age on the performance of index funds and on the performance of actively managed funds whose investment focus is on stocks of large and well-established companies with consistent generations of income. Our second test is based on evidence from the organizational economist literature that suggests a generally positive relationship between competition and a drive for innovation among organizations (see, e.g., Cohen, 2010). In particular, we investigate how fund age impacts on performance in environments of higher and lower competition. Thereby we study a simple idea: If competition is high, mature funds cannot afford to be less innovative relative to their younger competitors. Correspondingly, we find that aging is associated with decreases in fund performance if the competitive strength of their environment is low.

In the second part of our paper we make a more detailed exploration of the mechanism that generates the performance difference between a mature fund and its younger self. In general, we find strong support that the observed underperformance of older funds is attributable to them being less active and pursuing less innovative investment ideas. We start by showing that funds` trading activity decreases with age and that this substantial effect of up to 20 percent per year is robust to a battery of alternative measures for fund turnover. We further extend our analysis and examine an age effect on measures for active management that present a more direct link to future fund performance. In particular, we find that fund age is negatively related to active share (Cremers and Petajisto, 2009; Petajisto, 2013), return gap (Kacperczyk et al., 2008) and the R^2 measure (Amihud and Goyenko, 2013). In addition, we take another, more thorough step by investigating differences in funds' innovation at the stock holdings level. Consistent with our previous findings, we show that the held amount of hard-to-value stocks is lower in the portfolio of older funds. Taken together, our results provide strong evidence for the liability of aging theory. Mature funds do not reinvent themselves over time and thus are subject to diseconomies of life.

In the final part of our paper we investigate which types of investors have demand for fund shares of mature funds. Confirming the notion that funds seem to cater to different types of investors during their earlier and advanced stage of life, we find that shareholders of older funds are considerably less performance sensitive and less likely to be an institutional investor. Nevertheless, in further tests we show that these investors could benefit from mature funds' less extreme investment styles and more stable performance outcomes.

Our paper is linked to three strands of the economics literature. First, our paper is related to the literature on the identification of active management skills that has been of long-standing interest in mutual fund research (see, e.g., Jensen, 1968; Carhart, 1997; Daniel et al., 1997; Fama and French, 2010). A number of papers study the existence of investment skills by looking at fund actions reflected in the composition of their holdings. For example, Kacperczyk et al. (2008) find that funds' hidden investment decisions, captured by the difference between their actual return and the hypothetical return of the disclosed portfolio, predict performance. Relatedly, Cremers and Petajisto (2009) show that more active funds, represented by the deviation of their stock holdings position from their benchmark's composition, exhibit better performance. Still, despite these considerable efforts to explore the value of active management, it has mostly been a quest at a cross-sectional level. We contribute to this strand of the literature in documenting that funds' investment skills are not constant at the fund level but that dynamics over time determine their ability to generate superior performance. This has important implications for fund investors which should take the time dimension of investment skills into account when making their fund selection. In this spirit, our paper is also related to a group of papers that analyze time variations in investment skills. For instance, Kacperczyk et al. (2014) show that fund managers' use of their timing and picking abilities is dependent on the business cycle. Pástor et al. (2015) take an intra-fund perspective and revisit the idea that a fund's turnover is in fact a display of skill. However, none of these studies relate fund performance to fund age which in itself presents an influence of time on funds.[2]

Second, our paper is related to the literature on how aging affects organizational behavior which is an unresolved issue in organizational ecology (Hannan, 1998; Sorensen and Stuart, 2000). In their survey article Singh and Lumsden (1990) show a large body of inconclusive empirical research on the support of the liability of newness and liability of aging theory. We contribute to this literature by showing that the mutual fund industry as an archetype for a knowledge-intensive industry that crucially depends on the competence to be innovative is characterized by decreasing returns to life.

Finally, a third strand of the literature investigates the relation between characteristics of actively managed funds and their shareholders. For instance, Evans and Fahlenbrach (2012) show that institutional ownership in a fund improves performance. Relatedly, Del Guercio and Reuter (2014) find that the retail fund market is segmented into funds that cater to performance-oriented do-it-yourself investors and to investors that put more emphasis on advisory services. Our paper adds to this literature by showing that heterogeneity in funds' shareholder structures is not limited to the comparison between fund types but that there are also considerable dynamic changes within a fund's group of investors.

The paper proceeds as follows. In Section 2, we briefly review the liability of newness and the liability of aging theory and develop our main hypotheses that emerge from these theories. In Section 3, we discuss our employed data set and report the summary statistics. Section 4 presents the main result of our study. In Section 5, we provide additional tests for the validity

[2] Our paper also joins a recent study by Pástor et al. (2014) that takes an in-depth look at fund size as a mutual fund demographic that could proxy for active management skills. Specifically, Pástor et al. (2014) pick up the large and ongoing debate of a negative effect of fund size on performance that is arguably attributed to funds' diseconomies of scale and show that the measurement of skill is counteracted by the scale of the industry.

of the age-performance relation. In Section 6, we study the relation between fund age and innovative investment behavior. We investigate the demand for mature funds and their potential benefits in Section 7. Section 8 concludes.

2. Theoretical Foundation of the Age-Performance Relation

2.1 LIABLITY OF NEWNESS THEORY

The concept of learning over time intuitively applies to individuals in general and in particular in the mutual fund context (Kempf et al., 2014). However, learning does not only relate to personal improvements but also represents a determinant to the rise and fall of organizations. Specifically, the liability of newness theory indicates that mature organizations accumulated more experience in the execution of organizational processes than their younger competitors and thus are more successful (Stinchcombe, 1965). For instance, March (1991) argues that the reliability with which new strategies of firms' are implemented increases with experience. Hannan and Freeman (1984) suggest that internal learning increases with age and improves organizations' reliability and accountability. This in turn facilitates organizations' ability to adapt to environmental changes. Relatedly, Tushman and Anderson (1986) and Cohen and Levinthal (1990) argue that established firms' accumulation of organizational knowledge enhances their ability to recognize and adapt new ideas.

Overall, the liability of newness theory predicts that mature funds make better investment decisions than their younger peers because they accumulated a rich set of experience on a history of investment strategies. Specifically, older funds possess detailed track records on past failures and successes which allows them to constantly improve their investment strategies and to derive supportive investment guidelines. This leads us to the conclusion:

H1: Funds are subject to economies of life, i.e., fund age has a positive impact on fund performance.

2.2 LIABLITY OF AGING THEORY

Paralleling this view the liability of aging theory can be considered as the counterpart of the liability of newness theory. Specifically, the liability of aging theory suggests that aging manifests in the reduced propensity of mature organizations to undergo transformations and thus to be successful (Singh and Lumsden, 1990). In more detail, strict documentations of experience-based practices result in rigidities such as self-imposed constraints, bureaucratization or the dogmatic pursuit of best-practice approaches which prevent mature organizations to exploit their capabilities and diminish innovation (Barron et al., 1994). Relatedly, Cohen and Levinthal (1990) argue that the ability of organizations to recognize new ideas and to assimilate them depends on its innovative capabilities. Thus, if organizational rigidities increase with firms` age, their innovative capabilities will deteriorate over time.

Overall, the liability of aging theory suggests that older funds are less likely to change their investment routines and consequently underperform their younger peers. In particular, the documentation of experience-dependent success and derived investment guidelines make it more appealing to stick with proven returns of an existing course of action instead of choosing unproven investment routes. However, exactly this line of action is especially unfavorable in the context of mutual funds. Mutual funds' success is primarily driven by their ability to detect market inefficiencies and by their competence to deviate from their benchmarks' composition (see, e.g., Kacperczyk et al., 2005; Cremers and Petajisto, 2009). At the same time these market inefficiencies have timestamps which make the ignorance to untested approaches costly. Furthermore, due to market inefficiencies' temporary existence mature funds' used investment strategies become less valuable over time:

H2: Funds are subject to diseconomies of life, i.e., fund age has a negative impact on fund performance.

3. Data

3.1 SAMPLE SELECTION

Our paper uses two databases. First, the CRSP Survivor-Bias-Free U.S. Mutual Fund database that contains information on a range of fund characteristics such as funds' monthly returns, total net assets under management (TNA), age, expenses, turnover, and other characteristics. We assign each fund to a specific fund family and a specific investment segment based on the fund family identifier and investment objective code provided in CRSP. Since we focus on actively managed U.S. domestic equity funds we use funds' investment objective codes and keywords in their names to exclude index funds as well as global, international, balanced, fixed-income and other non-equity funds. Furthermore, frequently mutual funds offer multiple share classes that differ with respect to their fee structures but have the same underlying assets. Thus, we aggregate information on a fund's returns, expenses and other characteristics to the fund level by weighting the information with the TNA of the fund shares in the prior month. In addition, we take the maximum age, defined as the difference between the observation period and the inception date, across a fund's shares as its age.

Second, from the Thomson Mutual Fund Holdings database we obtain portfolio holdings information on securities held by each fund on each reporting date. We supplement the holdings data with information from the CRSP Monthly and Daily Stock Files and merge both databases using MFLINKS from Wermers (2000).

Our final sample consists of 3,489 actively managed U.S. domestic equity funds between 1991 and 2014.[3]

[3] We start the sample period in 1991, the first year in which CRSP reports information on funds' total net assets under management at the monthly not quarterly level.

3.2 SUMMARY STATISTICS

In Table I we present summary statistics (mean, median, standard deviation and cutoffs at the 25^{th} and 75^{th} percentile) on the most important variables in our analysis. In Panel A, we report funds' performance measures as our main dependent variables. Panel B of Table I presents our main independent variable fund age in number of years and the remaining variables that are employed as controls in the paper.

– Insert Table I approximately here –

Given the nature of our study that we are interest in the age impact on the superiority of investment strategies, we focus on risk-adjusted metrics for fund performance measurement.[4] We use four performance measures: Jensen (1968) alpha, Fama and French (1993) 3-factor alpha, Carhart (1997) 4-factor alpha, and the Pástor and Stambaugh (2003) 5-factor alpha. Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. Matching observations from the literature, the average fund in our sample of about 400,000 fund-month observations underperforms its passive benchmark. Referring to our main independent variable, the average fund in our sample is about 13 years old, that shows the typically skewed nature of the age distribution as its range between the 25^{th} and 75^{th} percentile amounts to approximately 5 and 16 years. The typical fund in our sample has about $1.1 billion assets under management. Mean net-of-fee return is 71 basis points per month and the average fund's growth is 43 basis points per month. Considering fund expenses and trading activity, the average expense ratio amounts to 1.31 percent per year and the mean turnover ratio is about 95 percent per year. Hence, our sample exhibits fund

[4] In this spirit, we follow a number of recent studies such as Evans and Fahlenbrach (2012), Del Guercio and Reuter (2014), Kacperczyk et al. (2014), and Kumar et al. (2015).

characteristics that are consistent with the prior literature (see, e.g., Kacperczyk and Seru, 2012; Evans and Fahlenbrach, 2012; Chen et al., 2013; Pástor et al., 2014).

4. Impact of Fund Age on Performance

In this section we investigate the relation between fund age and performance. In Section 4.1, we explore the two competing hypotheses liability of newness and liability of aging that suggest that fund performance, respectively, improves or deteriorates with fund age. In Section 4.2 we provide additional support for the main finding by making a number of robustness tests.

4.1 MAIN RESULT: LIABILITY OF AGING VS. LIABILITY OF NEWNESS

We begin our analysis by illustrating the impact of fund age on performance graphically. To obtain a first indication of the age-performance relation over a fund's lifetime, we run a piecewise-linear regression model:

$$Performance_{i,t} = \alpha_0 + \sum_{j=1}^{5} \beta_j AgeQuintile_{j,i,t-1} + \alpha_i + \varepsilon_{i,t}, \tag{1}$$

where the dependent variable, *Performance*, is the performance of fund *i* in month *t* measured as: Jensen (1968) alpha, Fama and French (1993) 3-factor alpha, Carhart (1997) 4-factor alpha, and Pástor and Stambaugh (2003) 5-factor alpha. Alphas are obtained through 36-month rolling window regressions of funds` net-of-fee returns on the common factors of the respective risk-factor model. The independent variables, *AgeQuintile*, are the five piecewise-linear ranges *j* based on funds' fractional age ranks in month *t-1*.[5] Thus, the coefficients on these piecewise decompositions represent the slope of the performance-age relation over their range of sensitivity. In addition, we include fund fixed effects, denoted by α_i, to account for

[5] In particular, the piecewise-linear regression coefficients are calculated according to the definitions: $AgeQuntile_1$ = Min(0.2; $AgeRank_{t-1}$) whereby $AgeRank_{t-1}$ is a fund's fractional age rank defined as the fund's percentile age relative to other funds in the same investment segment and month. Accordingly, the second quintile is estimated as $AgeQuntile_2$ = Min(0.2; $AgeRank_{t-1}$ - $AgeQuntile_1$), and so forth, up to the fourth quintile. The top quintile is defined as $AgeQuntile_5 = AgeRank_{t-1} - (AgeQuntile_1 + AgeQuntile_2 + AgeQuntile_3 + AgeQuntile_4)$.

unobservable fund effects that could impact on our results. More specifically, fund fixed effects absorb the cross-sectional variation in performance so that identification comes only from within-fund time variation (Pástor et al., 2015). Thus, using fund fixed effects in our regressions effectively allow us to estimate the age impact on fund performance within the same fund.[6]

– Insert Figure I approximately here –

Figure I shows that the performance of a fund declines with its age irrespective of the employed performance benchmark. Our estimates depict an almost linear negative performance effect of fund age with four out of five *AgeQuintiles* also being statistically significant negative. Again, since our regression design includes fund fixed effects, we measure the performance difference of a mature fund relative to its younger self. Thus, results from Figure I provide first evidence in favor of the liability of aging theory.

We support this performance impact of fund age by running the following panel regression model:

$$Performance_{i,t} = \alpha_0 + \beta LnAge_{i,t-1} + \gamma X_{i,t-1} + \alpha_i + \alpha_s + \alpha_t + \varepsilon_{i,t}. \quad (2)$$

The main independent variable, *LnAge*, is the age of fund *i* in month *t-1* measured as the natural logarithm of one plus the time difference between the prior month and the month when fund *i* first appears in the CRSP mutual fund database. We employ *LnAge* as our main independent variable because of the usual econometric concerns regarding the empirical distribution of age as well as to account for the fact that an equal year has a larger percentage impact, i.e. economic relevance, on younger funds.

[6] For a formal proof that panel regressions with fund fixed effects provide slope estimates that reflect time-series variation at the within-fund level and are equal to a weighted average of the slope estimates from pure time-series regressions see Pástor et al. (2015).

We include a broad range of other fund characteristics that have been documented to impact on fund performance to avoid that our assessment of age induced differences in funds' performance is contaminated. Specifically, X is a set of control variables (in month *t-1*) that includes the net-of-fee return of fund *i* in the prior month (*Fund return*), the logarithm of the fund's total net assets under management (*Ln TNA*), the fund's growth rate defined as in Sirri and Tufano (1998) (*Fund flow*), and the fund's turnover ratio (*Turnover ratio*). We also control for a fund's expense ratio (*Expense ratio*) to capture differences in funds' expenses that impact on performance. Hence, regression estimates correspond to gross-of-fee performance effects that better account for investment skill.[7] As before, we include fund fixed effects to maintain our perspective on an intra-fund level effect of fund age on performance and to control for unobservable fund heterogeneity. Furthermore, we include investment segment and time (month × year) fixed effects, denoted by α_s and α_t respectively, to account for unobservable segment and time effects that could impact on our results. Thus, our regression design estimates the performance impact of fund age within the same fund, while controlling for changes in the state of the mutual fund industry.[8] We cluster standard errors at the fund level.

– Insert Table II approximately here –

Results reported in Table II confirm our findings of Figure I and show that the performance of a fund deteriorates with its age. Specifically, the slope estimates for fund age show a negative impact on fund performance between 7 basis points for the Carhart (1997) 4-factor alpha and 9 basis points for the Jensen (1968) alpha. Thus, a doubling in a typical fund's age leads to a

[7] For robustness we repeat our analysis with gross-of-fee performance metrics as our dependent variables instead of controlling explicitly for funds' expense ratios. Specifically, we obtain gross-of-fee alphas based on 36-month rolling-window regressions of funds' gross-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. Funds' gross-of-fee returns are estimated by dividing their yearly expense ratios by twelve and adding it to their net-of-fee returns. Results (not reported) are qualitatively the same.

[8] Including time fixed effects in our regressions also accounts for the effects observed by Pástor et al. (2014) that changes in the mutual fund industry's scale could impact on fund age as a determinant of fund performance.

performance deterioration of up to 75 basis points per year.[9] In other words, to put the economic magnitude more into perspective our age estimates imply that a 12 year old fund underperforms its 3 year old self by up to 150 basis points per year. All effects are statistically significant with three out of four measures being significant at the 1 percent level. Hence, our empirical approach confirms performance effects that are consistent with the existence of the liability of aging theory in the mutual fund industry.[10]

To address the possibility that this underperformance is attributable to a diseconomies of scale effect we include fund size in our performance regression.[11] Consistent with the results of Berk and Green (2004) and Chen et al. (2004) fund size impacts negatively on fund performance across all performance measures. We also include as controls a fund's past return, growth rate, expense ratio and turnover ratio. Notably, we can confirm the findings of Pástor et al. (2015) that fund turnover impacts significantly positive on fund performance which is consistent with their finding that fund turnover is a proxy for investment skill.[12] Furthermore, funds' past performance impacts positively on performance consistent with Hendricks et al. (1993), Bollen and Busse (2005), and Busse and Irvine (2006), who argue that fund performance is persistent on short-term horizons.

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[9] In more detail, consider our linear regression model where the dependent variable, *Performance*, is in level terms and the independent variable of interest, *LnAge*, is in log terms. Holding all independent variables constant except fund age, a change in performance is equal to $\Delta Performance_i = \beta \ln\left(Age_{i,t-1}(1+\Delta\%)\right) - \beta \ln\left(Age_{i,t-1}\right) = \beta \ln(1+\Delta\%)$. Thus, a doubling in a typical fund's age corresponds to a decline in the annualized fund performance of $0.0009 * \ln(2) * 12 = 75$ basis point for the Jensen (1968) alpha.

[10] We additionally run our regression for each fund separately and perform standard *t*-tests over all coefficients of our main independent variable, *LnAge*. Irrespective of the employed performance measure the results remain statistically significant at the 1 percent level and the negative age-performance relation ranges from an underperformance of 34 basis points to 52 basis points per month.

[11] As an additional check, we repeat our analysis including squared values for fund size and all other control variables to allow for nonlinearities. Results (not reported) are qualitatively the same, if anything, they gain in statistical significance.

[12] The evidence on the impact of funds' trading activity on performance is rather mixed in the literature. While Carhart (1997) finds a negative impact of turnover on fund performance Elton et al. (1993), and Chen et al. (2004), find no significant effect. On the contrary, Wermers (2000), Chen et al. (2000), Kacperczyk et al. (2008) and Pástor et al. (2015) observe a positive impact. However, following Pástor et al. (2015) earlier studies look at cross-sectional differences between funds while our study investigates intra-fund changes. In line with this argumentation, we observe a positive performance impact of a fund's turnover ratio that becomes insignificant when we do not control for the heterogeneity across funds, i.e., include fund fixed effects.

4.2 ROBUSTNESS

4.2. a Incubation bias

One potential explanation for the negative age-performance relation could be that fund-month observations that are special with respect to fund age and size could drive our result. Specifically, Evans (2010) documents that fund families start a series of mutual funds but that only a limited number, presumably those with a better performance record, continue to be managed while the others are shut down. As a consequence these incubated funds outperform non-incubated funds. Thus, as a first methodological robustness check, we repeat our analysis and control for fund-month observations that are likely to belong to incubated funds. The additional control *Incubation* is a binary variable that equals one if the fund-month observation belongs to a fund whose age is less than three years or whose TNA are below $15 million, and zero otherwise. We define the indicator variable *Incubation* based on a three year cut-off since Evans suggests that the first three years of a fund largely account for the incubation bias. In addition, we complement this adjustment by accounting for funds that are very small in size, similar to Chen et al. (2004) and Pástor et al. (2014).

– Insert Table III approximately here –

The results from Table III clearly confirm the findings of Table II that mature funds are subject to diseconomies of life. The estimates remain statistically significant at comparable levels and the magnitude of the effect tends to become slightly smaller.

4.2. b Influences of the fund family

A growing strand of the literature documents that fund families' strategic decisions impact on their member funds' performance. For instance, Nanda et al. (2004) and Gaspar et al. (2006) investigate favoritism and cross-subsidization of funds in fund families. Other papers analyze the consequences arising from structural differences in fund families' organization (see, e.g., Kacperczyk and Seru, 2012; Chen et al., 2013; Cici et al., 2014; Sorhage, 2014). Thus, as a second methodological robustness check, we include time-varying family controls (in month *t-1*): the logarithm of the fund family's total net assets under management (*Ln TNA family*) and the concentration of a fund family across investment segments defined as in Siggelkow (2003) (*Family focus*). In addition, we add family fixed effects in the performance regressions to rule out that the age effect is affected by fund family influences.[13] Family fixed effects effectively allow us to control for any unobservable per se heterogeneity across families. Thus, in this specification we estimate the performance difference of a mature fund relative to its younger self, controlled for changes in the fund's family organization and the state of the world.

– Insert Table IV approximately here –

Table IV supports our findings of the earlier tests. Independent of the employed performance benchmark fund age impacts significantly negative on fund performance. Levels of economic and statistical significance are almost unaffected to our findings from Table III.

4.2. c Influences of the fund manager

When thinking about the success of funds' investment decisions an intuitive determinant that comes to mind is the fund manager and her abilities. Thus, a final concern is that the observed age-performance effect is attributable to the fund manager who is managing the fund at its earlier or advanced stage of life. For instance, one might argue that time dependent manager characteristics such as manager age that proxies for the effort put into the investment process drives the observed negative age-performance relation. This concern becomes more serious when a fund is not subject to a manager change since time dependent manager characteristics and fund age develop in lock-step leaving us unable to separate both effects.

[13] Including family controls effectively sets the sample period begin to the year 1996 since funds' family identifiers are not available for earlier periods in CRSP.

If this conjecture is true, manager changes – especially those to younger managers – that represent structural breaks in funds' performance generating processes (Khorana, 1996; Khorana, 2001), must reflect on the age-performance relation. We obtain information on fund managers from CRSP and assign them to the fund-month observations based on the derived manager identities.[14] This allows us to observe all changes in the manager who is running the fund. In addition, similar to Chevalier and Ellison (1999) we construct an approximate manager age as the time difference between the period of observation and the first time the manager appears in the CRSP sample plus 21 years to capture the time the manager graduated from college. Then, in Panel A of Table V we explore the impact of fund age on performance during regular periods and periods of managerial change by including two indicator variables, *Change young* and *Change old*, which equal one if the fund-month observation lies within a 12 month period around the change of the fund's manager to, respectively, a younger or older manager.[15]

– Insert Table V approximately here –

As expected, results from Panel A of Table V show clear support for our finding that the performance of funds declines over their lifetime. In fact, the negative age-performance relation gains in economic significance and ranges from 7 basis points to 16 basis points per month for a doubling in a typical fund's lifetime depending on the employed performance benchmark. More importantly, however, the estimated coefficients for the interaction terms of *LnAge* with *Change young* and *Change old* are insignificant. This indicates that time dependent manager characteristics do not drive our results since funds' age related performance

[14] In case of team-managed funds we assign the fund-month observations to the manager who arrived first at the fund as suggested by Pástor et al. (2014). Unfortunately, CRSP does not provide the identities of fund managers in all team-managed funds. Thus, we identify manager names that cannot be associated with an identity of individuals similar to Bär et al. (2011) and drop their observations from our analysis. As a further robustness check we re-run our analysis for single-managed funds only. Results (not reported) are qualitatively the same.

[15] For robustness we also measure the age-performance relation during periods of managerial change that span 10 months, 8 months, 4 months, and 2 months. Results (not reported) are qualitatively the same.

deterioration is not different during times of managerial change and periods when the fund is persistently managed by the same manager.[16]

In Panel B we address the conjecture that also differences in managers' skill could drive our main result. In fact, it could even be the case that more skilled managers are selected to younger funds. In this setting, we follow the argumentation of Custódio and Metzger (2014) that our closest test is to compare the same fund manager, managing the same fund during the fund`s younger and older stage of life. Thus, we repeat the analysis from Table IV with fund fixed effects × manager fixed effects. [17] Fund × manager fixed effects do not only take care of unobservable heterogeneity across funds and managers but allow us to adjust for manager-specific time periods within funds. Hence, identification comes from within-fund variation after subtracting time-varying manger effects. Results from Panel B of Table V confirm our finding from Panel A and earlier tables as fund age impacts significantly negative on fund performance.

Overall, the results from Section 4. strongly confirm the notion that younger funds outperform mature funds and that this effect holds for a large number of robustness checks at the fund, family, and manager level. Hence, evidence is consistent with the liability of aging theory that older funds are subject to diseconomies of life.

5. Do we capture Innovation Induced Performance Effects?

Building on the observation that funds are subject to decreasing returns to life, we take a first step in exploring whether the negative age-performance relation is attributable to differences in innovative investment behavior as suggested by the liability of aging theory. In Section 5.1,

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[16] Furthermore, to account for managerial changes with strong age gaps we repeat our analysis and additionally separate both variables *Change young* and *Change old* based on whether the differential between the managers' age is above or below median. Again, results (not reported) are qualitatively the same.

[17] The large number of fixed effects in our regression model gives rise to collinearity problems. Thus, to mitigate this bias we exclude time fixed effects from our testing model. However, when we insist on the inclusion of time fixed effects our results (not reported) are qualitatively the same.

we explore a quasi-natural experiment and we investigate the impact of fund age on the performance of passively managed index funds whose investment behavior is unlikely to be related to innovative investment strategies. Furthermore, we augment this test and analyze the age-performance relation among more or less innovative investment segments of actively managed funds. In Section 5.2, we study how fund age relates to performance in environments of different competitive strength.

5.1 AGE-PERFORMANCE RELATION AMONG INDEX AND ACTIVELY MANAGED FUNDS

The presence of actively and passively managed funds in the mutual fund industry provides us with a prime example to test whether active funds' diseconomies of life are attributable to a decline in innovative investment behavior. In contrast to actively managed funds that pursue investment strategies which purposely deviate from their benchmarks to generate abnormal returns, passively managed index funds aim to track an index as closely as possible. Thus, index funds' investment strategies are predefined and their performance is not likely to be related to an innovative investment style. We follow the approach used in Cici et al. (2014) to identify passively managed index funds that fully replicate their benchmarks.[18,19]

– Insert Table VI approximately here –

Contrary to the analyses from Section 4. our results from Panel A of Table VI show evidence that is clearly in favor of our hypothesis that fund age has no significant impact on the performance of index funds whose daily business is almost by definition unrelated to innovative investment behavior.

[18] We focus on S&P500 index funds since they represent the lion's share of passively managed index funds in the U.S. (Investment Company Institute, 2014). In addition, we include small-cap and mid-cap index funds that track the S&P400, S&P600, NASDAQ 100, and the Russell 2000 index.

[19] Since results from the reduced sample of Table V where manager information are available do not change our main results we employ the empirical approach from Table IV in this and all subsequent analyses. Results for the empirical approach from Table V (not reported) are qualitatively the same.

In Panel B we transfer the above rationale to our sample of actively managed funds and separate them into two groups based on their investment segments' potential for innovative investment strategies. Specifically, we would expect that funds that invest for example in Blue Chip stocks, i.e., stocks of large and well-established companies with consistent generations of income provide weaker opportunities for innovative investment strategies than an investment focus on smaller and more specialized stocks. Thus, we define funds with the CRSP investment objectives "Income", "Growth & Income" and "Mid Cap" ("Micro Cap", "Small Cap", "Sector" and "Growth") as less (more) innovative and repeat the performance analysis from Section 4. for both subsamples of actively managed funds. Results from Panel B of Table VI confirm our hypothesis that the negative age-performance relation cannot be confirmed among funds whose investment focus is on stocks with higher market capitalization and stable cash flows. However, a doubling in a typical fund's age whose investment segment permits more innovative investments is associated with a performance deterioration of up to 141 basis points per year.

Overall, the observations from Table VI supports our claim that mature funds' diseconomies of life are indeed related to their ability to generate influential new investment ideas, respectively, by their inability to reinvent themselves over time.

5.2 AGE-PERFROMANCE RELATION AND COMPETITION

Evidence from the organizational economist literature suggests a generally positive relationship between competition, respectively, market concentration and a drive for innovation among organizations. Cohen (2010) provides a comprehensive review on the link between innovative activity and performance as well as its associated determinants such as competition. These views in turn resemble observations in the fund literature that the mutual fund industry is shaped by its competitive forces. Specifically, Khorana and Servaes (2012) suggest that fund families gain market share through product differentiation. Relatedly, Wahal and Wang (2011) find that higher product competition through the market entry of funds with similar stockholdings affects funds' performance and survival in the market. This suggests that times of higher competition require a fund to put more emphasis on investing differently than its competitors. According to this narrative, we would expect that the negative age-performance relation can be observed in times of low competition but should be less pronounced in more competitive environments. We address this notion by repeating the performance analysis for subsamples that proxy for environments of different competitive strengths.

In Panel A of Table VII, we investigate the age-performance relation for different intensities of industry competition and split our sample into low and high competitive based on the market concentration (Herfindahl index) among mutual funds in the industry. Specifically, times with above median Herfindahl index values are classified as less competitive than times with below median values. In Panel B we extend this logic to the fund family level. We study the underperformance of mature funds for varying intra-family competition and thus environments that facilitate innovation at a more micro level. In particular, we classify observations as low (high) competitive if the fund belongs to a fund family with, respectively, below (above) median number of funds in its investment segment.[20]

– Insert Table VII approximately here –

The results from Table VII confirm that the negative age-performance effect is related to the competitive environment of the funds. Times of higher industry concentration and funds of families with less populated investment segments, all proxies for environments of lower competitive strength, show that fund performance deteriorates with age. Depending on the employed performance benchmark a doubling in a typical fund's lifetime is associated with a

[20] We additionally distinguish between other proxies that capture different intensities of intra-family competition. For instance, we classify observations as low (high) competitive if the fund belongs to a fund family with, respectively, below (above) median number of funds in the family or, analogous to the definition for industry competition, above (below) median asset concentration (Herfindahl index) across investment segments measured as in Siggelkow (2003). The results (not reported) are qualitatively the same.

performance decline of up to 114 basis points per year. In contrast, when competition is higher we find no significant effect of fund age on performance.

Overall, the results from Table VII show that funds' negative returns to life are limited to observations that are associated with lower competition and thus lower needs for funds to reinvent themselves.

6. Fund Age and Innovative Investment Behavior

In this section we explore age induced differences in investment behavior as the main mechanism for the observed diseconomies of life as suggested by the liability of aging theory. We investigate funds' innovative investment behavior from two different ankles. In Section 6.1 we provide evidence on how fund age impacts on trading behavior. In Section 6.2 we explore whether the difference in innovative investment behavior is observable in funds' stock holding characteristics.

6.1 IMPACT OF FUND AGE ON TRADING BEHAVIOR

Funds that exhibit truly innovative investment behavior through a constant pursuit of new profit opportunities need to put their ideas into practice and simultaneously abandon obsolete investment strategies (Pástor et al., 2015). Hence, we hypothesize that funds that aim to reinvent themselves time and again trade more heavily compared to funds that are less innovative and stick to the status quo of their portfolio.

To test this hypothesis, we study an impact of fund age on various measures of turnover. As in Cici et al. (2014) we use funds' turnover ratios, buy and sell turnover as well as funds' position-adjusted turnover as measures for trading behavior. A fund's turnover ratio is defined as the minimum of security purchases and sales divided by the fund's average total net assets under management during the period. Buy and sell turnover, defined as in Carhart (1997), intend to separately measure buy and sell induced trading behavior. As in Edelen et al. (2013)

the position-adjusted turnover of a fund is equal to the turnover ratio adjusted for the average size of the fund's holdings position. The idea is that the adjustment for a fund's relative position size takes the price impact of a fund's trading into account.

We complement the first group of measures with another set that is similar in spirit but does not employ funds' reported turnover ratios. Specifically, Dorn and Huberman (2009) suggest to measure funds' trading behavior based on their holdings. Accordingly, we estimate a fund's holdingsbased turnover as the absolute value of the fund's purchases and sales divided by twice the average portfolio value. In addition, we derive a fund's speculation induced turnover. Thereby, sales (buys) are classified as speculative trades only if the entire stock position is closed (newly added) (Barber and Odean, 2002). Hence, speculative trades are more driven by beliefs about future performance.

– Insert Table VIII approximately here –

Table VIII provides strong evidence that fund age is negatively related to trading behavior. In particular, a doubling in a typical fund's lifetime is associated with a decrease in fund turnover of up to 20 percent per year. This effect of less active investment behavior among older funds holds irrespective of the employed turnover measure. Particularly interesting is the strong and significantly negative loading on *Speculative turnover (holdingsbased)* that younger funds alter entire stock positions more frequently than their future selves. Thus, our findings are consistent with the liability of aging theory and present a first indicator that mature funds are less innovative than their younger peers.

To extend our finding from Table VIII we investigate the impact of fund age on a number of recent measures for active management that present more direct links to superior fund performance.

As proxies for this kind of activity we employ funds' active share (Cremers and Petajisto, 2009; Petajisto, 2013), return gap (Kacperczyk et al., 2008) and the R^2 measure (Amihud and

Goyenko, 2013). Specifically, Cremers and Petajisto (2009) suggest that superior investment skill is associated with an under- or overweight of particular stocks in the fund's portfolio relative to those stocks' weights in the benchmark portfolio. Hence, funds' active share, that are based on a comparison of the stocks' portfolio weights in the fund and the portfolio weights of the stocks in the fund's benchmark portfolio, predict future fund performance.[21] Kacperczyk et al. (2008) contribute to the literature on active management skill by showing that unreported actions add to a fund's performance. They measure this hidden performance benefit as the difference between the actual gross-of-fee fund return and the hypothetical return of the recently reported fund holdings. Accordingly, return gap positively predicts future fund performance. Lastly, Amihud and Goyenko (2013) propose that the R^2 from a regression of fund returns on a multifactor model indicates investment skill. In particular, funds with low values of R^2 generate superior future fund performance. We obtain the R^2 measures from 36-month rolling window regressions of funds' net-of-fee excess returns on the excess market return and the SMB, HML, and MOM (momentum) factors as in the Carhart (1997) 4-factor model. Then, as suggested by Amihud and Goyenko (2013) we define $1\text{-}R^2$ as funds' measure of selectivity.

Overall, in light of the liability of aging theory, we hypothesize that fund age is negatively related to all three measures of performance generating activity.

– Insert Table IX approximately here –

Results reported in Table IX support our hypothesis and show a negative impact of fund age on active share, return gap and the R^2 measure which are associated with positive future fund performance. This finding provides further support to the liability of aging theory that funds engage in less performance generating, innovative trading behavior when they grow

[21] We obtain the data on the active share information of mutual funds from the website of Antti Petajisto: http://www.petajisto.net/index.html.

older. Hence, evidence from Table VIII and Table IX confirm our claim that the mechanism behind the observed diseconomies of life is attributable to a decline in innovative investments.

6.2 FUND AGE AND HARD-TO-VALUE STOCKS

In this section we make a more detailed exploration in identifying the mechanism that drives funds' diseconomies of life. Specifically, we investigate how mature funds moderate their engagement in innovative investment activity by looking at funds' stock holding positions. Generating abnormal returns requires of a fund to put effort in the identification of new profit opportunities. Stocks that bear the potential for higher profit opportunities are stocks that are relatively harder to value. Thus, we expect that older funds hold less stocks in their portfolio whose valuation takes effort and are hard-to-value.

We measure hard-to-value stocks with various measures documented in the literature. First, Kumar (2009) suggests that stocks with more valuation uncertainty are characterized by higher idiosyncratic volatility, lower turnover and lower firm age. Thus, our first measure, *Idiosyncratic stock*, represents a fund's weight in stocks that belong to the top three deciles of stocks' idiosyncratic volatility in a month. We obtain stocks' idiosyncratic volatility as the variance of the residual from excess return regressions on the Carhart (1997) 4-factor model. As a complementary we also consider *Non-idiosyncratic stock*, a fund's weight in stocks that belong to the bottom three deciles, which are presumed to be associated with low valuation uncertainty and thus are easy-to-value. Furthermore, *Stock turnover*, is the portfolio weighted average of the stocks' turnover of all stocks in a fund's portfolio. Thereby stock turnover is defined as the ratio of the number of shares traded in a month to the total number of shares outstanding. *Firm age*, is the mean firm age of a fund's holdings in a month. Firm age is estimated as the number of years since the stock appears for the first time in the CRSP database. Second, we employ measures from the literature on differences of opinion among investors (see, e.g., Abarbanell et al., 1995; Diether et al., 2002; Garfinkel and Sokobin, 2006). In particular, stocks that are subject to less analyst coverage or show a higher dispersion of analyst forecast are expected to be harder to value. Thus, *Analyst coverage* and *Analyst dispersion*, respectively, represent the average analyst coverage and analyst forecast dispersion of the fund's stock holdings. Lastly, we employ measures of portfolio illiquidity that are related to the differences of opinion measures but are based on the market's perception and not just on a group of specialists. In particular, the literature documents a relation between the illiquidity of securities and information asymmetries in prices (see, e.g., Glosten and Milgrom, 1985; Glosten and Harris, 1988). Hence, we use *Relative spread* and the *Amihud* measure as proxies for the illiquidity of stocks. Relative spread is the difference between the logarithm of the best offer and the logarithm of the best bid price (see, e.g., Holden and Jacobsen, 2014). The Amihud (2002) measure is derived as the ratio of a stock's absolute return to its dollar volume. Both stock illiquidity measures are aggregated to the fund-portfolio level as the portfolio weighted mean (see Massa and Phalippou, 2005).

– Insert Table X approximately here –

Results from Table X confirm our hypothesis that older funds hold significantly less stocks that are hard-to-value. In particular, as fund age increases the fraction of stocks with higher idiosyncratic volatility, higher analyst dispersion and higher illiquidity, all proxies for higher valuation uncertainty, decreases. At the same time, their holdings in non-idiosyncratic volatility stocks, higher turnover stocks, older firms, and higher analyst coverage, all proxies for easier to value stocks, increases.

Overall, the conclusion that mature funds hold less stocks associated with higher valuation uncertainty and thus higher profit opportunities is robust to the various measures. This is consistent with the liability of aging theory that when funds grow older they pursue less innovative investment strategies.

7. Demand for Mature Funds and their Potential Benefits

In this section we explore what types of investors seek to invest in older funds and touch on potential benefits that these shareholders receive. In Section 7.1 we investigate whether there are differences in the investor types who populate funds between their earlier or advanced stages of life. In Section 7.2 we analyze what investors could stand to gain from investing in mature funds. In particular, since older funds seem to pursue less innovative investment strategies, we hypothesize that they exhibit less extreme investment styles and consequently deliver more stable performance outcomes.

7.1 DIVERSITY IN INVESTOR CHARACTERISTICS

In this section we study whether the type of shareholders change during a fund's lifetime. Unfortunately, data limitations on the availability of fund investor characteristics prevent us to establish a direct link between investor types and funds' age. However, we try to circumvent these limitations by using tests that relate to distinguishing characteristics among investor groups documented in the literature. Specifically, Evans and Fahlenbrach (2012) show that the response to a fund's past performance is significantly different among funds that cater exclusively to retail investors and those that are also populated by institutional investors. Hence, we hypothesize that investors' responsiveness to funds' past performance as well as the prevalence of institutional investors are indicators of significantly different shareholder structures in a fund.

We begin our analysis of whether mature funds attract different types of investors by studying the relation of fund age and the performance-flow sensitivity. In particular, we measure net-inflows as suggested by Sirri and Tufano (1998) for each fund *i* in each month *t* as:

$$Fund\ \ flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t})}{TNA_{i,t-1}}, \tag{3}$$

whereby *TNA* represents the total net assets under management and *R* the total net-of-fee return. Thus, a fund's monthly net-inflow, *Fund flow*, denotes the percentage growth rate of the fund adjusted for its internal growth. We then relate the growth of a fund to our main independent variable, *LnAge*, and the fund's past performance. To account for the well documented non-linear influence of past performance on net-inflows (see, e.g., Ippolito (1992), Chevalier and Ellison (1997), and Sirri and Tufano (1998)), we employ a piecewise-linear regression model and estimate separate slope coefficients for the performance groups *Bottom quintile*, *Middle quintiles*, and *Top quintile* that represent piecewise decompositions of funds' fractional performance ranks and are defined as:

$$\begin{aligned} \textit{Bottom quintile}_{i,t-1} &= \min(0.2; \textit{PerfRank}_{i,t-1}) \\ \textit{Middle quintiles}_{i,t-1} &= \min(0.6; \textit{PerfRank}_{i,t-1} - \textit{Bottom quintile}_{i,t-1}) \\ \textit{Top quintile}_{i,t-1} &= \textit{PerfRank}_{i,t-1} - (\textit{Bottom quintile}_{i,t-1} + \textit{Middle quintiles}_{i,t-1}). \end{aligned} \tag{4}$$

Thereby funds' performance ranks, *PerfRank*, are based on the percentile risk-adjusted performance relative to all other funds within the same investment segment and month as in Sirri and Tufano (1998). As control variables we include: *Ln TNA Family*, *Family focus*, *Ln TNA*, *Fund flow*, *Expense ratio*, and *Turnover ratio* as defined in Section 4. We supplement these controls with the average growth rate (in month *t-1*) of the fund's segment within a month (*Objective flow*) and cluster standard errors at the fund level.

– Insert Table XI approximately here –

The results of Table XI clearly confirm the findings from the literature of a convex performance-flow relationship. This observation holds irrespective of the employed performance ranks that are based on the Jensen (1968) alpha, Fama and French (1993) 3-factor alpha, Carhart (1997) 4-factor alpha, or Pástor and Stambaugh (2003) 5-factor alpha. In addition, we confirm the findings of Barber et al. (2015) that investors seem to account for market beta risk and respond most heavily to performance ranks based on Jensen (1968) alpha.

More importantly, however, we find significantly negative loadings on the interaction term of *LnAge* and *Top quintile* indicating that investors who populate funds at their earlier stages of life are considerably more sensitive to superior fund performance than at their advanced stages of life. This gives support to our hypothesis that the demand for mature funds stems from different kinds of shareholders than during their earlier years. Even further, looking at the results for Carhart (1997) 4-factor and Pástor and Stambaugh (2003) 5-factor we find evidence that shareholders in young funds are more sensitive to poor risk-adjusted fund performance and seem to avoid underperformers more strongly. However, consistent with the literature we cannot find any evidence that investors redeem their shares even if the fund belongs to the worst performers of their peer group. Hence, irrespective of a fund's stage of life investors do not vote with their feet when it comes to an underperformance of their fund investments.

Building on this observation we study a more direct link of an age-related difference in funds' shareholder structure and explore the probability of mature funds being populated by institutional investors. We obtain information on the primary investor group of a fund's share from Thomson Reuters Lipper (Lipper). Similar to Del Guercio and Reuter (2014) we classify a fund as an *Institutional fund* if more than 50 percent of the fund's assets are reflected through share classes sold to institutional investors. Then, we run the following logistic regression model:

$$\mathrm{Prob}(\textit{Institutional fund}_{i,t} = 1) = \Lambda(\alpha_0 + \beta \textit{LnAge}_{i,t-1} + \gamma Z_{i,t-1} + \mathrm{A}), \tag{5}$$

where *Institutional fund* is an indicator variable which equals one if fund *i* is primarily populated by institutional investors in month *t* and zero otherwise. $\Lambda(\bullet)$ indicates the logistic cumulative distribution function. Our main independent variable is *LnAge* to determine whether the likelihood of having an institutional fund increases or deteriorates with a fund's age. In addition, the vector Z is the set of control variables (in month *t-1*) from Table IV and fixed effects are represented by A .[22] We cluster standard errors at the fund level.

– Insert Table XII approximately here –

The coefficient on our main independent variable *LnAge* is negative and statistically significant. This indicates that the likelihood of a fund to be populated by an institutional majority deteriorates for mature funds. The magnitude of this effect suggests that a one-standard deviation increase in *LnAge* (0.9294) decreases the likelihood that a fund is an institutional fund by about 8.94 (-9.62 × 0.9294) percentage points. This is a notable effect considering that only about 25 percent of our fund-month observations belong to funds that are primarily populated by institutional investors.

7.2 STYLE AND PERFORMANCE EXTREMITY

Acknowledging that the type of shareholder changes during a fund's lifetime we touch in this section on what investors could stand to gain from investing in mature funds despite that they are unable to reinvent themselves over time and underperform their younger counterparts. Thereby, we analyze two implications arising from the differences in funds' age induced investment behavior. First, we explore in Panel A of Table XIII whether older funds take fewer large bets on specific investment styles, i.e., that the extremity of the funds' investment style deteriorates over time. Second, as a logical implication we test in Panel B of Table XIII whether mature funds deliver less extreme performance outcomes relative to their younger selves.

We measure the investment style of each fund *i* in each month *t* by the fund's Carhart (1997) factor sensitivities to the market factor (Market), value factor (HML), size factor (SMB)

[22] Note that, in this specification we refrain from including fund fixed effects because we are interested in whether mature funds are more or less populated by institutional investors. On the contrary, the use of fund fixed effects would alter the interpretation to mature funds being more or less likely to switch to a dominantly institutional shareholder structure. Hence, identification would come from changes at the fund level. However, results (not reported) with fund fixed effects are qualitatively the same.

and momentum factor (MOM) obtained from 36-month rolling regressions. Then we estimate funds' style extremities as suggested by Bär et al. (2011) as:

$$SE_{i,t}^{s} = \frac{\left|\beta_{i,t}^{s} - \bar{\beta}_{i,t}^{s}\right|}{\frac{1}{N}\sum_{j=1}^{N}\left|\beta_{j,t}^{s} - \bar{\beta}_{i,t}^{s}\right|}, \tag{6}$$

where S represents the analyzed investment style of the fund (Market, HML, SMB, MOM), β is the factor exposure of fund i in month t, and $\bar{\beta}$ is the average factor exposure of all funds in the same investment segment and month t as fund i. Accordingly, style extremity is estimated as the absolute difference between a fund's style, represented by its beta loading to one of the four factors in the Carhart (1997) 4-factor model, and the average style of all funds in the same investment segment and month. This difference is then normalized by the average absolute difference of all funds so that style differentials become comparable across styles, investment segments, and time.

Similar to the style extremity measure above we calculate the performance extremity measure for each fund i in each month t as suggested by Bär et al. (2011) as:

$$PE_{i,t} = \frac{\left|P_{i,t} - \bar{P}_{i,t}\right|}{\frac{1}{N}\sum_{j=1}^{N}\left|P_{j,t} - \bar{P}_{i,t}\right|}. \tag{7}$$

Thereby, the performance extremity of a fund is estimated as the absolute difference between a fund's performance P, represented by the four different performance measures Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh), and the average performance of all funds in the same segment and month, $\bar{P}$, divided by the average absolute deviation of all funds in the same investment segment and month.

– Insert Table XIII approximately here –

Results from Panel A of Table XIII show strong support for our hypothesis that mature funds pursue less extreme investment styles. These differences are statistically significant at the 1 percent level but also matter from an economic point of view. In particular, a doubling in a typical fund's age is associated with a decrease in the style extremity measure for the market factor of about 83 percentage points when compared to that of an average fund in the same investment segment and month. This differential becomes smaller but is still considerably large when we look at the differences in style extremity for the HML (SMB, MOM) factor that amounts to 42 (50, 30) percentage points.

In addition, results from Panel B of Table XIII clearly confirm our hypothesis that the extremity of performance outcomes deteriorates with fund age. Specifically, the decline in performance extremity associated with a doubling in a fund's age ranges from approximately 9 percentage points for the Jensen (1968) alpha up to 43 percentage points for the Pástor and Stambaugh (2003) 5-factor alpha.

Overall, the results from Section 7. suggest that funds cater to different groups of investors during their lifetime. In particular, our observations indicate that mature funds attract less performance sensitive and non-institutional investors by delivering more stable outcomes in terms of investment style and performance.

8. Conclusion

The perception of age as something positive or negative is often determined by the valuation standard of the spectator. Learning theorists evaluate the passing of time as a positive since it can stand for more learning opportunities. On the contrary, physicians tend to consider aging as a negative due to the decline in one's physical capabilities. In the active managed world of the mutual fund industry the valuation standard is represented by funds' competence to beat their benchmark. However, the economics literature on mutual funds has mostly been a quest to identify investment skill cross-sectionally which neglects the role of time as another important determinant for a fund's performance.

Borrowing from the organization ecology's frameworks of the liability of newness and the liability of aging theory we derive hypotheses on the impact of fund age on performance. Our results clearly support the liability of aging theory: funds' performance deteriorates as they mature due to a decline in innovative investment ideas. Hence, this confirms the existence of funds' diseconomies of life.

In particular, we document an age induced performance difference of up to 75 basis points per year for a doubling in fund age. This observation is robust to a broad range of controls that could contaminate the negative age-performance relation and is supported by tests that impose a relation to innovative investment behavior. Specifically, as funds grow older their trading strongly declines by up to 20 percent per year, they pursue less investment strategies that are predictors of superior future fund performance, and hold less stocks that are hard-to-value.

Nonetheless, our results indicate that the demand for mature funds stems from different investor groups than for younger funds. In particular, as funds grow older they are more populated by less performance sensitive and non-institutional investors that seem to put more emphasis on less extreme investment styles and more stable performance outcomes.

Taken together, our findings show that a fund's ability to beat its benchmark through the generation of influential ideas is subject to developments over time. This has important implications for mutual fund investors, that is, they need to be aware that funds` investment skills are not like wine and improve over time but are subject to a slow decay. This suggests a new dimension of mutual fund research. Specifically, avenues of future work should to take the evolutionary dimension into account when investigating investment skill.

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Figure I. Age-performance relation

The figure shows the relationship between fund age ranks and mutual fund performance. We obtain funds' performance-age sensitivities from piecewise-linear regressions of the performance measures Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh) on funds' relative age ranks and fund fixed effects. Funds' fractional age ranks represent a fund's percentile age relative to other funds with the same investment segment and month. Then, these fractional ranks are used to estimate five age quintiles similar to Sirri and Tufano (1998). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. Robust standard errors are clustered at the fund level.

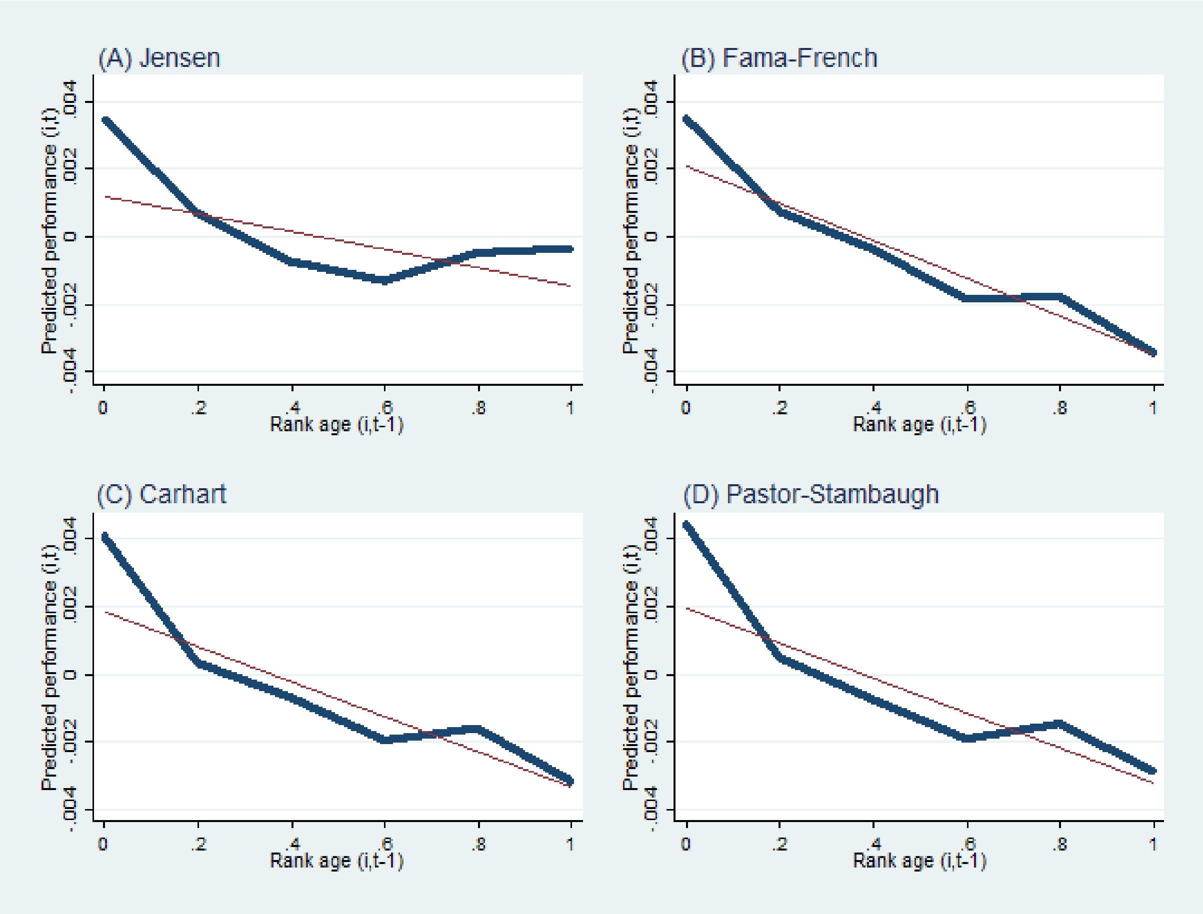

Table I. Summary statistics

This table reports summary statistics on the major variables for our sample of actively managed U.S. domestic equity funds between 1991 and 2014. In Panel A, we report funds' performance measures as our main dependent variables. Panel B presents our main independent variable fund age and the remaining variables that are employed as controls in the paper. Jensen (1968) alpha, Fama and French (1993) alpha, Carhart (1997) alpha, and Pástor and Stambaugh (2003) alpha are obtained from 36-month rolling-window regressions of funds' net-of-fee excess returns on the excess market return for the Jensen alpha, additionally the SMB, HML factors for the Fama-French alpha, augmented by the MOM (momentum) factor for the Carhart alpha, and the INNOV (innovation) factor for the Pastor-Stambaugh alpha. Fund age, is the fund's age in years. Family size, is the total net assets under management of the fund family in million USD. Family focus, represents the concentration of a fund family across investment segments defined as in Siggelkow (2003). Fund net-of-fee return, is the fund's monthly return after expenses. Fund size, represents the fund's total net assets under management in million USD. Fund flow, is the fund's monthly growth rate adjusted for internal growth as in Sirri and Tufano (1998). Expense ratio, is the fund's fees charged for total services. Turnover ratio, is the fund's yearly turnover. The performance metrics, Family focus, Fund net-of-fee return, Expense ratio and Turnover ratio, are reported in percentage points.

			Percentiles			
Variable	Mean	Stdev.	25%	50%	75%	N
Panel A: Performance measures						
Jensen alpha (%)	0.005	3.724	-1.244	-0.066	1.144	411,713
Fama-French alpha (%)	-0.076	2.348	-1.119	-0.094	0.928	411,713
Carhart alpha (%)	-0.083	2.376	-1.105	-0.097	0.914	411,713
Pastor-Stambaugh alpha (%)	-0.075	2.490	-1.133	-0.093	0.949	399,438
Panel B: Independent variables						
Fund age (years)	13.11	12.99	4.93	9.34	16.09	417,830
Family size (in million USD)	34,612	95,277	584	4,353	20,311	371,440
Family focus (%)	50.70	24.91	31.67	42.10	63.80	371,440
Fund net-of-fee return (%)	0.71	5.62	-2.10	1.17	3.90	417,817
Fund size (in million USD)	1,144	4,668	48	186	722	417,830
Fund flow (%)	0.43	5.54	-1.46	-0.26	1.34	417,179
Expense ratio (%)	1.31	0.96	0.99	1.24	1.52	417,728
Turnover ratio (%)	94.64	163.01	34.00	65.00	112.00	415,460

Table II. Impact of fund age on performance

This table presents results from pooled OLS regressions that analyze the impact of fund age on mutual fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. The main independent variable is Ln age, the logarithm of the fund's age in years. Additional independent controls include Fund return, Ln TNA, Fund flow, Expense ratio, and Turnover ratio. Fund return, is the net-of-fee return of the fund. Ln TNA, represents the logarithm of the fund's total net assets under management. Fund flow, represents the fund's growth rate defined as in Sirri and Tufano (1998). Expense ratio, represents the fund's total expense ratio. Turnover ratio is the fund's yearly turnover ratio. All independent variables are lagged by one month. Regressions are run with fund, segment, and time (month × year) fixed effects. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Jensen	Fama-French	Carhart	Pastor-Stambaugh
Ln age	-0.0009 **	-0.0008 ***	-0.0007 ***	-0.0008 ***
	(0.0168)	(0.0000)	(0.0001)	(0.0000)
Fund return	-0.0044	0.0169 ***	0.0049 **	0.0087 ***
	(0.3283)	(0.0000)	(0.0422)	(0.0003)
Ln TNA	-0.0022 ***	-0.0011 ***	-0.0015 ***	-0.0015 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fund flow	0.0000 ***	0.0000	0.0000	0.0000
	(0.0023)	(0.1388)	(0.2321)	(0.2443)
Expense ratio	-0.0966	-0.0189	-0.0202	-0.0202
	(0.1980)	(0.3825)	(0.4888)	(0.5147)
Turnover ratio	0.0002 *	0.0002 ***	0.0002 ***	0.0002 **
	(0.0988)	(0.0088)	(0.0057)	(0.0149)
Fund fixed effects	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Number of Observations	399,438	399,438	399,438	399,438
Adj.-R^2	0.0798	0.0760	0.0790	0.0778

Table III. Impact of fund age on performance with incubation control

This table presents results from pooled OLS regressions that analyze the impact of fund age on mutual fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. The main independent variable is Ln age, the logarithm of the fund's age in years. Additional independent controls include: Incubation fund fixed effect, a binary variable that equals one if the fund-month observation belongs to a fund whose age is less than three years or whose TNA are below $15 million, and zero otherwise. Other independent variables and fixed effects are defined as in Table II. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Ln age	-0.0011	**	-0.0007	***	-0.0006	***	-0.0007	***
	(0.0232)		(0.0011)		(0.0056)		(0.0014)	
Fund return	-0.0044		0.0169	***	0.0049	**	0.0087	***
	(0.3289)		(0.0000)		(0.0422)		(0.0003)	
Ln TNA	-0.0022	***	-0.0011	***	-0.0015	***	-0.0015	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund flow	0.0000	***	0.0000		0.0000		0.0000	
	(0.0022)		(0.1406)		(0.2336)		(0.2464)	
Expense ratio	-0.0963		-0.0191		-0.0203		-0.0203	
	(0.1991)		(0.3789)		(0.4870)		(0.5122)	
Turnover ratio	0.0002	*	0.0002	***	0.0002	***	0.0002	**
	(0.0969)		(0.0090)		(0.0057)		(0.0151)	
Fund fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	399,438		399,438		399,438		399,438	
Adj.-R^2	0.0798		0.0760		0.0790		0.0778	

Table IV. Impact of fund age on performance with family controls

This table presents results from pooled OLS regressions that analyze the impact of fund age on mutual fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. The main independent variable is Ln age, the logarithm of the fund's age in years. Additional independent controls include: Ln TNA family and Family focus. Ln TNA family, is the logarithm of the fund family's total net assets under management. Family focus, represents the concentration of a fund family across investment segments defined as in Siggelkow (2003). Ln TNA family and Family focus are both lagged by one month. In addition, regressions are run with family fixed effects to control for any unobservable heterogeneity across families. Other independent variables and fixed effects are defined as in Table III. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Ln age	-0.0011	*	-0.0006	**	-0.0006	**	-0.0007	***
	(0.0779)		(0.0138)		(0.0191)		(0.0061)	
Ln TNA family	-0.0005	**	-0.0003	**	-0.0002	*	-0.0003	**
	(0.0163)		(0.0140)		(0.0575)		(0.0186)	
Family focus	0.0009		0.0004		0.0004		0.0006	
	(0.2621)		(0.4772)		(0.4945)		(0.2956)	
Fund return	-0.0194	***	0.0160	***	0.0049	**	0.0077	***
	(0.0000)		(0.0000)		(0.0452)		(0.0021)	
Ln TNA	-0.0027	***	-0.0013	***	-0.0018	***	-0.0017	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund flow	0.0000	***	0.0000	***	0.0000	*	0.0000	*
	(0.0000)		(0.0018)		(0.0536)		(0.0827)	
Expense ratio	-0.0693		-0.0150		-0.0166		-0.0179	
	(0.2305)		(0.4718)		(0.5891)		(0.5766)	
Turnover ratio	0.0001		0.0001		0.0001	*	0.0001	*
	(0.5429)		(0.1269)		(0.0557)		(0.0974)	
Fund fixed effects	Yes		Yes		Yes		Yes	
Family fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	353,217		353,217		353,217		353,217	
Adj.-R^2	0.0812		0.0825		0.0870		0.0864	

Table V. Impact of fund age on performance with manager control

This table presents results from pooled OLS regressions that analyze the impact of fund age on mutual fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. The main independent variable in both Panel A and B is Ln age, the logarithm of the fund's age in years. Additional independent controls in Panel A include: Change young, a binary variable that equals one if the fund-month observation is within a 12 month period around the change of the fund's manager to a younger manager; and Change old, a binary variable that equals one if the fund-month observation is within a 12 month period around the change of the fund's manager to an older manager. Other independent variables and fixed effects in both panels are defined as in Table IV. Still, regressions in Panel B are run with fund fixed effects × manager fixed effects to control for any unobservable heterogeneity across funds and managers but without time fixed effects. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: Fund manager changes

Dependent variable:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Ln age	-0.0016	*	-0.0009	***	-0.0007	**	-0.0009	***
	(0.0689)		(0.0066)		(0.0309)		(0.0081)	
Ln age* Change young	0.0003		0.0001		0.0001		0.0002	
	(0.4139)		(0.6562)		(0.6100)		(0.3128)	
Ln age* Change old	0.0002		0.0002		0.0003		0.0003	
	(0.6956)		(0.4932)		(0.3053)		(0.2630)	
Change young	-0.0007		-0.0002		-0.0004		-0.0007	
	(0.4999)		(0.7833)		(0.4720)		(0.1940)	
Change old	-0.0009		-0.0008		-0.0009		-0.0010	
	(0.5472)		(0.3017)		(0.1761)		(0.1600)	
Ln TNA family	-0.0005	*	-0.0002		-0.0001		-0.0002	
	(0.0686)		(0.1448)		(0.3954)		(0.2065)	
Family focus	0.0009		0.0007		0.0003		0.0006	
	(0.4166)		(0.3564)		(0.6342)		(0.3936)	
Fund return	-0.0219	***	0.0137	***	0.0042		0.0067	**
	(0.0000)		(0.0000)		(0.1370)		(0.0206)	
Ln TNA	-0.0030	***	-0.0014	***	-0.0020	***	-0.0020	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund flow	0.0000		0.0000		0.0000		0.0000	
	(0.5943)		(0.5118)		(0.7868)		(0.8140)	
Expense ratio	-0.0460		-0.0157		-0.0164		-0.0178	
	(0.2609)		(0.4533)		(0.5936)		(0.5791)	
Turnover ratio	0.0001		0.0001		0.0001		0.0001	
	(0.7433)		(0.2973)		(0.1936)		(0.3202)	
Fund fixed effects	Yes		Yes		Yes		Yes	
Family fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	251,233		251,233		251,233		251,233	
Adj.-R^2	0.0839		0.0839		0.0884		0.0877	

Table V. Impact of fund age on performance with manager control (continued)

Panel B: Fund manager selection

Dependent variable:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Ln age	-0.0019	***	-0.0012	***	-0.0008	***	-0.0008	***
	(0.0013)		(0.0000)		(0.0026)		(0.0055)	
Ln TNA family	0.0005		0.0003	*	0.0002		0.0002	
	(0.1851)		(0.0898)		(0.2084)		(0.4329)	
Family focus	-0.0022		-0.0009		-0.0014		-0.0010	
	(0.1030)		(0.2870)		(0.1020)		(0.2192)	
Fund return	0.0078	***	0.0122	***	0.0117	***	0.0110	***
	(0.0011)		(0.0000)		(0.0000)		(0.0000)	
Ln TNA	-0.0044	***	-0.0021	***	-0.0027	***	-0.0028	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund flow	0.0000		0.0000		0.0000		0.0000	
	(0.6567)		(0.1868)		(0.7144)		(0.7615)	
Expense ratio	-0.0461		-0.0152		-0.0186		-0.0205	
	(0.2696)		(0.4489)		(0.5749)		(0.5511)	
Turnover ratio	0.0002		0.0001		0.0002		0.0002	
	(0.3020)		(0.3918)		(0.1639)		(0.2625)	
Fund fixed effects x Manager fixed effects	Yes		Yes		Yes		Yes	
Family fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	251,233		251,233		251,233		251,233	
Adj.-R^2	0.0439		0.0381		0.0393		0.0386	

Table VI. Impact of fund age on performance among index funds and actively managed funds

This table presents results from pooled OLS regressions that analyze the impact of fund age on fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. In Panel A we restrict our sample to observations of passively managed index funds. In Panel B regressions are run separately for funds that, respectively, belong to less and more innovative investment segments. Based on the style classification from CRSP we define the investment segments "Income", "Growth & Income" and "Mid Cap" ("Micro Cap", "Small Cap", "Sector" and "Growth") as less (more) innovative investment segment. The main independent variable in both panels is Ln age, the logarithm of the fund's age in years. Other independent variables and fixed effects are defined as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: Index fund sample

Dependent variable:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Ln age	0.0016		0.0003		0.0004		0.0003	
	(0.2817)		(0.5810)		(0.5034)		(0.6455)	
Ln TNA family	0.0006		0.0003		0.0003		0.0004	
	(0.1811)		(0.3062)		(0.2949)		(0.2426)	
Family focus	0.0036		0.0025		0.0018		0.0019	
	(0.1872)		(0.1790)		(0.2616)		(0.2221)	
Fund return	-0.0494	*	-0.0223		-0.0169		-0.0006	
	(0.0824)		(0.2274)		(0.3631)		(0.9818)	
Ln TNA	-0.0020	***	-0.0002		-0.0003	*	-0.0003	*
	(0.0000)		(0.3086)		(0.0891)		(0.0749)	
Fund flow	0.0012		-0.0007		-0.0008		-0.0010	*
	(0.2085)		(0.1415)		(0.1205)		(0.0865)	
Expense ratio	-0.2955		-0.1552		-0.1089		-0.1045	
	(0.1597)		(0.1705)		(0.3258)		(0.3366)	
Turnover ratio	0.0003		0.0002		0.0001		0.0002	
	(0.5339)		(0.3627)		(0.3643)		(0.3623)	
Fund fixed effects	Yes		Yes		Yes		Yes	
Family fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	14,372		14,372		14,372		14,372	
Adj.-R^2	0.0759		0.0713		0.0584		0.0593	

Table VI. Impact of fund age on performance among index funds and actively managed funds (continued)

Panel B: Actively managed funds

Subsample:	Less innovative investment segment				More innovative investment segment			
Dependent variable:	Jensen	Fama-French	Carhart	Pastor-Stambaugh	Jensen	Fama-French	Carhart	Pastor-Stambaugh
Ln age	0.0004	-0.0002	-0.0001	-0.0002	-0.0017 *	-0.0007 **	-0.0009 **	-0.0010 ***
	(0.6101)	(0.6041)	(0.7538)	(0.5897)	(0.0625)	(0.0339)	(0.0153)	(0.0067)
Ln TNA family	-0.0004 *	-0.0003 *	-0.0002	-0.0003	-0.0004	-0.0002	-0.0002	-0.0002
	(0.0975)	(0.0574)	(0.1844)	(0.1621)	(0.1042)	(0.1580)	(0.2380)	(0.1019)
Family focus	0.0017	0.0007	0.0003	0.0005	0.0006	0.0003	0.0002	0.0004
	(0.1736)	(0.3979)	(0.6862)	(0.5141)	(0.5648)	(0.7162)	(0.7280)	(0.5789)
Fund return	-0.0064	0.0330 ***	0.0202 ***	0.0220 ***	-0.0219 ***	0.0106 ***	0.0006	0.0036
	(0.2826)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.8345)	(0.2214)
Ln TNA	-0.0022 ***	-0.0011 ***	-0.0015 ***	-0.0016 ***	-0.0030 ***	-0.0014 ***	-0.0019 ***	-0.0019 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fund flow	0.0000	0.0000	0.0000	0.0000	0.0000 ***	0.0000 ***	0.0000 **	0.0000 *
	(0.4702)	(0.4192)	(0.7649)	(0.7455)	(0.0000)	(0.0008)	(0.0372)	(0.0612)
Expense ratio	0.1464	0.0825	0.0648	0.0613	-0.0763	-0.0186	-0.0196	-0.0205
	(0.4994)	(0.3709)	(0.4286)	(0.4437)	(0.2186)	(0.4104)	(0.5498)	(0.5472)
Turnover ratio	0.0005	0.0002	0.0002	0.0001	0.0000	0.0001	0.0002 *	0.0001
	(0.1962)	(0.1921)	(0.1565)	(0.2814)	(0.9242)	(0.2323)	(0.0800)	(0.1152)
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	110,967	110,967	110,967	110,967	242,250	242,250	242,250	242,250
Adj.-R^2	0.0888	0.1059	0.1095	0.1065	0.0999	0.0847	0.0882	0.0875

Table VII. Impact of fund age on performance stratified by competitive environment

This table presents results from pooled OLS regressions that analyze the impact fund age on mutual fund performance using four different performance measures: Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh). Alpha estimations are based on 36-month rolling-window regressions of funds' net-of-fee excess returns on the market excess return and, as required, the long-short portfolio returns of the benchmark mimicking portfolios. The main independent variable in each Panel is Ln age, the logarithm of the fund's age in years. In Panel A, we split fund-month observations into two subsamples of low and high industry competition based on the median cutoff of the industry concentration within a month. Industry concentration is defined as the Herfindahl index value among funds. In Panel B, we split fund-month observations into two subsamples of low and high intra-family competition based on the median cutoff of the number of funds in the same investment segment within a fund family. Other independent variables are defined as in Table IV and not reported for brevity. Regressions are run with fixed effects as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Jensen	Fama-French	Carhart	Pastor-Stambaugh
Panel A: Industry concentration				
Industry competition - Low	-0.0014 **	-0.0011 ***	-0.0012 ***	-0.0012 ***
	(0.0143)	(0.0085)	(0.0094)	(0.0071)
Industry competition - High	-0.0010	0.0003	0.0006	0.0005
	(0.4885)	(0.4137)	(0.1502)	(0.3056)
Panel B: # Funds in the investment segment of the family				
Intra-family competition - Low	-0.0022 **	-0.0015 ***	-0.0011 ***	-0.0012 ***
	(0.0402)	(0.0002)	(0.0060)	(0.0025)
Intra-family competition - High	-0.0006	0.0002	0.0000	0.0000
	(0.5330)	(0.6796)	(0.9039)	(0.9961)
Other fund and family controls	Yes	Yes	Yes	Yes
Fund fixed effects	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes

Table VIII. Impact of fund age on turnover

This table presents results from pooled OLS regressions that analyze the impact of fund age on mutual fund trading behavior. The dependent variables are categorized in three different groups of trading measures. The first group of measures consists of Fund turnover, Buy turnover, and Sell turnover. Fund turnover, is the fund's yearly turnover ratio, defined as the minimum of security purchases and sales divided by the fund's average TNA during the period. Buy and sell turnover separately measure the effects of buy and sell trading by adding the percentage change in a fund's total net assets under management as in Carhart (1997). Another measure is Position-adjusted turnover, defined as in Edelen et al. (2013), that is equal to the turnover ratio adjusted for the average size of the fund's holdings position. The third group of measures consists of three additional turnover variables that are estimated based on funds' portfolio holdings as in Dorn and Huberman (2009). Turnover (holdingsbased), is the absolute value of the fund's purchases and sales divided by twice the average portfolio value. Speculative turnover (holdingsbased) represents a funds speculation induced turnover. Whereby sales (buys) are classified as speculative trades only if the entire stock position in a fund is closed (newly added). The main independent variable is Ln age, the logarithm of the fund's age in years. Other independent variables and fixed effects are defined as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Fund turnover	Buy turnover	Sell turnover	Position adjusted turnover	Turnover (holdingsbased)	Speculative turnover (holdingsbased)
Ln age	-0.1809 ***	-0.2011 ***	-0.1761 ***	-0.0684 ***	-0.1614 ***	-0.0950 ***
	(0.0076)	(0.0030)	(0.0096)	(0.0069)	(0.0004)	(0.0008)
Ln TNA family	-0.0243	-0.0233	-0.0246	-0.0187 **	-0.0034	-0.0006
	(0.1621)	(0.1791)	(0.1565)	(0.0200)	(0.8299)	(0.9563)
Family focus	0.5179 ***	0.5212 ***	0.5178 ***	0.1128	0.0514	-0.0216
	(0.0027)	(0.0025)	(0.0027)	(0.1244)	(0.6124)	(0.7614)
Fund return	0.1637	0.2818 **	0.1143	0.2048 ***	0.2654 ***	0.1559 **
	(0.1556)	(0.0148)	(0.3230)	(0.0009)	(0.0068)	(0.0235)
Ln TNA	-0.0430 **	-0.0497 **	-0.0440 **	0.1129 ***	-0.0754 ***	-0.0453 ***
	(0.0427)	(0.0190)	(0.0382)	(0.0000)	(0.0004)	(0.0006)
Fund flow	0.0000 **	0.0000 ***	0.0000 **	0.0001	0.0003	0.0001
	(0.0339)	(0.0000)	(0.0338)	(0.2478)	(0.2893)	(0.4997)
Expense ratio	-1.7749	-1.6477	-1.7949	0.3485	6.5933	5.0159
	(0.3638)	(0.3941)	(0.3627)	(0.2731)	(0.1518)	(0.1936)
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	371,310	371,310	371,310	296,878	285,166	285,166
Adj.-R^2	0.5913	0.5936	0.5927	0.5770	0.3420	0.5114

Table IX. Impact of fund age on active management

This table presents results from pooled OLS regressions that analyze the impact of fund age on measures of active management. We use three measures for fund's activity: Active share, measures the difference between the stock's portfolio weights in the fund and the portfolio weights of the stocks in the fund's benchmark portfolio. Return gap, is the difference between the actual gross-of-fee fund return and the hypothetical return of the recently reported fund holdings as in Kacperczyk et al. (2008). 1- R^2, is the selectivity measure of Amihud and Goyenko (2013) that is obtained from 36-month rolling window regressions of funds' net-of-fee excess returns on the excess market return and the SMB, HML, and MOM (momentum) factors as in the Carhart (1997) 4-factor model. The main independent variable is Ln age, the logarithm of the fund's age in years. Other independent variables and fixed effects are defined as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Active share	Return Gap	1-R^2
Ln age	-0.0082 **	-0.0010 ***	-0.0124 ***
	(0.0211)	(0.0000)	(0.0041)
Ln TNA family	-0.0010	0.0001 **	-0.0006
	(0.5651)	(0.0377)	(0.6655)
Family focus	0.0578 ***	0.0009 ***	0.0190 **
	(0.0000)	(0.0047)	(0.0170)
Fund return	0.0252 ***	0.0042 **	0.0440 ***
	(0.0000)	(0.0382)	(0.0000)
Ln TNA	-0.0069 ***	-0.0004 ***	-0.0070 ***
	(0.0002)	(0.0000)	(0.0000)
Fund flow	0.0001 ***	0.0000	0.0000 ***
	(0.0083)	(0.1921)	(0.0003)
Expense ratio	0.1432	-0.0202	0.3820
	(0.8038)	(0.4686)	(0.1586)
Turnover ratio	-0.0020	-0.0001	0.0046 ***
	(0.2542)	(0.1269)	(0.0071)
Fund fixed effects	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Number of Observations	168,391	281,279	278,667
Adj.-R^2	0.8543	0.0773	0.8389

Table X. Impact of fund age on funds' holdings in hard-to-value stocks

This table presents results from pooled OLS regressions that analyze the impact of fund age on funds' holdings in hard-to-value stocks. The dependent variables are categorized in three different groups. The first group of measures includes Idiosyncratic stock, Non-idiosyncratic stock, Stock turnover, and Firm age that measures the valuation uncertainty of stocks as in Kumar (2009). Idiosyncratic stock, is the fund's weight in stocks that belong to the top three deciles of stocks' idiosyncratic volatility in a month. Complementary, Non-idiosyncratic stock, is the fund's weight in stocks that belong to the bottom three deciles of stocks' idiosyncratic volatility in a month. Stock turnover, is the portfolio weighted average of the stocks' turnover of all stocks in a fund's portfolio. Firm age, is the mean firm age of all stocks in fund's portfolio. For the second group of measures we use: Analyst coverage and Analyst dispersion, defined as the average analyst coverage and analyst forecast dispersion, respectively, of the fund's stock holdings. Both measures proxy for differences of opinion among investors (Abarbanell et al., 1995; Diether et al., 2002; Garfinkel and Sokobin, 2006). The third group measures fund's portfolio illiquidity. Relative spread, is the difference between the logarithm of the best offer and the logarithm of the best bid price as in Holden and Jacobsen (2014). Amihud, is based on the illiquidity measure of Amihud (2002). The main independent variable is Ln age, the logarithm of the fund's age in years. Other independent variables and fixed effects are defined as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Idiosyncratic stock	Non-idiosyncratic stock	Stock turnover	Firm age	Analyst coverage	Analyst dispersion	Relative spread	Amihud
Ln age	-0.0028 **	0.0102 **	0.0004 ***	0.0438 ***	0.0130 *	-0.0012 **	-0.0004 ***	-0.0165 **
	(0.0457)	(0.0383)	(0.0000)	(0.0000)	(0.0644)	(0.0349)	(0.0005)	(0.0266)
Ln TNA family	0.0006	-0.0023	0.0000 ***	0.0019	0.0082 **	-0.0004	-0.0001 **	-0.0118 ***
	(0.3900)	(0.3265)	(0.0001)	(0.7126)	(0.0164)	(0.2242)	(0.0315)	(0.0065)
Family focus	0.0062 *	-0.0182	-0.0004 ***	-0.0225	-0.0356 **	-0.0017	0.0002	-0.0003
	(0.0803)	(0.1141)	(0.0000)	(0.3110)	(0.0378)	(0.1956)	(0.3998)	(0.9878)
Fund return	0.0160 ***	0.0113	-0.0015 ***	-0.1046 ***	0.0188	-0.0100 ***	-0.0044 ***	-0.2444 ***
	(0.0002)	(0.2351)	(0.0000)	(0.0000)	(0.2286)	(0.0000)	(0.0000)	(0.0000)
Ln TNA	0.0007	-0.0036 **	0.0000 ***	-0.0012	0.0191 ***	0.0002	-0.0004 ***	-0.0274 ***
	(0.1521)	(0.0330)	(0.0070)	(0.7488)	(0.0000)	(0.5621)	(0.0000)	(0.0000)
Fund flow	0.0000	0.0000	0.0000 ***	0.0000	0.0000	0.0000	0.0000	0.0000 **
	(0.1339)	(0.1107)	(0.0000)	(0.1967)	(0.2507)	(0.2257)	(0.2836)	(0.0457)
Expense ratio	0.0995	-0.1199	-0.0006	-0.2634	-0.0741	0.0447	-0.0168 ***	0.3383
	(0.2659)	(0.1657)	(0.3391)	(0.3642)	(0.5882)	(0.4484)	(0.0026)	(0.1366)
Turnover ratio	0.0009 *	-0.0033	0.0000 *	-0.0013	0.0006	0.0000	0.0000 *	-0.0028 *
	(0.0597)	(0.1487)	(0.0577)	(0.6948)	(0.6847)	(0.7307)	(0.0958)	(0.0685)
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	296,945	296,945	296,945	296,945	296,866	296,589	296,927	296,927
Adj.-R^2	0.6657	0.8311	0.4839	0.8780	0.9006	0.2416	0.6452	0.7138

Table XI. Fund age and the performance sensitivity of investors

This table presents results from piecewise-linear regressions that analyze the relation between fund age and the performance-flow sensitivity. Fund flows are estimated as the fund's percentage growth rate adjusted for the internal growth of the fund as in Sirri and Tufano (1998). The main independent variables are Ln age, the logarithm of the fund's age in years as well as Top, Middle and Bottom quintile, a piecewise decomposition a fund's fractional performance rank defined as the fund's percentile past performance, represented by the four different performance measures Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh), relative to other funds within the same investment segment and month. In particular, the performance ranks are calculated according to the definitions in Sirri and Tufano (1998). Additional independent controls include Ln TNA family, Family focus, Ln TNA, Fund flow, Objective flow, Expense ratio, and Turnover ratio. Ln TNA family, is the logarithm of the fund family's total net assets under management. Family focus, represents the concentration of a fund family across investment segments defined as in Siggelkow (2003). Ln TNA, represents the logarithm of the fund's total net assets under management. Objective flow, is the average net-inflow of the funds in the same investment segment. Expense ratio, represents the fund's total expense ratio. Turnover ratio is the fund's yearly turnover ratio. All independent variables are lagged by one month. Regressions are run with fixed effects as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Fund flow in t							
Performance quintiles based on:	Jensen		Fama-French		Carhart		Pastor-Stambaugh	
Top quintile	0.0843	***	0.0718	***	0.0689	***	0.0690	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Middle quintiles	0.0081	***	0.0031	*	0.0032	*	0.0033	*
	(0.0000)		(0.0602)		(0.0570)		(0.0564)	
Bottom quintile	0.0212	***	0.0165	**	0.0071		0.0009	
	(0.0088)		(0.0371)		(0.3572)		(0.9026)	
Ln age	-0.0156	***	-0.0163	***	-0.0166	***	-0.0170	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Top quintile* Ln age	-0.0162	***	-0.0135	***	-0.0129	***	-0.0131	***
	(0.0000)		(0.0001)		(0.0002)		(0.0001)	
Middle quintiles* Ln age	-0.0009		0.0005		0.0003		0.0003	
	(0.1823)		(0.4656)		(0.6125)		(0.6420)	
Bottom quintile* Ln age	0.0010		0.0029		0.0058	*	0.0084	***
	(0.7491)		(0.3408)		(0.0532)		(0.0057)	
Ln TNA family	0.0013	***	0.0013	***	0.0012	***	0.0013	***
	(0.0030)		(0.0035)		(0.0038)		(0.0035)	
Family focus	0.0025		0.0026		0.0027		0.0026	
	(0.2058)		(0.1903)		(0.1893)		(0.1939)	
Ln TNA	-0.0057	***	-0.0059	***	-0.0058	***	-0.0058	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund flow	0.2269	***	0.2290	***	0.2293	***	0.2294	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Objective flow	0.0000		0.0000		0.0000		0.0000	
	(0.7484)		(0.8164)		(0.8081)		(0.8016)	
Expense ratio	-0.1122		-0.1209		-0.1200		-0.1169	
	(0.3818)		(0.3471)		(0.3506)		(0.3635)	
Turnover ratio	0.0000		0.0000		0.0000		0.0000	
	(0.8699)		(0.8818)		(0.9020)		(0.9215)	
Fund fixed effects	Yes		Yes		Yes		Yes	
Family fixed effects	Yes		Yes		Yes		Yes	
Incubation fund fixed effect	Yes		Yes		Yes		Yes	
Segment fixed effects	Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes	
Number of Observations	351,934		351,934		351,934		351,934	
Adj.-R^2	0.1867		0.185		0.1846		0.1845	

Table XII. Fund age and the demand through institutional investors

This table presents results from logistic regressions that analyze the impact of fund age on the probability of a fund being primarily populated by institutional investors. The dependent variable is Institutional fund, a binary variable which equals one if more than 50 percent of the fund`s assets stem from fund shares that cater primarily to institutional investors and zero otherwise. The main independent variable is Ln age, the logarithm of the fund's age in years. Other independent variables are defined as in Table IV. Regressions are run with incubation, segment and time fixed effects as well as with and without family fixed effects. P-values reported in parentheses are based on robust standard errors clustered at the fund level. Average marginal effects in percentages are shown in square brackets. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	Institutional fund			
Ln age	-0.7160	***	-0.6759	***
	(0.0000)		(0.0000)	
	[-9.6200]		[-8.1443]	
Ln TNA family	-0.1918	***	0.0646	
	(0.0000)		(0.3606)	
	[-2.5776]		[0.7789]	
Family focus	-2.3029	***	-0.4471	
	(0.0000)		(0.1893)	
	[-30.9421]		[-5.3871]	
Fund return	-0.1357		0.0048	
	(0.4095)		(0.9858)	
	[-1.8229]		[0.0581]	
Ln TNA	-0.1175	***	-0.1590	***
	(0.0002)		(0.0001)	
	[-1.5790]		[-1.9165]	
Fund flow	0.0001		0.0007	***
	(0.3072)		(0.0000)	
	[0.0000]		[0.0081]	
Expense ratio	-327.6299	***	-473.9045	***
	(0.0000)		(0.0000)	
	[-4402.16]		[-5710.52]	
Turnover ratio	0.0245		0.2983	***
	(0.1426)		(0.0000)	
	[0.3296]		[-3.5950]	
Family fixed effects	No		Yes	
Incubation fund fixed effect	Yes		Yes	
Segment fixed effects	Yes		Yes	
Time fixed effects	Yes		Yes	
Number of Observations	319,116		210,163	
Pseudo R^2	0.2318		0.5158	

Table XIII. Impact of fund age on style extremity and performance extremity

This table presents results from pooled OLS regressions that analyze the impact of fund age on funds' style extremity (Panel A) and performance extremity (Panel B). We estimate funds' style and performance extremity based on the approach by Bär et al. (2011) as:

$$SE_{i,t}^{s} = \frac{\left|\beta_{i,t}^{s} - \bar{\beta}_{i,t}^{s}\right|}{\frac{1}{N}\sum_{j=1}^{N}\left|\beta_{j,t}^{s} - \bar{\beta}_{i,t}^{s}\right|} \quad ; \quad PE_{i,t} = \frac{\left|P_{i,t} - \bar{P}_{i,t}\right|}{\frac{1}{N}\sum_{j=1}^{N}\left|P_{j,t} - \bar{P}_{i,t}\right|}$$

Thereby, for each fund and month style extremity (SE) is estimated as the absolute difference between a fund's style, that is represented by its sensitivity (beta loadings) to the market factor (Market), value factor (HML), size factor (SMB) as well as momentum factor (MOM) as in the Carhart (1997) 4-factor model, and the average style of all funds in the same segment and month. This difference is then divided by the average absolute difference of all funds in the same investment segment and month. Similarly the performance extremity (PE) is measured for each fund and month as the absolute difference between a fund's performance, that is represented by the four different performance measures Jensen (1968) alpha (Jensen), Fama and French (1993) 3-factor alpha (Fama-French), Carhart (1997) 4-factor alpha (Carhart), and Pástor and Stambaugh (2003) 5-factor alpha (Pastor-Stambaugh), and the average performance of all funds in the same segment and month divided by the average absolute deviation of all funds in the same investment segment and month. The main independent variable in both panels is Ln age, the logarithm of the fund's age in years. Other independent variables and fixed effects are defined as in Table IV. P-values reported in parentheses are based on robust standard errors clustered at the fund level. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: Style extremity

Dependent variable:	Style extremity			
	Market	HML	SMB	MOM
Ln age	-0.8291 ***	-0.4176 ***	-0.5019 ***	-0.3033 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ln TNA family	-0.0068	-0.0038	-0.0347 **	0.0001
	(0.6264)	(0.7748)	(0.0137)	(0.9947)
Family focus	0.1043	0.0251	0.0692	0.0856
	(0.1102)	(0.6889)	(0.2928)	(0.2109)
Fund return	-0.0544	0.2292 ***	0.0502	0.1304 *
	(0.5998)	(0.0085)	(0.5251)	(0.0943)
Ln TNA	-0.0004	-0.0263 **	0.0126	0.0079
	(0.9693)	(0.0105)	(0.2215)	(0.4272)
Fund flow	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Expense ratio	1.9342 ***	-0.3814	-0.2517	0.9643
	(0.0016)	(0.5489)	(0.7820)	(0.2624)
Turnover ratio	-0.0088	-0.0110 **	-0.0069	0.0184 **
	(0.2491)	(0.0133)	(0.2236)	(0.0268)
Fund fixed effects	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Number of Observations	353,217	353,217	353,217	353,217
Adj.-R^2	0.3141	0.2383	0.3305	0.3231

Table XIII. Impact of fund age on style extremity and performance extremity (continued)

Panel B: Performance extremity

Dependent variable:	Performance extremity			
	Jensen	Fama-French	Carhart	Pastor-Stambaugh
Ln age	-0.0893 ***	-0.2767 ***	-0.3507 ***	-0.4275 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Ln TNA family	-0.0063	-0.0131 *	-0.0128 *	-0.0161 *
	(0.2965)	(0.0683)	(0.0789)	(0.0659)
Family focus	0.0551 *	0.0677 **	0.0883 ***	0.0693 *
	(0.0608)	(0.0329)	(0.0071)	(0.0547)
Fund return	-0.0808	-0.0809	-0.0938	0.0043
	(0.4065)	(0.3750)	(0.3299)	(0.9638)
Ln TNA	-0.0123 ***	-0.0151 ***	-0.0190 ***	-0.0190 ***
	(0.0089)	(0.0048)	(0.0009)	(0.0023)
Fund flow	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***
	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Expense ratio	3.4481	3.6833	4.7149 **	5.1692 ***
	(0.2026)	(0.1154)	(0.0302)	(0.0085)
Turnover ratio	0.0096 ***	0.0071 *	0.0036	0.0015
	(0.0075)	(0.0632)	(0.2760)	(0.6437)
Fund fixed effects	Yes	Yes	Yes	Yes
Family fixed effects	Yes	Yes	Yes	Yes
Incubation fund fixed effect	Yes	Yes	Yes	Yes
Segment fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Number of Observations	353,217	353,217	353,217	353,217
Adj.-R^2	0.1930	0.1827	0.1741	0.1590

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