IQ, Education, and Mutual Fund Choice*

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Abstract

Using a comprehensive dataset of Finnish males, we study IQ's influence on mutual fund choice. High-IQ investors are less likely to own balanced funds, actively managed funds, and funds marketed through a retail network. This behavior tends to reduce high-IQ investors' fund fees. Moreover, within each asset class and service category, and controlling for other investor attributes, high-IQ investors prefer the lowest-fee funds, further reducing the fees incurred. IQ's effect on fee sensitivity is robust to the addition of fund family dummies, which help control for unobservable service attributes. IQ also influences the fee sensitivity of even the most affluent investors, ruling out wealth-related access to low-fee funds as the explanation for IQ's relationship to fees.

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Businesses often introduce features into products and pricing to obfuscate comparisons. Wireless telephone companies earn little profit from easily comparable monthly rates and subsidized equipment, but require lock-up periods. After the lock-up, they profit from ring-tone purchases, excess usage, and navigation software. Banks offer seemingly free accounts, but impose charges for statement printing, cancelled checks, or insufficiently frequent debit card use. Since January 2012, U.S. regulators, seemingly frustrated by the inconsistent inclusion of fees and taxes in posted fares, have required airlines to post all-inclusive fares.[1] However, consumers of airline travel still have to compare the costs and benefits of a bewildering number of services, including baggage, telephone bookings, travel plan changes, mileage awards, and even use of bathroom.

Theoretical models increasingly feature firms that optimize by making consumer product choice confusing.[2] Gabaix and Laibson (2006), Carlin (2009), Ellison and Ellison (2009), and Carlin and Manso (2011) model product design and marketing intended to generate a more complex and difficult-to-solve consumer search problem.[3] Sorting out which product features are important and how they compare across competitors imposes significant cognitive costs on the consumer. Cognitive costs play a central role in models of consumption choice and contracting (e.g., Chetty, Looney, and Kroft (2007) and Tirole (2009)), and models link cross-sectional differences in the cognitive cost of search to consumer demand elasticity, product choice, equilibrium pricing, and consumer welfare. For example, in Gabaix and Laibson's (2006) model,

[1] See "Airfares with less small print", New York Times, December 26, 2011.

[2] DellaVigna and Malmendier (2004) characterize the profit-maximizing contract for goods with immediate costs and delayed benefits, such as health club attendance. DellaVigna and Malmendier (2006) show that contractual design in the health club industry is consistent with suboptimal consumer behavior.

[3] See Diamond (1978) for a model of how firms earn rents from consumer search costs.

sophisticated consumers with high "consumer IQ" earn rents from those with "low consumer IQ."

In contrast to the impressive theoretical progress on consumer choice and cognitive ability, scarcely any empirical work studies cognitive variation across consumers, and whether such variation generates "consumption mistakes." We study variation in intellectual ability (IQ) across consumers and analyze how this variation influences consumer choice in the mutual fund market. We find that intelligent consumers are more price-sensitive and less likely to make mistakes in fund selection.

The IQ data used to draw this conclusion come from a test specifically designed to measure intellectual ability. The test, administered to virtually every Finnish male who reaches military draft age, mimics the design of other well-known IQ tests, like the Wechsler Adult Intelligence Scale. It is also unique because of its timing—at the age of induction into military service (about 19 or 20), a time in life prior to any post-high school education or any significant participation in financial markets. Indeed, we generally observe the inductees' mutual fund choices many years and sometimes decades after their IQ assessment. Our data records are comprehensive, as we have every score on the exam taken since 1982.

Mutual funds offer an ideal arena for understanding cross-sectional differences in consumer demand elasticity and how cognitive costs (proxied by IQ score) influence the elasticity. One reason is that it is easier to compare mutual funds than many other products or services, facilitating the econometrician's ability to identify the link between IQ and consumption mistakes. The key service rendered by mutual funds is an after-fee risk-return tradeoff. Some consumers, barraged by recommendations, ratings, and information about ex-post performance, may ignore fees or think they are relatively minor contributors to the after-fee risk-return tradeoff. However, a large body of finance research concludes that higher mutual fund fees tend to reduce the risk-adjusted returns earned by fund investors.[4] In light of this literature, many researchers believe fees are informative about the extent to which an investor has overpaid for fund services.[5] Even if fund attributes differ in dimensions like asset class, service speed, degree of handholding, or quality of tax reports, the variation is relatively easy to control for because it is either observable (asset class) or likely to affect all funds within the same fund family in the same way (service speed, handholding, or quality of tax reports).

The mutual fund industry may be the only industry where (at least in some countries) every consumer's demand is observable and can be linked with data on IQ and important control variables like education, occupation, and wealth. There also is widespread belief that cognitive costs are significant in the mutual fund industry, possibly motivating regulation. In most developed countries, regulators require funds to disclose the expenses borne by their shareholders and in some jurisdictions can limit what they consider to be excessive fees.[6] While our study has no way to determine if the fees paid for fund services are fair, it does provide evidence on whether search costs significantly vary across consumers.

Our study also represents an alternative way to assess the finance literature's prescriptive conclusion, presented as longstanding "folk wisdom," which suggests that it is a

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[4] See Blake et al. (1993), Elton et al. (1993) Malkiel (1995), Gruber (1996), Carhart (1997), Otten and Bams (2002), and Gil-Bazo and Ruiz-Verdú (2009).

[5] Fama and French (2010) write, "… [alpha] estimated on the net (post-expense) returns realized by investors is negative by about the amount of fund expenses" and any attempt to identify positive alpha managers "… is largely based on noise." This point is echoed in the 2008 presidential address to the American Finance Association, in which French (2008) observes, "a representative investor who switches to a passive market portfolio would increase his average annual return by 67 basis points from 1980 to 2006." The 67 basis point enhancement is entirely due to the larger expense ratio of actively managed funds. For a contradictory view, see Del Guercio and Reuter (2011), who show that actively managed funds do not underperform index funds within certain fund groups.

[6] In Jones et al. v. Harris Associates L.P. (2010), the United States Supreme Court ruled that the court has the jurisdiction to regulate mutual fund fees when those fees are excessive and in breach of fiduciary duty.

mistake to invest in high-fee funds. The smart-investor preference for low-fee funds corroborates the folk wisdom, particularly if one believes the observed behavior has some likelihood of arising from independent validation. This would mean smart investors are doing their own homework or extrapolating from their own experience (as opposed to parroting others' recommendations).

Using unique individual-level data from Finland on fund holdings and IQ, our study shows that investors with high IQ tend to avoid high-fee funds in two ways. First, they avoid categories of funds that tend to charge higher fees. These categories include actively managed funds, balanced funds, and funds distributed through a retail network. We also find that high-IQ investors, controlling for other investor characteristics, avoid high-fee funds even after holding fund asset class, distribution channel, and investment philosophy (active vs. passive) fixed. IQ's sensitivity to this "idiosyncratic component" of fees lowers the fees paid by high-IQ investors beyond that obtainable from a low-fee asset class, distribution channel, or investment philosophy. For example, within the class of actively managed equity funds, constrained even further to a single fund family, high-IQ investors tend to choose funds with the lowest management fees.

The fund selection logit regressions that demonstrate the latter finding—a high-IQ preference for low-fee funds *per se*—draw inferences from IQ-fee interaction coefficients. Controls—that are interesting also in their own right—include the investor's wealth, education (university or business), and profession (here, working in the financial services industry). The paper's fund-attribute controls extend to any variable spanned by a combination of fund asset class, investment philosophy, and fund family dummies. The influence of IQ on the sensitivity to fund fees remains highly significant when we control for fund family.

In all versions of the regression, IQ's influence over fee sensitivity is economically large, and of a magnitude comparable to that of significant education variables. As further evidence of economic importance, we show that the IQ-fee relationship applies even to the wealthiest investors. IQ's comparable influence over the price elasticity of wealthy consumers' demand functions also helps rule out access to high minimum investment funds as an explanation for an IQ-fee relationship in the general population.

The methodology used to study IQ-fee interactions also facilitates the analysis of preferences across asset classes, distribution channel, and investment philosophy separate from fees. For example, evidence presented in this paper suggests that high-IQ investors would have no significant preference for passively managed funds if these funds charged the same fees as actively managed funds in the same asset class; only the fee difference leads high-IQ investors to gravitate towards the passively managed funds.

Our results are highly robust. Different definitions of wealth, inclusion of additional education controls, or controlling for the tendency of measured IQ to increase over time (i.e. the "Flynn effect") generate nearly identical findings. The results are also highly similar if we run separate regressions for each fund-investment year. Finally, alternative estimation methodologies, like the linear probability model, or alternative specifications, like regressing fees on IQ, generate qualitatively similar results.

Our paper builds on three strands of empirical literature. The first strand, which studies the role of fees and expenses in fund selection, arrives at conflicting conclusions. Barber, Odean, and Zheng (2005) contend that investors are sensitive to loads but not to less visible fees. However, Ivković and Weisbenner (2009) find that investors are sensitive to less visible fees. Anagol and Kim (2012), studying changes in India's regulations of fund fees, conclude that demand for closed-end funds diminishes when issuing costs are charged as up-front loads rather than being amortized and thus shrouded by market volatility. Müller and Weber (2010) and

Bailey, Kumar, and Ng (2011) report that experience and financial literacy are negatively associated with the loads investors pay for their funds; the association with fees tends to be weaker and generally insignificant. Consistent with this, Choi et al. (2010) find no relationship between subjects' SAT scores and fund fees in an experimental setting, using Harvard and Wharton students and staff as subjects. By contrast, Wilcox (2003) and Engström (2007) find that highly educated, wealthy, and more experienced investors exhibit preferences for funds with *high* fees or loads. None of these studies uses real IQ data representative of a broad population or relate IQ to real-world investment choice.

The second strand, exemplified by Grinblatt, Linnainmaa, and Keloharju (2011a, 2011b), studies IQ's role in stock market decisions. It shows that high-IQ investors are more likely to participate in the stock market and earn high returns and Sharpe ratios. It also concludes that smart investors are more likely to be diversified, time the market, provide liquidity, incur low trading costs, and engage in share purchases that predict the returns of individual stocks. They are less likely to exhibit wealth destroying behavioral biases. These studies are silent on the role IQ plays in generating price sensitivity to offerings of financial products.

Finally, there is a literature that links various measures of financial literacy to the use of financial services. Hastings and Tejeda-Ashton (2008), Moore (2003), and Lusardi and Tufano (2009) find that financial literacy contributes to informed social security fund and borrowing choices. Agarwal and Mazumder (2011) observe higher-IQ individuals making fewer credit card balance-transfer and rate-changing mistakes; Zagorsky (2007) finds them to be *more likely* to "max out" their credit line, miss payments, or go bankrupt. The data from our study, drawn from official registers, not only have more controls, but also lack the selection issues and response bias of the survey-based samples that dominate this strand of the literature.

The paper is organized as follows: Section I describes the institutional setting, the data, and provides summary statistics. Section II presents multiple regression results. Section III concludes the paper by interpreting the regression results.

I. Institutional Setting, Data, and Summary Statistics

A. The Finnish Mutual Fund Market

The market for mutual funds in Finland differs from the U.S. market in size, advisory fee transparency, distribution, asset focus, and tax treatment.

Size. Compared to the U.S., the Finnish mutual fund market is small. According to the 2009 Investment Company Handbook, assets under management and the number of funds are less than 1% and 5% of comparable figures for the U.S., respectively.

Advisory fee transparency. For the vast majority of Finnish mutual funds (and for all funds in the sample we analyze), the "management fee" is equivalent to the expense ratio in the U.S. Distribution fees, like the 12b-1 fees charged by U.S. funds, are part of the management advisory fee rather than being allocated to the expense ratio portion that is separate from the management fee. Management fees account for over 90% of Finnish advisory firm revenue.[7] The relatively small amount of other revenue is collected from the loads that most Finnish funds charge. Front-end loads tend to be lower than those for U.S. load funds—usually 1% for equity and balanced funds, and 0.5% for bond funds. Because loads are one-time events, and are relatively small, we do not study their role in mutual fund selection.

[7] We verified this from the year 2006 income statements of the fund management companies in our sample.

Distribution. Finnish investors tend to buy funds directly from an intermediary representing the fund company, most often the local bank branch selling its bank's financial products, which include a single family of funds.[8] We refer to the funds distributed by banks with extensive branch outlets as "retail bank funds" or sometimes just "retail funds" and refer to all other funds as non-retail funds. The retail funds come with advice on how to invest and a great deal of handholding. While brokers are not used to buy funds, some investors buy funds through a voluntary pension insurance plan or at the recommendation of free "independent" advisors.[9]

Fund sales are concentrated among large banks with extensive retail distribution networks; the three largest banks account for about two-thirds of the market. A retail network generally does not distribute index funds, which are far less popular in Finland than in the U.S.[10] There also are many smaller asset management houses or other players in the market, such as one major Swedish bank, Handelsbanken, but its funds lack the wide distribution network of the banks that offer what we refer to as retail funds.

Asset focus. Most but not all Finnish funds invest predominantly in the equity and bonds of foreign markets. The general equity and bond funds concentrate in OECD markets, with

[8] Some banks or asset management houses also sell more specialized products (e.g., North America or Japan funds) produced by foreign subcontractors under their own brands. Only one bank with a relatively small retail network sells mutual fund products of its domestic competitors.

[9] This type of advisor (as opposed to the management advisory firm) makes money by negotiating volume discounts with the funds (including an exemption from the front-load fee), pocketing the difference. In practice, the volume discounts often generate little incentive for the advisers to recommend the funds, so they tend to advise clients to buy *more expensive* products (e.g., nontransparent insurance products) that offer the advisor fatter margins.

[10] Finland's relatively small aggregate investment in passive funds, including one ETF (which, being a closed-end fund, is not in our sample) may stem from the prevalence of retail distribution. Distribution method influences the mix of actively managed and passively managed funds in the U.S. as well. For example, Del Guercio and Reuter (2011) observe that few U.S. passively managed funds are distributed through brokers. Moreover, among U.S. funds directly distributed to investors, they discern no significant difference in the risk-adjusted returns to investors of actively managed and passively managed funds.

emphasis on Europe. Some funds specializing in emerging markets' stocks or bonds are identified accordingly.

Tax treatment. Finnish mutual funds, like U.S. funds, do not pay tax on undistributed income, whether from interest or dividends, nor on capital gains realized by the fund. Investors are subject to taxation only when they receive dividend distributions from the funds or when they realize capital gains by selling shares in the fund. However, in contrast to the U.S., Finnish mutual funds are not compelled to distribute interest, dividend, or capital gains income. Indeed, Finnish mutual funds have tranches that reinvest these sources of income in the fund rather than distribute them to fund investors. The vast majority of Finnish investors prefer these tax-advantaged tranches. Their existence implies that Finland's relatively unpopular index funds lack the same relative tax advantage that U.S. index funds possess. Likewise, balanced funds, which are more popular in Finland than in the U.S., lack U.S. balanced funds' tax disadvantage from rebalancing. During the period studied, our sample of Finnish investors paid a flat 28% rate (in 2004, a flat 29% rate) on their capital income. (See Grinblatt and Keloharju (2004) for a more exhaustive description of personal taxation in Finland.)

B. Data Sources

We obtain data from five sources, described below. To link individuals across the data sets, we employ a personal identification number unique to an individual, similar to a U.S. social security number.

Finnish Tax Administration (FTA). The FTA collects fund shareholder data from all directly held Finnish-domiciled open-end mutual funds held in taxable accounts.[11] Each individual's holdings are reported on a fund-by-fund basis. The filings we obtained, from holdings at end-of-years 2004-08, are highly reliable. The reliability stems both from enforceable statutory requirements, which penalize inaccurate, false, or incomplete reporting, and because the filings are submitted and stored in electronic format. We have no way to study Finnish investors' holdings of funds domiciled outside of Finland because the FTA does not collect these data. However, we suspect the foreign-domiciled funds represent a relatively small portion of the Finnish mutual fund market. Aside from anecdotal observation, evidence for this is found in the prevalence of Finnish retail networks as the primary distribution outlet for funds domiciled in Finland.[12]

Euroclear Finland Registry. This data set contains the end-of-year values of the portfolios of all Finnish household investors in stocks registered to Euroclear Finland (all traded Finnish stocks plus foreign stocks traded on the Helsinki Exchanges). We use the Euroclear holdings to assess the market value of each investor's portfolio of individual stocks at the end of years 2004-08. Our wealth control at the end of each of these five years is the natural logarithm of the sum of the market values of the investor's stock portfolio and his FTA fund holdings.

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[11] Finland has a generous government-run pension and pensions tend to be of the defined benefit variety. The influence employees have on the choice of funds in pension plans ranges from highly limited (defined contribution plans) to nonexistent (defined benefit plans). Tax authorities lack data on individuals' fund holdings in any of these plans.

[12] Foreign-domiciled funds tend to have lower fees than Finnish-domiciled funds (Khorana et al., 2008) and are likely to be relatively more popular among investors for whom the cognitive costs for finding and assessing foreign funds are lower. Excluding these funds from our sample means that our results represent a conservative judgment of the sensitivity of IQ to fees.

Finnish Armed Forces (FAF). The FAF provides data on intellectual ability. Around the time of induction into mandatory military duty in the Finnish armed forces, typically at ages 19 or 20, males in Finland take a battery of psychological tests. One portion consists of a 120-question intelligence test for which we have comprehensive data beginning January 1, 1982. Since financial investment is relatively rare among youth of military recruitment age, we typically observe investment behavior many years and sometimes decades after the IQ score is generated.

The FAF test measures intellectual ability in three areas: mathematical ability, verbal ability, and logical reasoning. The FAF constructs a composite ability score from the results in these three areas. We use the composite ability score in our analysis, referring to it as "IQ". As noted in Grinblatt, Keloharju and Linnainmaa (2011a), the FAF ability score significantly predicts life outcomes, such as income, wealth, and marital status. The scores on the ability test are standardized to follow the stanine distribution (integers 1-9, approximating the normal distribution with each stanine representing one half of a standard deviation and 9 being the highest IQ). Although we control for education with degree dummies, as described below, variation in IQ is unlikely to be explained by more precise education controls that measure education quality. The Finnish school system is remarkably homogeneous and accessible. All education, including university education, is free and the quality of education is high and fairly uniform.

Statistics Finland. Statistics Finland, which collects data from many government agencies, provides career and education information for the subjects in our sample. The data they collect is from a sequence of random draws of the population born after December 31, 1954 and before January 1, 1985. The sample consists of about 5.8% of the sample cohorts and 2.3% of the Finnish population (about 5.4 million). For each fund decision year (2004-08), we eliminate all subjects lacking IQ scores and those who hold no mutual funds.[13] The random sampling by Statistics Finland, combined with these filters, reduces the sample size to about 7,500 male subjects per year who hold funds. These data indicate whether the subject has a university degree, a degree in business or economics, and whether he works in the finance profession at the end of each of the years 2004-08.

Mutual Fund Report, a monthly publication, details for our purposes fees, fund asset class (short-term bond, long-term general bond, long-term emerging markets bond, general equity, emerging markets equity, and balanced), distribution outlet (retail vs. non-retail), management philosophy (actively managed or passive index fund), and fund family (generating 22 dummies with every fund belonging to some family). We have all issues of the report over our sample period of 2004-08. Because we analyze all funds from all reports and the report covers all Finnish-domiciled funds, survivorship bias concerns do not apply to our study. We exclude funds with incentive fees, hedge funds, miscellaneous funds, and any funds with fees that are not transparent from the report.

C. Summary Data on Funds, Their Fees, and Their Investors

Table 1 presents end-of-2008 summary statistics from our sample of 335 Finnish mutual funds. For each fund category, it reports the number of funds, mean and standard deviation of the fees charged by management, aggregate assets under management, number of investors holding fund shares in the category, and average IQ of those who invest in that category. All numbers in the table, except for average IQ, come from the Mutual Fund Report. Table 1 indicates that our

[13] Investors who hold funds only in some years are included in those investor-years in which they hold a fund.

sample of funds managed over 30 billion Euros in assets, with almost 40% concentrated in general equity, emerging markets equity, and balanced funds—an equity fraction comparable to the U.S. This fraction declined substantially from 2007 because of asset declines and equity fund outflows in 2008 stemming from the world financial crisis. Despite the crisis, all categories witnessed a net increase in the number of funds from 2004 to 2008.

Table 1 indicates that balanced funds tend to have higher fees than a mix of general bond and equity funds that replicate the typical balanced fund's allocation of 60% in stocks and 40% in bonds. Except for balanced funds and the relatively small emerging markets fund categories, funds distributed through a retail network tend to have higher fees. The higher fees for balanced funds and retail funds are consistent with the findings of Korkeamäki and Smythe (2004). Emerging markets funds also tend to have higher fees, while passively managed (index) funds have lower fees.

Table 1 also shows the sum of the number of investors in each fund in the category, measured at the end of 2008. The three categories of pure fixed income funds are less popular than funds with equity investment; passively managed funds are far less popular than actively managed funds. Note that many of the investors counted here are not in our sample because we lack data on IQ or some control variable for them.

D. Summary Data on IQ

The "average IQ" rows in Table 1 indicate that the average investor in balanced funds and in retail funds tends to possess lower IQ than other investors and that the IQs of those in passively managed funds tend to be higher. Thus, high-IQ investors tend to concentrate in the lower-fee fund categories. The exception, short-term bond funds, will be discussed later. In contrast to the rest of Table 1, the investors in Table 1's IQ rows and in all subsequent tables are necessarily males. The distinction arises from the requirement that investors in these rows have an IQ score.

Table 2 reports the distribution of the IQ variable (Panels A), the averages of other key investor-specific attributes conditional on IQ (Panel B), and the proportion of fund investors holding a specific fund type conditional on IQ (Panel C). Panel A indicates that there are slightly fewer individuals in stanines 1-4 and slightly more in stanines 5-9 than in the theoretical stanine distribution. Bigger differences arise when we focus on mutual fund investors. They tend to be quite a bit smarter than the theoretical distribution would predict, consistent with Grinblatt, Keloharju, and Linnainmaa's (2011a) finding that financial market participants have higher IQ scores. Panel B confirms that a high-IQ Finn is also more likely to have a university degree, a business or economics degree, and a career in the finance profession. Panel C suggests that high-IQ fund investors are more likely to hold passively managed funds and less likely to hold short-term bond funds and funds distributed through a retail network. Stanines 8 and 9 are also less likely than others to hold balanced funds.

II. Multivariate Results

Table 1 indicated that high-IQ investors tend to hold certain types of funds and shy away from others. Within asset classes, high-IQ shareholders are more prevalent in fund types with lower fees: the non-retail and passively managed funds. High-IQ investors also tend to avoid balanced funds, which have fees similar to equity funds but far higher than bond funds. These findings are intriguing, but rely only on the simple bivariate relationship between IQ and choice of fund type. IQ is correlated with wealth and education, as well as profession. These other investor attributes are also likely to influence fund choice. To better understand whether and how IQ influences fund choice, we need to control for investor characteristics that correlate with IQ. Motivated by this consideration, this section uses multivariate logit regression to study fund selection. Our analysis controls for education (2 variables), finance career, and wealth. Including wealth in regressions has the added benefit of ruling out wealth-related differences in access to services as the source of a spurious IQ-fee relationship. All regression test statistics use standard errors that cluster at the investor level and control for (unreported) year fixed effects.

The first part of our analysis focuses on the choice of fund type without separate regard for abnormally large or small fund fees within the fund category. Data for this portion of study are organized within a "holding-investor" matrix. The unit of observation in this matrix consists of each pairing of an investor with one of his fund holdings in a year. With this data structure, an investor who owns M mutual funds in a year has M observations for that year. The second part studies how fund type, abnormal fund fees within the fund category, and investor characteristics interact to identify desirable and undesirable funds. Data here are organized within a "fund-investor" matrix, which consists of every fund-investor-year triplet. Data organized in this fashion have a much larger set of observations because funds that are not held by an investor contribute to the sample size. For example, if the number of funds in a given year is N, and the number of funds held by an investor is M, where $M < N$, the investor, along with every other investor, appears N times for that year.

In the regressions that follow, IQ score, coded by the Finnish Armed Forces as an integer from 1 to 9, is rescaled with a linear transformation to vary from -1 to 1. This rescaling, which has no effect on test statistics, facilitates the interpretation of the IQ and IQ interaction coefficients. The coefficient on the rescaled IQ variable represents the effect of being a stanine-9 rather than a stanine-5 (median IQ) investor, or a stanine-5 rather than a stanine-1 investor. In the second part of our analysis, which allows IQ to interact with fees, the transformation allows us to add or subtract the interaction coefficient to understand how much more (or less) sensitive stanine-9 and stanine-1 investors are to fees compared to stanine-5 investors.

A. The Choice of Asset Class, Distribution Channel, and Investment Philosophy

Table 3 presents coefficients and test statistics for nine logit regressions, each appearing in a separate row. Panel A presents logit coefficients. Panel B reports marginal effects, evaluated at the average values of the continuous regressors and at zero for binary regressors. The table analyzes the role of IQ and other investor attributes in selecting nine particular categories of fund. The first seven categories are associated with the asset class the fund invests in; the remaining two identify whether the fund is distributed via a retail network and whether it is passively managed. Each regression estimates the probability of owning funds in a category as a function of five investor attributes: IQ, holding a university degree, having completed a business education (a degree in economics or business), working in the finance profession, and wealth (the logged sum of mutual fund and individual stock wealth). We also include (unreported) calendar-year fixed effects in each of the nine regressions. Two of the asset class regressions indicate how investor attributes influence demand for balanced funds; one of the two is for a subset of investors with fund holdings that contain both stocks and bonds.

Table 3 uses the holding-investor matrix for data organization: The dependent variable is "1" only if the fund held by the investor that year belongs to the listed category associated with the regression row. For eight of Table 3's nine regressions, the reported sample sizes are identical. For the "Balanced fund, bond and equity exposure" row, we throw out observations associated with any investor who does not own (i) at least one balanced fund (alone or in combination with any other funds) or (ii) at least one general equity and one general long-term bond fund (referred to as a "home-made balanced fund"). The latter specification tests whether substitution between balanced funds and homemade balanced funds is related to IQ.

The coefficients from Table 3's regressions effectively summarize whether investors of differing IQ, education, profession, and wealth select funds from each of the nine categories. One of the more striking inferences is that high-IQ investors are reluctant to hold balanced funds. For example, the full-sample balanced fund regression's logit and marginal IQ coefficients are more significant than (and of similar magnitude to) the coefficients for university degree, business education, and finance profession. Panel B's marginal effect for IQ in this regression suggests that a four-stanine shift in IQ (exactly 30 IQ points on a standardized test) decreases the probability of owning a balanced fund by .024 other things equal. To obtain a sense of scale for this number, the investor-fund row in Table 1's "All funds" section suggests that a mutual fund holder's unconditional probability of holding a balanced fund is .183 (322,075 divided by the sum of the numbers in the row); Table 3 Panel B's reference probability for holding a balanced fund is .171. The .024 marginal effect is approximately 13% and 14% of the .183 and .171 (unconditional and reference probabilities), respectively. When the logit model reference probability (unconditional probability) is used as the benchmark, each one-point increase in IQ is thus associated with a 0.47% (0.44%) decrease in the likelihood to own balanced funds.

Do high-IQ investors shun balanced funds because they perceive balanced funds' services to be overpriced? Recall from Table 1 that among the three most popular fund classes—

general bond, equity, and balanced funds—the balanced fund class exhibits the highest fees given the asset mix they typically have. On average, they charge 43 basis points more per year than a 60-40 mix of equity and bond funds. The similarity of Panel A's IQ coefficients in Table 3's two balanced fund regressions is consistent with high-IQ investors recognizing that a homemade balanced fund generates lower fees than an otherwise identical balanced fund. Panel B's corresponding marginal effect for substituting a homemade balanced fund for a balanced fund, observed in the "Balanced fund, bond and equity exposure" row, suggests that a university education is equivalent to about 33 more IQ points, while a business education has the same effect as about 8 more IQ points. These calculations, being nonlinear, represent very rough approximations.

Table 3's first row indicates that high-IQ investors are less willing to hold short-term bond funds. It is possible that high-IQ investors are better at finding profitable alternatives to short-term bond funds that charge 37 basis points for a low-yield financial instrument. Bank CDs come to mind. High-IQ investors also exhibit a relative preference for equity funds (both general and emerging markets) in Table 3. Such a preference could arise from IQ being correlated with an omitted variable like risk tolerance or a better understanding of the risk-reward trade-off of equity. If the latter explanation is the correct one, the insignificant effect of the business education and finance profession dummies on the general equity fund choice could stem from individual stocks acting as substitutes for equity fund holdings. Business-educated investors and finance professionals may be more inclined to engage in this substitution than high-IQ investors. Grinblatt, Keloharju, and Linnainmaa (2011a, Table IA.2), for example, show that the finance profession dummy is a stronger predictor of Finnish investors' tendency to hold individual stocks than a four-stanine increase in IQ.

The bottom rows of Table 3 present two regressions that analyze the choice of retail versus non-retail funds and of actively managed versus passively managed funds. The "Retail funds" regression's negative IQ, education, and finance professional coefficients and "Passively managed" regression's analogous positive coefficients suggest that more sophisticated investors tend to avoid retail funds and actively managed funds. Table 1 indicated that these types of fund categories are likely to have higher fees. However, both coefficients are significant only for IQ and university education. Business education plays no significant role in avoiding retail funds and being in the finance profession has no significant bearing on either choice. The sign and significance of the university and business education dummies in these regressions indicate similar behavior among the educated. The coefficients for the finance professional dummy share the same sign pattern but are not significant.

Panel B's marginal effects offer some guidance on the absolute and relative importance of each investor attribute in the choice of fund distribution type and management philosophy. Each one-point increase in IQ is associated with a 0.22% decrease in the likelihood to own retail distributed funds and a 2.0% increase in the likelihood to own passively managed funds. Moreover, the panel's coefficients indicate that the influence of a four-stanine (or 30-IQ-point) change in IQ on avoidance of high-fee retail funds is almost 50% greater than the effect from obtaining a university degree and 250% greater than the effect of having business education or being a finance professional. In deciding on whether to invest in passive funds, the IQ coefficient is about 40 per cent smaller than the university degree coefficient and of similar size as the business education and finance profession coefficients.[14]

B. High-IQ Investors Avoid High-Fee Funds Other Things Equal

In contrast to Table 3, which only uses information about funds held, Table 4 uses data points on the funds an investor holds and does not hold to fit its regression. This shift in observation unit (to elements of the fund-investor-year matrix) dramatically increases the sample size, to about 7 million observations. The shift allows inclusion of a fee regressor along with other fund attributes as determinants of fund choice. Table 4 reports logit coefficients (Panel A) and marginal effects (Panel B) from a single logit regression to assess whether *fees per se* (measured as logged percentage fee) influence fund choice, separate from fee correlates like asset class, distribution channel, and investment philosophy. In this regression, the dependent variable is one when the investor owns the fund that year.

The five columns on the right report the regression's "interaction coefficients," describing how investor characteristics, particularly IQ, alter their row's main effect coefficient in the leftmost column.[15] For example, the fee row indicates how IQ, university education, business education, and having a finance career alter the sensitivity of fund choice to the fee regressor. Including asset class, distribution channel, and investment philosophy dummies as regressors ensures that the fee component associated with the fund category (asset class, retail vs.

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[14] The results above assume a linear IQ specification. Using individual IQ stanines as dummy variables leads to similar results. High-IQ investor aversion to balanced funds, retail funds, and actively managed funds is nearly monotonic in IQ and differences in this aversion across the IQ spectrum tend to be statistically significant.

[15] We are well aware of Ai and Norton's (2003) critique of interaction effects in logit models. Because the linear probability model yields similar results and significant logit coefficients are almost always associated with marginal effects of similar significance and sign, we do not believe the critique is valid here.

non-retail, active vs. passive) does not influence the fee coefficient; only the fee's idiosyncratic variation within the category matters.

The IQ column coefficients assess how stanine-9 or (if subtracting) stanine-1 investors react to fund attributes in comparison to stanine 5. One of the paper's central results comes from the fee coefficient in this column. The logit and marginal effects coefficients for the IQ-fee interaction, -0.34 (Panel A) and -0.0023 (Panel B), respectively, are highly significant. Thus, high-IQ investors shun high-fee funds, other things equal. No other investor characteristic has a more significant fee interaction coefficient than IQ, but all have a significant effect on aversion to fees.

To illustrate the economic magnitude of Panel B's -0.0023 IQ-fee marginal effects coefficient, consider a fund that doubles its fee, thus increasing the logged fee by ln(2). The interaction coefficient represents the shift in fee sensitivity between a stanine-5 and a stanine-9 investor. Doubling the fee reduces the stanine-9 investor's holding propensity by 0.0016 (=.ln(2) x 0.0023) more than it reduces the stanine-5 investor's probability of holding the same fund, thus decreasing an investor's propensity to hold a fund by 2.0% for each one-point increase in IQ.[16]

The IQ column asset class coefficients measure IQ-related preferences relative to the omitted asset class category—short-term bonds. The relative preferences expressed by the IQ column's asset class coefficients hold fees constant. Thus, they cannot be compared to IQ coefficients from Table 3, as the latter regressions lack controls for fees. Table 4's asset class coefficients measure whether there is an IQ-related (or for other columns, wealth-, education-, or profession-related) preference for the asset class over short-term bonds that is separate from

[16] The reference probability is the predicted likelihood of holding a fund, computed at the regressor values used for evaluating marginal effects. Both reference probabilities and marginal effects would differ, due to nonlinearities, at other regressor values.

preferences about distribution channel and management philosophy. Table 4 also studies the influence of distribution channel and investment philosophy, controlling for fees and other fund categorizations.

The positive asset class coefficients in Table 4's IQ column indicate that as IQ increases, the value to the investor from holding shares in any of the five listed asset classes rises relative to short-term bond funds. For example, the significant balanced fund coefficients in the IQ columns of Panels A and B suggest that high-IQ investors exhibit a relative preference for balanced over short-term bond funds, other things equal. The balanced fund IQ coefficient is also larger than (but does not differ significantly from) the long-term general bond fund IQ coefficient (both in Panels A and B). Thus, high-IQ investors show a slight preference for balanced funds over long-term general bond funds other things equal. The IQ-related substitution of homemade balanced funds for balanced funds in Table 3 must therefore arise from high-IQ investors' greater fee sensitivity combined with the tendency of balanced funds to charge higher fees. Table 4's IQ column also indicates that smart investors place relatively lower value on retail bank funds' services. However, there are no significant IQ-related preferences for active over passive management, other things (including fees) equal. (Being university-degreed is the only investor characteristic with a significant influence on Table 4's passive vs. active fund choice.)

The coefficients in the "main-effects" columns and rows are generally of less interest than the interaction coefficients. We notice, for example, that Panel A's main-effects column indicates that having relatively high fees within an asset class increases the likelihood of holding a fund. Consistent with this finding, weighting a fund's fees by its number of shareholders produces a weighted average fee that exceeds the average fee. The higher investor-weighted fee (not reported) exceeds the average for all funds, as well as within all but one small asset class.

However, the coefficient, like all other coefficients in the main-effects column, applies only to an investor having zeros for the other column values. Such an investor has median IQ, no university or business degree, works outside the finance profession, and has zero logged wealth. Because this benchmark investor is so unusual, one cannot interpret the main-effects column's coefficients as applying to a typical investor or as an average across the entire sample of investors. Likewise, the main-effects row applies only to non-retail actively managed short-term bond funds with zero logged percentage fees.

C. Omitted Service Attributes

Table 4 makes the striking observation that fees matter more to high-IQ and educated individuals, as well as finance professionals, controlling for asset class and a pair of fund service attributes. However, service has many dimensions that may not be captured by these controls. Anyone familiar with the U.S. mutual fund market knows that fund families differ in the quality of their advice, service speed, software for executing transactions or monitoring portfolio value, and quality of tax reports. Service hours and number of walk-in branches also vary widely. These service differences are likely to influence the attractiveness of a particular fund family.

IQ and other investor attributes, like wealth, could also influence how attractive the services offered by mutual funds are. For example, as Alexander et al. (1997) demonstrate, investors self-select into different distribution channels based on their overall level of financial literacy. A low-IQ investor may place greater value on a telephone or personal contact with investment advisor and be more averse to funds that restrict access to investors facile with a computer and an Internet connection. A high-IQ investor may show greater appreciation for the specialized software of a particular fund family. A wealthy investor may appreciate a fund family's tax and estate planning resources more than a less wealthy investor.

Motivated by the observation that funds operating within the same family share similar services, that fund families attract different clienteles, and that these clienteles stratify by different levels of service, Table 5 adds additional regressors as service controls. These regressors consist of the 22 fund family dummies and their interactions with each investor attribute in Table 4's regression. As the fund family dummies are perfectly collinear with the retail network dummy, we omit the latter variable from the analysis.[17] Table 5's fee interaction coefficients thus represent fee preferences that are orthogonal to observable asset class and passive-fund dummies, as well as any unobservable variable tied to the fund family itself. If the services provided by a fund do not vary across the fund family, this regression effectively controls for the attractiveness of a fund's unobservable services. These fund family dummies represent effective controls even if the attractiveness of the services varied across investors. Table 5's implementation of fund family fixed effects thus represents a powerful way to control for omitted variables that might explain a relationship between fees and IQ, or between fees and other investor attributes.

Table 5 shows that the interaction between fees and IQ remains highly significant (the *t*-statistic increases from -3.69 in Table 4 Panel A to -5.34 in Table 5 Panel A), suggesting that high-IQ investors shun high-fee funds, even within the same fund family, asset class, and management philosophy (passive vs. active). The primary difference from Table 4 is that the fee interaction with having a university degree no longer has a significant influence on aversion to fund fees once we control for fund family.

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[17] Del Guercio and Reuter (2011) find that for U.S. funds, the choice of distribution channel operates almost exclusively at the fund family level.

The marginal coefficients from Panel B of Tables 4 and 5 tell a similar story. Indeed, comparing the IQ columns from these panels shows very similar coefficient vectors. IQ's interaction coefficients with fund attributes are scarcely influenced at all by the inclusion of the fund family dummies. This suggests that observable fund characteristics adequately capture the service dimensions that have differing appeal across the IQ spectrum.

D. Wealthy Investors

Table 6 repeats Table 4's regression specification using only the wealthiest 10% of investors (measured by wealth invested in mutual funds plus individual stocks). Panels A and B report logit and marginal effects coefficients, respectively. The median mutual fund wealth of this group is over 70,000 Euros.

Table 6 is of interest for two reasons. First, if smart investors within the wealthiest class care as much about fees as those of lower wealth, there are significant amounts of money being saved by avoiding high-fee funds. This dispels the argument that Table 4's results apply to low-wealth investors only and are of little interest because the amount of money lost from selecting high-fee funds is small. Second, Table 6 addresses a critique of the inferences we have drawn from Tables 4 and 5 about IQ's influence over fees. We term this critique "the access hypothesis." According to this hypothesis, all investors, irrespective of IQ, are aware of and would like to invest in (often high-minimum investment) low-fee funds. IQ per se has no effect on the tendency to select low-fee funds; its association with low fees arises from its correlation with a true wealth component not captured by our wealth regressor. If the IQ-fee relationship arises only from IQ's correlation with wealth-related access to high-minimum investment funds, there should be no IQ-fee relationship among the wealthiest investors—all of whom have access to high-minimum investment funds.

Table 6's IQ-fee interaction coefficient is significantly negative (*t*-statistic = -2.11 in both panels), indicating that wealthy high-IQ investors shun high-fee funds. Comparing Panel B of Tables 4 and 6 suggests that affluent investors have, if anything, a more negative IQ-fee interaction coefficient than the full sample. The marginal effects coefficient for the IQ-fee interaction is -.0051 for the wealthiest investors and -.0023 for the full sample. The larger coefficient magnitude for the wealthy-investor subsample makes it unlikely that the "access hypothesis" explains the greater fee sensitivity of high-IQ investors.

E. Other Robustness Checks

We use a number of robustness checks to assess if IQ's inverse relationship with mutual fund fees is an artifact of specific methodological choices. These checks indicate whether the same results obtain with OLS estimation, different clustering assumptions, finer education regressors, controls for where one resides, an alternative wealth regressor, a dependent variable that depends on the degree of fund investment, alternative regression methodologies, IQ measurements adjusted to avoid the "Flynn effect," and separate regressions for each fund-investment year. The results, not presented in formal tables, are summarized below.

OLS estimation and clustering assumptions. Table 4 estimates coefficients with logit regression. Estimating its coefficients with a linear probability model generates an IQ-fee interaction coefficient of -.0008 with a significant *t*-statistic of -2.23, computed from standard errors clustered at the investor level. Table 4's *t*-statistic (-3.69 with investor clustering) would be a significant -3.23 if computed from standard errors clustered at the fund level.

More extensive education controls. Inadequate education controls could artificially inflate IQ's importance in Table 4. In lieu of Table 4's specification, we use all remaining education controls for which Statistics Finland maintains data—adding dummy variables for degrees in educational science, humanities and arts, social sciences, natural sciences, technology and engineering, agriculture and forestry, health and welfare, and services. The IQ-fee interaction coefficient is of similar magnitude as Table 4's coefficient with these additional educational controls and it has a significant *t*-statistic of -3.16. The fee-business education interaction remains significantly negative, while having a degree in educational science generates a significantly positive fee interaction coefficient.

Controlling for urban residence. The IQ-fee relationship remains virtually unchanged when Table 4's regression controls for being in a big city. Adding a dummy for whether one resides in a top-5 urban area (and corresponding interactions with the eight fund attribute variables) yields an IQ-fee logit coefficient of -0.30 with a significant *t*-statistic of -3.23 (compared to -0.34 with *t*-statistic of -3.69 in Table 4). The urban-fee interaction coefficient is negative but not significant. This robustness check, as well as Table 5's similar-sized IQ-fee interaction despite near-perfect controls for service differences, suggests that location-based access to or preference for low-fee funds cannot explain our results.

Alternative wealth measure. We also assessed whether a regressor based on wealth invested only in mutual funds would alter Table 4's results. The alternative wealth regressor has no material effect on any of the results.

Regression methodology and dependent variable. An alternative regression approach can assess whether the individual attributes of a fund's shareholders are related to fees. Using the holdings-investor matrix to organize data, we regress the fee of every investor's holding in a year on his IQ and controls. The investor's IQ turns out to be a significant predictor of the management fee (t = -2.05). The significant prediction here controls for all the (now familiar) non-fee fund- and investor-level variables from the column and row headings of Table 4, as well as interactions between investor attributes and non-fee fund attributes.

More complex measures of fund choice add nothing to the analysis. For example, conditional on owning the fund, the size of a holding is not influenced by the interaction between IQ and fee (t = -0.91). Thus, while IQ explains whether an investor tends to own low-fee funds, it does not explain investment size conditional on owning the fund.

Flynn effect. Adjusting IQ for Flynn's (1984) effect—the tendency of measured IQ to rise in a repeatedly tested population over time—does not alter our results. Replacing IQ in Table 4 by "residual IQ," computed from regressing IQ on dummies for the year in which an investor's IQ is assessed, yields virtually identical interaction coefficients and test statistics as those observed in Table 4.

Separate regressions by investment year. We also reran Table 4's regression for each year of the 2004-08 sample period. The five IQ-fee interaction coefficients range from -0.32 (year 2006) to -0.38 (year 2007). All coefficients are significant, with t-statistics ranging from -2.56 (year 2006) to -3.31 (year 2007).

III. Summary and Conclusion

Using remarkable data from Finland, including measurement of individual investor IQ, we find that high-IQ investors tend to own low-fee funds. Their gravitation to low-fee funds partly reflects a preference for asset classes, distribution outlets, and passive vs. active management philosophies that tend to have low fees. However, controlling for these fund attributes, high-IQ investors still prefer low-fee funds. We also control for service differences by adding 22 fund family dummies, but these fund family fixed effects scarcely alter the IQ-fee relationship.

Our study of IQ's role in fund selection focuses on its incremental effect, holding four other investor characteristics constant. These other characteristics—having a university or business degree, working in the finance profession, and wealth—are all related to the tendency to hold a low-fee fund, controlling for observable fund attributes. However, the joint effect of these four investor attributes does not eliminate the IQ-fee relationship.

The paper's results are highly robust to alternative specifications and methodologies. However, we would be remiss if we censor all mention of analyses that lack significance. First, high-IQ investors' fund flow sensitivity to past performance does not significantly differ from the sensitivity of low-IQ investors. Second, high-IQ investors' funds do not earn significantly greater post-fee risk-adjusted returns than low-IQ investors' funds. The lack of significantly different performance stands in marked contrast to the Grinblatt, Keloharju, and Linnainmaa (2011b) results on individual (IQ-stratified) stock holdings, but we have a shorter sample period and lower data frequency than they do. As with the insignificant alteration in fund-flow sensitivity, the insignificant performance difference of IQ-stratified funds could easily stem from low power. We leave study of these issues to a later date when more time series observations have accumulated.

Our empirical results suggest that intellectual ability, education, and career-related financial expertise play a role in consumer demand elasticity. Because the underlying fund product is a relatively simple risk-return investment trade-off—which many believe is the same for all funds—mutual funds are an ideal industry for studying the drivers of consumer price elasticity. Despite the narrow industry focus, price is a common attribute in the exchange of money for goods and services. Thus, IQ's documented influence over price elasticity for mutual funds should generalize to other products.

It is probably easier to compare mutual funds than products whose demand critically depends on attributes other than price. Since IQ represents a metric that helps the consumer assess quality as well as price, it may play an even more important role in the demand for other products. However, the added complexity of such products also makes it much more difficult for the econometrician to verify that IQ influences price elasticity because of the greater challenge of finding adequate controls. For example, medical services may vary along many dimensions—skill of the doctor at diagnosing and treating many different disease categories, hospital one can be admitted to, waiting time when seeking medical help, bedside manner, etc. Some of these are unique to the provider. Similarly, the utility obtained from a fashionable line of clothing or cosmetics may differ along dimensions that are unique to the provider.

Besides the implications for consumer models, the study may also be of interest to regulators. Policy makers often express concerns that mutual funds overcharge for services, pointing to the fact that mutual fund fees vary widely, even among funds with identical investment objectives.[18] This perspective stems from a "cognitive friction" story. According to the story, low-IQ investors, being either bad judges of value or less able to discern the price charged, receive nothing extra in exchange for the higher fees some funds charge. However, a significant IQ-fee correlation could also arise from IQ's stratification of preferences—here, for

[18] See Elton, Gruber, and Busse (2004) and Hortaçsu and Syverson (2004) for documentation of such wide variation in fees.

unobserved costly services. This "clientele equilibrium" story implies that investors of low intellectual ability place greater value on the services higher-fee funds provide.

There is evidence to support both stories. Quite plausibly, the low-IQ preference for higher-priced retail funds in Tables 3 (without fee controls) and 4 (with fee controls) reflects rational recognition of a greater need for costly handholding and other services retail distribution provides. The resulting "clientele equilibrium" allocates the costly services of retail funds to those who value it most—the low-stanine groups. We also find evidence consistent with the cognitive frictions story: Table 5's fund family fixed effects regression, which contains effective controls for service differences, not only exhibits a significant IQ-fee interaction component, but one of similar magnitude to Table 4's regression.

Despite this evidence, we lack data on the underlying cost of providing fund services, which prevent us from determining whether funds are overcharging for their services. What seems to be evident, however, is that high-IQ consumers of fund services are relatively better off. They find less expensive workarounds for the services others pay dearly for, finding alternatives to balanced funds and the handholding of retail distribution networks. Even more importantly, they seem to be less confused about pricing, making better choices when evaluating the exchange of services for money. We believe that this IQ-related acuity at evaluating economic exchange extends to other industries. Incorporating this feature into models of the consumption decision can only help economic thought rest on a more intelligent foundation.

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Table 1

Descriptive statistics on funds

For each asset class, Table 1 lists 2008 values of the number of funds, average fee, standard deviation of the fee within the category, aggregate assets under management (AUM), and number of investors in all funds in the category along with their average IQ. Each Finnish-domiciled mutual fund in the category at the end of 2008 is a data point. Closed-end funds (including ETFs), hedge funds, and any funds with performance-related fee components or nontransparent fees are excluded from the sample. Long-term bond funds include intermediate- and long-term bond funds. Retail funds are funds run and distributed by fund families affiliated with commercial banks.

	Pure asset classes					Balanced funds
	Short-term bond	Long-term general bond	Long-term emerging market bond	General equity	Emerging markets equity	
All funds						
Number of funds	32	61	8	153	42	39
Average fee, bp	37.4	61.1	98.8	146.7	259.9	155.7
Sd of fee, bp	13.2	26.9	30.0	56.1	55.1	44.8
AUM, mill. Euros	9,018	10,580	249	7,268	1,456	2,788
Number of investor-funds	191,051	89,157	2,912	749,939	405,905	322,075
Average investor IQ	5.85	6.39	6.73	6.22	6.26	5.87
Retail funds						
Number of funds	21	42	4	81	28	29
Average fee, bp	39.6	64.3	92.5	162.1	237.7	155.7
Sd of fee, bp	14.1	28.7	25.0	46.3	46.8	41.7
AUM, mill. euros	6,981	8,877	197	5,352	1,160	2,404
Number of investor-funds	179,646	79,772	1,861	705,029	386,546	309,790
Average investor IQ	5.69	6.27	6.74	6.07	6.15	5.81
Non-retail funds						
Number of funds	11	19	4	72	14	10
Average fee, bp	33.0	54.2	105.0	129.1	304.3	155.8
Sd of fee, bp	10.3	21.3	37.0	61.2	42.9	55.3
AUM, mill. Euros	2,036	1,703	52	1,916	296	385
Number of investor-funds	11,405	9,385	1,051	44,910	19,359	12,285
Average investor IQ	7.00	7.00	6.73	7.12	7.20	6.94
Actively managed funds						
Number of funds	32	54	8	138	42	39
Average fee, bp	37.4	65.6	98.8	157.2	259.9	155.7
Sd of fee, bp	13.2	25.0	30.0	48.3	55.1	44.8
AUM, mill. euros	9,018	9,607	249	6,668	1,456	2,788
Number of investor-funds	191,051	88,097	2,912	736,297	405,905	322,075
Average investor IQ	5.85	6.38	6.73	6.15	6.26	5.87
Passively managed funds						
Number of funds		7		15		
Average fee, bp		26.1		50.8		
Sd of fee, bp		9.6		19.4		
AUM, mill. Euros		973		599		
Number of investor-funds		1,060		13,642		
Average investor IQ		6.59		7.26		

Table 2

IQ, investor, and fund variables

Panel A reports the theoretical stanine distribution and its empirical equivalents for both the full sample and the sample of mutual fund holders. The full sample randomly selects Finns who are born between 1955 and 1984. The percent of fund holders is the proportion of individuals who have some fund holdings in each stanine. Panel B summarizes investor attributes in the total sample of mutual fund holders. Each investor at the end of each year 2004-08 is the unit of observation. Fund wealth is the value of all fund holdings at the end of a year. Highest education is the proportion of investors whose highest degree is basic, vocational, high school, or university. Business education refers to having earned a degree in business or economics. Finance professionals work in the finance industry. Panel C calculates the proportion of investor-fund observations in each asset class and in each fund type. "ST" refers to short-term, "LT" to long-term, and "Em. market" to Emerging market.

Panel A: IQ distribution

	IQ stanine									
	1	2	3	4	5	6	7	8	9	*N*
Theoretical IQ distribution	4.0%	7.0%	12.0%	17.0%	20.0%	17.0%	12.0%	7.0%	4.0%	
Full sample IQ distribution	2.5%	6.0%	7.4%	16.9%	22.3%	16.8%	15.0%	7.1%	6.1%	34,490
Fund holder IQ distribution	1.2%	3.6%	5.4%	12.5%	21.0%	18.1%	18.1%	10.4%	9.6%	7,454
% fund holders in IQ stanine	10.4%	13.1%	15.9%	16.0%	20.4%	23.2%	26.2%	31.7%	34.3%	21.6%

Panel B: IQ stratified averages of socioeconomic characteristics

	IQ stanine									
	1	2	3	4	5	6	7	8	9	Total
Financial wealth	4,430	8,077	12,037	12,357	12,830	16,641	23,168	22,998	218,907	37,073
Number of funds	1.4	1.6	1.6	1.7	1.9	2.0	2.1	2.3	2.6	2.0
Highest education										
Basic	28.2%	25.3%	17.9%	13.0%	7.3%	5.5%	5.3%	3.1%	3.5%	7.8%
Vocational	65.8%	65.9%	72.1%	67.7%	58.3%	41.7%	31.0%	21.4%	11.5%	43.7%
High school	1.7%	3.5%	2.6%	7.0%	8.9%	13.9%	14.2%	18.5%	16.4%	11.8%
University	4.4%	5.3%	7.4%	12.3%	25.5%	38.9%	49.5%	57.0%	68.5%	36.7%
Business education	1.0%	1.1%	0.7%	2.9%	4.9%	8.1%	8.4%	10.4%	8.5%	6.5%
Finance professional	0.0%	2.0%	1.5%	1.8%	3.8%	4.3%	4.1%	4.9%	5.5%	3.8%

Panel C: IQ stratified portfolio weights in asset classes and fund types

	IQ stanine									
	1	2	3	4	5	6	7	8	9	Total
Asset classes										
ST bond	21.6%	14.3%	14.3%	13.4%	11.5%	9.3%	10.5%	9.2%	9.2%	10.8%
LT general bond	2.9%	5.6%	4.9%	3.6%	4.2%	5.0%	5.6%	5.3%	6.5%	5.0%
LT em. market bond	0.0%	0.0%	0.0%	0.2%	0.2%	0.4%	0.3%	0.2%	0.4%	0.3%
General equity	36.3%	35.5%	36.0%	40.8%	40.7%	42.3%	42.0%	44.0%	43.3%	41.6%
Em. market equity	20.6%	19.3%	23.6%	22.3%	25.1%	25.6%	26.1%	27.9%	26.2%	25.3%
Balanced	18.6%	25.2%	21.2%	19.8%	18.2%	17.5%	15.5%	13.3%	14.4%	16.9%
Fund types										
Retail	96.1%	97.3%	97.8%	96.1%	91.1%	90.9%	87.5%	84.2%	74.6%	88.4%
Passively managed	0.0%	0.7%	0.0%	0.7%	1.6%	2.7%	3.5%	5.1%	5.5%	2.9%

Table 3

Choice of asset class and fund type

Panel A reports logit coefficients and their associated *t*-values, in parentheses; Panel B reports marginal effects (at means of continuous regressors and at zero for binary regressors) and their *z*-values, in parentheses, from logit regressions that explain investor *i*'s decision to hold a fund in an asset class or of a service type at the end of year *t*, where *t* ranges from 2004 to 2008. Panel B also reports the reference probabilities for the benchmark investor in each regression. Standard errors used to compute test statistics are clustered at the investor level and are robust to heteroskedasticity. The regressions are estimated over investor-holdings-year observations. The dependent variable is one if the fund held by the investor that year belongs to the category in each row. Balanced fund regressions are run separately for all investors and investors who hold a balanced fund or at least a pair of general equity and long-term bond funds (the latter containing both intermediate- and long-term bond funds). Independent variables are the IQ stanine rescaled to vary from -1 to 1, dummies for having a university or a business degree and working in the finance industry, and logged wealth (in Euros) held in mutual funds and individual stocks at the end of year *t*. All regressions include unreported dummies for the five calendar years of observation, 2004-08.

Panel A: Coefficients

Dependent variable: The fund an investor holds is...	Independent variables					Summary statistics	
	IQ score	University degree	Business degree	Finance professional	Ln (Wealth)	Pseudo-R^2	*N*
Short-term bond	-0.326	-0.083	0.048	0.163	0.033	0.006	50,691
	(-5.21)	(-1.39)	(0.51)	(1.55)	(2.28)		
Long-term general bond	0.064	0.255	0.035	0.053	0.185	0.023	50,691
	(0.60)	(2.64)	(0.24)	(0.33)	(7.79)		
Long-term emerging market bond	0.194	-0.083	-1.284	0.761	0.477	0.093	50,691
	(0.54)	(-0.23)	(-1.59)	(1.27)	(8.24)		
General equity	0.110	0.044	0.001	-0.078	-0.008	0.007	50,691
	(2.46)	(1.01)	(0.01)	(-0.92)	(-0.93)		
Emerging markets equity	0.176	0.031	0.039	0.210	0.066	0.018	50,691
	(2.90)	(0.54)	(0.38)	(1.89)	(5.79)		
Balanced fund, all investors	-0.173	-0.109	-0.147	-0.376	-0.141	0.021	50,691
	(-3.19)	(-1.98)	(-1.35)	(-3.01)	(-13.50)		
Balanced fund, bond and equity exposure	-0.174	-0.195	-0.043	-0.392	-0.436	0.125	25,541
	(-2.46)	(-2.93)	(-0.37)	(-2.83)	(-22.91)		
Retail fund	-0.734	-0.532	-0.225	-0.225	-0.402	0.134	50,691
	(-5.03)	(-4.03)	(-1.20)	(-1.12)	(-12.34)		
Passively managed fund	0.620	1.088	0.579	0.234	0.149	0.086	50,691
	(2.77)	(5.52)	(2.46)	(0.90)	(3.97)		

Panel B: Marginal effects							
Dependent variable: The fund an investor holds is...	Independent variables					Summary statistics	
	IQ score	University degree	Business degree	Finance professional	Ln (Wealth)	Ref. prob.	*N*
Short-term bond	-0.036	-0.009	0.005	0.018	0.004	0.127	50,691
	(-5.19)	(-1.39)	(0.51)	(1.55)	(2.28)		
Long-term general bond	0.003	0.010	0.001	0.002	0.007	0.042	50,691
	(0.60)	(2.61)	(0.24)	(0.33)	(7.45)		
Long-term emerging market bond	0.000	0.000	-0.003	0.002	0.001	0.002	50,691
	(0.54)	(-0.23)	(-1.52)	(1.26)	(5.51)		
General equity	0.027	0.011	0.000	-0.019	-0.002	0.439	50,691
	(2.46)	(1.01)	(0.01)	(-0.92)	(-0.93)		
Emerging markets equity	0.030	0.005	0.007	0.035	0.011	0.220	50,691
	(2.89)	(0.54)	(0.38)	(1.89)	(5.74)		
Balanced fund, all investors	-0.024	-0.015	-0.020	-0.052	-0.020	0.171	50,691
	(-3.19)	(-1.98)	(-1.35)	(-3.01)	(-13.69)		
Balanced fund, bond and equity exposure	-0.033	-0.037	-0.008	-0.074	-0.083	0.383	25,541
	(-2.45)	(-2.95)	(-0.37)	(-2.83)	(-28.08)		
Retail fund	-0.060	-0.043	-0.018	-0.018	-0.033	0.900	50,691
	(-5.02)	(-4.00)	(-1.20)	(-1.12)	(-10.99)		
Passively managed fund	0.011	0.018	0.010	0.004	0.003	0.018	50,691
	(2.72)	(4.83)	(2.39)	(0.90)	(3.78)		

Table 4

Logit regression of fund choice

This table reports coefficients and marginal effects and their associated *t*-values, in parentheses, from a logit regression that explains investor *i*'s decision to own fund *j* at the end of year *t*. The regression includes main effects for each fund and investor attribute and the interaction of each fund attribute with each investor attribute. Fund variables are the management fee, six dummy variables for asset classes (short-term bond funds omitted) and two dummy variables—for funds that are run and distributed by a retail bank, and for passively managed funds. Long-term bond funds include intermediate- and long-term bond funds. Management fee is the logged percentage fee of the fund. The main effects of fund attributes are reported in column 1. The first row of columns 2 through 6 reports the main effects of investor attributes. The IQ score from 1 to 9 is rescaled to vary from -1 to 1 and ln(Wealth) is investor *i*'s logged Euros held in mutual funds and individual stocks at the end of year *t*. The remaining rows in columns 2 through 5 report the coefficients on interactions of the investor attribute in the column and the fund attribute in the row. The regression includes unreported dummy variables for the five calendar years of observation, 2004-08. Funds with non-transparent fees and missing information on the underlying asset class are excluded from the sample. Standard errors used to compute test statistics are clustered at the investor level and are robust to heteroskedasticity.

Panel A: Coefficients						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		0.09	0.26	-0.29	-0.21	0.47
		(0.54)	(1.57)	(-1.45)	(-0.85)	(12.78)
Management fee	1.70	-0.34	-0.23	-0.50	-0.53	-0.05
	(12.04)	(-3.69)	(-2.55)	(-3.56)	(-3.38)	(-2.70)
Long-term general bond fund	-3.78	0.48	0.40	0.18	0.11	0.14
	(-14.64)	(3.56)	(3.15)	(1.00)	(0.51)	(5.03)
Long-term emerging market bond fund	-6.47	0.59	0.13	-0.85	0.98	0.38
	(-9.34)	(1.50)	(0.33)	(-1.05)	(1.64)	(6.05)
General equity fund	-2.17	0.79	0.36	0.59	0.53	0.01
	(-8.60)	(5.27)	(2.48)	(2.64)	(2.20)	(0.31)
Emerging market equity fund	-2.67	1.00	0.46	0.87	0.95	0.09
	(-8.66)	(5.34)	(2.50)	(3.18)	(3.47)	(2.39)
Balanced fund	-0.85	0.61	0.30	0.52	0.33	-0.09
	(-3.43)	(4.12)	(2.06)	(2.33)	(1.37)	(-3.07)
Retail fund	5.19	-0.61	-0.49	-0.15	-0.07	-0.32
	(20.82)	(-4.27)	(-3.59)	(-0.91)	(-0.38)	(-11.33)
Passively managed fund	-0.10	0.01	0.82	0.01	-0.35	-0.01
	(-0.33)	(0.05)	(4.32)	(0.08)	(-1.35)	(-0.31)
Pseudo-R^2	0.087					
Number of observations	7,183,674					

Panel B: Marginal effects						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		0.0006	0.0018	-0.0020	-0.0014	0.0031
		(0.54)	(1.57)	(-1.45)	(-0.85)	(12.50)
Management fee	0.0115	-0.0023	-0.0015	-0.0034	-0.0036	-0.0003
	(12.01)	(-3.69)	(-2.54)	(-3.56)	(-3.39)	(-2.70)
Long-term general bond fund	-0.0255	0.0033	0.0027	0.0012	0.0007	0.0010
	(-14.34)	(3.56)	(3.15)	(1.00)	(0.51)	(4.99)
Long-term emerging market bond fund	-0.0437	0.0040	0.0009	-0.0057	0.0066	0.0025
	(-9.31)	(1.50)	(0.33)	(-1.05)	(1.64)	(6.02)
General equity fund	-0.0146	0.0053	0.0025	0.0040	0.0036	0.0001
	(-8.55)	(5.27)	(2.48)	(2.64)	(2.20)	(0.31)
Emerging market equity fund	-0.0180	0.0067	0.0031	0.0059	0.0064	0.0006
	(-8.59)	(5.34)	(2.50)	(3.18)	(3.47)	(2.38)
Balanced fund	-0.0058	0.0041	0.0020	0.0035	0.0022	-0.0006
	(-3.43)	(4.12)	(2.06)	(2.33)	(1.38)	(-3.08)
Retail fund	0.0350	-0.0041	-0.0033	-0.0010	-0.0005	-0.0022
	(20.05)	(-4.28)	(-3.60)	(-0.91)	(-0.38)	(-11.09)
Passively managed fund	-0.0007	0.0001	0.0055	0.0001	-0.0024	-0.0001
	(-0.33)	(0.05)	(4.31)	(0.08)	(-1.35)	(-0.31)
Reference probability	0.0027					

Table 5

Controlling for omitted services

This table reports coefficients and marginal effects and their associated *t*-values, in parentheses, from a logit regression that explains investor *i*'s decision to own fund *j* at the end of year *t*. The regression includes main effects for each fund and investor attribute and the interaction of each fund attribute with each investor attribute. Table 5 adds 22 fund family dummies and their interactions with all the investor attributes to the regression in Table 4 (fund family dummies and fund family dummy interactions not reported for brevity). Fund variables are the management fee, six dummy variables for asset classes (short-term bond funds omitted) and two dummy variables—for funds that are run and distributed by a retail bank, and for passively managed funds. Long-term bond funds include intermediate- and long-term bond funds. Management fee is the logged percentage fee of the fund. The main effects of fund attributes are reported in column 1. The first row of columns 2 through 6 reports the main effects of investor attributes. The IQ score from 1 to 9 is rescaled to vary from -1 to 1 and ln(Wealth) is investor *i*'s logged Euros held in mutual funds and individual stocks at the end of year *t*. The remaining rows in columns 2 through 5 report the coefficients on interactions of the investor attribute in the column and the fund attribute in the row. The regression includes unreported dummy variables for the five calendar years of observation, 2004-08. Funds with non-transparent fees and missing information on the underlying asset class are excluded from the sample. Standard errors used to compute test statistics are clustered at the investor level and are robust to heteroskedasticity.

Panel A: Coefficients						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		-0.40	0.05	-0.29	0.05	0.25
		(-3.27)	(0.40)	(-1.57)	(0.26)	(9.73)
Management fee	2.05	-0.37	-0.02	-0.33	-0.52	-0.07
	(16.66)	(-5.34)	(-0.28)	(-3.20)	(-4.30)	(-4.92)
Long-term general bond fund	-4.03	0.52	0.33	0.13	0.17	0.15
	(-15.54)	(3.87)	(2.61)	(0.67)	(0.86)	(5.09)
Long-term emerging market bond fund	-6.74	0.55	0.06	-0.91	1.37	0.36
	(-9.25)	(1.45)	(0.16)	(-1.23)	(2.38)	(5.26)
General equity fund	-2.89	0.88	0.12	0.38	0.58	0.05
	(-11.96)	(6.61)	(0.91)	(1.98)	(2.93)	(1.83)
Emerging market equity fund	-2.63	0.95	0.07	0.62	0.90	0.06
	(-9.62)	(6.05)	(0.48)	(2.68)	(3.71)	(1.87)
Balanced fund	-1.63	0.68	0.05	0.33	0.60	-0.05
	(-6.94)	(5.18)	(0.43)	(1.77)	(2.82)	(-1.70)
Passively managed fund	-0.43	0.03	0.64	-0.03	-0.07	-0.01
	(-1.60)	(0.20)	(3.83)	(-0.16)	(-0.31)	(-0.20)
Pseudo-R^2	0.126					
Number of observations	7,110,752					

Panel B: Marginal effects						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		-0.0027	0.0003	-0.0020	0.0003	0.0017
		(-3.27)	(0.40)	(-1.57)	(0.26)	(9.59)
Management fee	0.0139	-0.0025	-0.0001	-0.0022	-0.0035	-0.0005
	(16.11)	(-5.34)	(-0.28)	(-3.19)	(-4.31)	(-4.87)
Long-term general bond fund	-0.0273	0.0035	0.0022	0.0008	0.0012	0.0010
	(-15.06)	(3.87)	(2.61)	(0.67)	(0.86)	(5.03)
Long-term emerging market bond fund	-0.0457	0.0037	0.0004	-0.0062	0.0093	0.0025
	(-9.14)	(1.45)	(0.16)	(-1.23)	(2.39)	(5.21)
General equity fund	-0.0196	0.0060	0.0008	0.0025	0.0039	0.0004
	(-11.69)	(6.61)	(0.91)	(1.98)	(2.94)	(1.82)
Emerging market equity fund	-0.0178	0.0065	0.0005	0.0042	0.0061	0.0004
	(-9.46)	(6.05)	(0.48)	(2.68)	(3.72)	(1.86)
Balanced fund	-0.0111	0.0046	0.0004	0.0023	0.0041	-0.0003
	(-6.87)	(5.18)	(0.43)	(1.77)	(2.82)	(-1.71)
Passively managed fund	-0.0029	0.0002	0.0044	-0.0002	-0.0005	0.0000
	(-1.60)	(0.20)	(3.82)	(-0.16)	(-0.31)	(-0.20)
Reference probability	0.0069					

Table 6

Results for affluent investors

This table reports coefficients and marginal effects and their associated *t*-values, in parentheses, from a logit regression that explains investor *i*'s decision to own fund *j* at the end of year *t*. The regression includes main effects for each fund and investor attribute and the interaction of each fund attribute with each investor attribute. Table 6 runs Table 4's logit regression on investors who belong to the highest 10 percent of the fund wealth distribution. The average (median) wealth of these investors equals 330,845 (77,275) euros. Fund variables are the management fee, six dummy variables for asset classes (short-term bond funds omitted) and two dummy variables—for funds that are run and distributed by a retail bank, and for passively managed funds. Long-term bond funds include intermediate- and long-term bond funds. Management fee is the logged percentage fee of the fund. The main effects of fund attributes are reported in column 1. The first row of columns 2 through 6 reports the main effects of investor attributes. The IQ score from 1 to 9 is rescaled to vary from -1 to 1 and ln(Wealth) is investor *i*'s logged Euros held in mutual funds and individual stocks at the end of year *t*. The remaining rows in columns 2 through 5 report the coefficients on interactions of the investor attribute in the column and the fund attribute in the row. The regression includes unreported dummy variables for the five calendar years of observation, 2004-08. Funds with non-transparent fees and missing information on the underlying asset class are excluded from the sample. Standard errors used to compute test statistics are clustered at the investor level and are robust to heteroskedasticity.

Panel A: Coefficients						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		-0.07	0.11	-0.39	0.21	0.36
		(-0.22)	(0.34)	(-1.16)	(0.53)	(3.93)
Management fee	2.64	-0.42	-0.29	-0.55	-0.26	-0.12
	(3.61)	(-2.11)	(-1.56)	(-2.53)	(-1.04)	(-1.87)
Long-term general bond fund	-4.13	0.58	0.38	-0.09	-0.37	0.16
	(-5.88)	(2.41)	(1.65)	(-0.31)	(-1.31)	(2.79)
Long-term emerging market bond fund	-6.94	0.77	0.51	-0.66	0.28	0.39
	(-5.80)	(1.44)	(0.99)	(-0.82)	(0.35)	(4.12)
General equity fund	-2.92	0.91	0.17	0.75	-0.11	0.05
	(-2.86)	(2.85)	(0.53)	(2.10)	(-0.28)	(0.56)
Emerging market equity fund	-3.54	1.11	0.21	0.86	0.28	0.15
	(-2.55)	(2.87)	(0.55)	(2.04)	(0.64)	(1.21)
Balanced fund	1.20	0.89	0.24	0.44	-0.18	-0.31
	(0.96)	(2.91)	(0.83)	(1.17)	(-0.44)	(-2.83)
Retail fund	5.53	-0.56	-0.28	-0.03	-0.20	-0.38
	(6.77)	(-2.10)	(-1.18)	(-0.10)	(-0.68)	(-5.07)
Passively managed fund	1.78	-0.01	0.62	0.06	-0.03	-0.17
	(1.07)	(-0.02)	(1.73)	(0.23)	(-0.07)	(-1.11)
Pseudo-R^2	0.052					
Number of observations	718,281					

Panel B: Marginal effects						
Dependent variable	Ownership dummy					
Specification	Logit					
	Main effects of fund attributes	Main effects and interactions				
		IQ	University degree	Business degree	Finance profes-sional	Ln (Wealth)
	1	2	3	4	5	6
Main effects of investor characteristics		-0.0009	0.0013	-0.0047	0.0025	0.0043
		(-0.22)	(0.34)	(-1.16)	(0.53)	(3.83)
Management fee	0.0320	-0.0051	-0.0035	-0.0066	-0.0032	-0.0015
	(3.64)	(-2.11)	(-1.56)	(-2.53)	(-1.04)	(-1.88)
Long-term general bond fund	-0.0500	0.0070	0.0046	-0.0011	-0.0045	0.0020
	(-5.87)	(2.42)	(1.64)	(-0.31)	(-1.31)	(2.79)
Long-term emerging market bond fund	-0.0839	0.0093	0.0061	-0.0080	0.0033	0.0048
	(-5.85)	(1.45)	(0.99)	(-0.82)	(0.35)	(4.14)
General equity fund	-0.0353	0.0110	0.0020	0.0091	-0.0014	0.0006
	(-2.87)	(2.84)	(0.53)	(2.10)	(-0.28)	(0.56)
Emerging market equity fund	-0.0428	0.0134	0.0025	0.0104	0.0034	0.0018
	(-2.55)	(2.86)	(0.56)	(2.03)	(0.64)	(1.21)
Balanced fund	0.0145	0.0108	0.0029	0.0053	-0.0022	-0.0037
	(0.96)	(2.91)	(0.83)	(1.17)	(-0.44)	(-2.80)
Retail fund	0.0668	-0.0068	-0.0034	-0.0003	-0.0024	-0.0045
	(6.75)	(-2.11)	(-1.19)	(-0.10)	(-0.68)	(-5.05)
Passively managed fund	0.0215	-0.0001	0.0075	0.0008	-0.0003	-0.0020
	(1.08)	(-0.02)	(1.72)	(0.22)	(-0.07)	(-1.11)
Reference probability	0.0123					