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ABSTRACT

Environmental, social, and governance (ESG) objectives have risen to near the top of the agenda for corporate executives and boards, driven in large part by their perceptions of shareholder interest. We quantify the value that shareholders place on ESG using a revealed preference approach, where shareholders pay higher fees for ESG-oriented index funds in exchange for their financial and non-financial benefits. We find that investors are willing, on average, to pay 20 basis points more per annum for an investment in a fund with an ESG mandate as compared to an otherwise identical mutual fund without an ESG mandate, suggesting that investors as a group expect commensurately higher pre-fee, gross returns, either financial or non-financial, from an ESG mandate. Our point estimate has risen from 9 basis points in 2019 when our sample begins to as much as 28 basis points in 2022. When we incorporate the possibility that investors are willing to accept lower financial returns in exchange for the psychic and societal benefits of ESG, when we consider that the holdings of ESG and non-ESG index funds overlap, when we measure the ESG ratings of these holdings, and when we focus on 401(k) participants who report being concerned about climate change or who work in industries with lower levels of emissions, we find that the implicit value that investors place on ESG stocks is higher still. A simple model of supply suggests that the large majority of these benefits accrue to investors and firms, with intermediaries capturing 5.9 basis points in fees, half of which reflect higher markups.

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1 Introduction

In the last decade, Larry Fink, the CEO of Blackrock, the world's largest asset manager with more than $10 trillion under management, has been encouraging corporate executives and boards to focus on a "north star" of purpose, on all stakeholders not just shareholders, and on environmental sustainability, with ever greater volume and conviction (Fink, 2022). The Blackrock Investment Institute claims that we are still at the beginning of a "tectonic" capital reallocation as investor interest in the environmental, social, and governance (ESG) objectives of their investments intensifies (Hildebrand et al., 2020). Bloomberg projects that ESG will account for as much as a third of global AUM in 2025.[1] While investments with an explicit ESG mandate are now tracked and forecasted with enthusiasm, understanding investor preferences and measuring their perceived returns for ESG remains unknown. We aim to fill that void with a revealed preference approach that pins down how much index fund investors have been willing to pay for ESG over time.

We develop and estimate an investor demand model for index funds using a standard framework borrowed from the industrial organization literature (Berry, 1994; Berry et al., 1995). Investors, on average, have been willing to pay an additional 20 basis points to invest in funds with an ESG mandate. Moreover, the value that investors have placed on ESG has more than tripled over the period from 2019 to 2022, starting at 9 basis points and rising to 28 basis points in four years. We offer two interpretations of our main finding.

Traditional finance theory, with efficient capital market pricing, suggests that an investment in ESG involves a tradeoff where investors sacrifice financial returns for the psychic and societal benefits of promoting non-financial social and environmental objectives. Heinkel et al. (2001) and more recently, Oehmke and Opp (2020), Pástor et al. (2021), and Pedersen et al. (2021) develop models where investor interest in ESG leads to a reduction in returns. In this interpretation, investors collectively aim to push up the prices of firms that seek these societal goals above a traditional discounted value of their future cash flows, thereby lowering the firms' cost of capital. The 20 basis points we estimate is then a lower bound. Investors are paying for ESG explicitly in their willingness to pay higher fees and implicitly in earning lower future returns.

By contrast, many investment management firms do not embrace traditional finance theory and efficient capital markets: They do not describe ESG investing as a tradeoff. For example, Blackrock argues that today's prices do not yet reflect the financial benefits of corporate ESG and the tailwind of the investor "transition to sustainable preferences." This is akin to a demographic shift that increasingly favors firms with highly rated ESG practices; a shift that these market watchers argue is not yet reflected in current market prices. The Blackrock pitch is that both firms and investors can do well, earning higher than average profits through ESG practices and higher than average returns by reallocating investable assets towards funds with ESG

[1] Link: ESG assets may hit $53 trillion by 2025, a third of global AUM

mandates. This is consistent with a literature in behavioral asset pricing, where the stock market underreacts in its valuation of relevant information—particularly slow, demographic shifts as in DellaVigna and Pollet (2007), and where shifts in the supply of securities and investor demand drive asset prices, as in Greenwood and Vayanos (2010). In this second interpretation, investors only care about returns, not societal externalities, and our estimates of revealed preference suggest that investors on average believe that the return on an ESG fund will be 20 basis points higher than an otherwise equivalent non-ESG fund.[2]

The key testable implication that separates these two interpretations is their diametrically opposed predictions for the link between ESG and future returns. Traditional finance theory suggests a negative relationship between ESG preferences and future returns. The practitioner view suggests a positive one. We have limited power to test this hypothesis, and we find evidence for both points of view. ESG funds, as a whole, did earn returns that were 62 basis points higher per year over our short sample period, suggesting a tailwind of rising preferences consistent with the practitioner view. Meanwhile, holding this tailwind constant, the time variation in investors' willingness to pay for ESG has been negatively related, although not significantly different from zero, to the future returns on ESG funds – suggesting that once investor interest in ESG has risen, future returns on ESG funds will fall if this pattern holds, consistent with traditional finance theory. In our preferred specification, we find that a one standard deviation increase in the value investors place on ESG is correlated with a 25 basis point decline in the return of ESG funds, meaning that investors are on average paying 20 basis points more for ESG exposure and realizing a return that is 46 basis points lower, bringing our estimate of investor preference for ESG to 66 basis points in total. If investor preferences for ESG continue to rise and fees on ESG funds fall with competition, we can expect much of this benefit to be passed on to firms in the form of a lower cost of capital.

Next, we shift our lens from index funds that claim an ESG mandate to the ESG characteristics of the individual stocks that these funds hold. We start by comparing the portfolios of ESG and non-ESG index funds within the same fund category. Despite a stated difference in mandate, these funds hold portfolios that are similar and that deliver similar returns. For example, at the end of December 2021, the overlap between the holdings in Vanguard's FTSE Social Index Fund (ticker:VFTNX) and the holdings in Vanguard's Mega Cap Index Fund (ticker:VMCTX) was 84 percent. On average the overlap in holdings in our sample between ESG and matched non-ESG funds is 68 percent for US broad market funds. Thus, we can convert investors' willingness to pay 20 basis points to invest in an ESG fund into a willingness to pay 63 basis points (=20/(1-68%)) to invest in a pure, disjoint portfolio of ESG stocks.

There are two ways to interpret this much higher estimate of value that investors place on ESG. In a first interpretation, investors lack sophistication and do not understand and appreciate

[2]Survey evidence from Krueger et al. (2020) suggests that institutional investors believe that both pecuniary and non-pecuniary benefits are important motives for thinking about climate risks.

the underlying holdings of the funds they own. They are susceptible to what Kaustia and Yu (2021) call greenwashing in mutual funds, paying more simply for the ESG labeled mandate. In a second interpretation, investors are more sophisticated. They are wise to greenwashing, paying more only in accordance with the ESG qualities of their fund portfolios. Having said that, verifying ESG claims remains hard. Firm-level ESG scores in 2021 are notoriously unreliable: The correlation of sustainability ratings from Morningstar and Refinitiv, the two prominent data providers for ESG investors who we rely on, is only 0.17.[3] Even a determined and sophisticated investor might have difficulty grading the funds in which they invest.

To test these interpretations, we supplement the indicator variable for an ESG mandate with two continuous measures of the average ESG score of each fund's holdings. Consistent with the second interpretation, we find that investors place a higher value on ESG funds with higher Morningstar and Refinitiv scores. Investors are willing to pay an additional 3 basis points more to invest in a top-rated ESG fund as per Morningstar (i.e., 4 or 5 Globe Rating). When we use Refinitiv instead, we find that investors are willing to pay an additional 3 basis points for a fund ranked in the top decile relative to a fund in the bottom decile. Because of the low correlation between the two scores, our point estimate for investors' willingness to pay for a hypothetical fund that scores in the top decile of both ratings is higher still at 6 basis points. At the same time, it is worth pointing out that the ESG mandate itself remains significant controlling for the ESG scores of its holdings. This suggests two possibilities. One is consistent with the second interpretation, with legitimate notions of ESG captured by a fund's stated mandate but not by either Morningstar's or Refinitiv's less-than-perfect scores. The other is consistent with the first interpretation, with a mix of investors, some of whom rely naively on a fund's mandate and some of whom rely more heavily on the ESG characteristics of a fund's underlying holdings. If we extrapolate our return predictability evidence, this suggests that firms that improve their Refinitiv and Morningstar ratings can expect their cost of capital to fall commensurately.

Next, we examine the drivers of investor interest in ESG, or, to be specific, how investors' preferences for ESG vary geographically across the US, in locations where households exhibit more or less concern for climate change, and across industries, where firms emit more or less carbon. Starting with geographic variation, we examine how the availability of ESG-oriented funds in employer sponsored 401(k) plans varies across counties in the US. Using data from BrightScope Beacon and the Department of Labor, we observe the investment menus for 55,000 401(k) plans as of 2019, accounting for roughly 87% of 401(k) assets. We also use data from Egan et al. (2021) which provides estimates of investors' expected returns at the fund-by-401(k) plan level.[4] The availability of ESG-related funds is highly correlated with households' attitudes towards climate change. At the county level, a 10 percentage point increase in the share of the

[3]For example, Chatterji et al. (2016) and Berg et al. (2022) document that ESG ratings differ substantially across ratings agencies.

[4]Using the same 401(k) data set and a similar methodology, Egan et al. (2021) show how variation in mutual fund fees can be used to recover investors' expectations of fund returns.

population worried about climate change is correlated with a 5% increase in the availability of ESG-related funds. These investors also place a premium on ESG funds. Investors who are worried about climate change are willing to pay an additional 37 basis points for ESG. Continuing with industry variation, we examine how the prevalence of ESG-related funds varies across industries. Employees working in the education and information services sectors are 33% more likely to have at least one ESG investment option in their 401(k) plan than employees working in the transportation sector. These investors, working in the education and information services sectors, are, on average, willing to pay an additional 23 to 32 basis points for ESG, while the average investor working in the transportation sector places no value on ESG.

Finally, we consider how much of the value that investors assign to ESG mandates is lost through intermediation. One might be concerned that, given the market for index funds is imperfectly competitive (Hortaçsu and Syverson, 2004), index fund providers will extract the value investors are willing to pay for ESG by charging a premium for ESG funds. While investors are willing to pay 20 basis points more for ESG funds, they are, on average, only paying 5.9 basis points in higher fees.[5] This suggests that the vast majority of investor value is consumer surplus that comes in financial, psychic, or societal returns is not captured by index fund providers. To further understand the effects of competition, we model and estimate the supply-side of the index fund market. This allows us to decompose the 5.9 basis points higher fee that index fund providers charge for ESG funds: higher marginal costs account for 2.9 basis points and higher markups account for the remaining 3 basis points. Thus, index fund providers earn an additional 3 basis points per year in profit on funds with an ESG mandate. Our results suggest that the market is sufficiently competitive and that investors and ESG firms, as opposed to intermediaries, capture the benefits of ESG.

The paper proceeds as follows: In Section 2, we describe the data used in our analysis, and we present basic facts about flows into ESG funds and the associated fund expenses. We develop and estimate our index fund demand model in Section 3 and report our baseline estimates of an investor's willingness to pay for ESG. In Section 4, we examine the portfolios of ESG and non-ESG funds to understand what investors are paying for at finer resolution, and we explore the geographic and industry drivers of investor interest in ESG funds in 401(k) plans in Section 5. Section 6 estimates the intermediary share. Section 7 concludes.

Related Literature

The primary strand of the existing empirical literature on ESG and socially responsible investment focuses on its price or performance effects. In one prominent example, Hong and Kacperczyk (2009) and Blitz and Fabozzi (2017) examine the returns of so-called "sin stocks" examining whether stocks that are avoided by investors for non-financial, societal reasons have

[5] Consistent with these results, Laudi et al. (2021) find in a lab-in-the-field experiment, that financial advisers charge a premium for accounts with a socially responsible investing mandate.

lower average returns. The former concludes that sin stocks are shunned and therefore deliver higher returns, while the latter concludes that this link is incidental. A broader range of estimates of the influence of ESG on returns (Friede et al., 2015; Bolton and Kacperczyk, 2021; Pedersen et al., 2021; Pástor et al., 2022; Zerbib, 2022) and firm costs of capital (Chava, 2014; Berk and van Binsbergen, 2021) have also been mixed, with varying measures of ESG, investor composition, and tastes for ESG among the equities studied. Researchers have also examined the promised yields of corporate and municipal bonds. Baker et al. (2022) provide an overview of research on green bonds, which has found an inconsistent link between environmental scores and bond price, ranging from a small, positive effect of a green bond designation on the price of corporate and municipal bonds to a small negative one. Barber et al. (2021) look not at public markets for equity or debt but at venture capital impact funds, finding lower average returns. Our approach is different and complementary: We focus not on the price effects of ESG but on investor preferences for ESG as revealed by their purchases of ETFs.

A second strand focuses on the direct measurement of investor interest in ESG investing, not its indirect effect on price or performance. In lab experiments, Humphrey et al. (2021) find that social preferences, particularly those concerning negative externalities, drive responsible investing behavior. In surveys, Riedl and Smeets (2017) find that responsible investors expect to learn lower returns and pay higher management fees. Similarly, in an experimental setting, Heeb et al. (2022) find that investors are willing to pay an additional 45 basis points for a equity fund that lowers carbon dioxide emissions. In a natural experiment, Hartzmark and Sussman (2019) establish a causal link between ESG labels and mutual fund flows. Not surprisingly, investor interest in ESG in turn affects fund managers' allocation decisions (Alok et al., 2020; Li et al., 2022). Our approach is again complementary: We aim to measure investor interest in ESG in units of return.

A third strand focuses on the underlying drivers of investor interest in ESG investing. Broccardo et al. (2020) and Berk and van Binsbergen (2021) argue that ESG investing ought to be motivated by "voice," gaining shareholder influence directly rather than indirectly through divestment and resulting effects on the cost of capital. Other research suggests a wider range of drivers of ESG preferences, including hedging motives (Tran, 2019; Baker et al., 2019), failures in the private sector funding of ESG (Oehmke and Opp, 2020; Green and Roth, 2020), and a broader set of measures of impact (Cohen et al., 2020; Allcott et al., 2022). We examine the distinct effects of green labeling and green ratings on investor interest, but we do not attempt to peel back the onion further.

Our paper also relates to the growing literature on demand system asset pricing, which focuses on using data on quantities to recover investors preferences and beliefs. In their seminal work, Koijen and Yogo (2019a) develop a flexible characteristics-based demand system asset pricing model with heterogeneous investors.[6] One distinction between our setting and

[6]The Koijen and Yogo (2019a) methodology has been extended to study other settings, including exchange

the demand system asset pricing literature is that much of that literature focuses on how investors form portfolios. In contrast, we are focused on the specific index fund an investor chooses within a narrowly defined investment category (e.g., Large Cap Value Funds, Small Cap Growth Funds, etc.), conditional on (i) the investor's choice to buy an index fund in that specific investment category and (ii) the investor's existing portfolio. This allows us to abstract away from the investor's portfolio choice problem more generally and instead focus on index fund choice.

Our model and framework is closest to the index fund choice model in Hortaçsu and Syverson (2004). While Hortaçsu and Syverson (2004) models index fund choice as a search problem and we model it as a multinomial choice problem with horizontally differentiated products; the two approaches are quite similar and one could interpret the investor-specific logit shocks in our model as driven by search frictions. Two other papers that model index fund choice are An et al. (2021) and Egan et al. (2022). While An et al. (2021) use a similar Berry (1994)-type model to understand index fund choice and quantify the value that investors place on the underlying index, Egan et al. (2022) develop and estimate a model of index fund demand to recover investors expected returns of the market. More generally, our paper builds on a growing literature at the intersection of industrial organization and finance, estimating demand for financial products.[7]

2 Data: Flows and Expenses of ESG and non-ESG Index Funds

2.1 Mutual Fund Data

Our core data are from the CRSP Mutual Fund database. CRSP provides monthly mutual fund returns and total net assets, as well as quarterly summary information regarding fund expense ratios and Lipper classifications. In our main analysis, we restrict attention to those funds identified in CRSP as index funds.

We merge our CRSP data set with monthly data from Morningstar Direct at the ticker-by-month level. Morningstar provides fund-by-month level data on fund ESG ratings as described further below, on Morningstar Category such as U.S. Mid-Cap Value, U.S. Small Blend, and on the well-known Morningstar Rating. The Morningstar Rating is a propriety measure of a fund's risk-adjusted return, ranges from one to five stars, and remains an important factor determining mutual fund choice as highlighted in the academic literature on mutual fund flows (Del Guercio and Tkac (2008); Evans and Sun (2020); Ben-David et al. (2021); Reuter and

rates (Koijen and Yogo, 2019b), cryptocurrencies (Benetton and Compiani, 2021), bonds (Bretscher et al., 2020), competition in the stock market (Haddad et al., 2021), and global equities (Koijen et al., 2019).

[7]Researchers have used demand systems to estimate the value of bank deposits (Dick, 2008; Egan, Hortaçsu, and Matvos, 2017; Wang, Whited, Wu, and Xiao, 2018; Egan, Lewellen, and Sunderam, 2022), bonds (Egan, 2019), credit default swaps (Du et al., 2019), insurance (Koijen and Yogo, 2016, 2022), and mortgages (Robles-Garcia, 2019; Benetton and Compiani, 2021).

Zitzewitz (2021)).

Our final sample is at the fund-by-month level over the 35-month time period from May 2019 through March 2022. Our sample starts in May 2019 when ESG ratings from Morningstar become available for the first time in our data. While our sample period is relatively short, this period captures the recent growth in the public's interest in ESG funds. Figure 1a displays Google search data from Google Trends for the search term "ESG" over a much longer period from 2004 through 2022. There was a fivefold increase in the search popularity of the term in our sample period from 2019 through 2022. Similarly, Figure 1b displays the share of index funds that mention "ESG" in the strategy section of their summary prospectus weighted by assets. The share of index fund assets in funds that mention ESG as part of their investment strategy increased more than sevenfold over in our sample period from 2019 to 2022.

2.1.1 Measures of ESG

We use data from three different sources to measure a fund's ESG attributes.

Morningstar Morningstar provides data on several different measures of ESG at the fund-by-month level. First, Morningstar provides indicator variables that show whether a fund has an explicit ESG mandate, a sustainability mandate, and an impact mandate. Second, Morningstar provides its own Sustainability Rating ranging from one to five globes, where five indicates the highest possible sustainability rating (globes are used to distinguish this metric from the traditional, risk-adjusted stars). Morningstar constructs its Sustainability Rating with a bottom-up aggregation of the fund's portfolio. A fund's sustainability rating is a weighted-average of the sustainability ratings of companies in its portfolio, which measures company-level ESG risks and opportunities.[8]

Refinitiv We supplement Morningstar with firm-level data from Refinitiv. We create a fund's Refinitiv score as the asset-weighted Refinitiv ESG score of securities in its portfolio. Refinitiv provides firm-level ESG scores annually over the period from 2002 to 2021 that measure performance along environmental, sustainability, and governance dimensions. The scores range from 0 to 1, a relative ranking of each firm within its industry group and incorporation location. We use quarterly mutual fund holdings data from CRSP to compute a fund's holdings shares as the percentage of total net assets allocated to each security, replacing missing values by imputing the ESG score of holdings that are not covered by Refinitiv to be the mean score across our sample. Specifically, let w_{kft} denote fund k's holdings share for security f at time $t$and τ denote security f's ESG score in year t. The overall ESG score for each fund k in year t

[8]Link: The Morningstar Sustainable Investing Handbook

is computed as:

$$Refinitiv\,Score_{kt} = \sum_{f \in \mathcal{H}(k)} w_{fkt}\tau_{ft}$$

where $\mathcal{H}(k)$ denotes the set of securities held by fund k.

Fund Prospectuses We also measure funds' ESG leanings through the language they use in their summary prospectuses. We download summary disclosure forms (Form 497K) for each fund from the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database, supplementing our database with updates to definitive materials (Form 497) in years with missing summary disclosures. Our simple measure of a fund's ESG leaning in a given year is whether its prospectus mentions "ESG."

2.1.2 Summary Statistics

The general interest in ESG (e.g, Google Trends; Figure 1a) has been matched by an increase in the number of index funds with an ESG mandate. Figure 2 panel (a) displays the share of index funds with an ESG mandate over our sample period as per Morningstar. Over the period from 2019 to 2022 the share of index funds with an ESG mandate almost doubled from less than 3% to 5%. Panel (b) displays the corresponding share of index funds with an ESG mandate weighted by assets. The results indicate that the share of index-fund assets in funds with an ESG mandate roughly tripled over our sample period.

Table 1 displays the summary statistics corresponding to our base data set. Observations are at the index fund-by-month level. Panel (a) displays summary statistics for the full data set and panel (b) displays summary statistics separately for funds with and without an ESG mandate. The median fund in our sample has assets of $155 million and charges an expense ratio of 43 basis points. It is useful to compare ESG and non-ESG funds, which we do in Panel (b). On average, funds with an ESG mandate tend to be slightly smaller, with lower expense ratios and higher Morningstar Ratings, than funds without an ESG mandate. The biggest distinction between funds with and without an ESG mandate is fund age: ESG funds are on average about half as old as non-ESG funds. The median ESG fund has been around for 3.7 years while the median non-ESG fund has been around for 9.4 years. Because newer funds tend have less assets and lower expense ratios, fund age is a key control variable in our analysis.

Table 2 displays the share of index funds with an ESG mandate as of December 2022 for each Morningstar Category. ESG mandates are most common in the Morningstar Categories "Allocation-30% to 50% Equity," "Global Large-Stock Blend," "Corporate Bond," and "Global Small/Mid Stock." For example, one in five funds tracking global small/midcap stock indices have an ESG mandate. In the largest Morningstar Category by number of funds and assets, "Large Blend", roughly 9% of funds have an ESG mandate.

We use six different ESG measures in our main analysis. We report the correlation between the different measures of ESG in Table 1 Panel (c). The variables *ESG Fund*, *Impact Fund*, and *Sus. Fund* indicate whether the fund has an ESG, impact, or sustainability mandate as measured by Morningstar. The mandates are all highly correlated, indicating that funds with an ESG mandate are also highly likely to have impact and sustainability mandates. The variable *Sus. Rating* reflects the fund's Morningstar Sustainability Rating, which ranges from 1 to 5. We find a modest correlation between whether a fund has an ESG mandate and its Morningstar Sustainability Rating ($\rho = 0.25$). The variable *Refinitiv Rating* is the average Refinitiv ESG Score of the firms held by the fund, which varies from zero to one. While we find that *Refinitiv Rating* is positively and significantly correlated with our other ESG measures, the relationship between *Refinitiv Rating* and whether a fund has an ESG, impact, or sustainability mandate is relatively weak. Lastly, the variable *ESG Strategy* indicates whether a fund mentions "ESG" in the investment strategy of its summary prospectus. This measure has a correlation of 0.94 with the Morningstar ESG mandate.

2.2 ESG vs. Non-ESG Index Funds

We start by examining the relationship between whether a fund has an ESG mandate and both fund flows and fund expense ratios. Consistent with the previous literature, we find that over our sample period ESG funds have experienced higher flows (Hartzmark and Sussman, 2019). We also find that, after accounting for fund characteristics, ESG funds tend to be more expensive.

2.2.1 Fund Flows

We examine the relationship between index fund flows and whether a fund has an ESG mandate in the following regression specification:

$$d \log TNA_{kt} = \beta ESG_{kt} + X'_{kt}\Gamma + \mu_{j(k)} + \mu_{m(k)t} + \varepsilon_{kt}.$$

Observations are at the index fund-by-month level as described above in Section 2. The dependent variable $d \log TNA_{kt}$ measures the change in log assets of fund k at time t. The independent variable of interest is ESG_{kt}, which measures whether a fund has an ESG mandate. We also control for the age of the fund, the fund expense ratio, and the fund's Morningstar rating in X_{kt}. In our full specification we include fund sponsor fixed effects ($\mu_{j(k)}$) where j indexes the sponsor of fund k (e.g., Vanguard, Blackrock, etc.). We also include market-by-month fixed effects. We define the market based at the Lipper Class-by-Fund Type level to control for the investment objective of the index fund and the type of fund (i.e., ETF or mutual fund).

We report the corresponding estimates in Table 3. We control for whether the fund has an ESG mandate in columns (1) through (2), a sustainability mandate in columns (3) through (4),

an impact mandate in columns (5) through (6), and whether the fund mentions ESG as part of its investment strategy in columns (7) through (8). In each specification, we document a positive and significant relationship between ESG-type mandates and fund flows. The results in column (2) indicate that funds with an ESG mandate experience 3.2% higher flows than non-ESG funds. We find quantitatively similar effects for each ESG measure. These results are in line with the previous literature. Using the introduction of Morningstar ESG Globe Ratings as a natural experiment, Hartzmark and Sussman (2019), find that top-rated funds experienced monthly flows that were roughly 1% higher than bottom rated funds in the proceeding year. We find slightly larger effects, which is intuitive given that we study a more recent sample (from 2019 to 2022 versus 2016), we restrict our attention to index funds, and we focus on ESG mandates rather than on sustainability scores.[9]

2.2.2 Fund Expense Ratios

We also examine the relationship between fund expense ratios and ESG mandates. As discussed further in Section 3, variation in fund expense ratios plays a critical role in estimating an investor's willingness to pay for ESG.

We start with several simple descriptions of the data. Figure 3 displays the distribution of fund expense ratios for funds with and without an ESG mandate. Panel (a) displays the equal weighted distribution of fund expenses and panel (b) displays the asset weighted distribution of fund expenses. Panel (a) indicates that there are more non-ESG funds than ESG funds with extremely low expenses (i.e., less than 10 basis points), but that the median non-ESG fund is more expensive than the median ESG fund. While we find the average non-ESG fund is more expensive than the average ESG fund, this relationship may be a product of there existing many bespoke non-ESG funds—the picture looks quite different once we examine the funds held at large scale by investors. Panel (b) indicates that, on an asset weighted basis, the average ESG fund investor pays an expense ratio that is 8 basis points higher than the average investor who invests in funds without an ESG mandate.

We examine the relationship between fund expense ratios and ESG mandates more systematically in the following regression specification:

$$Expense\,Ratio_{kt} = \gamma ESG_{kt} + X'_{kt}\Omega + \phi_{j(k)} + \phi_{m(k)t} + \varepsilon_{kt}. \tag{1}$$

Observations are at the index fund-by-month level as described above in Section 2. The dependent variable $Expense\,Ratio_{kt}$ measures expense ratio of fund k at time t in basis points. We control for whether the fund has an ESG mandate (ESG_{kt}) as well as the age of the fund, the fund expense ratio, and the fund's Morningstar rating. Recall that funds with an ESG man-

[9] As documented in Figure 1a, interest in ESG has grew tremendously over the period from 2016 through 2022. ESG mandates, which are typically mentioned in the fund name, may also be more salient than sustainability scores. Lastly, ESG mandates/scores may be a more salient feature among index funds than among actively managed funds.

date tend to be substantially younger than funds without an ESG mandate. Given that younger funds tend to charge lower expense ratios, it is important to control for fund age in our analysis. Lastly, we include sponsor fixed effects ($\phi_{j(k)}$) and market-by-month fixed effects ($\phi_{m(k)t}$). The market fixed effects capture differences that are important to account for because expenses vary systematically by investment objectives. For example, funds that track emerging market indices are systematically more expensive than funds that track US large cap stocks.

Table 4 displays the estimates corresponding to eq. (1). We find that funds with ESG, sustainability, and impact mandates are more expensive on average than funds without mandates. The results in column (2) indicate that funds with an ESG mandate charge expense ratios that are 4.6 basis points higher per annum than funds without an ESG mandate. Similarly, in column (4) we find that funds with a sustainability mandate charge expense ratios that are 5.8 basis points higher on average than funds without a mandate. To put this in perspective, the average fund without an ESG/impact/sustainability mandate charges an expense ratio of 61 basis points. Thus, the results indicate that funds with a sustainability mandate charge a premium of 10% (=5.8/61).

Overall, we find evidence that funds with an ESG mandate experienced higher flows and charged a premium over our sample period. In the subsequent section, we combine these insights to estimate how much investors are willing to pay for ESG.

3 The Value of ESG: How Much Are Investors Willing to Pay?

We build and estimate a model of investor demand for index funds which allows us to quantify how much investors are willing to pay for ESG. Investors may be willing to pay a premium for index funds with an ESG mandate because: (a) they anticipate these funds will deliver higher risk-adjusted returns; (b) they experience non-pecuniary benefits from investing in ESG companies, whether these benefits reflect taste or a desire to see non-financial returns; or (c) a combination of these two. In this section, we measure investors' willingness to pay for ESG. We then consider these two hypotheses and their implications for the link between ESG and future returns on funds with an ESG mandate.

3.1 Framework

We model index fund selection as a discrete choice problem with a standard model used in the industrial organization literature (Berry, 1994). We consider the discrete choice problem of investor i choosing to invest in one fund from the set of funds $\mathcal{L}_{mt}$ that track investment objective m (e.g., US Large Cap Equities, US Small Cap Equities, European Large Cap Equities) and that are available for sale at time t. Thus, we model which index fund an investor chooses conditional on the investor's chosen investment objective. This allows us to abstract away from how investors select investment objectives and fund categories and from the larger optimization

problem of an investor's entire portfolio. The real-world analogue is the separation of asset allocation and security selection. For example, an investor might first choose to put 30% of her assets into US Large Cap Equities and only then choose whether these assets might be allocated to an ESG index fund in that category or a corresponding non-ESG fund. We are modeling this lower level choice.

Each investor chooses the fund k that maximizes her indirect utility. Investor i's indirect utility flow from purchasing index fund k at time t is given by

$$u_{ikt} = -\alpha p_{kt} + \gamma ESG_{kt} + X'_{kt}\Theta + \xi_{kt} + \epsilon_{ikt}. \tag{2}$$

Investors receive a dis-utility flow $-\alpha p_{kt}$ from paying expense ratio p_{kt} and receive utility flow $X'_{kt}\Theta$ from other mutual fund characteristics X_{kt}. The term ξ_{kt} captures unobserved fund-by-time characteristics and ϵ_{ikt} is an unobserved investor-by-fund-by-time specific demand shock. The investor-specific ϵ_{ikt} indicates that the product-space is horizontally differentiated such that investors potentially disagree about which index fund is the best.

The variable ESG_{kt} indicates whether the fund has an ESG mandate, and the parameter γ measures the utility flow that investors assign to ESG funds. All else equal, investors are willing to pay γ/α higher expense ratio for an ESG fund. One can think of γ/α either as capturing investors' beliefs about the excess returns of ESG funds and/or the non-pecuniary utility investors get from investing in an ESG fund. Both interpretations of γ/α are isomorphic in the underlying model.

Given that we model an investors fund choice conditional on choosing a fund in investment objective m, we define the market for an index fund at the investment objective level such that market is synonymous with investment objective. Following the standard assumption in the literature that the unobserved demand-shock ϵ_{ikt} is distributed with a type-1 extreme value (T1EV), the market share of fund k in market m at time t is given by:

$$s_{kmt} = \frac{\exp(-\alpha p_{kt} + \gamma ESG_{kt} + X'_{kt}\Theta + \xi_{kt})}{\sum_{l \in \mathcal{L}_{mt}} \exp(-\alpha p_{lt} + \gamma ESG_{lt} + X'_{lt}\Theta + \xi_{lt})}. \tag{3}$$

This market share equation forms the basis of our estimation strategy below where we recover the underlying utility parameters.

3.2 Estimation

We estimate our discrete choice demand system to recover an investor's willingness to pay for ESG. Following eq. (3), the market share of fund k in tracking investment objective m at time

t can be written in logs as:

$$\ln s_{kmt} = -\alpha p_{kt} + \gamma ESG_{kt} + X'_{kt}\Theta + \xi_{kt} - \ln\left(\sum_{l\in\mathcal{L}_{mt}} \exp(-\alpha p_{lt} + \gamma ESG_{lt} + X'_{lt}\Theta + \xi_{lt})\right). \quad (4)$$

We estimate the following equivalent regression specification:

$$\ln s_{kmt} = -\alpha p_{kt} + \gamma ESG_{kt} + X'_{kt}\Theta + \mu_{mt} + \xi_{kt}, \quad (5)$$

where the market-by-time fixed effect (μ_{mt}) absorbs the nonlinear term in eq. (4) such that we can estimate eq. (5) using linear regression methods.

We estimate the model using monthly index fund data. We calculate a fund's market share in terms of net fund flows where we define the relevant market as the Lipper Class-by-fund type:

$$s_{kmt} = \frac{Flow_{kmt}}{\sum_{l\in\mathcal{L}_{mt}} Flow_{lmt}}.$$

We focus on flows rather than assets under management to capture the active decisions of investors. Lipper Classes are designed to create homogeneous groups of funds with similar investment objectives (e.g., Large Cap Core, Small Cap Growth, High Yield Funds, etc.) and fund type indicates whether an index fund is structured as an ETF or mutual fund.

In our regression specifications we control for the fund's expense ratio and its traditional Morningstar "star" rating. We also control for fund age by including fund age fixed effects. These fixed effects help control for the fact that ESG funds tend to be newer funds—we want to compare the relative market shares of funds that were launched in the same market at the same time.

One challenge with directly estimating eq. (5) is that fund expenses are potentially endogenous: We are effectively regressing quantities on prices (i.e. expense ratios). The concern is that if a fund sponsor either partially or fully observes the demand shock ξ_{kt} prior to setting its expense ratio p_{kt} then expense ratios are endogenous. For example, if a fund sponsor anticipates a high demand shock for its fund then the sponsor may find it optimal to increase the expense ratio it charges to investors. The resulting endogeneity bias would cause us to underestimate how sensitive investors are to prices such that our estimate of α ($-\alpha$) would be biased downwards (upwards).

To address this endogeneity, we instrument for expense ratios using Hausman instruments (Hausman, 1996). Specifically, we instrument for the expense ratio that fund sponsor j charges for its fund k in market m at time t using the average expense ratio that sponsor j charges on all of its other funds (active and passive) in other markets (excluding m) at time t. The idea is that the instrument is potentially relevant because a sponsor's marginal costs of operating funds are correlated across the funds it operates. The exogeneity condition requires that the demand

shock at time t for fund k in market m managed by sponsor j is orthogonal to the expense ratios that sponsor j charges on its funds in other markets. For example, the exogeneity condition requires that the unobserved demand shock for Fidelity's US Large Cap Equity Index fund is uncorrelated with the fees that Fidelity charges on Fidelity's Corporate Bond Fund.

3.3 Results

Table 5 displays the results corresponding to our baseline demand model. Columns (1),(3), and (5) display our OLS estimates and columns (2), (4) and (6) display our IV estimates. The columns differ with respect to our sample and controls. Columns (3)-(4) include market-by-fund age fixed effects to control for differences driven by fund age. As discussed in Section 2.1.2 it is important to control for fund age because ESG funds tend to be newer funds, which tend to be smaller and charge lower fees. For similar reasons, in columns (5)-(6) we restrict our attention to those new funds that are less than five years old.

As expected, in each specification, we estimate a negative and statistically significant coefficient on fund expenses. We report these demand elasticities in the bottom panel of Table 5. We find that demand for index funds is relatively elastic, with elasticities ranging from 1.9-3.5 depending on the exact specification, a result that is consistent with an interpretation that index funds tend to be relatively homogeneous products. We estimate a slightly higher elasticity of demand in columns (3)-(6) when we further control for fund age.

We also find that investors value ESG. In each specification, we estimate a positive and significant coefficient on an indicator variable for an ESG mandate. By examining the ratio of the ESG coefficient relative to the expense ratio coefficient, we can interpret how investors value ESG in units of annual return. As reported in the bottom panel of Table 5, our results indicate that investors were willing to pay an additional 9 to 28 basis points for an ESG fund, depending on the sample and whether or not we instrument for the expense ratio. In our most preferred specification, where we instrument for the expense ratio and include market-by-fund age fixed effects, we estimate that investors are willing to pay an additional 20 basis points for an ESG fund. This willingness to pay is driven by investors' non-pecuniary preferences for ESG, their expectations of future returns on ESG funds, or both.

Table 6 display specifications where we allow investors' preferences for ESG to vary over time. The results here suggest that the value investors place on ESG increased over our sample period from 2019 to 2022. Investors were willing to pay an additional 9 basis points for an ESG fund in 2019 in column (4); however, this value increased more than threefold by the end of our sample period to 28 basis points.

3.4 Interpretation: ESG and Fund Returns

Our empirical framework allows us to measure how investors value ESG but it does not allow us to separately identify the motivation behind those preferences. In other words, it does not tell us whether the 20 basis point premium we measure captures investors' expectations of fund returns or non-pecuniary benefits and preferences for ESG. In the case of the latter, it is possible that our estimate of 20 basis points is just one component of the value that investors place on ESG. If they knowingly pay a price that is not justified by future returns, then our estimate is lower, possibly materially lower, than the total value assigned to ESG. A key differentiator, then, is return predictability. If investors rationally expect higher returns from ESG funds, we should see that in the data: ESG funds should higher returns. If investors rationally accept a lower return, again we should see that in the data: ESG funds should earn lower returns.

To understand this distinction further, we examine whether ESG funds have higher realized returns than non-ESG funds and whether investors' time-varying preferences or beliefs about ESG are positively correlated with future ESG returns. We add the significant caveat that our sample is quite short, which makes this type of return prediction exercise challenging. This testable implication that separates the two possibilities is clear in theory but harder to implement with precision. We add another caveat that there are other versions that feature less investor rationality. Perhaps investors believe that ESG funds will earn higher returns, but they are incorrect. So, our estimates both above and below are statements about the tradeoffs that investors are making, not the tradeoffs they necessarily intended to make. Everywhere we say that investors value ESG at a certain level, we could add a more precise but wordy substitute that investors "act as if" they value ESG at a particular level.

3.4.1 ESG and Fund Returns

We examine whether ESG funds have higher realized returns than non-ESG funds in the following regression specification:

$$Ret_{kt} = \phi ESG_{kt} + \eta_{kt}, \tag{6}$$

where Ret_{kt} measures the monthly net of fee return of fund k at time t, and is annualized (i.e., multiplied by 12) in columns (1) through (3). We also include market-by-time fixed effects to control for market-wide trends and account for risk. We report the estimates in column (1) of Table 7, and we find no statistically significant link between an ESG mandate and future returns, though the point estimate is an economically meaningful 62 basis points per year. The standard error is equally high, so we cannot reject the hypothesis that there is no link.

Next, we examine whether investors' willingness to pay for ESG are correlated with returns.

We start by estimating the utility parameters corresponding to the specification:

$$u_{ikt} = -\alpha p_{kt} + \sum_{t=0}^{T} \gamma_t ESG_{kt} + X'_{kt}\Theta + \xi_{kt} + \epsilon_{ikt}, \tag{7}$$

where we allow investor's preferences for ESG, denoted γ_t, to vary month-to-month over our sample period ($t = 0$ to $t = T$). We report the corresponding estimates in terms of an investor's willingness to pay for ESG, which we denote $Value\,of\,ESG_t = -\hat{\gamma}_t/\hat{\alpha}$, in Figure 4. Consistent with our earlier results, we find that the value investors place on ESG steadily increased over our sample period.

We estimate whether the value investors place on ESG is correlated with future fund returns in the following regression:

$$Ret_{kt} = \phi ESG_{kt-1} + \theta Value\,of\,ESG_{t-1} + \psi Value\,of\,ESG_{t-1} \times ESG_{kt-1} + \eta_{kt}. \tag{8}$$

The parameter ψ captures whether the value investors place on ESG is correlated with ESG returns in the proceeding month.

These results appear in columns (2)-(3) of Table 7. We find some evidence that the value investors place on ESG are negatively correlated with future returns, although the estimates are not statistically different from zero. The results in column (3) indicates that a one standard deviation (11 basis points) increase in an investor's expectations about the annual returns of ESG is correlated with a 25 basis point decline in the monthly annualized return of the fund. Thus, we find some evidence that investors' beliefs about ESG are actually negatively correlated with future returns of ESG funds. This suggests two possibilities. One is that investors either have biased beliefs about the future returns of ESG. The other is that investors' preferences for ESG are driven by the non-pecuniary benefits of holding ESG funds, and these investors willingly accept a lower return. We find some evidence for both of our starting hypotheses. ESG investing has offered a financial benefit in the form of higher returns, from a tailwind of ESG investor preference. But, as investor preferences for ESG have increased in magnitude, average future returns have fallen. Again, we repeat the caveat at the outset, our power to draw precise conclusions here is limited by the sample size.

3.4.2 Implications for ESG Preferences

The value of ESG we recover in the data is a function of the investors preferences for ESG, or in other words the non-pecuniary benefits the investor gets from investing in ESG, as well as the investor's beliefs about the expected returns of ESG funds relative to non-ESG funds. Thus, we can write the value investors place on ESG as:

$$Value\,of\,ESG_t = Preference\,for\,ESG + E[R_{ESG} - R_{Non-ESG}].$$

From our baseline estimates, we cannot directly decompose our results into investor preferences for ESG and expected returns. However, if we make the assumption that investors correctly forecast and internalize the effect investors' preferences for ESG on expected returns, we can use our subsequent results to decompose the value investors place on ESG into its subcomponents. Our previous results from Section 3.4.1 indicate that a one standard deviation increase (11 basis point) in the value investors place on ESG is correlated with a 25 basis points decrease in expected returns (Column 3 Table 7), such that $\frac{\partial E[R_{ESG}-R_{Non-ESG}]}{Value\,of\,ESG} = -2.3$.

If we further assume that there is no further tailwind in rising ESG preferences so that $E[R_{ESG,t}-R_{Non-ESG,t}] = 0$, we can use our estimates of $Value\,of\,ESG$ and $\frac{\partial E[R_{ESG}-R_{Non-ESG}]}{\partial Value\,of\,ESG} = -2.3$ to solve for the non-pecuniary benefits investors receive from ESG:

$$Preference\,for\,ESG = Value\,of\,ESG \times (1 - \frac{\partial E[R_{ESG} - R_{Non-ESG}]}{\partial Value\,of\,ESG}).$$

Thus, our baseline estimates suggest that the non-pecuniary benefits investors receive from investing in ESG index funds is equivalent to 66 basis points of additional risk-adjusted return. In other words, keeping expected returns and risk fixed, investors are willing to pay an additional 66 basis points for an ESG fund. In this sense the direct value of ESG investing as revealed by a tolerance for higher fees is only a small part of the total investor value.

While this calculation assumes that investors correctly internalize the relationship between preferences for ESG and returns, which may not be true in practice, it illustrates how our baseline estimate of 20 basis points may underestimate investors true preferences for ESG materially.

3.4.3 Robustness: Alternative Measures of ESG

Here, we explore a number of robustness checks to ensure our parameter estimates are robust to alternative measures of ESG. In our baseline demand specification, we examine the value investors place on whether a fund has an ESG mandate, as defined by Morningstar. As a robustness check, we also examine if investors are willing to pay a premium for funds with either a sustainability mandate or impact mandate, or for funds that discuss ESG in the investment strategy section of their prospectus. The corresponding estimates are displayed in Table 8. The results in column (2) of Table 8 indicate that investors were willing to pay an additional 9 basis points for a fund that has a sustainability mandate. Conversely, we do not find any evidence that investors are willing to pay a premium for funds with an impact mandate (column 3). Lastly, we explore whether a fund mentions "ESG" as part of its investment strategy. The results in column (4) indicate that investors are willing to pay a 9 basis point annual premium for funds that mention ESG in their prospectuses.

4 Heterogeneity in ESG Portfolios: What are Investors Paying For?

In this section, we examine what investors are paying for when they invest in ESG funds along two dimensions. First, we examine the portfolio similarity of funds in the same Lipper Class with and without an ESG mandate. To the extent that ESG and non-ESG index funds hold a similar portfolios, this may cause us to underestimate the value investors place on ESG. For example, if 75% of the portfolio of an ESG fund is identical to that of a non-ESG fund, it suggests that rather than paying a 20 basis points premium for ESG, investors are behaving as if they would be willing to to pay an additional 80 basis points (=0.20%/(1-75%)) for ESG. Second, we examine whether investors are essentially paying for an ESG label or whether they are discerning about the underlying portfolio. We find that investors are discerning and are willing to pay a premium for index funds that rank higher in terms of both the Morningstar Sustainability Rating and the Refinitiv ESG Rating of the underlying fund portfolio.

4.1 Portfolio Similarity of ESG and Non-ESG Funds

Here we examine the similarity of ESG and non-ESG portfolios in terms of holdings and returns.

4.1.1 Portfolio Overlap

Our base portfolio overlap measure computes the total percentage of two funds' assets that are invested in the same securities. We take the sum across all securities of the minimum portfolio share either fund allocates to each security. For fund k and l in year t and holdings w_{kft} for each security f, we define portfolio overlap to be:

$$portfolio\,overlap_{k,l,t} = \sum_{f \in \mathcal{H}(k) \cap \mathcal{H}(l)} \min\left(w_{kft}, w_{lft}\right).$$

For each ESG fund, we can find the non-ESG fund in the same Lipper class that has the most similar portfolio. We define $\mathcal{C}_{k,t}$ to be the set of non-ESG competitors to fund k in year t belonging to the same Lipper class. The portfolio overlap between ESG fund k and its closest non-ESG competitor is

$$non\,esg\,portfolio\,overlap_{kt} = \max_{l \in \mathcal{C}_{kt}} portfolio\,overlap_{klt}$$

Table 9 displays the average (within category) portfolio overlap between ESG funds and their closest non-ESG competitors. For the average ESG fund, we can find an non-ESG fund within the same investment category where roughly 65% of the holdings are the exact same. There is also variation across categories. For the average ESG index funds tracking the US broad market (i.e., US Blend/Core), we can find a non-ESG fund within the same investment category

where roughly 68% of the holdings are the same. Similarly, for the average ESG index fund tracking the global market, we can find a non-ESG fund within the same investment category where roughly 42% of the holdings are the same.

4.1.2 Return Correlation

We conduct a similar exercise that measures the return correlation between ESG and non-ESG funds. For each ESG fund, we calculate the maximum pairwise correlation between its monthly returns and the monthly returns the non-ESG funds in the same category in 2021.

Given ESG fund k and its set of non-ESG competitors $\mathcal{C}_k$ within the same Lipper class, we can compute the return correlation between

$$non\,esg\,return\,similarity_k = \max_{l \in \mathcal{C}_k} \mathrm{Corr}(\mathrm{ret}_k, \mathrm{ret}_l)$$

Figure 5 displays the distribution of $non\,esg\,return\,similarity_k$ across ESG funds in our sample. The results indicate that for the average (median) ESG fund, there is a non-ESG fund with returns that are 96% (99%) correlated with the ESG fund. Overall, our results suggest that both the returns and portfolios of many ESG funds are quite similar to those of non-ESG competitors. The upshot is that our measure of the value that investors place on ESG funds might be a small fraction of the value that investors place on ESG activity.

4.2 Do Investors Discern between High and Low Rated ESG Funds? Continuous Portfolio-Level Measures of ESG

A skeptic of ESG investing might argue that ESG investors are simply paying for the ESG label. To understand whether investors are paying for an ESG label, we examine whether demand for index funds is sensitive to the ESG ratings of the companies in the fund's underlying portfolio. As described in Section 2, we measure how a fund's portfolio ranks in terms of ESG using Morningstar's Sustainability Rankings and Refinitiv ESG Rating. Both measures are constructed based on the firms held in a fund's portfolio.

Using these additional measures, which measure the degree of ESG, we augment our initial utility specification as follows:

$$u_{ikt} = -\alpha p_{kt} + \gamma ESG_{kt} + \lambda ESG\,Rating_{kt} + X'_{kt}\Theta + \xi_{kt} + \epsilon_{ikt}.$$

The variable ESG_{kt} again indicates whether fund k at time t has an ESG mandate and the variable $ESG\,Rating_{kt}$ measures the fund's ESG rating as per Morningstar and Refinitiv. We estimate our augmented demand specification following eq. (5) with our additional ratings control variables.

We report the corresponding estimates in Table 10. In column (1), we control for whether a firm has an ESG mandate. In column (2), we control for whether the fund has a four or five globe rating as per Morningstar. In column (3), we control for a fund's ESG rating as per Refinitiv. And in column (4), we control for all three ESG measures. Overall, the results suggest that investors are discerning when it comes to ESG. The results in column (2) indicate that investors behave as if they would be willing to pay an additional 3 basis points (=0.074/0.041) for a four or five globe rated fund as per Morningstar.

The results in column (3) indicate that investors are willing to pay an additional 33 basis points for a one unit increase in a fund's Refinitiv ESG score. Recall that our fund-level Refinitiv score measures the average firm-level Refinitiv score, which corresponds to the firm's percentile ranking, in the fund's portfolio. Thus, our estimates imply that investors are willing to pay 17 basis points more for a fund that holds firms that fall in the 75th percentile of the Refinitiv's ESG rankings relative to a fund that holds firms that fall in the 25th percentile of Refinitiv's ESG rankings. Figure 6 displays the distribution of Refinitiv ESG Scores at the firm level as of 2021. Assuming that investors ESG preferences when selecting index funds are the same as their ESG preferences when selecting individual stocks, our estimates imply that investors are willing to pay an additional 27 basis points to invest in a firm like SolarEdge Technologies Inc, a solar/photovoltaics technology company, than in a petroleum energy supply company like Global Partners LP.

Lastly, the results in column (4) indicate that investors independently value the three different ESG characteristics of a fund's portfolio. This finding suggests that investors are not simply paying for an ESG label and are at least somewhat discerning when selecting ESG funds. In other words, investors appear to not only care about whether a fund is labeled as ESG but also about the degree of ESG. Note, however, that the ESG label remains statistically significant with similar magnitude. This suggests either that there are aspects of investment relevant ESG that are missing in the Morningstar and Refinitiv ratings or that investors (or a subset of them) value the label itself irrespective of the underlying qualities of the portfolio.

5 Heterogeneity among ESG Investors: What Drives Investor Interest?

We also explore how preferences for ESG vary geographically across the US and across industries. Using comprehensive data covering 55,000 401(k) plans in the US, we examine which 401(k) plans include at least one investment option with an ESG mandate. The typical 401(k) plan allows investors to allocate their retirement savings to a fixed menu of investment options (typically mutual funds) that are determined by the 401(k) sponsor (e.g., employer). 401(k) plans are an important source of wealth and equity exposure for US households. As of 2021, Americans held roughly $7 trillion in 401(k) assets, and defined contribution plans were the

sole source of equity exposure for most American households (Badarinza et al., 2016).[10]

Our 401(k) data comes from BrightScope Beacon and the Department of Labor (see Egan et al. (2021) for a description of the data). In the data we observe the 401(k) menu and plan-level allocations for 55,000 401(k) plans in the US as of 2019.[11] The entire BrightScope data set covers 85 percent of assets in ERISA defined contribution plans. The typical 401(k) plan has 26 different investment options, which are typically structured as mutual funds. Using our Morningstar data we can determine which mutual funds available in 401(k) plans have an ESG mandate.[12]

We also use data on investors' expected fund returns from Egan et al. (2021). Using the same 401(k) data set and conceptually similar identification strategy, Egan et al. (2021) show how variation in mutual fund expense ratios can be used to recover investors' expectations of fund returns for each fund that appears in an investor's 401(k). Importantly, Egan et al. (2021) provides estimates of the expected returns at the 401(k) plan-by-year-by-fund level. We use this variation in expected returns to estimate how investors' willingness to pay for ESG varies geographically and across industries.

5.1 Geographic Variation

5.1.1 Geographic Variation in the Availability of ESG Investment Options

Figure 7 displays the share of 401(k) plans in a county that have at least one ESG investment option as of 2019.[13] Roughly 48% of 401(k) plans in our sample have at least one ESG investment option. The map illustrates that there is substantial variation across the country and that that households living in areas in the coastal regions, both the East and West Coast, are more likely to have an ESG investment alternative in their 401(k) plans.

We more formally examine geographic dispersion in the availability of ESG-related investment options in the following regression specification:

$$Share\,of\,401k\,with\,ESG\,Option_c = \theta\,Attitudes\,about\,Climate\,Change_c + X_c'\Psi + \eta_c. \quad (9)$$

Observations are at the county c level. The dependent variable $Share\,of\,401k\,with\,ESG\,Option_c$ measures the share of 401(k) plans in county c that have at least one investment option with an ESG mandate. The main independent variables of interest are investors' attitudes towards climate change. We measure investors' attitudes towards climate change using survey data from the Climate Change in the American Mind project between 2008 and 2021 (Howe et al., 2015).

[10] Link: 401(k) Plan Research: FAQs

[11] We focus on the year 2019 due to the availability of both 401(k) and ESG data.

[12] We also treat any investment fund name which includes one of the following terms as ESG: esg, environment, sustainability, social, responsible, and impact.

[13] We assign 401(k) plans to counties based on the firm's headquarters.

Each variable in the survey data set corresponds to the estimated percentage of adults in each county holding a particular belief about climate change. These beliefs include: whether climate change is happening, whether we should be worried about climate change, whether climate change is caused by humans, and whether we should regulate CO_2. We also measure political attitudes based on the two-party Democrat presidential vote share in 2020 from county-level election returns tabulated by the MIT Election Data + Science Lab. These measures of attitudes towards climate change are all highly correlated; the first principal component explains 92% of the variance.

We also control for demographic and climate change risk factors. We measure local climate risks using the Federal Emergency Management Agency's National Risk Index, which computes natural hazard risk across hazard types and also provides an aggregate county-level risk score that ranges from zero to one. We also control for median household income, percent of the population with a college education, and the median age.

Table 11 displays the estimates corresponding to Eq. (9). In each specification we find a positive and significant relationship between climate change concerns and ESG investment. The results in column (5) indicate that a 10 percentage point increase in the share of the population that believes climate change is caused by humans is correlated with a 3 percentage point (8%) increase in the share of 401(k) plans with an ESG investment option. Similarly, the results in column (7) indicate that a 10 percentage point increase in the share of the population that believes we should regulate CO_2 emissions is correlated with a 4 percentage point (12%) increase in the share of 401(k) plans with an ESG investment option. We also find that areas with higher incomes are more likely to have an ESG alternative, and we find some modest evidence that areas with older and more educated populations, and that are more exposed to climate change risk are more likely to have an ESG investment alternative. Overall, the results suggest that investors' attitudes towards climate change show up in their 401(k) plans.

5.1.2 Geographic Variation in the Willingness to Pay for ESG

We also examine how investors' willingness to pay for ESG varies geographically. Specifically, we use the expected returns estimates, which vary at the fund-by-401(k) plan level, from Egan et al. (2021) to measure geographic variation in investors' willingness to pay for ESG.

We estimate the value investors place on ESG in the following regression specification:

$$Expected\,Returns_{pk} = \varphi ESG_k + \psi Attitudes\,about\,Climate\,Change_{c(p)} \times ESG_k + \delta_p + \phi_{m(k)} + \eta_{pk}. \quad (10)$$

Observations are at the 401(k) plan-by-fund level as of 2019, where we restrict our attention to index funds. The dependent variable, $Expected\,Returns_{pk}$, reflects the average (across fund participants) expected return of fund k in 2019 among participants in 401(k) plan p, as per Egan et al. (2021). The independent variable ESG_k indicates whether fund k has an ESG

mandate and the coefficient φ measures investors' willingness to pay for ESG. We include the interaction term $Attitudes\,about\,Climate\,Change_{c(p)} \times ESG_k$ to allow the value investors place on ESG to vary depending on investors' attitudes about climate change. We also include 401(k) plan fixed effects to account for differences across plans as well as Morningstar Category-by-BrightScope Category fixed effects, which capture differences in risk.

We report the estimates in Table 12. The results in column (1) indicate, consistent with our previous results, that investors are willing to pay an additional 25 basis points for ESG. Note that this point estimate is remarkably similar to our baseline estimate of 20 basis points, despite using different data and methodologies. We also find that the value investors place on ESG varies with their attitudes towards climate change. The results in column (2) indicate that investors who are worried about climate change are willing to pay an additional 37 (=43-6) basis points for ESG, while investors who are not worried about climate change are effectively not willing to pay anything for ESG (-6 basis points). Similarly, the results in column (4) indicate that investors who believe climate change is caused by humans are willing to pay an additional 40 basis points for ESG. Lastly, we find that both sides of the political spectrum place some value on ESG. At the extremes, the results in column (6) indicate that in a county with a 100% Republican vote share, investors are willing to pay 12 basis points for ESG. Conversely, in a county with a 100% Democrat vote share, investors are willing to pay 31 basis points (=19+11).

5.2 Variation Across Industries

5.2.1 Variation in the Availability of ESG Investment Options Across Industries

Following Egan et al. (2021), we examine how holdings and preferences vary across industries. We start by examining how the availability of ESG-related investment options in 401(k) plans varies across industries. Table 13 displays the share of 401(k) plans that have at least one ESG investment option at the industry level (2-digit NAICS). The results indicate that there is substantial variation in the availability of ESG investment options across sectors. We find that 401(k) participants working in the technology and education sector are 33% more likely to have an ESG investment option than 401(k) participants working in the construction sector. The results suggest that sectors that are larger contributors to emissions, such as transportation, oil and gas, utilities, and agriculture, are less likely to offer an ESG-related investment option.

Figure 8 displays a scatter plot of the availability of ESG-related investment options versus environmental score at the industry level. We measure environmental score at the industry level using data from Sustainalytics, where a higher environmental score corresponds to lower environmental risk. Although the sample is small, the results indicate that there is a positive slope between environmental score and share of employers offering an ESG-related investment options. Thus, employers in those industries with lower emissions are more likely to offer ESG

alternatives in their 401(k) plans.

5.2.2 Variation in the Willingness to Pay for ESG Across Industries

We also examine how the value investors place on ESG varies across industries. We extend our regression specification (Eq. 10), where we allow an investor's willingness to pay for ESG to vary across industry (i.e., 2-digit NAICS). We display the corresponding estimates in Table 14. The results are broadly consistent with our previous findings regarding the availability of ESG investments in Table 13. The results suggest that, on average, investors working in the management of companies and industries (i.e., NAICS 52) are willing to pay 69 basis points per annum for ESG. Conversely, the average investor working in the transportation sector places negative value on ESG (-63 basis points), although the estimate is not statistically different from zero.

6 Division of Value Between Investors and Intermediaries

Our estimates indicate that investors are willing to pay in order to invest in an ESG index fund. How much of that benefit is potentially captured by intermediaries depends on the competitiveness of the index fund market. For example, if the index fund market is perfectly competitive then we might expect to see intermediaries capture zero ESG benefit. However, if the index fund market is not very competitive, such that fund sponsors are price setters rather than price takers, we might expect ESG funds to charge higher expense ratios on ESG funds, which is consistent with the evidence presented in 2.2.2. Imperfect competition in the index fund market allows index fund sponsors to exploit the fact that investors are willing to pay a premium for ESG funds and potentially extract all of the ESG benefit. In this section we complete the supply-side of our model in order to estimate the marginal costs of operating an index fund and compute the markup that sponsors charge for each index fund. We then examine if index fund sponsors charge a larger markup for funds with an ESG mandate.

6.1 Supply-Side Framework

To understand how the competitive forces in the index fund market impact ESG investing, we model the supply-side of the index fund market that corresponds to our estimated demand framework from Section 3. The profits of index fund sponsor j are given by

$$\Pi_j = \sum_{m \in \mathcal{M}} \sum_{k \in \mathcal{J}_j} N_m s_k (p_k - \kappa_k),$$

where we omit the time subscripts t for convenience. The set $\mathcal{M}$ denotes the set of markets (i.e., fund objectives) and the size of each market in terms of total net assets is denoted N_m.

The set $\mathcal{J}_j$ denotes the set of index funds that are operated by index fund sponsor j. We assume that the sponsor managing index fund k has a constant marginal cost κ_k such that its profit margin is given by $p_k - \kappa_k$.

We further assume that index fund sponsors play a multi-product differentiated Nash Bertrand expense ratio setting game, where index fund sponsors take the set of index funds and associated non-expense ratio characteristics as given. The first order condition corresponding to fund k operated by sponsor j is:

$$\frac{1}{\alpha} = (p_k - c_k) - \sum_{k' \in \mathcal{J}_j} s_{k'}(p_{k'} - \kappa_{k'}). \tag{11}$$

Note that given an estimate of α and observed expense ratios and market shares, we can use the above set of first order conditions to recover the marginal cost of operating a fund κ_k for each fund k.[14] The median cost is 15 basis points.

6.2 Results

One implication of this simple supply and demand framework is that, because investors are willing to pay more for ESG funds, index fund sponsors will find it optimal to charge a premium for ESG funds. To quantify the premium that index fund sponsors charge for ESG funds, we regress a fund's costs on whether the fund has a ESG mandate and a set of other controls similar to our expense ratio regressions in Section 2.2.2 (i.e., eq. 1). We report the corresponding estimates in Table 15. In column (1), the dependent variable is a fund's expense ratio while in column (2), the dependent variable is the firm's costs. We see that the average ESG fund charges an expense ratio that is 5.85 basis point higher than for the average non-ESG fun. The results in column (2) indicate that ESG funds have a 2.85 basis points higher marginal cost. This implies that ESG funds charge a markup that is 3 basis points higher than non-ESG funds. Overall, we find that index fund investors are willing to pay 20 basis points more for ESG funds. Index fund sponsors effectively capture 25% of this premium because of the higher costs of operating an ESG fund and because of market power.

7 Conclusion

We estimate investors willingness to pay for ESG index funds. Using the workhorse demand model from the industrial organization literature, we estimate that investors are willing to pay an additional 20 basis points to invest in an ESG index fund over an otherwise equivalent non-ESG fund. The value that investors place on ESG has increased nearly three fold over our

[14] Note that our estimation procedure allows costs to be negative. When computing marginal costs, we assume the minimum marginal cost is -10 basis points.

sample period, from 9 basis points in 2019 to 28 basis points in 2022.

Our baseline estimate of 20 basis points is likely an underestimate of investor preferences for ESG for several reasons. First, the value that investors place on ESG is a function of both investors' preferences for ESG as well as their expectations of fund returns. To the extent that investors correctly internalize how their preferences for ESG lower the expected returns of ESG funds, our point estimates suggest that investors' preferences for ESG are willing to pay an additional 66 basis points in lower risk-adjusted returns. Our return predictability evidence does not meet conventional hurdles for statistical significance, however, given the short time series. Second, we show that there is substantial overlap between the portfolios of ESG and non-ESG funds. Given that the average overlap is 68% across US broad market index funds, this suggests that investors are effectively paying 63 basis points (=20/(1-68%)) to invest in a pure, disjoint fund with only ESG stocks. Third, we use firm-level ESG scores to understand whether investors are discriminating when it comes to the underlying holdings of their index funds. Our baseline estimate is also an average. Some investors value ESG more highly, and some less highly. We explore employee interest in 401(k) options for ESG investing across geographies and industries within the US. In locations with a greater reported concern for climate change and in industries that emit less carbon, investor interest in ESG is greater.

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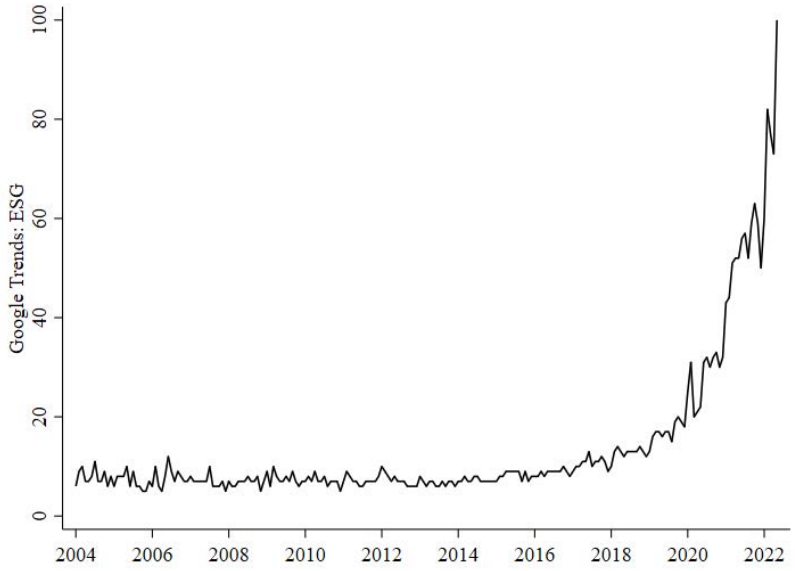
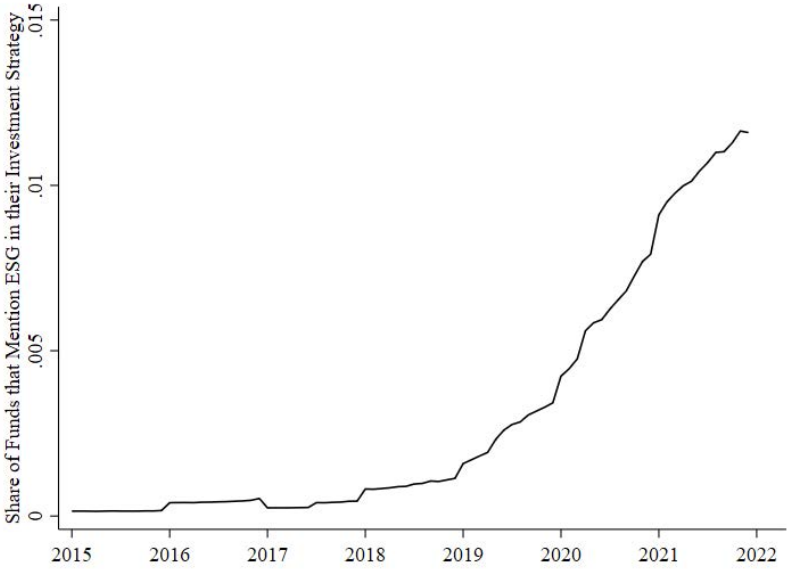
Tables and Figures

Figure 1: Popularity of ESG of Over Time

(a) Google Trends - Searches for "ESG"



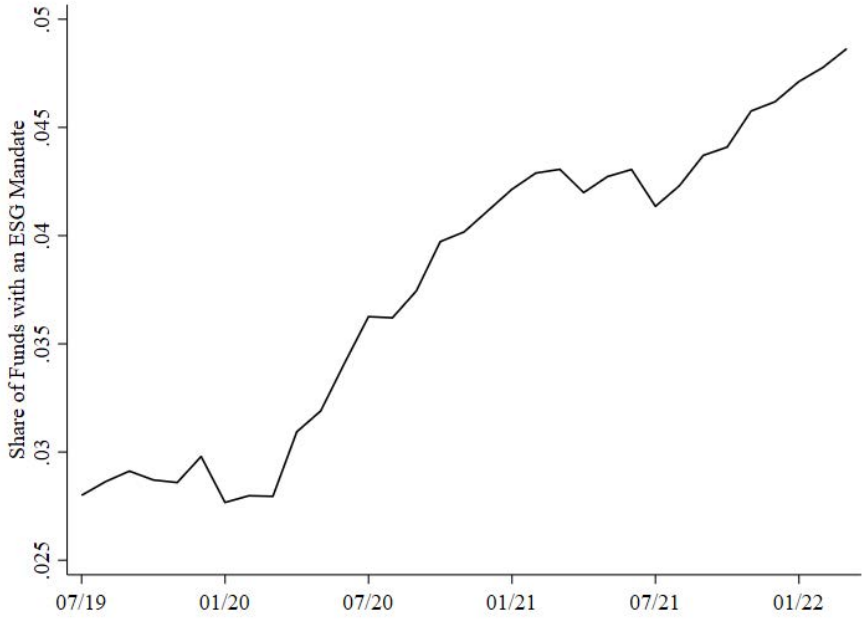
(b) Share of Index Funds Mentioning "ESG" as Part of their Investment Strategy



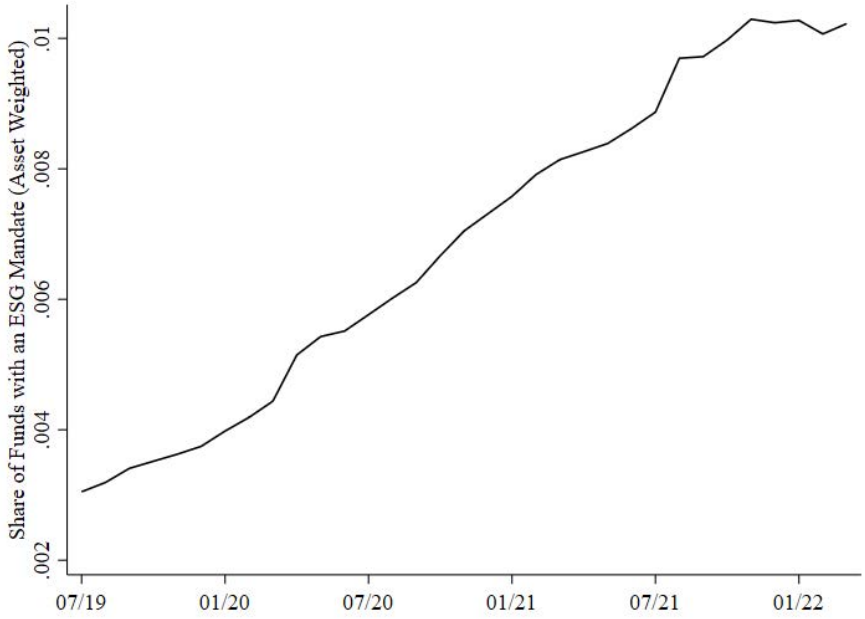
Notes: Figure 1a displays the popularity of the search term "ESG" as per Google Trends. Observations are monthly over the period 2004 through May 2005. Google Trends are scaled such that numbers represent search interest relative to peak popularity, which is assigned a value of 100.For example, a value of 50 in a given month means that the term is half as popular in that month relative to the term's peak popularity. Figure 1b displays the share of index funds that mention "ESG" in the investment strategy section of their investment prospectus over time. The share is computed weighted by fund assets.

Figure 2: Growth of ESG Index Funds

(a) ESG Index Funds (Equal Weighted)



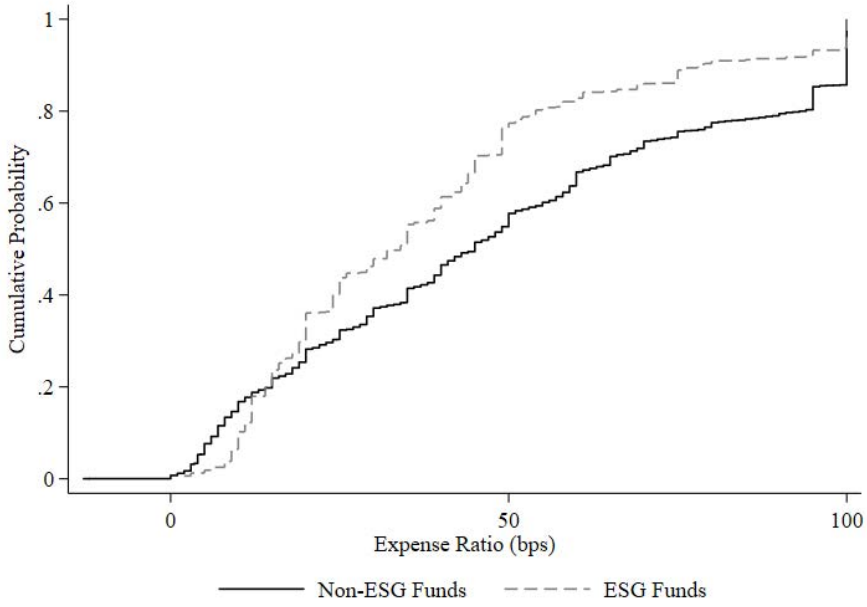
(b) ESG Index Funds (Asset Weighted)



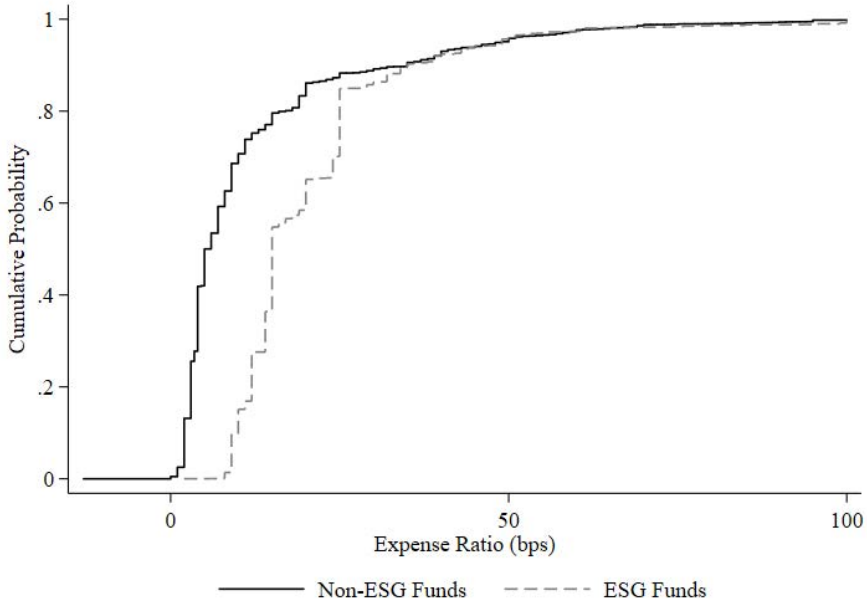
Notes: Figure 2 displays the share of index funds with an ESG mandate. In panel (a), we report the equal weighted share of index funds and in panel (b) we report the AUM weighted share of index funds.

Figure 3: Expense Ratios - ESG vs. Non-ESG

(a) Expense Ratios - Equal Weighted

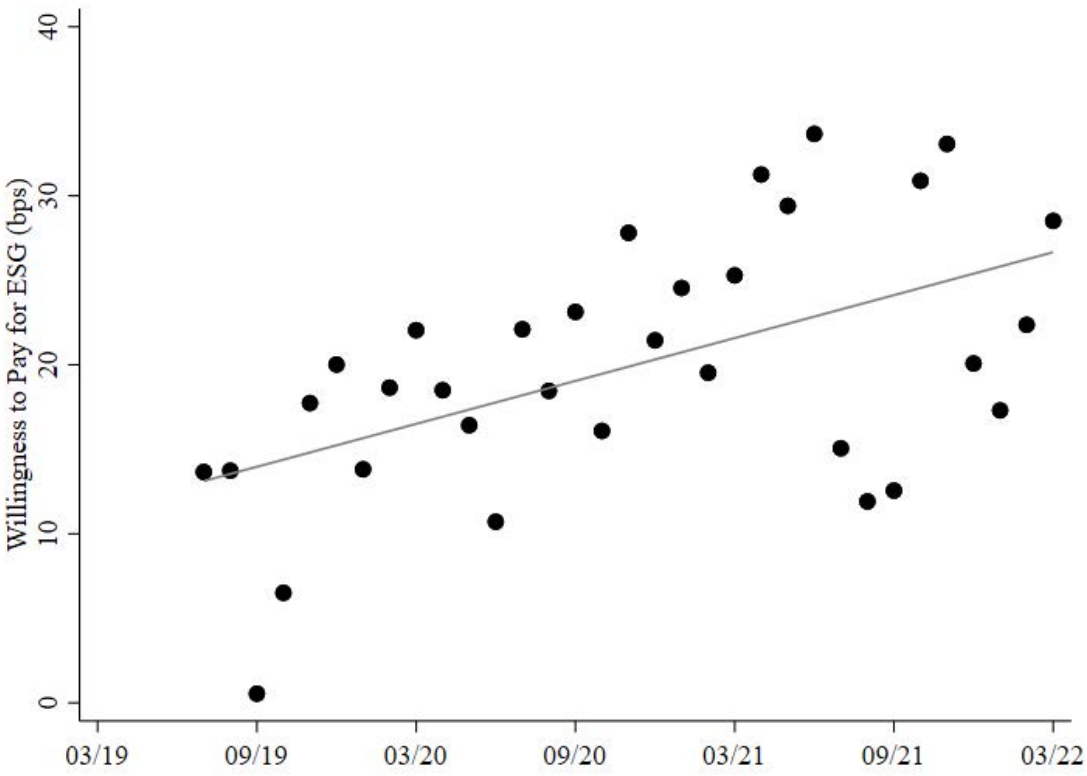


(b) Expense Ratios - Asset Weighted



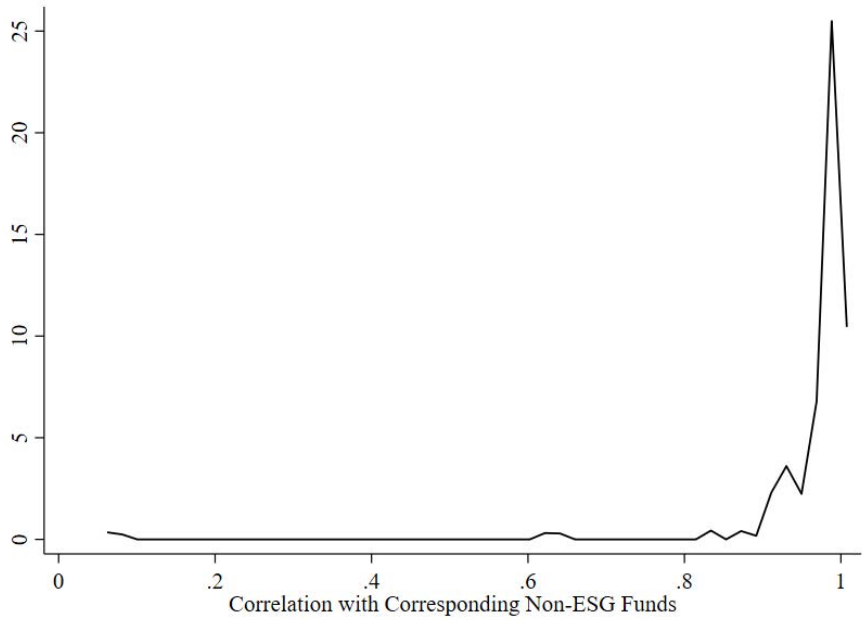
Notes: Figure 3 displays the average expense ratios for index funds with and without ESG mandates. In panel (a) we report the equal weighted average and in panel (b) we report the AUM weighted average.

Figure 4: Willingness to Pay for ESG Over Time



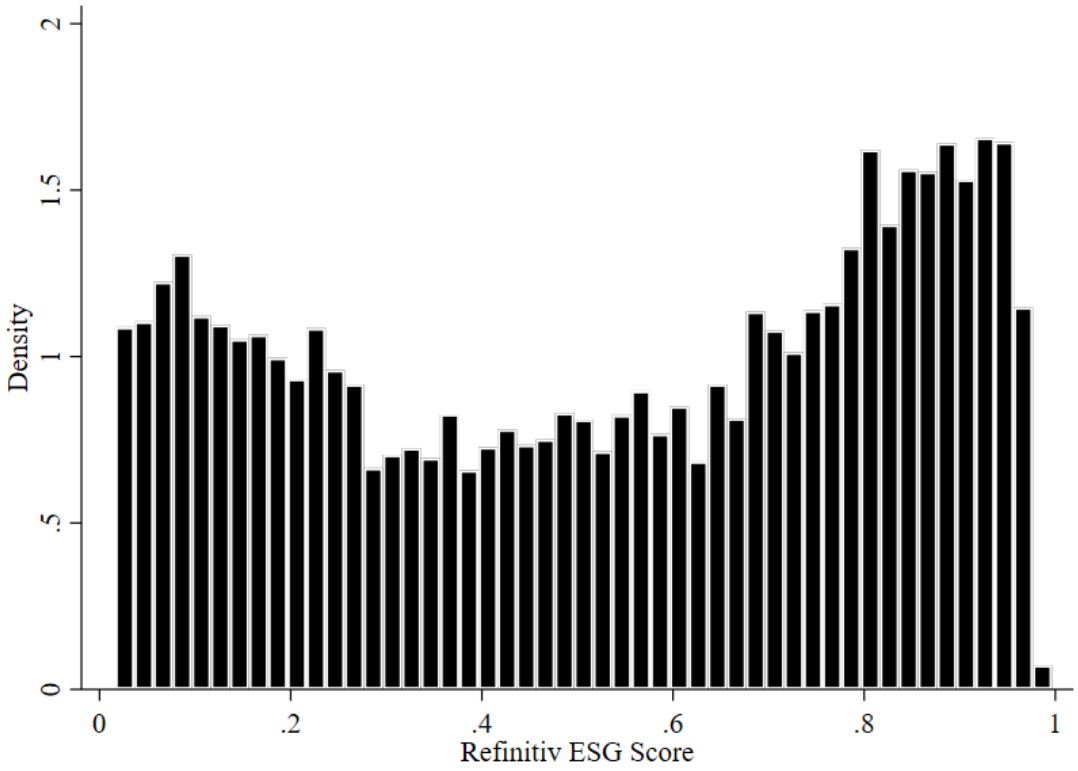
Notes: Figure 4 displays our estimates corresponding to an investor's willingness to pay for ESG where we allow an investor's preference for ESG to vary month-to-month (eq. 7). We report the 3-month rolling average over our sample period.

Figure 5: Return Correlation of ESG and Non-ESG Funds



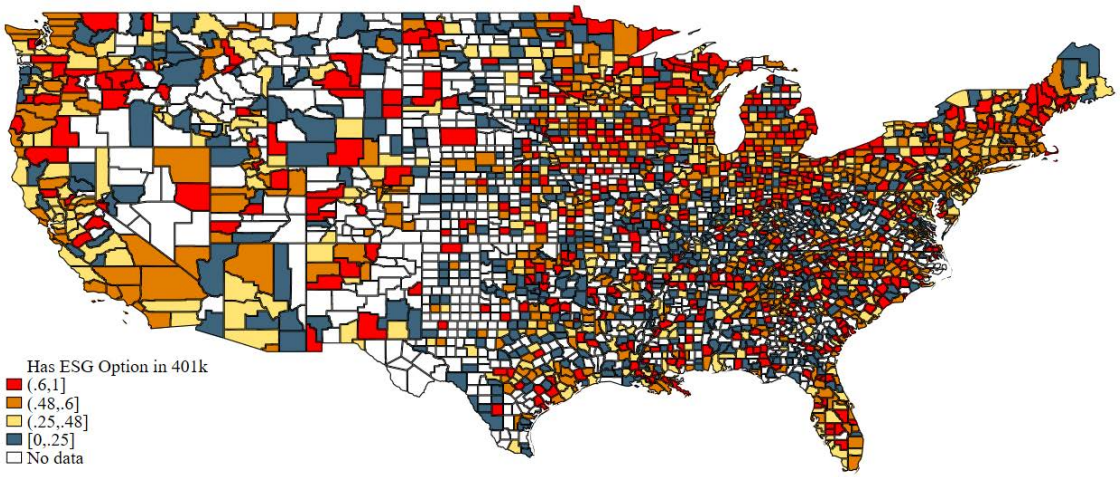
Notes: Figure 5 displays the density of monthly return correlations between each ESG fund and the corresponding non-ESG fund with the most similar portfolio.

Figure 6: Distribution of Refinitiv ESG Scores (Firm Level)



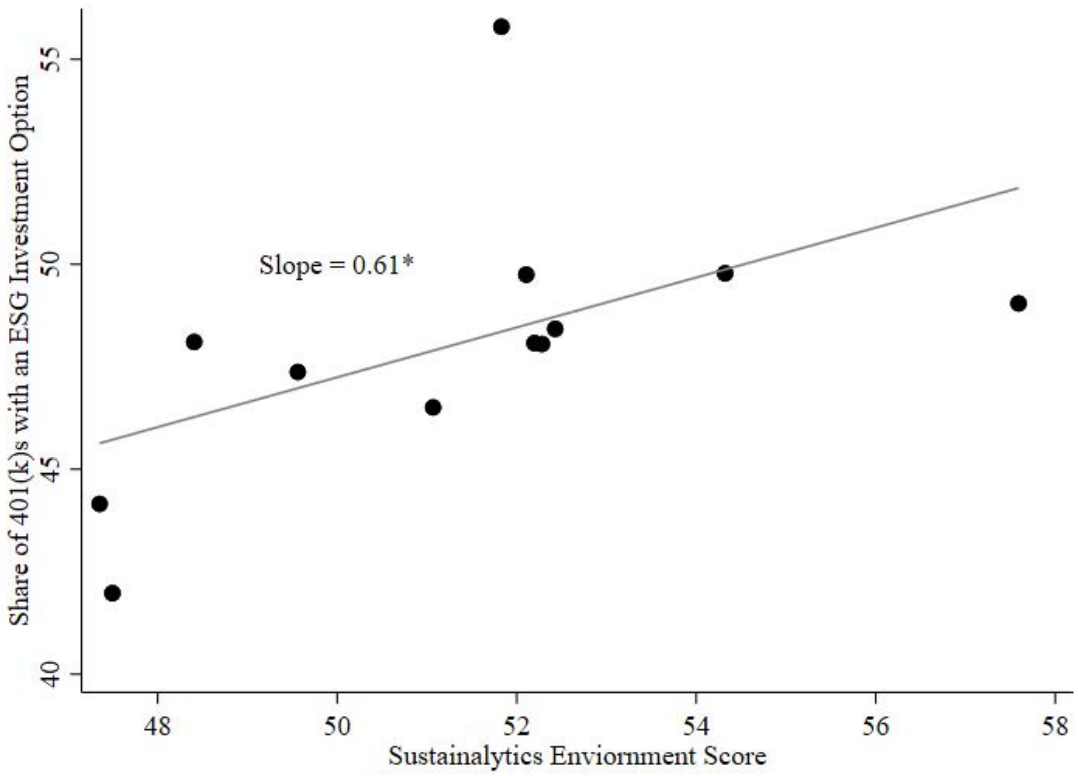
Notes: Figure 6 displays the distribution of Refinitive ESG scores at the firm level. Refinitiv provides firm-level ESG scores annually over the period 2002-2021 that correspond to performance on environmental, sustainability, and gov- ernance indicators. The scores range from 0 to 1 and correspond to the average ESG rank of each firm within its industry group and incorporation location.

Figure 7: Share of 401(k) Plans with an ESG Investment Option



Notes: Figure 7 displays the share of 401(k) plans that have at least one ESG investment alternative. Observations are at the county level as of 2019.

Figure 8: Share of 401(k) Plans with an ESG Investment Option vs. Environmental Score



Notes: Figure 8 displays a scatter plot of the availability of ESG-related investment options versus environmental scores at the industry level. We measure environmental score at the industry level using data from Sustainalytics, where a higher environmental score corresponds to lower environmental risk.

Table 1: Summary Statistics

(a) Fund Summary Statistics

	Obs	Mean	Std. Dev.	Median
ln(Total Net Assets)	93,705	4.96	2.83	5.03
Expense Ratio (bps)	91,373	59.44	59.76	43.00
Fund Age (Years)	93,741	9.96	6.87	9.25
Morningstar Rating	69,931	3.15	1.09	3.00
ESG Measures:				
ESG Fund	88,587	0.04		
Impact Fund	88,587	0.03		
Sustainability Fund	88,587	0.05		
Sustainability Rating	73,007	2.89	1.01	3.00
Refinitiv Rating	64,040	0.69	0.06	0.68
ESG-Related Strategy	68,268	0.04		

(b) ESG vs. Non-ESG

	Non-ESG		ESG		
	Mean	Std. Dev.	Mean	Std. Dev.	Difference
Total Net Assets ($mm)	3,694	19,089	647	1,870	3,047***
Expense Ratio (bps)	60.81	60.89	40.06	32.61	20.75***
Fund Age (Years)	10.16	6.90	5.48	5.85	4.68***
Morningstar Rating	3.13	1.09	3.43	1.02	-0.29***

(c) Correlations between ESG Measures

Variables	ESG Fund	Impact Fund	Sus. Fund	ESG Strategy	Sus. Rating	Refinitiv Rating
ESG Fund	1.00					
Impact Fund	0.65	1.00				
Sus. Fund	0.87	0.70	1.00			
ESG Strategy	0.94	0.62	0.84	1.00		
Sus. Rating	0.25	0.18	0.23	0.23	1.00	
Refinitiv Rating	0.07	0.06	0.06	0.07	0.17	1.00

Notes: Table 1 displays summary statistics for our base data set. Observations are at the fund-by-month level over the period 05/2019-03/2022. In panel (a) we report summary statistics for the full sample and in panel (b) we separately report summary statistics for funds with and without an ESG mandate. In panel (c) we report the correlations between our different ESG measures. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 2: ESG Funds by Morningstar Category

Morningstar Category	# Funds	Total Assets ($mm)	Share with ESG Mandate
US Fund Allocation–30% to 50% Equity	5	3,033	40.00%
US Fund Global Large-Stock Blend	36	71,117	38.89%
US Fund Corporate Bond	31	118,520	22.58%
US Fund Global Small/Mid Stock	10	3,265	20.00%
US Fund Allocation–70% to 85% Equity	6	382	16.67%
US Fund Intermediate Core-Plus Bond	7	18,019	14.29%
US Fund Natural Resources	42	45,853	11.90%
US Fund Allocation–50% to 70% Equity	9	64,818	11.11%
US Fund Global Real Estate	18	13,834	11.11%
US Fund Foreign Large Blend	138	915,655	10.14%
US Fund Global Bond-USD Hedged	10	164,698	10.00%
US Fund India Equity	11	8,420	9.09%
US Fund High Yield Bond	46	77,802	8.70%
US Fund Diversified Emerging Mkts	81	291,433	8.64%
US Fund Large Blend	316	4,662,384	8.54%
US Fund Large Growth	110	719,934	8.18%
US Fund Large Value	138	620,842	6.52%
US Fund Miscellaneous Sector	32	30,015	6.25%
US Fund Small Blend	114	405,343	6.14%
US Fund Mid-Cap Growth	49	219,594	6.12%
US Fund Emerging Markets Bond	17	28,660	5.88%
US Fund Intermediate Core Bond	59	826,864	5.08%
US Fund China Region	45	35,646	4.44%
US Fund Mid-Cap Blend	106	368,051	3.77%
US Fund Short-Term Bond	29	174,791	3.45%
US Fund Mid-Cap Value	40	67,412	2.50%
US Fund Foreign Large Value	41	49,383	2.44%

Notes: Table 2 displays summary statistics for our data set. Observations are at the fund-by-month level over the period 05/2019-03/2022 and we report averages by Morningstar category.

Table 3: Index Fund Flows

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG Fund	0.028***	0.032***						
	(0.004)	(0.005)						
Sustainability Fund			0.028***	0.031***				
			(0.004)	(0.005)				
Impact Fund					0.023***	0.021***		
					(0.005)	(0.008)		
ESG-Related Strategy							0.031***	0.034***
							(0.004)	(0.005)
Observations	64,014	64,017	64,017	64,017	64,017	64,017	50,629	50,629
R-squared	0.120	0.260	0.253	0.260	0.252	0.259	0.256	0.263
Mkt FE	X	X	X	X	X	X	X	X
Managment FE		X		X		X		X

Notes: Table 3 displays the regression results corresponding to a linear regression model. Observations are at the fund-by-month level over the period 05/2019-03/2022. The dependent variable is the change in log fund assets. *ESG Fund* indicates whether a fund has an ESG mandate. *Sustainability Fund* indicates whether a fund has an sustainability mandate. *Impact Fund* indicates whether a fund has an impact mandate. *ESG-Related Strategy* indicates whether the fund mentions ESG as part of its investment strategy. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 4: Index Fund Expenses

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG Fund	2.369***	4.610***						
	(0.665)	(0.415)						
Sustainability Fund			3.906***	5.815***				
			(0.609)	(0.369)				
Impact Fund					2.861***	2.724***		
					(0.980)	(0.682)		
ESG-Related Strategy							3.586***	5.710***
							(0.742)	(0.623)
Observations	64,044	64,044	64,044	64,044	64,044	64,044	50,651	50,651
R-squared	0.439	0.766	0.439	0.766	0.439	0.765	0.422	0.753
Mkt FE	X	X	X	X	X	X	X	X
Managment FE		X		X		X		X

Notes: Table 4 displays the regression results corresponding to a linear regression model. Observations are at the fund-by-month level over the period 05/2019-03/2022. The dependent variable is the fund's expense ratio in basis points. *ESG Fund* indicates whether a fund has an ESG mandate. *Sustainability Fund* indicates whether a fund has an sustainability mandate. *Impact Fund* indicates whether a fund has an impact mandate. *ESG-Related Strategy* indicates whether the fund mentions ESG as part of its investment strategy. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 5: Demand for Index Funds

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Expense Ratio (bps)	-0.034***	-0.042***	-0.035***	-0.060***	-0.040***	-0.062***
	(0.001)	(0.001)	(0.001)	(0.007)	(0.001)	(0.003)
ESG Fund	0.333***	0.356***	0.977***	1.228***	0.822***	0.836***
	(0.066)	(0.067)	(0.189)	(0.186)	(0.103)	(0.106)
Observations	30,960	30,722	10,989	10,828	8,840	8,651
R-squared	0.433	0.428	0.701	0.684	0.422	0.397
Mkt FE	X	X	X	X	X	X
IV		X		X		X
AgeXMarket F.E.			X	X		
New Fund Sample					X	X
Elasticity of Demand	1.9	2.3	2.0	3.4	2.2	3.5
Value of ESG [bp]	10	9	28	20	21	13

Notes: Table 5 displays the regression results corresponding to our demand model (5). Observations are at the fund-by-month level over the period 05/2019-03/2022. In columns (5) and (6) we restrict the sample to those funds that are less than 5 years old. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In the bottom panel we interpret the demand estimates in terms of the elasticity of demand and investors' willingness to pay for ESG. We compute the elasticity of demand using the average expense ratio in the data (59 basis points) and assuming a market share of 5%.

Table 6: Demand for Index Funds - Time-Varying Preferences for ESG

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Expense Ratio (bps)	-0.034***	-0.042***	-0.035***	-0.060***	-0.040***	-0.062***
	(0.001)	(0.001)	(0.001)	(0.007)	(0.001)	(0.003)
ESG Fund x (Year=2019)	0.013	0.039	0.315	0.550	0.448**	0.540***
	(0.131)	(0.131)	(0.424)	(0.390)	(0.186)	(0.188)
ESG Fund x (Year=2020)	0.492***	0.538***	0.863***	1.231***	0.842***	0.832***
	(0.115)	(0.117)	(0.318)	(0.309)	(0.174)	(0.180)
ESG Fund x (Year=2021)	0.371***	0.373***	1.221***	1.427***	1.025***	1.013***
	(0.110)	(0.113)	(0.322)	(0.330)	(0.181)	(0.186)
ESG Fund x (Year=2022)	0.337	0.348	1.589***	1.694***	1.445***	1.431***
	(0.220)	(0.224)	(0.528)	(0.460)	(0.458)	(0.463)
Observations	30,960	30,722	10,989	10,828	8,840	8,651
R-squared	0.433	0.428	0.702	0.685	0.422	0.397
Mkt FE	X	X	X	X	X	X
IV		X		X		X
AgeXMarket F.E.			X	X		
New Fund Sample					X	X
Elasticity of Demand	1.9	2.3	2.0	3.4	2.2	3.5
Value of ESG [bp]						
Value of ESG [2019; bp]	0	1	9	9	11	9
Value of ESG [2020; bp]	15	13	25	21	21	13
Value of ESG [2021; bp]	11	9	35	24	26	16
Value of ESG [2022; bp]	10	8	46	28	36	23

Notes: Table 6 displays the regression results corresponding to our demand model (5). Observations are at the fund-by-month level over the period 05/2019-03/2022. In columns (5) and (6) we restrict the sample to those funds that are less than 5 years old. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In the bottom panel we interpret the demand estimates in terms of the elasticity of demand and investor's willingness to pay for ESG. We compute the elasticity of demand using the average expense ratio in the data (59 basis points) and assuming a market share of 5%.

Table 7: ESG Returns vs. Beliefs about ESG

VARIABLES	(1)	(2)	(3)
ESG Fund	62.478	61.774	
	(62.186)	(61.697)	
Value of ESG (σ) x ESG Fund		-29.373	-25.469
		(48.256)	(50.210)
Expense Ratio (bps)	-0.072	-0.072	10.486
	(0.515)	(0.515)	(7.010)
Observations	62,012	62,012	62,005
R-squared	0.898	0.898	0.902
Mkt FE	X	X	X
Fund FE			X

Notes: Table 7 displays the regression results corresponding to our linear regression model (8). Observations are at the fund-by-month level over the period 05/2019-03/2022. The dependent variable are monthly fund annualized returns measured in basis points. The Value of ESG are in units of standard deviations. Markets are defined at the Lipper Class-by-month-by-fund type level. Standard errors are in parenthesis and are clustered at the monthly level. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 8: Demand for Index Funds - Alternative ESG Measures

VARIABLES	(1)	(2)	(3)	(4)
Expense Ratio (bps)	-0.042***	-0.042***	-0.042***	-0.041***
	(0.001)	(0.001)	(0.001)	(0.001)
ESG Fund	0.356***			
	(0.067)			
Sustainability Fund		0.380***		
		(0.065)		
Impact Fund			-0.034	
			(0.077)	
ESG-Related Strategy				0.350***
				(0.075)
Observations	30,722	30,722	30,722	24,324
R-squared	0.428	0.428	0.428	0.437
Mkt FE	X	X	X	X
IV	X	X	X	X
Elasticity of Demand	2.3	2.3	2.3	2.3
Value of ESG [bp]	9			
Value of Sustainability [bp]		9		
Value of Impact [bp]			-1	
Value of ESG-Related Strategy [bp]				9

Notes: Table 8 displays the regression results corresponding to our demand model (5). Observations are at the fund-by-month level over the period 05/2019-03/2022. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In the bottom panel we interpret the demand estimates in terms of the elasticity of demand and investor's willingness to pay for ESG. We compute the elasticity of demand using the average expense ratio in the data (59 basis points) and assuming a market share of 5%.

Table 9: Portfolio Overlap

Category	Avg. Portfolio Overlap
US Blend/Core	0.68
US Growth	0.61
US Value	0.31
Growth	0.25
International	0.67
Emerging Markets	0.69
Global	0.43
Other	0.28
All Categories	**0.65**

Notes: Table 9 displays the average portfolio overlap (weighted by assets within a fund category) for each ESG fund and the corresponding Non-ESG fund with the most similar portfolio. Investment categories are constructed by aggregating Lipper classes.

Table 10: Demand for Index Funds - The Effect of Portfolio and Stock-Level ESG Ratings

VARIABLES	(1)	(2)	(3)	(4)
Expense Ratio (bps)	-0.042***	-0.041***	-0.040***	-0.041***
	(0.001)	(0.001)	(0.001)	(0.001)
ESG Fund	0.356***			0.476***
	(0.067)			(0.083)
4+ Globe Rating		0.135***		0.115**
		(0.043)		(0.053)
Refinitiv Sustainability Rating			1.334***	0.806*
			(0.447)	(0.464)
Observations	30,722	32,784	23,617	22,124
R-squared	0.428	0.420	0.400	0.408
Mkt FE	X	X	X	X
IV	X	X	X	X
Elasticity of Demand	2.3	2.3	2.3	2.3
Value of ESG [bp]	9			12
Value of 4+ Globe Rating [bp]		3		3
Value of Inc in Refinitiv Sus. Rating [bp]			33	20

Notes: Table 10 displays the regression results corresponding to our demand model (5). Observations are at the fund-by-month level over the period 05/2019-03/2022. Refenitive Sustainability Rating ranges from 0 to 1. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** p<0.01, ** p<0.05, * p<0.10.

In the bottom panel we interpret the demand estimates in terms of the elasticity of demand and investors' willingness to pay for ESG. We compute the elasticity of demand using the average expense ratio in the data (59 basis points) and assuming a market share of 5%.

Table 11: Geographic Variation in the Availability of ESG-Oriented Funds in 401(k) Plans

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Worried About Climate Change	0.214***	0.118*								
	(0.070)	(0.064)								
Climate Change is Happening			22.801***	0.120*						
			(7.660)	(0.068)						
Climate Change is Caused by Humans					0.309***	0.202***				
					(0.077)	(0.061)				
Should Regulate CO2							0.434***	0.226**		
							(0.112)	(0.105)		
Democratic Vote Share									0.105***	0.040
									(0.031)	(0.028)
Overall Risk	-0.011	0.034*	-0.262	0.041**	-0.021	0.022	0.000	0.036**	-0.012	0.036*
	(0.018)	(0.018)	(1.678)	(0.016)	(0.019)	(0.016)	(0.017)	(0.017)	(0.018)	(0.019)
ln(Income)	0.055***	0.074***	6.184***	0.076***	0.046**	0.069***	0.064***	0.078***	0.068***	0.077***
	(0.019)	(0.018)	(1.936)	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)
Pct College	0.060	0.103*	3.879	0.095	0.031	0.074	0.025	0.084	0.018	0.102*
	(0.070)	(0.055)	(7.133)	(0.058)	(0.070)	(0.054)	(0.067)	(0.058)	(0.073)	(0.058)
ln(Median Age)	0.110***	0.034	10.068**	0.026	0.112***	0.048	0.077*	0.031	0.107***	0.025
	(0.038)	(0.037)	(3.930)	(0.036)	(0.037)	(0.036)	(0.040)	(0.037)	(0.039)	(0.038)
Observations	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142	2,142
R-squared	0.071	0.197	0.069	0.197	0.079	0.200	0.081	0.197	0.072	0.196
State F.E.		X		X		X		X		X

Notes: Table 11 displays the regression results corresponding to a linear regression model (Eq. 9). Observations are at the county level. The dependent variable is the share of 401(k) plans in a county as of 2019 that include at least one mutual fund with an ESG mandate. The regressions are weighted by the number of 401(k) plans in each county. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 12: Geographic Variation in Willingness to Pay for ESG

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ESG Fund	0.253***	-0.064	-0.054	-0.020	-0.145	0.119*
	(0.016)	(0.148)	(0.180)	(0.132)	(0.294)	(0.070)
ESG Fund x Worried About Climate Change		0.434**				
		(0.204)				
ESG Fund x Happening			0.390*			
			(0.231)			
ESG Fund x Climate Change is Caused by Humans				0.421**		
				(0.205)		
ESG Fund x Should Regulate CO2					0.521	
					(0.388)	
ESG Fund x Democratic Vote Share						0.192*
						(0.100)
Observations	160,697	159,410	159,410	159,410	159,410	159,410
R-squared	0.965	0.965	0.965	0.965	0.965	0.965
Plan F.E.	X	X	X	X	X	X
Fund Category F.E.	X	X	X	X	X	X

Notes: Table 12 displays the regression results corresponding to a linear regression model (Eq. 10). Observations are at the fund-by-401(k) plan level, where we restrict our attention to index funds. The dependent variable the plan participants' average (across participants) expected return of the fund as per Egan, MacKay and Yang (2021). Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 13: Availability of ESG-Oriented Funds in 401(k) Plans Across Industries

Sector	Mean
Educational Services	.56
Information	.56
Professional, Scientific, and Tech. Services	.53
Wholesale Trade	.5
Real Estate and Rental and Leasing	.5
Management of Companies and Enterprises	.49
Manufacturing	.49
Arts, Entertainment, and Recreation	.49
Admin and Support and Waste Services	.48
Finance and Insurance	.48
Mining, Quarrying, and Oil and Gas Extraction	.48
Utilities	.48
Other Services (except Public Administration)	.48
Health Care and Social Assistance	.47
Retail Trade	.47
Transportation and Warehousing	.47
Agriculture, Forestry, Fishing and Hunting	.45
Public Administration	.45
Accommodation and Food Services	.44
Construction	.42

Notes: Table 13 Table displays the share of 401(k) plans that have at least one ESG investment option at the industry level (2-digit NAICS) as of 2019.

Table 14: Willingness to Pay for ESG Across Industries

VARIABLES	(1)
ESG Fund x Management of Companies and Enterprises	0.690*
	(0.409)
ESG Fund x Real Estate and Rental and Leasing	0.466***
	(0.122)
ESG Fund x Public Administration	0.423***
	(0.083)
ESG Fund x Information	0.316***
	(0.048)
ESG Fund x Other Services (except Public Administration)	0.312***
	(0.050)
ESG Fund x Arts, Entertainment, and Recreation	0.308***
	(0.106)
ESG Fund x Professional, Scientific, and Tech. Services	0.276***
	(0.029)
ESG Fund x Health Care and Social Assistance	0.257***
	(0.038)
ESG Fund x Utilities	0.257*
	(0.138)
ESG Fund x Wholesale Trade	0.248***
	(0.082)
ESG Fund x Admin and Support and Waste Services	0.225**
	(0.097)
ESG Fund x Educational Services	0.225***
	(0.054)
ESG Fund x Finance and Insurance	0.218***
	(0.067)
ESG Fund x Mining, Quarrying, and Oil and Gas Extraction	0.200
	(0.154)
ESG Fund x Manufacturing	0.180***
	(0.049)
ESG Fund x Construction	0.173**
	(0.077)
ESG Fund x Retail Trade	0.168***
	(0.063)
ESG Fund x Agriculture, Forestry, Fishing and Hunting	0.119
	(0.190)
ESG Fund x Accommodation and Food Services	0.067
	(0.098)
ESG Fund x Transportation and Warehousing	-0.625
	(0.734)
Observations	160,697
R-squared	0.965
Plan F.E.	X
Fund Category F.E.	X

Notes: Table 14 displays the regression results corresponding to a linear regression model (Eq. 10), where we allow investors' willingness to pay for ESG to vary across industries (i.e., 2-digit NAICS). Observations are at the fund-by-401(k) plan level, where we restrict our attention to index funds. The dependent variable the plan participants' average (across participants) expected return of the fund as per Egan, MacKay and Yang (2021). Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 15: Expense Ratios and Markups

VARIABLES	(1) Exp. Ratio	(2) Markup
ESG Fund	5.852***	2.851***
	(0.807)	(0.858)
Observations	11,506	11,506
R-squared	0.765	0.745
Mkt FE	X	X
Managment FE	X	X

Notes: Table 15 displays the regression results corresponding to our linear regression model. Observations are at the fund-by-month level over the period 05/2019-03/2022. The dependent variable in column (1) is the fund's expense ratio in basis points and the dependent variable in column (2) is the estimated fund markup in basis points. Markets are defined at the Lipper Class-by-month-by-fund type level. Robust standard errors are in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.