

Doing Good, Investing Less? Substitutability between Digital Climate Effort and Green Investment

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This paper studies whether pro-environmental behaviors in daily life substitute for or complement sustainable financial investments. Using microdata from Ant Group’s Alipay platform, which integrates Ant Forest—an environmental protection program—with Ant Fortune—the largest mutual fund marketplace in China—we link individual environmental actions to mutual fund holdings. We find a robust substitution effect: individuals who actively collect and redeem green points for tree planting are less likely to hold ESG funds, while passive or low-cost activities show little impact. Principal component analysis reveals that genuine pro-environmental behaviors substitute for ESG investment, whereas symbolic or socially motivated actions may complement it. Our results highlight the multidimensional nature of household environmental preferences and caution against assuming lifestyle engagement translates into greater ESG demand.

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1 Introduction

Mobilizing private capital is essential for financing the global transition to a low-carbon economy. While governments and corporations play a central role, households are increasingly viewed as critical participants in this reallocation of capital. Retail investors, in particular, can contribute by directing their savings toward sustainable financial products. In response, the supply of environmental, social, and governance (ESG) funds has grown rapidly across both developed and emerging markets. However, there is a debate on whether ESG investment is an effective device for environmental protection. On the one hand, evidence shows that institutional investors care about climate risk and ESG investment (Krueger et al., 2020, prefer socially responsible (Hartzmark and Sussman, 2019; Bauer et al., 2021) and climate-conscious investment products (Ceccarelli et al., 2024). On the other hand, there are also suspicions about ESG investments (e.g., Pucker and King, 2022, Edmans, 2023, Chatterji and Toffel, 2024).

In particular, we lack knowledge of what drives the participation of retail investors in ESG investment. There can be either connection or disconnection between environmental preference and financial investment. Consistency between different behaviors of individuals implies a positive connection between pro-environmental behaviors in real world and financial investments. However, individuals may have a fixed quota (account) for environmental protection and use financial and non-financial tools interchangeably. In this paper, we ask the following question: when individuals engage in pro-environmental behaviors in their daily lives, such as reducing carbon emissions or supporting conservation projects, do they become more likely to invest in ESG funds? Or do these real-world behaviors substitute for financial investments in sustainability, satisfying individuals' moral or psychological desire to contribute outside the financial system?

This paper provides novel evidence on this question using rich microdata from Ant Group, the operator of Alipay, China's largest digital finance platform. Alipay is uniquely positioned for this study because it integrates both non-financial and financial channels of environmental engagement. On the non-financial side, it hosts Ant Forest, a gamified environmental protection program launched in 2016. Users accumulate "green points" when they engage in low-carbon activities such

as walking, paying utility bills online, or taking public transportation. The program transforms these digital points into tangible outcomes: once accumulated, points can be redeemed to plant trees or support biodiversity projects in cooperation with non-governmental organizations and local governments. On the financial side, Alipay operates Ant Fortune, the country’s largest mutual fund distribution platform, which includes a rapidly growing segment of ESG-oriented funds classified by Morningstar’s sustainability ratings and other industry standards. As a result, Alipay provides an integrated ecosystem in which the same individuals engage in environmental protection through Ant Forest while also making investment decisions through Ant Fortune. This dual setting offers a rare opportunity to study whether environmental protection in daily life complements or substitutes for sustainable financial investment.

We assemble a dataset of 180,000 active and 20,000 inactive Ant Forest users between January 2023 and December 2024. Our data merge detailed information on demographics, green point accumulation, Ant Forest activities (including tree planting, biodiversity projects, and badge collection), and mutual fund trading and holdings. To classify ESG funds, we rely on Morningstar’s Sustainability Rating (Globes), Low Carbon Designation, and Sustainable Investment indicator, as well as an algorithmic/manual classification of fund names using ESG-related keywords. These unique data allow us to provide the first large-scale evidence on how non-financial environmental engagement shapes financial green investment.

Our analysis is motivated by a simple but powerful economic intuition: environmental protection can be produced using both labor (time and effort devoted to green actions) and capital (financial investment in ESG assets). Individuals differ in their relative costs of labor and capital, which gives rise to heterogeneous choices over how they contribute to environmental protection. For individuals with a relatively high marginal cost of capital, engaging in green actions may be a more attractive channel than allocating funds to ESG investments. Conversely, individuals with a relatively high marginal cost of labor may prefer to express environmental preferences through financial investment rather than direct action. This labor–capital tradeoff implies that, at the margin, action-based environmental engagement and ESG investment may be substitutes rather than complements.

To test this hypothesis, we focus on participation in a large-scale digital environmental program that rewards users with green points for verified low-carbon behaviors such as walking instead of driving, using public transportation, and making digital payments that reduce paper consumption. These green points can be accumulated, displayed, and eventually redeemed for symbolic environmental rewards. Importantly, the program does not involve direct financial transfers and primarily captures effort-based contributions to environmental protection. At the same time, we observe users' complete mutual fund portfolios, including their investments in ESG-classified funds under multiple widely used classification schemes.

Our main empirical finding is a robust negative relationship between participation in action-based environmental engagement and ESG investment. Individuals who accumulate more green points are significantly less likely to invest in ESG funds and, conditional on investing, allocate a smaller share of their portfolios to ESG assets. Results are robust across all definitions of ESG investment, including Morningstar globes (Hartzmark and Sussman, 2019), Low Carbon designation (Ceccarelli et al., 2024), and ESG fund names (Cochardt et al., 2023). This substitution effect is economically meaningful and statistically significant across a wide range of specifications, ESG definitions, and sample restrictions. The results suggest that individuals who actively engage in environmental actions are less inclined to express environmental preferences through financial investment, consistent with a labor–capital substitution mechanism.

We further strengthen the causal interpretation of our findings by exploiting quasi-experimental variation generated by an annual environmental awareness campaign. Around this event, participation in green actions increases sharply, providing plausibly exogenous variation in action-based environmental engagement. Using a difference-in-differences framework, we show that the increase in green actions following the event is associated with a decline in ESG investment on both the extensive and intensive margins. These effects are concentrated among individuals for whom the marginal cost of labor is likely to be lower, providing additional support for our proposed mechanism.

To further unpack the labor–capital tradeoff, we examine heterogeneity across wealth levels, portfolio performance, and engagement intensity. The substitution effect is strongest among users

with lower wealth and lower portfolio returns—groups for whom the marginal cost of financial capital is plausibly higher. In contrast, for wealthier users and those with higher investment returns, the negative relationship between green actions and ESG investment is substantially attenuated. These patterns are difficult to reconcile with explanations based solely on unobserved environmental preferences and instead point toward economically meaningful tradeoffs between time and money in environmental decision-making.

Our findings contribute to the literature of sustainable finance on the drivers of household demand for ESG products: financial attributes, such as risk and return, and non-financial pro-environmental actions. The current literature shows mixed evidence on the relationship between non-pecuniary preference and financial investment. There are evidence on the consistency in environment-related experience in real-world and financial market participation. For example Choi et al. (2020) find that retail investors sell carbon-intensive firms in abnormally warm weather, and return patterns are unlikely to be driven by changes in fundamentals. Pástor et al. (2021) and Zerbib (2022) show mechanisms through which environmental preferences can generate a “taste” premium in green stocks. However, on the other hand, Anderson and Robinson (2022) find that pro-environment households are not more likely to hold pro-environment portfolios, which results from financial disengagement that they are less likely to own stocks and other financial assets. Ceccarelli and Ramelli (2024) find that green taste substitutes for beliefs in forming green investment expectations and preferences. Murfin and Spiegel (2020) find that real estate prices do not factor in the risk of sea level rise. Our paper advances the literature by revealing a substitution effect between real-world environment protection and financial green investment.

2 Institutional background

Alipay is the first and largest third-party digital payment system in China and is used by a dominant share of the population. Beyond payments, the Alipay app integrates a broad range of daily services, including transportation, consumption, and financial services. Its user base reached 1.43 billion in mid-2024. [Figure IB.1](#) in the Internet Appendix illustrates the interfaces of Alipay, Ant Forest, and

mutual fund investments.

This paper focuses on two core components of the Alipay ecosystem. The first is Ant Forest, launched in 2016, an environmental protection program in which users accumulate virtual trees through environmentally friendly actions, with Alipay committing to plant corresponding real trees in desert-adjacent regions (Hu et al., 2025). The second is Ant Fortune, launched in 2014, an online mutual fund investment platform that provides access to nearly the full universe of mutual funds in China (Hong et al., 2025). By the end of 2024, Ant Fortune had become the largest mutual fund distribution platform in China, with assets under distribution exceeding RMB 1.45 trillion.

Ant Forest seeks to mobilize individual participation in environmental protection through a bottom-up approach, leveraging the scale and infrastructure of a large technology platform. It is the largest digital initiative in China aimed at reducing carbon emissions and promoting reforestation. Since its launch, Ant Forest has introduced multiple badge categories, including trees, biodiversity reserves, wildlife protection, and solar (photovoltaic) dedesertification. By August 2023, in collaboration with nine charitable partners, Ant Forest had facilitated the planting of more than 475 million trees in 11 provinces and helped establish 31 biodiversity reserves in 13 provinces, protecting roughly 4,800 square kilometers of land.¹

[INSERT [Figure 1](#) AROUND HERE]

[Figure 1](#) illustrates the sequence of actions through which users contribute to Ant Forest. In the first step, users *produce* “green points” by engaging in behaviors avoiding carbon emissions through various sub-apps embedded in Alipay. The five largest categories of green-point generation in our sample are walking, subway, bill payment, train, and buses, which together account for approximately 88% of green-point production at the 95th percentile of users. [Table IB.1](#) in the Internet Appendix lists all 69 subcategories observed in our sample. Following Ant Research’s naming convention, we refer to these points as *Produce Grams*. Green points in this step are generated automatically once users grant Alipay permission to track relevant behaviors. As shown in the summary statistics in

¹Source: antgroup.com/en/esg/lowcarbon

Table 1, total produced green points exceed collected green points, indicating that users convert only a fraction of their available green-point endowment into contributions to Ant Forest. Accordingly, *Produce Grams* and its subcategories provide a noisy proxy for actual engagement. Further discussion is provided in Section IB.1 of the Internet Appendix.

In the second step, users must manually collect the green points generated in the first step in order to contribute to Ant Forest. Following Ant Research’s terminology, we refer to the points as *Collect Grams* and *Rob Grams*. This stage is highly labor intensive: unlike *Produce Grams*, *Collect Grams* is not automatic and requires daily logins and multiple clicks, with uncollected points expiring within 72 hours. Moreover, Ant Forest allows a user’s Alipay friends to collect available points first if they act earlier. More rules are discussed in Section IB.1 of the Internet Appendix. As a result, this step is both time- and attention-demanding and is meaningful only for users who actively choose to participate in Ant Forest. Variation in *Collect Grams* therefore closely reflects individuals’ willingness to engage in environmental protection through actions.

In the third step, users redeem accumulated green points for trees or other environmental protection badges. Upon redemption, users receive a badge that is visible to their social network on the Ant Forest interface (see Figure IB.2 in the Internet Appendix). Badge redemption itself involves minimal additional effort beyond a single click. However, there is large heterogeneity in the number of green points needed to redeem different badge categories. Redeeming a tree requires a substantially larger number of green points than redeeming other badges, although these alternatives still require nontrivial point accumulation (see Table IB.2 in the Internet Appendix).

To recap, *Collect Grams* is the most conservative and behaviorally meaningful measure of individuals’ willingness to protect the environment through actions. The primary input in Ant Forest is individual’s labor, embodied in the repeated effort required to collect green points on a daily basis.

3 Data

The data used in this paper combine two sources. First, we obtain individual-level data from Alipay on users’ participation in the tree-planting program Ant Forest and their mutual fund holdings through Ant Fortune. Second, we collect sustainable ratings and indicators from Morningstar.

Our main analysis focuses on a randomized sample of 180,000 active Ant Forest users over the period from January 2023 to December 2024.² We additionally draw a randomized sample of 20,000 users who are only active in generating green points for robustness checks. Details in Section [IA.1](#).

3.1 Alipay: Individual-level environmental actions and mutual fund holdings

We obtain individual-level data from the Ant Open Research Platform at Ant Financial under Alipay.³ We merge three datasets to construct our individual-level cross-sectional sample: (i) basic demographic information, (ii) users’ green points and Ant Forest activity records, and (iii) users’ mutual fund holdings.

Basic demographics. This dataset contains information on users who created a profile on Alipay. The main variables include the profile creation date, users’ age, gender, location of residence, stated risk tolerance, and total liquid wealth on Alipay

Green points activities. This dataset contains detailed information on users’ green point activities—measured in units called grams by Alipay—including the production, collection, and robbing of green points. To mitigate potential biases arising from extreme values, we winsorize all green-point-related variables at the 99th percentile. Details in Section [IA.1](#).

Ant Forest badge redemption. The dataset includes information on the number of badges each user redeems in Ant Forest and the corresponding amount of green points consumed. We compute the total number of green points consumed for badge redemptions over the sample period.

²Ant Open Research imposes restrictions of a maximum sample size of 200,000 users and a maximum time span of two years.

³Most online platforms in China (including Alipay) require real-identity verification, implying that each individual can hold only one account. As a result, account-level data correspond one-to-one with individual-level data.

All badge redemption–related variables are winsorized at the 99th percentile to reduce the influence of extreme observations.

Mutual-fund trading and holding histories. This dataset contains information on holdings in mutual funds in Ant Fortune, the Alipay asset management subfunction, associated with each user. We aggregate the information to the individual level and calculate variables on whether the individual has held at least one ESG mutual fund during our sample period and, conditional on holding at least one ESG fund, the proportion of money one puts in ESG funds. In addition, we also calculate the average return, Sharpe ratio, and total amount of money that the individual puts into mutual funds on Ant Fortune.

3.2 Morningstar: Fund-level sustainable ratings

We focus primarily on China open-end funds and additionally include closed-end funds, ETFs, and the “other” category in Morningstar. These funds are matched to those available in Ant Fortune using the CSDCC code. During our main sample period (2023 -2024), all funds listed in Ant Fortune are matched to a corresponding Morningstar fund, yielding a 100% matching rate.⁴

To classify funds as ESG or non-ESG, we construct four alternative ESG classifications based on the following indicators: (1) the Sustainable Investment indicator, (2) the Morningstar Sustainability Rating (Globes), (3) the Low Carbon Designation indicator, and (4) whether the fund name contains ESG-related keywords. For the Low Carbon Designation and Sustainable Investment indicators, we follow Morningstar’s original binary classification, where a value of one indicates an ESG fund. For the Globes, funds with four or five Globes are classified as ESG funds, while all others are classified as non-ESG. For the fund-name-based classification, we identify a set of 41 ESG-related keywords using a hybrid approach that combines GPT detection with manual screening, following recent literature (e.g., Chen et al., 2025, Ding et al., 2024). Details of the keyword construction procedure and the full list of keywords are provided in Section IA.2.⁵ These four classifications are

⁴For the period from 2017 to 2022, at least 98% of funds in Ant Fortune can be matched to a Morningstar fund.

⁵All keywords are directly related to environmental protection except for “social responsibility,” “sustainable,” and “sustainable development,” which are broader terms associated with socially responsible investment. Accordingly, we

used independently as alternative measures of ESG investment in the empirical analysis.

For the three ESG indicators obtained from Morningstar, we interpolate missing values. Details in Section IA.3. Funds that do not have any Morningstar sustainability ratings are classified as non-sustainable funds. As a robustness check, Section 4.4 restricts the sample to funds with available Morningstar sustainability ratings.

3.3 Summary Statistics

[INSERT Table 1 AROUND HERE]

Table 1 shows the summary statistics of the variables for the 180,000 active Ant Forest users. Panel A presents descriptive statistics for the dependent variable on green investments. Individuals in our sample have a high degree of ESG investment. 52% of the users invest in at least one fund that has a Morningstar Globe equal to four or five. Similarly, 52% of the users make at least one investment in funds labeled as sustainable funds in Morningstar. The percentage of investments in low-carbon designation (LCD) is even higher: 79% of users make at least one investment into LCD funds. The share of investments using ESG names is between the share using the Globe/Sustainable and LCD indicators: 61% of users make at least one investment of funds with an ESG name.

Panel B reports summary statistics for variables related to the generation of green points, all measured as cumulative grams over the two-year sample period. Green points must be collected or robbed before being used to redeem badges in Ant Forest. The produced green points discussed in the next paragraph will be discarded if neither the user themselves nor anyone on the user’s Alipay network collects or robs the points. Panel B shows that *Collect* is the primary source of green points, with the 5th-percentile user accumulating 602 grams and the median user accumulating 21,364 grams. In contrast, *Rob* contributes far fewer green points: the 5th-percentile user accumulates zero grams and the median user accumulates 1,370 grams (about 6.4% of *Collect*). Interestingly, among right-tail users, the gap between *Rob* and *Collect* narrows. At the 75th percentile, users accumulate

do not distinguish between ESG and green fund names in this paper.

47,929.50 grams from *Collect* and 17,642.50 grams from *Rob* (about 36.8% of *Collect*). At the 95th percentile, users of *Rob* accumulate more green points than those of *Collect*, with *Rob* amounting to 124.3% of *Collect*. The gap widens further when comparing maximum values. These patterns suggest that typical users accumulate green points primarily through *Collect*, whereas a small group of highly achievement-oriented or competitive users rely much more heavily on *Rob*, even surpassing *Collect* at the extreme tail.

The remaining twelve variables in Panel B, from *Produce* (sum of), *Walking*, through *Ele.me*, capture various subcategories of daily-life behaviors that produce green points, plus the sum of all the subcategories. Green points are produced automatically no matter whether the individual collects the points to redeem badges in Ant Forest. For all statistics, the *Produce* (sum of) exceeds *Collect*, indicating that users convert only a portion of their available green-point assets into contributions to Ant Forest. This pattern is consistent with a key feature of the platform: achieving badges requires not only green points but also substantial labor and attention from users. The input of labor and attention is central to our usage of the Ant Forest setting and interpretation of the findings below. Interestingly, similar to the pattern observed for right-tail users in terms of *Rob*, we also find that for the 95th-percentile and maximum users of *Produce*, the sum of *Collect* and *Rob* exceeds their *Produce*. This indicates that robbing green points plays an important role for a small group of extremely enthusiastic Ant Forest users.

For the subcategories of how users generate green points in Alipay, we observe a large degree of heterogeneity. *E-Bill* (“Dian Zi Zhang Dan”), *Offline Payment*, and *Walking* exhibit non-zero values beginning at the 5th percentile, whereas most other categories only become non-zero at the median or the 75th percentile. These patterns indicate that a typical user concentrates their green-point generation in only a small subset of categories, yet within the categories they do engage in, some users exhibit exceptionally high levels of activity. Moreover, certain categories are used far more frequently than others, reflecting systematic differences in users’ daily routines.

Panel C reports descriptive statistics for the redemption of Ant Forest badges, which reflect higher-effort and more discretionary forms of environmental engagement. Several striking patterns.

First, the *Tree Person* badge dominates all other categories. Its median redemption amount is 19,680 grams—about 21 times that of *Reserve Person* (936 grams)—and its 75th percentile (58,442 grams) is 14.88 times the corresponding value for *Reserve Person* (3,928 grams). The contrast is even sharper for newer badge types: both *Animal Person* and *Solar* have medians of zero, and while the 75th percentile of *Solar* reaches only 894 grams, the 75th percentile of *Tree Person* exceeds it by a factor of 65.37. This prominence reflects both the substantially higher gram requirements for planting trees and the central role of tree-planting in Ant Forest’s original design. Tree badges were the earliest and most prominent achievements in the program, as indicated by the name “Forest”, and users may therefore disproportionately favor this category.

Second, unlike *Collect*, *Rob*, and *Produce* (sum of) in Panel B, badge redemptions exhibit substantial mass at zero across all categories. Even the two most prominent badges, *Tree Person* and *Reserve Person*, only show positive values at the median, whereas categories such as *Solar* and *Beautiful China* become positive only at the 75th percentile and several others not until the 95th percentile. This pattern indicates that a large share of users never redeem badges in many categories—even within our sample of active Ant Forest participants (details in [subsection IA.1](#)). This is because redeeming a badge requires a large number of green points, especially for trees. Without sustained and repeated effort to collect (and rob) points, users simply do not accumulate enough points to redeem. At the same time, the sizable values observed in from the medians to the 95th percentiles highlight substantial heterogeneity in the willingness of users to convert the points accumulated into real environmental actions, such as planting trees. This variation provides meaningful differences in badge enthusiasm that allow us to conduct valid analysis of user participation in Ant Forest.

Panel D reports summary statistics of demographic information, including age and gender. In addition, it also presents the other control variables, including risk level, Sharpe ratio, and the number of years registered on the platform, and the interaction variables, including wealth (bao)⁶ and the average return of the individual’s portfolio in our analysis period. Our sample is representative in the aspects of the gender distribution (approximately balanced) and self-considered

⁶Wealth (bao) is the amount of cash-equivalent asset a user has on Alipay, mainly under Yue’bao.

risk level (the median user with a level of three out of five). The median user registered on Alipay for around 11 years (that is, started the Alipay account in 2014). The median investor has 40 thousand RMB (more than 5.6 thousand USD) liquid wealth on Alipay and more than 115 thousand RMB (more than 16.3 thousand USD) investments in mutual funds on Ant Fortune. However, we potentially cover a relatively young and less skillful sample of investors. Approximately 75% of the users are younger than 40 years old. The user in the 75th percentile has a Sharpe ratio near zero and the average user has a return of -0.03, indicating a sample containing more money-loss investors.

4 Empirical Analysis

In this section, we examine the association between the participation of individuals in Ant Forest and their sustainable investment behavior on Ant Fortune.

[INSERT [Figure 2](#) AROUND HERE]

To begin, [Figure 2](#) plots the share of investors holding ESG funds (upper panels) and the total share of money value allocated to ESG funds (lower panels). In our sample, 51.71%, 52.50%, 79.01%, and 60.56% of investors hold at least one ESG fund when ESG funds are classified using the Morningstar Sustainable Investment indicator, Globes ratings of four or five, Low Carbon Designation, and ESG fund names, respectively. This relatively high prevalence of ESG participation likely reflects both the relaxed definition of ESG investment—holding at least one ESG fund—and the fact that our sample consists of users who are active in Ant Forest and therefore have a certain degree of environmental interest.

Across classifications, the Low Carbon Designation yields the highest participation rate, consistent with Ant Forest’s emphasis on carbon emission reduction. The second-highest participation rate arises from the ESG-name classification, aligning with the notion that retail investors are relatively less sophisticated and may rely on simple cues such as fund names. A similar ranking emerges for the share of capital allocated to ESG funds: 4.55%, 3.65%, 16.88%, and 7.31% under the four

respective classifications. These allocation shares are substantially smaller than the corresponding participation rates—the former being from 6.95% to 12.08% of the latter —indicating that while many investors choose to hold ESG funds, they allocate only a limited fraction of their portfolios to them.

[INSERT [Figure 3](#) AROUND HERE]

Moreover, [Figure 3](#) illustrates the relationship between individual participation in Ant Forest—measured by the collection of green points—and ESG investments. In particular, this figure reports the number of investors holding at least one ESG fund under each ESG classification. In each panel, we divide investors into quartiles based on the total number of green points collected during the sample period, with the quartiles shown on the x-axis. We observe a clear declining pattern from the second to the fourth quartile, indicating that investors who participate more intensively in Ant Forest are less likely to hold ESG funds. At the same time, there is an increase in ESG participation from the first to the second quartile of green point collection.

[INSERT [Figure 4](#) AROUND HERE]

[Figure 4](#) displays the average share of portfolio value allocated to ESG funds for investors in each quartile, along with 95% confidence intervals around the means. A similarly pronounced decreasing pattern emerges: individuals with higher levels of Ant Forest participation allocate a smaller share of their portfolios to ESG funds. From the second to the fourth quartiles of green point collection, the average share invested in ESG funds declines by 8.4%, 10.8%, 6.3%, and 8.0% when ESG funds are classified using the Morningstar Sustainable Investment indicator, Globes ratings of four or five, Low Carbon Designation, and ESG fund names, respectively. Moving from the first to the second quartile, the ESG allocation share increases modestly—by 0.65%, 0.45%, and 0.37% under the Morningstar Sustainable Investment, Low Carbon Designation, and ESG-name classifications, respectively—while it decreases slightly by 0.89% when using Globes.

4.1 Empirical Specifications

Following Riedl and Smeets (2017), we conduct cross-sectional regression analyses on both the probability and proportion of ESG investments. We measure environmentally oriented activity using user actions of green points and assess how the green point actions relate to both extensive and intensive margins of ESG investments using the following specifications.

$$\Pr(\text{ESG}_i) = \Phi(\alpha + \beta \text{GreenPoints}_i + X_i'\Gamma + \alpha_c + \varepsilon_i), \quad (1)$$

$$\text{ESGShare}_i = \alpha + \beta \text{GreenPoints}_i + X_i'\Gamma + \alpha_c + \varepsilon_i, \quad (2)$$

where $\Pr(\text{ESG}_i)$ is the probability that the investor i holds at least one ESG fund, and ESGShare_i denotes the proportion of the mutual fund portfolio of the investor i , measured by the maximum of the monetary value during our sample period, that is allocated to ESG funds. GreenPoints_i denotes the user’s Ant Forest green points actions, X_i includes the full set of portfolio- and individual-level controls, and α_c denotes city fixed effects that capture variation common for users in the same city. Portfolio-related control variables include *Sharpe Ratio*, *Morningstar Rating* (averaged across all funds), and *Total Money* invested in all funds held by the individual on Alipay during our sample period from January 2023 to December 2024. Individual-level characteristics include *Registered Years* (the number of years since Alipay registration), *Female*, *Age*, and investment *Risk Level* (self-reported to Alipay at the start of investment). These specifications provide a comprehensive baseline characterization of how the environmental participation of individuals is related to their sustainability choices in mutual fund investments.

Our main analysis employs a cross-sectional regression specification, as it is more conservative to assume persistence in individuals’ environmental protection attitudes over a relatively short time horizon—two years in our sample. This approach is also consistent with prior research on ESG investing, such as Riedl and Smeets (2017), Krueger et al. (2020) and Bonnefon et al. (2025).

4.2 Collection of Green Points and ESG investments

We use *Collect* green points as our primary measure of individuals’ environmental engagement. As discussed in [section 2](#), *Collect* is the most conservative measure of individuals’ willingness to protect the environment through actions. In contrast, alternative measures may contain noise unrelated to environmental protection. In particular, *Produce* green points is partly driven by incentives to boost consumption and encourage the use of Alipay as a payment tool. By comparison, collected green points can only be used for planting trees in Ant Forest and therefore provide a cleaner measure of environmental protection. *Redeem* green points also faces limitations due to their discreteness: users must accumulate a large number of green points to redeem a tree badge, so variation in redemption may partly reflect this discontinuity. In contrast, collecting actions occur on a daily basis and thus exhibit substantially less discreteness.

[INSERT [Table 2](#) AROUND HERE]

[Table 2](#) presents results on the relationship between individuals’ participation in Ant Forest—measured by *Collect Grams* and *Rob Grams*—and their sustainable mutual fund investments on Ant Fortune. The odd-numbered columns report estimates for the *extensive margin*, presented as marginal effects from Probit regressions in which the dependent variable equals one if an investor holds at least one ESG fund and zero otherwise. The even-numbered columns report results for the *intensive margin*, based on OLS regressions in which the dependent variable is the percentage of the total mutual fund portfolio value allocated to ESG funds, conditional on holding at least one ESG fund. ESG funds are identified using four commonly used sustainability classifications: Morningstar *Sustainable Indicator* (columns (1)–(2)), *Globes 4 or 5* (columns (3)–(4)), *Low Carbon Designation* (LCD) (columns (5)–(6)), and *ESG Name* (columns (7)–(8)). The key independent variables are *Collect* and *Rob*, which capture two distinct ways of accumulating green points in Ant Forest to grow trees, protect animals, and support other environmental protection projects.

As discussed above, the relationship between direct environmental protection and ESG invest-

ments may be either positive, reflecting value alignment, or negative, reflecting a substitution effect. The results reported in Table 2 provide consistent evidence of a substitution effect between environmental protection via actions and via ESG investments. Across all eight specifications, *Collect Grams* exhibits a consistently negative and statistically significant association with sustainable investment at both the extensive and intensive margins. Specifically, higher levels of collected green points are associated with a lower likelihood of holding any ESG fund (the extensive margin). For example, the Probit estimates using the Morningstar Sustainable Investment indicator in column (1) indicate that a one standard deviation increase in *Collect* is associated with a 93.53 basis point decrease in the probability of holding at least one ESG fund ($\frac{32512.53}{10^8} \times 28.77$). While economically modest, this effect is small relative to the sample mean ESG participation rate of 52%. The coefficient is statistically significant at the 1% level.

Consistent with the extensive-margin results, we also find that larger amounts of collected green points are associated with a lower proportion of mutual fund investments allocated to ESG funds at the intensive margin. For example, column (2) reports OLS estimates based on the same Sustainable Investment indicator, showing that a one standard deviation increase in *Collect* is associated with a 71.10 basis point reduction in the share of mutual fund investments allocated to sustainable funds ($\frac{32512.53}{10^8} \times 21.87$). This effect corresponds to approximately 15.63% of the whole sample’s allocation to sustainable funds (4.55%) and is statistically significant at the 1% level.

Other specifications that classify ESG funds using alternative indicators yield consistent results. The marginal effect coefficients on *Collect* in the Probit models are close to that reported in column (1), ranging from -20.35 to -31.99 . These estimates are statistically significant at the 5% level under ESG classifications based on Globes and at the 1% level under classifications using other indicators. Similarly, the coefficients on *Collect Grams* in the OLS regressions are close to that reported in column (2), ranging from -21.71 to -35.89 , and are uniformly statistically significant at the 1% level. Comparing coefficient magnitudes across ESG classifications, specifications that rely on fund names exhibit the largest effects in the Probit extensive-margin analysis. This pattern is likely driven by the lower level of sophistication among some individual investors, who may rely more heavily on salient and easily observable information such as fund names. In contrast, for

the OLS intensive-margin analysis, specifications based on the Low Carbon Designation yield the largest coefficient magnitudes. This finding is consistent with Ant Forest being explicitly promoted as a low-carbon activity, making substitution effects strongest for ESG investment products that are most closely aligned with low-carbon indicators.

The coefficients on *Rob Grams* are small and statistically insignificant across all eight specifications, with the exception of column (3), which reports a negative coefficient in the Probit specification using Globes as the ESG fund classification. Overall, these results indicate that robbing green points does not exhibit a systematic relationship with sustainable investing, which can be attributed to two plausible reasons. First, as shown in [Table 1](#), users obtain most green points through *Collect Grams*, making collection the dominant accumulation channel. Second, *Rob Grams* is a noisier measure of environmental engagement, as it may reflect behavior negatively associated with pro-social values (e.g., discomfort with taking others' points). The substitution effect we document is driven primarily by *Collect*—the active harvesting of one's own green points—rather than *Rob*, which reflects a more gamified form of accumulation.

Next, we discuss the results for control variables. Before turning to each coefficients, it is useful to highlight a general pattern. Unlike *Collect Grams*, whose effects are highly consistent across specifications, several controls exhibit variation across ESG measures, consistent with the well-documented divergence in ESG rating methodologies (Berg, Kölbel, Pavlova, & Rigobon, 2022; Berg, Kölbel, & Rigobon, 2022).⁷ In the following analysis, we focus on results that are robust across ESG measures.

[Table 2](#) shows that investors having a higher *Sharpe Ratios* for their portfolios are more likely to invest in ESG funds and, conditional on doing so, allocate a larger share of their portfolios to ESG funds. Taking columns (3) and (4), where Globes is used for ESG classifications, as an example, a 10% increase in the *Sharpe Ratio* is associated with a 9.47% increase in the likelihood of holding at least one ESG fund and a 2.01% increase in the portfolio share allocated to ESG funds. However,

⁷While the existing literature emphasizes discrepancies across rating agencies, the same logic arguably applies—perhaps even more strongly—to different sustainability indicators produced by a single provider, namely Morningstar in our setting.

there are differences in using different ESG indicators. On the extensive margin, the coefficients are more than 15 times larger when ESG funds are classified using Globes or LCD than when alternative indicators are used. On the intensive margin, the coefficients become negative when ESG funds are identified using the overall sustainable investment indicator or ESG fund names. These differences across ESG indicators are consistent with the fund-level evidence in [Table IC.2](#), where Globes and LCD classifications are positively associated with fund-level Sharpe Ratios, while the overall sustainable investment indicator and ESG name classifications are negatively associated with Sharpe Ratios.⁸ All estimates are statistically significant at the 1% level.

[Table 2](#) shows that the average fund quality measure, *Morningstar Rating*, is negatively associated with the likelihood of investing in ESG funds but positively associated with the share allocated to ESG funds conditional on investing in ESG funds. For example, based on the sustainable fund indicator for ESG classification in column (1), a one-star increase in an investor’s average portfolio *Morningstar Rating* is associated with a 44.32% lower probability of holding any ESG fund, consistent with the lower ratings of ESG funds documented in [Table IC.2](#). This negative extensive-margin relationship likely reflects the effect that investors who hold lower-rated portfolios are more likely to include ESG funds.⁹ In contrast, conditional on investing in ESG funds, column (2) shows that a one-star increase in the average portfolio rating is associated with a 4.68% larger allocation to ESG funds. Together, these results indicate that investors who tend to select higher-rated funds are less likely to enter ESG investments, but once they do, they concentrate more heavily in higher-rated ESG funds. This pattern holds across nearly all specifications in columns (1)–(8), with the exception that the Low Carbon Designation allocation in column (6) is also negative on the intensive margin. All coefficients are statistically significant at the 1% level.

Turning to portfolio size, measured by *Total Money*, we find that it is positively associated with the likelihood of holding at least one ESG fund but negatively associated with the fraction of assets invested in ESG funds, consistent with Riedl and Smeets ([2017](#)). For instance, column (1)

⁸Recent literature also shows both a positive relation between ESG indicators and return driven by demand (Van der Beck ([Forthcoming](#)) and negative due to non-financial utility (Baker et al. ([2024](#)), Gantchev et al. ([2024](#))).

⁹While ESG-name funds are not systematically lower rated, investors with lower-rated portfolios invest more heavily in them, suggesting weaker differentiation across ESG classifications among investors holding lower-rated funds.

shows that an increase in portfolio size raises the probability of holding at least one ESG fund by 13.68 percentage points. By contrast, column (2) indicates that, conditional on investing in ESG funds, a 10,000 RMB increase in portfolio size (approximately 1,407 USD) is associated with a 6.80 percentage point reduction in the share allocated to ESG funds. This pattern is consistent with a diversification mechanism: as investors' portfolios grow, they are more likely to include ESG funds, but the ESG share declines as investments are spread across a broader set of assets. These results are robust across specifications and statistically significant at the 1% level.

Turning to individual-level characteristics, we find that earlier Alipay users, female investors, and older individuals are less likely to invest in sustainable funds and, conditional on doing so, allocate a smaller share of their portfolios to these funds. For these characteristics, coefficients are generally of the same sign across specifications and are statistically significant at the 1% level. *Risk Level* exhibits a significant yet dual role: higher risk tolerance is associated with a greater likelihood of holding at least one ESG fund but a smaller proportion invested in sustainable funds, with both effects significant at the 1% level, which is consistent with Riedl and Smeets (2017), although their study identifies statistical significance only on the intensive margin.

Taken together, we observe several patterns. First and foremost, we document a robust negative association between green-point collection in Ant Forest and sustainable investment in Ant Fortune, indicating a substitution effect between environmental protection via actions and via investments. While the economic magnitude on the extensive margin is tiny, it is sizable on the intensive margin compared to the entire sample's allocation. Second, we find that portfolio characteristics and individual attributes significantly influence both the extensive and intensive margins of ESG investment. The two margins are aligned for individual characteristics. In contrast, the two margins exhibit opposite signs for portfolio characteristics, suggesting a portfolio-formation effect at work. Finally, our results show that the divergence in ESG rating methodologies (Berg, Kölbel, Pavlova, & Rigobon, 2022; Berg, Kölbel, & Rigobon, 2022) also manifests across different ESG classifications provided by the same rating agency, Morningstar when looking at the results of portfolio and individual characteristics (but our main finding of a substitution effect between Ant Forest and sustainable investment is immune to different ESG indicators).

4.3 Alternative Measures of Ant Forest Participation

4.3.1 Production of Green Points

Another measure of environmental protection in Ant Forest is *Produce* green points. As discussed in [section 2](#), green-point production—points automatically generated through various low-carbon behaviors tracked by Alipay—is a noisy proxy for environmental protection. Nevertheless, in this subsection we show that the substitution effect between environmental protection actions and ESG investments remains robust when *Produce* green points are used to measure Ant Forest participation.

[INSERT [Table 3](#) AROUND HERE]

As shown in [Table 3](#), the results based on *Produce Grams* are broadly consistent with those using *Collect Grams*. *Produce Grams* is also negatively associated with ESG investments on both the extensive and intensive margins, with all coefficients statistically significant at the 1% level. However, the economic magnitudes are smaller than those for *Collect Grams*: the effects of *Collect Grams* are larger by a factor of 4.60, 2.08, 3.69, and 4.34, respectively, for columns (1), (3), (5), and (7), on the extensive margin and 3.05, 2.62, 3.21, and 3.20, respectively, for columns (2), (4), (6), and (8), on the intensive margin.

[Table IC.3](#) in the Internet Appendix further analyzes the eleven largest subcategories of produced green points, which together account for over 96% of total production for the average user.¹⁰ The sole exception to the general negative pattern is *Offline Payment*—the largest category by usage—which exhibits positive coefficients across all eight specifications. These coefficients are statistically significant at the 1% or 5% levels on the intensive margin but remain positive and insignificant on the extensive margin. While this pattern suggests a complementary relationship with ESG investments, its interpretation needs caution: *Offline Payment* may reflect environmentally motivated paperless behavior, but it may also capture unrelated factors such as convenience,

¹⁰More than 80% of the remaining categories are rarely or never used even at the 99th percentile ([Table IB.1](#)), justifying our focus on the dominant subcategories.

record-keeping, or general digital preference. The majority of coefficients for the other subcategories are negative, especially on the intensive margin.

Moreover, we conduct two additional analyses using aggregated measures of produced green points. First, we aggregate the eleven subcategories into two broader groups based on their economic interpretation: *Green Travel* and *Digital Payment*.¹¹ As shown in [Table IC.4](#), both *Green Travel* and *Digital Payment* exhibit negative coefficients on both margins; results are statistically significant at the 1% level on the intensive margin, while results on the extensive margin are mixed. Second, we apply principal component analysis (PCA) to the eleven subcategories and use the first principal component (*PC1*) as a summary measure. [Table IC.5](#) shows that *Walking* dominates *PC1* (loading equal to 1.000), and that *PC1* explains 87.6% of the total variation. Consistent with the aggregated-category results, the regression estimates in [Table IC.6](#) yield negative coefficients on both margins and statistically significant at the 1% level on the intensive margin. The less statistically significant results on the extensive margin when using the subcategories than when using the total *Produce Grams* are consistent with the argument that our main finding on the substitution effect is more due to the environmental protection motivation in Ant Forest than due to low cost/low-carbon behaviors such as taking the bus and walking.

Prior studies rely on production-based measures of green points (Chen et al., [2023](#); Gao et al., [2023](#)). Our aggregated measures—*Green Travel* and *Digital Payment*—are closest in spirit to their approach, though two key differences distinguish our analysis. First, we focus on cross-sectional differences in individuals’ participation in Ant Forest, whereas prior studies rely on panel regressions with individual fixed effects that exploit month-to-month variation within individuals—variation that is likely to reflect noise rather than meaningful changes in environmental engagement.¹² Sec-

¹¹The original five broad categories defined by Alipay ([Table IB.1](#)) suffer from cross-identification issues, with no clear mapping between subcategories and overarching groups. We therefore construct our own classification based on meanings, grouping the eleven largest subcategories into *Green Travel* (Shared Bicycle, Public Bus, Walking, and Subway) and *Digital Payment* (Bill Payment, E-invoice, Train Ticket, Ele.me (Food Delivery), E-Bill, Offline Payment, and Online Payment).

¹²Accumulating enough green points to redeem a tree takes substantial time: the average user in our sample plants only 1.5 trees over two years. Moreover, preferences for environmental protection are plausibly stable over such horizons, making it unlikely that short-run shocks (e.g., subway-line expansions; Gao et al. [2023](#)) materially alter underlying preferences.

ond, we explicitly address extreme observations through filtering and winsorization (see [subsection IA.1](#)), a step largely absent in prior work; including extreme values leads to sign reversals in some specifications (available upon request). As a result, we document a negative relationship between environmental protection via actions and via investments, in contrast to the positive associations reported in earlier studies.

To recap, when focusing on the production of green points through public transportation and digital payment behaviors tracked by Alipay, we also find evidence of a substitution effect between participation in Ant Forest and ESG investments. However, the results are less coherent across alternative measures. When using the total amount of green points produced, the estimated coefficients are statistically significant, supporting the presence of a substitution effect. By contrast, when using aggregated measures of green point production, statistically significant results emerge only on the intensive margin: higher production of green points is associated with a smaller share of ESG investments, while the results for the likelihood of ESG investment are mixed and generally insignificant.

4.3.2 Redemption of Green Points

As discussed in [section 2](#), users must *redeem* green points in order to contribute to tree planting and other environmental protection activities, which provides an alternative measure of participation in Ant Forest. In this section, we examine the relationship between the redemption of green points and ESG investments.

[INSERT [Table 4](#) AROUND HERE]

In [Table 4](#), we examine the relationship between green points redeemed for badges in Ant Forest and ESG investments. The key independent variable, *Redeem Grams*, measures the total number of green points a user consumes across all badge redemptions during the two-year sample period. The dependent variable and control variables are identical to those used in [Table 2](#). The results in

Table 4 also indicate a negative relationship between Ant Forest participation and ESG investments when participation is proxied by *Redeem Grams*. The economic magnitudes of the *Redeem Grams* coefficients are smaller than those obtained for *Collect Grams* in Table 2 (and even smaller than those for *Produce Grams*), with the coefficients on *Collect Grams* being 3.85 to 9.72 times larger than those on *Redeem Grams* on the extensive margin and 5.04 to 6.38 times larger on the intensive margin. In terms of statistical significance, the *Redeem Grams* coefficients are significant at the 1% level in all OLS specifications, but are less consistently significant in some probit specifications.

We also perform a principal component analysis (PCA) on the eight subcategories of badges redeemed in Ant Forest. As reported in Table IC.7 in the Internet Appendix, the first principal component (PC1) explains 66.7% of the total variation—nearly twice that of PC2—and places a dominant loading on *Tree (Person)* (0.483), with all other badge categories loading at 0.031 or below. This pattern indicates that PC1 primarily captures the most central environmental action, namely individual tree planting. Table IC.8 in the Internet Appendix examines the relationship between this common component and ESG investments. We find that investors with higher PC1 scores allocate a smaller share of their portfolios to ESG funds: the coefficients on *PC1* are negative in all specifications and statistically significant at the 1% in all specifications on the intensive margin.

Overall, results on green point redemption parallel those for green point collection, displaying a similar substitution effect, whereby higher redemption activity—whether for badges that require consuming points or for those that do not—is associated with reduced ESG investment, both on intensive and extensive margins.

4.3.3 Summary of Different Measures Based on Green Points

Using *Collect*, *Produce*, and *Redeem*, we find a robust negative relationship between Ant Forest participation and ESG investments across all three measures. However, *Collect* yields effects of larger magnitude and more consistent statistical significance than the other two measures. In addition, *Collect* has the cleanest interpretation as a measure of contributions to environmental protection. Owing to both its cleaner interpretation and more robust results, we focus on the

collection of green points as our primary measure in the subsequent analysis. Results based on the production and redemption of green points are reported in the Internet Appendix for the main results and are available upon request for the remaining analyses.

4.4 Robustness Checks

We conduct three sets of robustness checks based on alternative sample constructions. First, we remove outliers in green-point variables instead of winsorizing them. Second, we exclude funds without Morningstar ratings rather than assigning them a zero value in the ESG fund classifications. Third, we examine a sample of users who are active in generating green points but less-active in planting trees through Ant Forest.

We begin by addressing potential bias arising from extreme values in green-point activities. Anecdotal evidence suggests that exceptionally high levels of green-point accumulation may be associated with the use of “cheating” tools (Lau and Shan, 2024). Consistent with this concern, [Table IB.1](#) in the Internet Appendix shows that the maximum frequency of green-point-generating behaviors in each subcategory is substantially larger than the corresponding 99th percentile, indicating that a small subset of users—those above the 99th percentile—engage in unusually intensive green-point generation. Although such behaviors are rare, including these extreme observations may bias the estimates.

In the main analysis, we mitigate the influence of extreme values by winsorizing each subcategory of green-point production, badge redemption, collection, and robbing at the 99th percentile. As a robustness check, we instead exclude users whose accumulated green points exceed 1.1 times the 99th percentile in at least one of the green-point or badge-related activities. [Table IC.9](#) in the Internet Appendix reports the results. This procedure leads to a nontrivial reduction in sample size: the full sample decreases from 179,997 to 136,845 users, and the subsample of ESG investors declines from 91,047 to 69,580. Nevertheless, the substitution effect between *Collect Grams* and ESG investments presented in Panel A remains robust in the outlier-excluded sample, indicating that our main findings are not driven by extreme green-point behaviors. Results using *Produce*

Grams and *Redeem Grams* are robust: all coefficients are negative. While results on the extensive margin are statistically insignificant in general, results on the intensive margin remain statistically significant at a 1% level in all specifications.

Second, we address the missing values in Morningstar sustainable ratings using an alternative approach. Not all funds in Morningstar are assigned sustainable ratings or indicators. Specifically, 10.62%, 52.47%, and 21.88% of the entire Morningstar Chinese domestic fund sample lack information on the Sustainable Overall Indicator, Globes, and Low Carbon Designation (LCD), respectively. In the main analysis, we classify funds without the relevant information as non-ESG funds in the corresponding category.

As a robustness check reported in [Table IC.10](#) in the Internet Appendix, we restrict the sample to funds with the corresponding Morningstar indicator and aggregate individual investments accordingly. (All funds have a name; hence no robustness check for ESG name.) The substitution effect remains robust: all coefficients are negative and statistically significant at the 1% level on the intensive margin. On the extensive margin, results using *Collect Grams* are significant at the 1% level for the Sustainable Overall and LCD, and at the 10% level for Globes. Results using *Produce Grams* are significant at the 5% level for all three ESG indicators, while results using *Redeem Grams* are significant at the 10% level for the Sustainable Overall and at the 5% level for Globes.

Third, we examine a sample of less-active Ant Forest users. Specifically, we focus on investors who actively produce green points—based on the same criteria used for the active sample (see [Section IA.1](#))—but do not redeem any trees or reserve badges during the sample period, most likely because they do not accumulate sufficient green points. The median number of collected green points is 668 for the less-active sample and 24,448 for the active Ant Forest sample, corresponding to 1.42% and 24.99% of the respective median levels of produced green points. [Table IC.11](#) in the Internet Appendix reports results using *Collect Grams* and *Produce Grams*. By construction, we do not report results using *Redeem Grams*, as less-active users do not redeem tree or reserve badges.

Overall, we continue to observe a substitution effect between environmental protection actions and ESG investments, although statistical significance is confined to the intensive margin. Notably,

the magnitude of the substitution effect is larger than that observed in the active Ant Forest sample. This pattern suggests that users who collect fewer green points exhibit a stronger substitution effect, consistent with the larger effects among individuals with higher marginal costs of labor, as documented in Section 5.

The persistence of the substitution effect among less-active Ant Forest users is consistent with a “value-alignment,” rather than an “impact-seeking,” interpretation of ESG investing (Bonnefon et al., 2025), as well as the “warm-glow” motive emphasized in Heeb et al. (2023). That is, investors appear to derive utility from the pro-social nature of the action itself, rather than from the objective environmental impact it generates. While we do not exclude the “impact-seeking” motivation, results using the less-active Ant Forest suggests that even without generating much real environmental protection projects, i.e., the trees or reserves, individuals who collecting green points in Ant Forest also make less ESG investment.

5 Mechanism: Labor-Capital Tradeoff

In this section, we test the mechanism based on the tradeoff between labor and capital in environmental protection to explain the substitution effect documented in section 4. Our model predicts that individuals with a higher marginal cost of money than labor engage in environmental protection through actions (labor), whereas those with a higher marginal cost of labor than money do so through ESG investments. We test this prediction by examining heterogeneous effects across users with different wealth levels, portfolio Sharpe ratios, and green-point–badge redemption ratios.

5.1 Marginal Cost of Money

5.1.1 Wealth

Our model predicts that the division between environmental protection via action and via financial investments among different people arises from the difference in their marginal costs of money to labor. Assuming decreasing returns to scale, rich people have a lower marginal cost of money. In

this subsection, we begin our analysis by estimating the effect of wealth, captured by the variable *Wealth (Yu'e Bao)*, which measures cash-equivalent assets held on Alipay and serves as a proxy for an individual's wealth level.

[INSERT [Table 5](#) AROUND HERE]

Panel A of [Table 5](#) reports the results. The table shows that individuals with higher cash-equivalent assets exhibit a larger substitution effect on the extensive margin, although the estimated coefficients are not statistically significant. Conditional on making ESG investments, wealthier individuals display a smaller substitution effect on the intensive margin, with coefficients that are statistically significant at the 5% level when using the Sustainable Fund Indicator in columns (1) and (2), and at the 1% level for the remaining columns.

In terms of economic magnitude, the coefficients on the interaction term between *Collect Grams* and *Wealth (Yu'e Bao)* are sizable. Focusing on the statistically significant results on the intensive margin, the coefficients on the interaction term are 2.29, 2.88, 2.04, and 2.21 times as large as the coefficients on *Collect Grams* alone in columns (2), (4), (6), and (8), respectively. Because the factors are larger than 1.0, it implies that the relationship between *Collect Grams* and ESG investments becomes positive for individuals in the upper range of the wealth distribution in our sample. That is, for very rich investors, those who contribute more to Ant Forest also invest more in ESG funds.

Using the sustainable fund indicator in column (2) as an example, we find that, holding *Collect Grams* constant, moving from the 25th percentile to the 50th percentile of *Wealth (Yu'e Bao)* leads to a 1.59% increase in the share of capital allocated to ESG funds ($\frac{40000.02-13842.48}{10^6} \times 60.71$), which is approximately one-third of the sample overall share. Moving from the 50th percentile to the 75th percentile of *Wealth (Yu'e Bao)* results in a 3.66% increase in the ESG allocation share ($\frac{100250.61-40000.02}{10^6} \times 60.71$), corresponding to about 80% of the sample overall share.

Turning to the coefficients on *Collect Grams*, they remain negative across all specifications, with magnitudes close to the baseline estimates reported in [Table 2](#). As for *Wealth (Yu'e Bao)* itself, we

find opposite effects on the extensive and intensive margins. Wealthier individuals are less likely to hold ESG funds, but conditional on holding ESG funds, they allocate a larger share of their portfolio to them. Using the sustainable fund indicator in columns (1) and (2) as an example, a one-standard-deviation increase in *Wealth (Yu'e Bao)* is associated with a 1.34 percentage point decrease in the likelihood of investing in ESG funds. In contrast, conditional on investing in ESG funds, a one-standard-deviation increase in *Wealth (Yu'e Bao)* leads to a 0.67 percentage point increase in the share of capital allocated to ESG funds. While the magnitude on the extensive margin is negligible relative to the 51.71% sample share, the effect on the intensive margin amounts to about 15% of the sample overall share (4.55%) and is consistent with Andersen et al. (2023), who show that ESG investments are a luxury good.

Table IC.12 reports results using *Produce* (Panel A) and *Redeem* (Panel B) green points as alternative measures of Ant Forest participation. Results based on *Produce Grams* and its interaction with wealth are largely consistent with those using *Collect Grams* in terms of signs, relative magnitudes, and statistical significance, with only mild differences in the significance of the coefficients on *Produce Grams* itself in columns (1), (3), (5), and (7) (i.e., on the extensive margin). When using *Redeem Grams*, the coefficient before the interaction term with wealth is less statistically significant for the intensive margin and becomes insignificant in column (2). However, in specifications where the coefficients on *Redeem Grams* and its interaction with wealth are statistically significant at the 5% or 1% levels, both the signs and relative magnitudes align closely with those obtained using *Collect Grams*. Overall, the evidence of a substitution effect between environmental protection through actions and through ESG investments, as well as the mitigating role of wealth, is robust across alternative green-point measures, with the strongest and most coherent results obtained using *Collect Grams*.

In addition, the results in Panel A show a difference between the extensive and intensive margins for the effect of wealth. On the extensive margin, the interaction with *Wealth (Yu'e Bao)* is statistically insignificant, and *Collect Grams* also has statistically insignificant or less significant coefficients. Wealth itself emerges as the primary predictor of ESG participation. In contrast, on the intensive margin, *Collect Grams*, *Wealth (Yu'e Bao)*, and their interaction are all statistically sig-

nificant. These patterns suggest that both the substitution effect and the mitigating role of wealth operate mainly through portfolio allocation among individuals who invest in ESG funds, rather than through the decision to make ESG investments. We observe the same pattern for *Collect Grams* and its interaction with *Wealth (Yu'e Bao)* across different ESG fund classifications.

5.1.2 Portfolio Sharpe Ratio

To further support the hypothesis that individuals with a lower marginal cost of money are more willing to invest in ESG funds, we examine how the substitution effect between environmental protection actions and ESG investments varies with investors' portfolio returns, measured by the Sharpe ratio of the portfolios held during the sample period. Conditional on the same level of wealth, investors with higher risk-adjusted returns derive greater utility from monetary resources, and therefore, our model predicts a weaker substitution effect for these individuals.

Panel B of [Table 5](#) reports the results. We find positive coefficients on both the extensive and intensive margins, indicating that higher portfolio returns are associated with weaker substitution effects. Consistent with the wealth results in Panel A, however, we only have statistically significant results on the intensive margin: the coefficients are significant at the 5% level for Globes and ESG name classifications and at the 1% level for Low Carbon Designation. Overall, these findings suggest that investors who manage portfolios with a higher Sharpe ratio—that is, better-performing portfolios after risk adjustments—exhibit a smaller substitution effect between participation in Ant Forest and ESG investments, particularly in terms of the share of capital allocated to ESG funds.

The coefficients on the interaction term between *Collect Grams* and *Sharpe Ratio* are economically sizable. Focusing on the statistically significant results on the intensive margin, the coefficients on the interaction term are 2.03, 2.33, and 1.57 times as large as the coefficients on *Collect Grams* alone in columns (4), (6), and (8), respectively. (The coefficient before the interaction term is statistically insignificant in column (2).) Because the coefficients on the interaction between *Collect Grams* and *Sharpe Ratio* are larger in absolute value than those on *Collect Grams*, it implies that the relationship between *Collect Grams* and ESG investments is positive for individuals whose port-

folio performance lies in the upper range of the distribution – i.e., a complement effect instead of a substitution effect.

Using the Globes classification in column (4) as an example, we find that, holding *Collect Grams* constant, a one-standard-deviation increase in the *Sharpe Ratio* leads to a 7.94 percentage point increase in the share allocated to ESG investments, which corresponds to approximately 43% of the substitution effect itself ($\frac{0.21 \times 37.79}{18.66}$). Finally, the coefficients on *Sharpe Ratio* alone are of the same sign and similar magnitude to those in the baseline regressions reported in [Table 2](#), after accounting for the fact that the Sharpe ratio is scaled by 100 in [Table 2](#).

Moreover, mirroring the results on the mitigating role of wealth, results in Panel B also show differences between the extensive and intensive margins when examining the mitigating role of portfolio returns in the substitution effect. While the effect of portfolio performance is not statistically significant on the extensive margin, it is consistently significant on the intensive margin across ESG indicators. In addition, [Table IC.13](#) reports the results using *Produce Grams* and *Redeem Grams* which are consistent with results using *Collect Grams*, with slight differences in statistical significance in some specifications.

Taken together, in both the analysis of wealth and portfolio return, on the intensive margin, we find that among investors with higher wealth levels or portfolio Sharpe ratios, the substitution effect between Ant Forest participation and ESG investments is smaller. For investors in the upper range of the wealth level or Sharpe ratio distribution, this mitigating effect exceeds the substitution effect itself, implying that greater Ant Forest contributions are associated with higher ESG investment shares among these individuals.

5.2 Marginal Cost of Labor

Mirroring the analysis of decreasing returns to capital, we test the labor–capital tradeoff in this subsection by examining the role of labor in the substitution effect between environmental protection actions and financial investments. As discussed in [section 2](#), participation in Ant Forest primarily requires individual labor through the daily production and collection of green points. Our model

predicts that individuals with a higher marginal cost of labor—those who place a higher value on their time—exhibit a stronger substitution effect, as they require greater compensation to supply the same amount of labor input.

One distinctive feature of Ant Forest is that the number of green points required to redeem different types of badges varies substantially. In particular, the app is mechanically designed such that redeeming a tree badge requires dramatically more green points in order to limit the number of trees planted, since each real tree is ultimately planted by Alipay and entails a capital cost. Consequently, the amount of labor required from Ant Forest users differs markedly across badge types. As shown in [Table IB.2](#), tree badges require substantially higher green-point consumption—more than 90 times that of other categories.

We exploit this feature of the app by constructing two badge redemption ratio variables. The first is the *Badge–Green-Point Ratio*, defined as the number of badges a user redeems divided by the total number of green points consumed during the sample period. The second is the *% of Non-Trees*, defined as the number of green points a user redeems for non-tree badges divided by the total number of green points redeemed for all badges during the sample period. Higher values of either badge redemption measure indicate a higher marginal cost of labor for the user.

[INSERT [Table 6](#) AROUND HERE]

[Table 6](#) reports results on how the two badge redemption ratio variables affect the substitution effect. Panel A interacts *Collect Grams* with the *Badge–Green-Point Ratio*. On the intensive margin, the coefficients on the interaction term between *Badge–Green-Point Ratio* and *Collect Grams* are negative and statistically significant at the 1% level in column (2) using the Morningstar sustainable indicator, and at the 5% level in the remaining columns. For example, in column (2), holding *Collect Grams* constant, a one-standard-deviation increase in the *Badge–Green-Point Ratio* leads to an 11.52% increase in the substitution effect, corresponding to 68% of the substitution effect itself ($\frac{0.70 \times 16.46}{17.05}$). On the extensive margin, the coefficients on the interaction term are positive but statistically insignificant. The coefficients on *Collect Grams* remain negative and statistically

significant at the 1% level across all specifications, except in columns (3) and (5) on the extensive margin—using Globes and Low Carbon Designation—where significance is at the 5% level.

Panel B interacts *Collect Grams* with *% of Non-Trees* and delivers similarly robust results. The substitution effect is stronger for individuals with higher values of *% of Non-Trees*. On the intensive margin, the interaction coefficients are negative and statistically significant at the 1% level across all specifications. For instance, in column (2) using the Morningstar sustainable indicator, holding *Collect Grams* constant, a one-standard-deviation increase in *% of Non-Trees* raises the substitution effect by 10.57%, equivalent to 81% of the substitution effect itself ($\frac{24.03 \times 0.44}{13.07}$). On the extensive margin, the interaction terms are positive but statistically insignificant, consistent with Panel A. Coefficients on *Collect Grams* remain negative and highly significant in almost all specifications, with magnitudes close to those in Panel A.

Results using *Produce Grams* are robust and are reported in [Table IC.14](#). Because total green-point redemption and badge redemption ratios are constructed using largely overlapping components, we do not use *Redeem Grams* as an alternative measure in this subsection. Taken together, these robustness checks reinforce our main finding that the substitution effect between environmental protection through actions and through mutual fund investments is stronger among individuals with higher marginal costs of labor.

6 Platform Promotion Events

In this section, we examine how events designed by Ant Forest affect users’ incentives in the tradeoff between labor-led and capital-led environmental protection. Specifically, we study how two prominent and large-scale tree-planting promotional designs influence the substitution effect documented above. The first is certification through formal recognition (“Beautiful China”). The second is a large-scale tree-planting promotion event held annually around Earth Day.

6.1 Beautiful China Certificates

Ant Forest allows users to claim certificates known as “Beautiful China,” which are formally recognized by the Chinese government. Such official recognition of individuals’ contributions to environmental protection provides additional non-monetary incentives to participate and may therefore mitigate the substitution effect between labor-led and financial environmental investments. Importantly, obtaining the certificate does not require additional labor effort beyond redeeming a virtual tree in Ant Forest but merely clicking to apply for the certificate itself. Users who accumulate sufficient green points to redeem a tree within a calendar year are eligible to apply for the certificate. In addition, the certificate itself does not generate any additional environmental impact and thus only serves as a certification role for the user.

The ideal experiment to identify the effect of certification would randomly assign some users to receive the certificate while withholding it from others. Although individual incentives to claim the certificate undoubtedly play a role—signaling that users who value recognition may be more likely to apply—there is also a degree of randomness stemming from platform design. The certificate option is not prominently displayed on the app’s main interface, and some users may simply be unaware of its availability. In the absence of random assignment, we adopt a quasi-experimental approach. Specifically, we control for the number of “Beautiful China” certificates claimed by each user and compare differences in the substitution effect between users who have obtained the certificate and those who have not. Users who hold at least one certificate are treated, while those without certificates serve as the control group.

[INSERT [Table 7](#) AROUND HERE]

[Table 7](#) presents the results. On the extensive margin, the coefficients on the interaction between *Collect Grams* and *Beautiful China* exhibit mixed signs across specifications and are statistically insignificant. In contrast, on the intensive margin, the interaction coefficients are positive and statistically significant at the 10% level in columns (2), (6), and (8), and at the 5% level in column

(4) when Globes are used. The magnitudes of these coefficients are similar across specifications, ranging from 2.63 to 2.96. These results suggest that for individuals who obtain more “Beautiful China” certificates, the substitution effect between environmental protection actions and the share of capital allocated to ESG funds is attenuated. For example, using Globes in column (4), a one-standard-deviation increase in *Beautiful China* is associated with a 3.70% increase in the ESG investment share, corresponding to 15.11% of the substitution effect itself ($\frac{1.25 \times 2.96}{24.49}$).

Table IC.15 reports robustness results using *Produce Grams* in Panel A and *Redeem Grams* in Panel B. The results are qualitatively similar to those using *Collect Grams* in Table 7. In particular, the interaction coefficients with *Beautiful China* remain positive and statistically significant on the intensive margin—at the 1% level in all specifications—while results on the extensive margin are positive but statistically insignificant.

Taken together, these findings indicate that receiving a well-recognized environmental certificate—“Beautiful China”—reduces the substitution effect between environmental protection through actions and the share of capital allocated to mutual fund investments (i.e. the intensive margin). The results are robust across alternative measures of Ant Forest participation and ESG fund classifications.

6.2 Earth Day Events

Ant Forest holds large-scale tree planting events to the level of several millions of trees on the Earth Day each year.¹³ Such events can largely promote public’s awareness and proundness of environmental protection via Ant Forest and thus may change the substitution effect between environmental protection actions and financial investments we document.

In this subsection, we employ a Difference-in-differences (DID) specification as an extension to the baseline specifications in Equation 1 and Equation 2 to study the impact of the annual Earth Day Event. We use the following specifications,

¹³<https://www.techinasia.com/news/alipay-ant-forest-marks-600m-trees-milestone-on-earth-day>.

$$\Pr(\text{ESG}_{i,t}) = \Phi(\alpha + \beta \text{GreenPoints}_{i,t} + \text{GreenPoints}_{i,t} \times \text{Post}_{i,t} + \text{Post}_{i,t} + X'_{i,t}\Gamma + \alpha_c + \varepsilon_i) \quad (3)$$

$$\text{ESGShare}_{i,t} = \alpha + \beta \text{GreenPoints}_{i,t} + \text{GreenPoints}_{i,t} \times \text{Post}_{i,t} + \text{Post}_{i,t} + X'_{i,t}\Gamma + \alpha_c + \varepsilon_i, \quad (4)$$

where $\Pr(\text{ESG}_{i,t})$ is the probability that the investor i holds at least one ESG fund, and $\text{ESGShare}_{i,t}$ denotes the proportion of the mutual fund portfolio of the investor i , measured by the maximum of the monetary value during the corresponding post/before period, that is allocated to ESG funds. $\text{GreenPoints}_{i,t}$ denotes the user's Ant Forest green points actions, $X_{i,t}$ includes the full set of portfolio- and individual-level controls as in the baseline specifications, and α_c denotes city fixed effects. $\text{Post}_{i,t}$ equals one for periods after Earth Day through December of each year, and zero for periods from January through Earth Day.

Except for demographic controls, all variables are calculated as the accumulation during period t . To be more specific, we split the sample period each year into two parts, one before the Earth Day and one after the Earth Day. For 2023, the before event period is from January to March and the post event period is from April to December. For 2024, the before event period is from January to April and the post event period is from May to December. The difference is based on the month when Ant planted the millions of trees. In the placebo test, the before event period is from August 2023 to January 2024 and the post event period is from February 2024 to October 2024. Take the before event period in 2023 as an example, we calculate the accumulated number of green points during January 2023 to March 2023. Other variables are calculated in the same way.

In this way, [Equation 3](#) and [Equation 4](#) estimate the difference in the substitution effect between the periods before and after the Earth Day event, and therefore can show how the substitution effect is impacted by the large-scale tree planting events.

[INSERT [Table 8](#) AROUND HERE]

[Table 8](#) presents the results. Panel A reports estimates for the Earth Day event in 2023 and

shows strong effects on both the extensive and intensive margins, with opposite signs across the two margins. On the extensive margin, the coefficients on the interaction between *Collect Grams* and *Post* are negative and statistically significant at the 5% level across all specifications (columns (1), (3), (5), and (7)), indicating that the substitution effect becomes stronger after the Earth Day promotion. Although the coefficients on *Collect Grams* alone are positive, the sum of the coefficient on *Collect Grams* and its interaction with *Post* is negative in all specifications, implying that the net relationship between Ant Forest participation and ESG investment remains a substitution effect.

On the intensive margin, the interaction coefficients between *Collect Grams* and *Post* are positive and statistically significant at the 1% level in all specifications, suggesting that the substitution effect on the share of ESG investments weakens after the Earth Day event. The coefficients on *Collect Grams* are negative and statistically significant at the 1% level and larger in magnitude than the positive interaction terms, resulting in a negative sum of the two coefficients. Thus, the net effect on the intensive margin also remains a substitution effect.

Panel B reports results for the Earth Day event in 2024, which are weaker than those for 2023. In columns (1)–(4), where ESG funds are classified using the Morningstar Sustainable Investment indicator and Globes ratings, the interaction coefficients between *Collect Grams* and *Post* are statistically insignificant. In columns (5)–(8), where ESG funds are classified using the Low Carbon Designation and ESG-name criteria, the interaction coefficients are positive and statistically significant at the 5% level in column (6) and at the 10% level in columns (5) and (7). These results provide some evidence of a narrowing substitution effect following the 2024 Earth Day promotion. The coefficients on *Collect Grams* remain negative across all specifications, statistically significant at the 1% level on the intensive margin and at the 10% level in column (1) and 5% level in columns (5) and (7). As in 2023, the sum of the two coefficients is negative in all cases, indicating a net substitution effect between Ant Forest participation and ESG investment.

Panel C presents a placebo test in which the post-event cutoff is set to a hypothetical date—January 2024—instead of Earth Day. We do not observe systematic patterns in the interaction coefficients between *Collect Grams* and *Post*, suggesting that the moderating effects observed in Panels A and

B are not driven by mechanical features of the difference-in-differences specification.

Results based on *Produce Grams* are robust and reported in [Table IC.16](#). For the 2023 Earth Day event, we find negative coefficients on the interaction between *Produce Grams* and *Post* on the extensive margin, indicating a stronger substitution effect after the event. In contrast, on the intensive margin, the interaction coefficients are positive, implying a weaker substitution effect following Earth Day. All of these estimates are statistically significant at the 1% level. For the 2024 Earth Day event, the interaction coefficients are again positive on the intensive margin, with statistical significance at the 1% level in columns (2), (6), and (8), where ESG funds are classified using the overall Sustainable Investment indicator, Low Carbon Designation, and ESG fund names.

Results using *Redeem Grams* yield mixed signs and are statistically insignificant for both Earth Day events. These weaker findings likely reflect the longer time horizon required to accumulate sufficient green points to redeem badges, which limits the ability of the *Post* indicator to capture short-run responses to Earth Day promotions. For brevity, these results are not reported but are available upon request.

Regarding differences across ESG classifications, the results in this subsection suggest that individual investors are more responsive to direct ESG indicators, such as the Morningstar Sustainable Investment measure and fund names. In addition, results based on the Low Carbon Designation are generally more statistically significant, consistent with Ant Forest's primary focus on carbon reduction.

Finally, mirroring the moderating effects documented for wealth, portfolio returns, badge redemption ratios, and certification, the impact of Earth Day events on the substitution effect operates primarily on the intensive margin. Overall, while the substitution effect between environmental protection actions and ESG investments persists, it is attenuated following Earth Day promotions. However, the mitigating effect of Earth Day events does not fully overturn the substitution effect.

7 Conclusion

This paper provides novel evidence on the relationship between real-world environmental protection and financial green investment using unique microdata from Ant Group’s Alipay platform. Leveraging the coexistence of Ant Forest, a large-scale gamified environmental protection initiative, and Ant Fortune, China’s leading mutual fund distribution platform, we show that individual environmental actions and sustainable financial investments act largely as substitutes rather than complements. Our findings advance the literature on household sustainable finance by highlighting that environmental preferences are not unidimensional. Instead, individuals appear to balance their contributions across domains, allocating effort either through lifestyle actions or financial portfolios, but rarely both simultaneously. This sheds light on the behavioral foundations of household ESG demand and helps explain the mixed evidence in prior research.

From a policy perspective, our results caution against assuming that promoting pro-environmental lifestyles will automatically translate into stronger ESG investment demand. If anything, lifestyle engagement may crowd out sustainable finance participation. Policymakers and financial institutions aiming to mobilize retail capital for the low-carbon transition should recognize this substitution channel and design instruments that integrate, rather than compete with, individuals’ real-world environmental commitments.

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Appendix: Figures

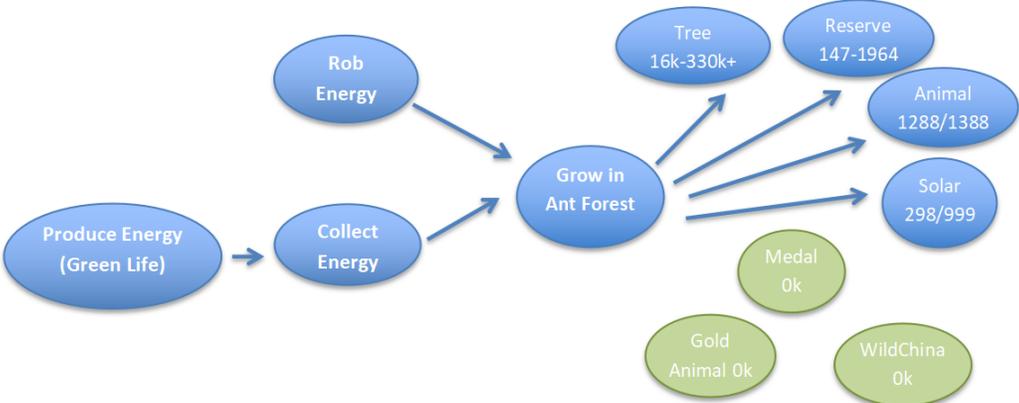
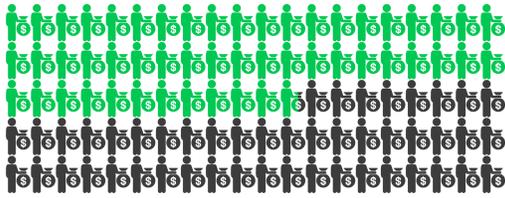


Figure 1: Structure of Ant Forest

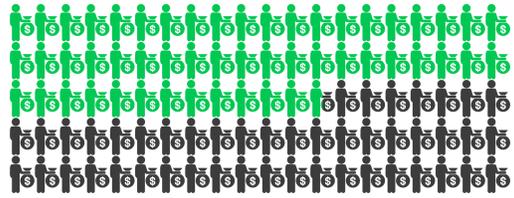
Note: This figure shows the relationship between different actions (i.e., produce, collect, rob, and redeem green points) when using Ant Forest.

51.71% of investors invest in mutual funds that are marked as "Sustainable" by Morningstar



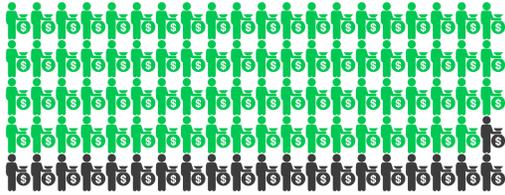
(a) Sustainable (Investors)

52.50% of investors invest in mutual funds that are marked as "Globe 4 or 5" by Morningstar



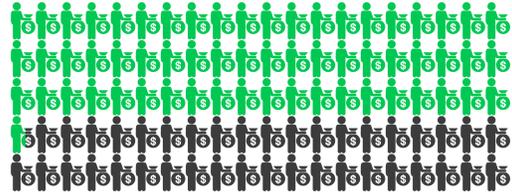
(b) Globe 4 or 5 (Investors)

79.01% of investors invest in mutual funds that are marked as "Low Carbon Design" by Morningstar



(c) Low Carbon Design (Investors)

60.56% of investors invest in mutual funds that contain green keywords



(d) ESG Name (Investors)

4.55% of investor's money are invested in mutual funds that are marked "Sustainable" by Morningstar



(e) Sustainable (Money)

3.65% of investor's money are invested in mutual funds that are marked "Globe 4 or 5" by Morningstar



(f) Globe 4 or 5 (Money)

16.88% of investor's money are invested in mutual fund that is marked "Low Carbon Design" by Morningstar



(g) Low Carbon Design (Money)

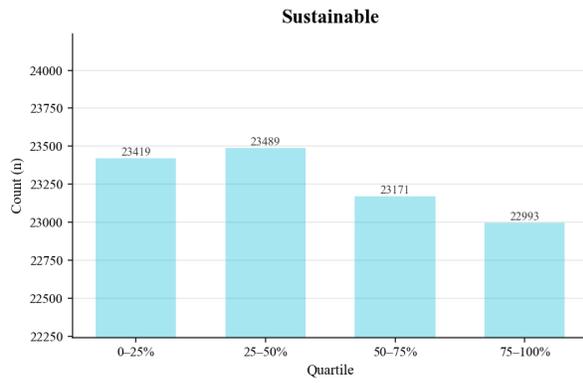
7.31% of investor's money are invested in mutual funds that contain green keywords



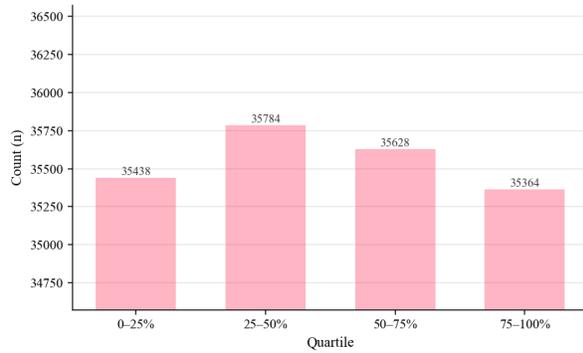
(h) ESG Name (Money)

Figure 2: Aggregate Share of ESG Investments

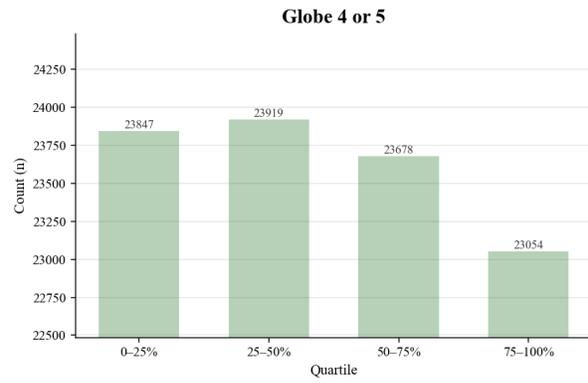
Note: This figure plots ESG investments across four classifications (Sustainable, Globes 4 or 5, Low Carbon Design, and ESG fund name). Upper panels report the share of investors who hold at least one ESG-labeled fund. Lower pannels report the share of money invested in ESG-labeled funds in the entire sample. Green icons represent ESG investments, while gray icons represent non-ESG investments.



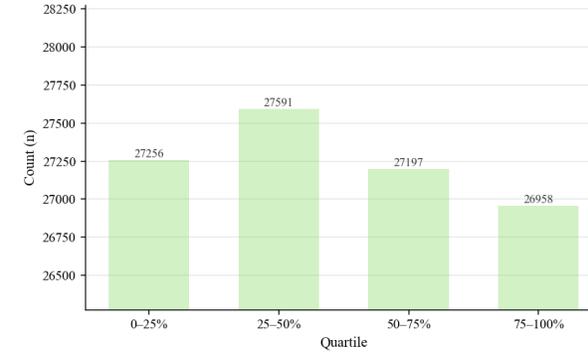
(a) Sustainable (N. Investors)
Low Carbon Designation



(c) Low Carbon Designation (N. Investors)



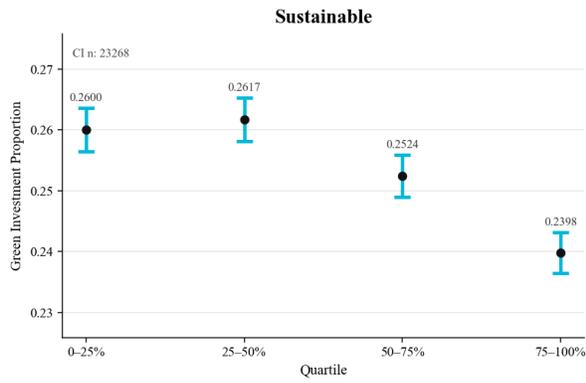
(b) Globe 4 or 5 (N. Investors)
ESG Name



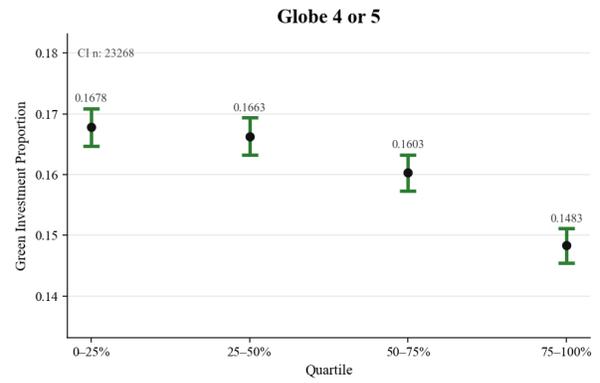
(d) ESG Name (N. Investors)

Figure 3: Collecting Green Points and Number of ESG investors

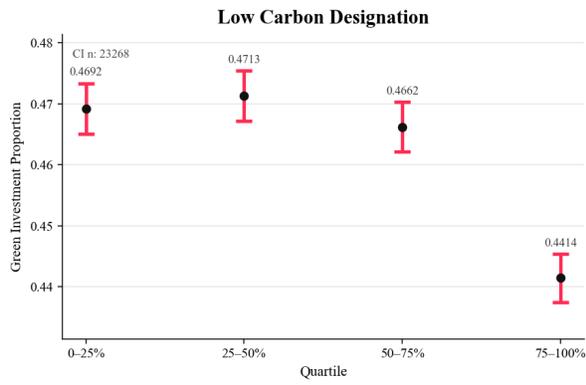
Note: This figure plots the relationship between investors' collected green points and the number of investors who invest in at least one ESG fund. The x-axis groups investors into quartiles of collected green points (from the first quartile to the third quartile). Each panel report the number of ESG investors in each quartile for each ESG classification (i.e., Sustainable, Globe 4 or 5, Low Carbon Designation, and ESG Name).



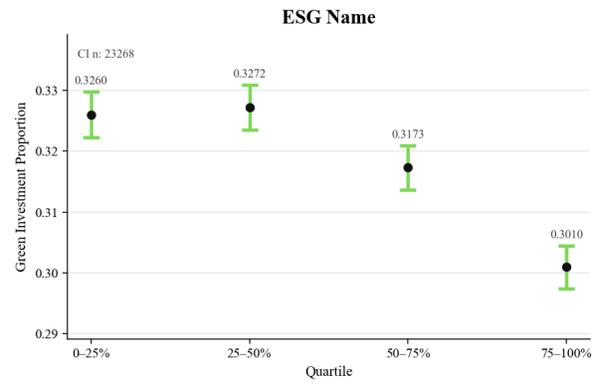
(a) Sustainable (% Money)



(b) Globe 4 or 5 (% Money)



(c) Low Carbon Designation (% Money)



(d) ESG Name (% Money)

Figure 4: Collecting Green Points and % ESG Investments

Note: This figure plots the relationship between investors' collected green points and the proportion of money value allocated into ESG investments. The x-axis groups investors into quartiles of collected green points (from the first quartile to the third quartile). Each panel reports the mean ESG investment proportion in each quartile and its 95% confidence interval for each ESG classification (i.e., Sustainable, Globe 4 or 5, Low Carbon Designation, and ESG Name).

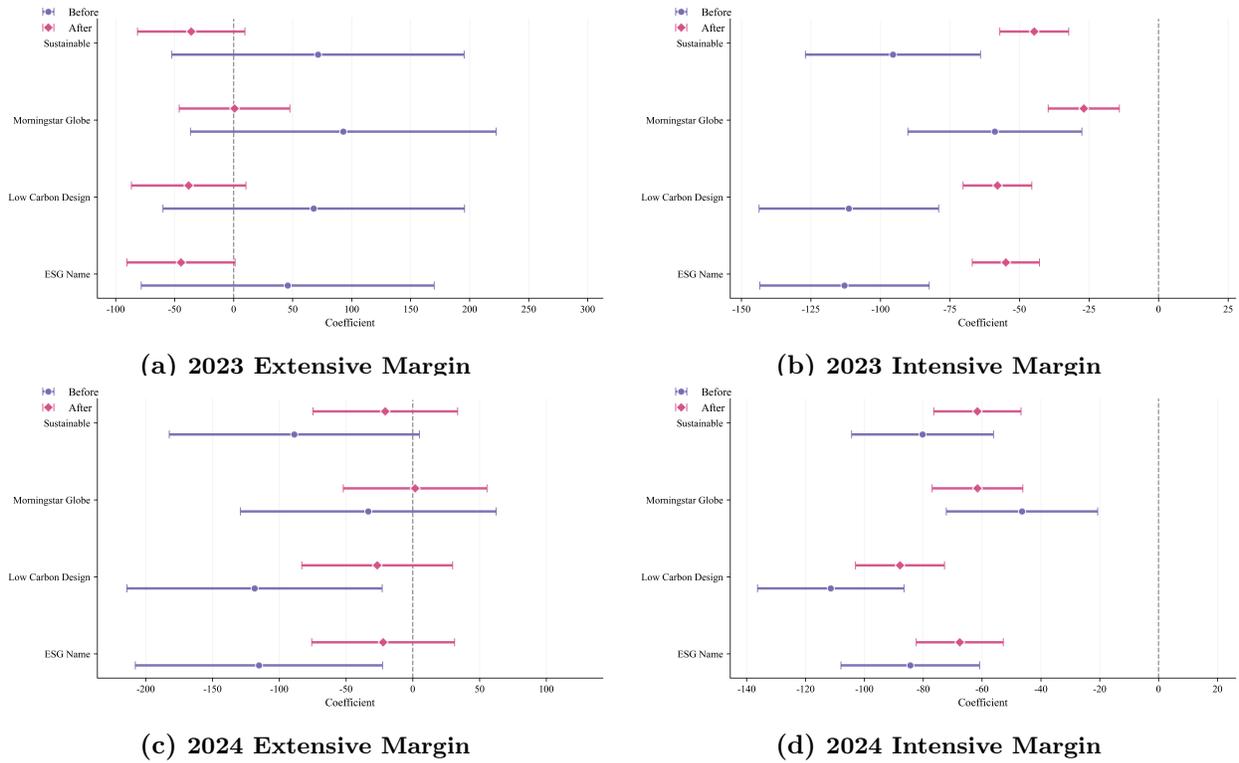


Figure 5: The Impact of Earth Day Event On the Substitution Effect

Note: This figure plots the point estimates, with 95% confidence intervals, of the relationship between investors' collected green points and ESG investments. Using the 2023 Earth Day Event as the before-after cutoff, panel (a) plots the coefficients in the Probit regression where the dependent variable is a dummy that equals one if the investor holds at least one ESG fund and zero otherwise, and panel (b) plots the coefficients in the OLS regression where the dependent variable is the proportion of money in ESG funds conditional on the subsample of investors holding at least one ESG fund. Panels (c) and (d) plot the coefficients in regressions mirroring panels (a) and (b) using the 2024 Earth Day Event as the before-after cutoff.

Table 1: Summary Statistics for Key Variables – Active Users

This table reports summary statistics for variables used in the following regression analysis. The sample consists of 180,000 active users from January 2023 to December 2024. Detailed variable definitions and sample construction procedures are provided in [subsection IA.1](#). Green point variables are already winsorized at the 99th percentile (i.e., those directly used in the regressions).

Variables	Num	Mean	S.d.	Min	5th	25th	50th	75th	95th	Max
Panel A: Dependent Variables										
Sustainable (Dummy)	180000	0.52	0.50	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Sustainable (Proportion)	180000	0.13	0.23	0.00	0.00	0.00	0.00	0.16	0.70	1.00
Globes 4 or 5 (Dummy)	180000	0.52	0.50	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Globes 4 or 5 (Proportion)	180000	0.12	0.22	0.00	0.00	0.00	0.00	0.16	0.65	1.00
Low Carbon (Dummy)	180000	0.79	0.41	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Low Carbon (Proportion)	180000	0.38	0.35	0.00	0.01	0.01	0.31	0.64	1.00	1.00
ESG Name (Dummy)	180000	0.61	0.49	0.00	0.00	0.00	1.00	1.00	1.00	1.00
ESG Name (Proportion)	180000	0.19	0.27	0.00	0.00	0.00	0.06	0.28	0.88	1.00
Panel B: Green Points Generation in Alipay (Grams)										
Collect Grams	180000	37263.19	39820.07	0.00	671.00	6684.00	24448.00	54703.00	118263.50	196029.11
Rob Grams	180000	28099.90	63592.34	0.00	0.00	120.00	1678.50	22065.25	155385.15	382493.30
Produce Grams	180000	133162.75	116411.51	1848.00	23672.00	56850.00	97824.50	168955.75	368127.20	873864.64
Panel C: Badge Redemptions in Ant Forest (Grams unless noted)										
Redeem Grams	180000	99905.43	173228.80	0.00	0.00	5027.00	27745.00	108651.25	458227.44	1425298.60
Tree Person	180000	52903.07	92081.33	0.00	0.00	0.00	19680.00	58442.00	235941.10	543265.58
Tree Cooperation	180000	38370.15	111034.30	0.00	0.00	0.00	0.00	0.00	230460.00	715650.90
Reserve	180000	3249.91	5758.34	0.00	0.00	0.00	936.00	3928.00	13653.15	35958.12
Animal	180000	2115.46	7722.42	0.00	0.00	0.00	0.00	0.00	12880.00	47580.00
Solar	180000	3266.84	11490.11	0.00	0.00	0.00	0.00	894.00	16986.00	82844.00
Beautiful China (N)	180000	0.77	1.25	0.00	0.00	0.00	0.00	1.00	3.00	6.00
Gold Animal (N)	180000	0.13	0.61	0.00	0.00	0.00	0.00	0.00	1.00	4.00
Patrol Medal (N)	180000	0.66	1.64	0.00	0.00	0.00	0.00	0.00	4.00	9.00
Panel D: Financial Characteristics & Demographics										
Total Money	180000	177694.34	323483.12	1.00	12557.89	45000.75	84457.61	196970.27	632264.19	2.80E+07
Return	180000	-0.00	0.03	-10.21	-0.03	-0.00	0.00	0.00	0.01	50.04
Sharpe Ratio	180000	0.12	0.21	-2.95	-0.45	0.21	0.11	0.00	0.19	1.49
Morningstar Rating	180000	3.87	0.74	0.00	2.77	3.33	3.88	4.50	5.00	5.00
Risk Level	180000	2.55	1.58	-2.00	-1.00	2.00	3.00	4.00	4.00	5.00
Age	180000	35.50	9.31	20.00	24.00	29.00	33.00	40.00	54.00	82.00
Female	180000	0.49	0.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00
Registered Years	180000	11.54	3.24	2.00	6.84	9.26	11.17	13.59	17.60	20.10

Table 2: Collecting Green Points and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between collecting green points in Ant Forest and sustainable investment in Ant Fortune. The dependent variables are a dummy variable that equals to one if the individual invests in at least one ESG fund (odd columns) and the proportion of money an individual invested in ESG funds conditional on at least one ESG fund investment (even columns). More specifically, ESG funds are identified using Morningstar Sustainable Indicator (columns (1), (2)), Globes 4 or 5 (columns (3), (4)), Low Carbon Designation (columns (5), (6)), and ESG name (columns (7), (8)), respectively. The independent variable of interest is *Collect Grams* (unit: grams of green points) which is the total number of green points a user collected in Ant Forest during the sample period from January 2023 to December 2024. For demonstration purposes, *Collect Grams* and *Rob Grams* are divided by 10^8 , *Total Money* by 10^6 , and other control variables by 100. Detailed sample and variable construction in [subsection IA.1](#). All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Environmental protection</i>								
Collect Grams	-28.77*** (9.23)	-21.87*** (2.60)	-20.35** (9.40)	-21.71*** (2.51)	-28.38*** (10.84)	-35.89*** (2.54)	-31.99*** (9.41)	-27.94*** (2.53)
Rob Grams	2.76 (5.66)	0.84 (1.54)	-11.89** (5.76)	-2.43 (1.51)	-1.12 (6.70)	-0.18 (1.54)	1.79 (5.79)	1.06 (1.50)
<i>Portfolio characteristics</i>								
Sharpe Ratio	5.99*** (1.48)	-6.17*** (0.64)	94.65*** (1.59)	20.10*** (0.63)	95.10*** (1.65)	16.33*** (0.55)	4.45*** (1.47)	-12.59*** (0.61)
Morningstar Rating	-44.32*** (0.42)	4.68*** (0.15)	-52.31*** (0.43)	1.01*** (0.14)	-66.57*** (0.50)	-6.06*** (0.13)	-53.08*** (0.43)	1.83*** (0.14)
Total Money	13.68*** (1.02)	-6.80*** (0.64)	38.01*** (1.18)	-5.43*** (0.51)	10.10*** (1.31)	-8.75*** (0.66)	14.50*** (1.07)	-7.42*** (0.62)
<i>Individual characteristics</i>								
Registered Years	-1.73*** (0.10)	-0.40*** (0.03)	-1.57*** (0.10)	-0.29*** (0.03)	0.32*** (0.12)	-0.37*** (0.03)	-1.34*** (0.10)	-0.48*** (0.03)
Female	-14.39*** (0.62)	-5.82*** (0.18)	-18.23*** (0.63)	-6.29*** (0.17)	-24.94*** (0.74)	-8.70*** (0.17)	-14.61*** (0.64)	-6.40*** (0.17)
Age	-0.35*** (0.04)	-0.12*** (0.01)	-0.40*** (0.04)	0.02* (0.01)	-0.90*** (0.04)	-0.21*** (0.01)	-0.64*** (0.04)	-0.18*** (0.01)
Risk Level	4.16*** (0.20)	-0.87*** (0.06)	4.49*** (0.20)	-0.54*** (0.06)	6.07*** (0.23)	-0.43*** (0.06)	4.97*** (0.20)	-0.84*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 3: Producing Green Points and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between producing green points via Alipay and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variable of interest is *Produce Grams* (unit: grams of green points) which is the total number of green points a user produced using Alipay during the sample period from January 2023 to December 2024. For demonstration purposes, *Produce Grams* is divided by 10^8 , *Total Money* by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Environmental protection</i>								
Produce Grams	-6.25** (2.66)	-7.16*** (0.75)	-9.79*** (2.71)	-8.28*** (0.72)	-7.69** (3.13)	-11.17*** (0.73)	-7.37*** (2.71)	-8.73*** (0.72)
<i>Portfolio characteristics</i>								
Sharpe Ratio	6.00*** (1.48)	-6.20*** (0.64)	94.69*** (1.59)	20.09*** (0.63)	95.13*** (1.65)	16.30*** (0.55)	4.48*** (1.47)	-12.62*** (0.61)
Morningstar Rating	-44.33*** (0.42)	4.68*** (0.15)	-52.30*** (0.43)	1.01*** (0.14)	-66.56*** (0.50)	-6.07*** (0.13)	-53.08*** (0.43)	1.82*** (0.14)
Total Money	13.67*** (1.02)	-6.80*** (0.64)	37.99*** (1.18)	-5.43*** (0.51)	10.08*** (1.31)	-8.75*** (0.66)	14.48*** (1.07)	-7.42*** (0.62)
<i>Individual characteristics</i>								
Registered Years	-1.70*** (0.10)	-0.39*** (0.03)	-1.58*** (0.10)	-0.28*** (0.03)	0.36*** (0.12)	-0.35*** (0.03)	-1.30*** (0.10)	-0.46*** (0.03)
Female	-14.20*** (0.62)	-5.83*** (0.18)	-18.39*** (0.63)	-6.32*** (0.17)	-24.76*** (0.74)	-8.70*** (0.17)	-14.41*** (0.64)	-6.40*** (0.17)
Age	-0.40*** (0.03)	-0.13*** (0.01)	-0.41*** (0.04)	0.01 (0.01)	-0.95*** (0.04)	-0.22*** (0.01)	-0.69*** (0.04)	-0.19*** (0.01)
Risk Level	4.14*** (0.20)	-0.88*** (0.06)	4.48*** (0.20)	-0.54*** (0.06)	6.05*** (0.23)	-0.43*** (0.06)	4.96*** (0.20)	-0.84*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 4: Redeeming Green Points and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between redeeming green points in Ant Forest and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variable of interest is *Redeem Grams* (unit: grams of green points) which is the total number of green points a user redeemed in exchange of badges in Ant Forest during the sample period from January 2023 to December 2024. For demonstration purposes, *Redeem Grams* is divided by 10^8 , *Total Money* by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Environmental protection</i>								
Redeem Grams	-3.37*	-3.50***	-5.28***	-4.31***	-2.92	-5.62***	-3.49*	-4.49***
	(1.76)	(0.48)	(1.80)	(0.46)	(2.08)	(0.48)	(1.80)	(0.47)
<i>Portfolio characteristics</i>								
Sharpe Ratio	6.05***	-6.19***	94.74***	20.10***	95.19***	16.30***	4.54***	-12.62***
	(1.48)	(0.64)	(1.59)	(0.63)	(1.65)	(0.55)	(1.47)	(0.61)
Morningstar Rating	-44.30***	4.69***	-52.25***	1.03***	-66.49***	-6.04***	-53.04***	1.84***
	(0.42)	(0.15)	(0.43)	(0.14)	(0.50)	(0.13)	(0.43)	(0.14)
Total Money	13.62***	-6.81***	37.89***	-5.44***	9.95***	-8.77***	14.42***	-7.43***
	(1.02)	(0.64)	(1.18)	(0.51)	(1.31)	(0.66)	(1.07)	(0.62)
<i>Individual characteristics</i>								
Registered Years	-1.69***	-0.39***	-1.58***	-0.28***	0.34***	-0.35***	-1.31***	-0.46***
	(0.10)	(0.03)	(0.10)	(0.03)	(0.12)	(0.03)	(0.10)	(0.03)
Female	-13.81***	-5.66***	-17.74***	-6.13***	-23.96***	-8.44***	-13.90***	-6.19***
	(0.62)	(0.18)	(0.63)	(0.17)	(0.73)	(0.17)	(0.63)	(0.17)
Age	-0.41***	-0.13***	-0.42***	0.00	-0.98***	-0.23***	-0.70***	-0.20***
	(0.03)	(0.01)	(0.04)	(0.01)	(0.04)	(0.01)	(0.04)	(0.01)
Risk Level	4.14***	-0.88***	4.47***	-0.55***	6.04***	-0.43***	4.95***	-0.84***
	(0.20)	(0.06)	(0.20)	(0.06)	(0.23)	(0.06)	(0.20)	(0.06)
Pseudo R^2 /Adj R^2	0.058	0.052	0.096	0.045	0.147	0.064	0.080	0.049
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 5: Marginal Cost of Money: Wealth/Portfolio Sharpe Ratio

This table reports regression results from Probit and OLS models examining the relationship between collecting green points in Ant Forest and sustainable investment in Ant Fortune, interacted with liquid wealth in Panel A, and with portfolio Sharpe ratio in Panel B. *Wealth (Yu'e Bao)* is the amount of liquid assets the user holds on Alipay, primarily in *Yu'e Bao*. *Sharpe Ratio* is Sharpe ratio of the user's mutual fund portfolio over the sample period. The dependent variables are the same as in Table 2. For demonstration purposes, *Collect Grams* and *Rob Grams* are divided by 10^8 , and *Wealth (Yu'e Bao)* by 10^6 . Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects and other control variables as in Table 2, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Interaction with Wealth								
Collect Grams	-26.37** (11.85)	-26.52*** (3.31)	-14.36 (12.07)	-28.35*** (3.21)	-24.17* (14.05)	-42.80*** (3.22)	-29.10** (12.11)	-33.65*** (3.21)
Collect Grams × Wealth (Yu'e Bao)	-31.78 (89.84)	60.71** (26.78)	-75.37 (91.95)	81.67*** (25.05)	-50.24 (102.54)	87.25*** (26.02)	-37.72 (91.19)	74.26*** (25.98)
Rob Grams	3.76 (7.40)	0.83 (1.99)	-13.24* (7.53)	-3.92** (1.96)	-0.28 (8.86)	-0.40 (1.99)	2.78 (7.59)	0.94 (1.93)
Rob Grams × Wealth (Yu'e Bao)	-7.06 (55.66)	-2.77 (16.36)	20.28 (56.89)	14.55 (16.04)	-4.49 (63.88)	-0.51 (16.42)	-5.90 (56.64)	-1.85 (15.82)
Wealth (Yu'e Bao)	-0.14*** (0.05)	0.07*** (0.02)	-0.12** (0.05)	0.03** (0.02)	-0.14** (0.05)	0.05*** (0.02)	-0.16*** (0.05)	0.06*** (0.02)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.146	0.066	0.079	0.050
Panel B: Interaction with Sharpe Ratio								
Collect Grams	-25.92** (10.48)	-18.91*** (3.29)	-14.36 (10.77)	-18.66*** (3.01)	-25.22** (12.64)	-29.38*** (3.00)	-29.70*** (10.66)	-23.86*** (3.19)
Collect Grams × Sharpe Ratio	25.28 (44.18)	27.54 (19.06)	55.23 (48.48)	37.79** (18.86)	23.65 (49.53)	68.61*** (16.64)	20.00 (43.87)	37.39** (18.14)
Rob Grams	0.91 (6.50)	1.06 (2.00)	-13.28** (6.64)	-1.34 (1.87)	-2.65 (7.84)	-1.29 (1.87)	0.51 (6.62)	1.80 (1.96)
Rob Grams × Sharpe Ratio	-16.33 (27.92)	1.49 (11.53)	-13.05 (30.41)	12.27 (12.19)	-11.61 (30.92)	-12.38 (10.49)	-11.26 (27.79)	6.05 (11.18)
Sharpe Ratio	0.05** (0.02)	-0.07*** (0.01)	0.90*** (0.02)	0.18*** (0.01)	0.93*** (0.02)	0.14*** (0.01)	0.03 (0.02)	-0.14*** (0.01)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 6: Marginal Cost of Labor: Badge Redemption Ratios

This table reports regression results from Probit and OLS models examining the relationship between collecting green points in Ant Forest and sustainable investment in Ant Fortune, interacted with badge to green point ratio in Panel A and with % of non-tree badges in Panel B. *Badge-Green-Point Ratio* equals the number of badges a user redeemed divided by total number of green points consumed during the sample period. *% of Non-Trees* equals the number of green points a user redeemed for non-tree badges divided by the green points redeemed for all badges during the sample period. The dependent variables are the same as in Table 2. For demonstration purposes, *Collect Grams* and *Rob Grams* are divided by 10^8 , and *Badge-Green-Point Ratio* multiplied by 1000. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects and other control variables as in Table 2, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D) (1)	OLS (%) (2)	Probit (D) (3)	OLS (%) (4)	Probit (D) (5)	OLS (%) (6)	Probit (D) (7)	OLS (%) (8)
Panel A: Interaction with Badge-Green-Point Ratio								
Collect Grams	-29.84*** (10.43)	-17.05*** (2.93)	-21.15** (10.63)	-17.17*** (2.87)	-29.83** (12.23)	-32.07*** (2.88)	-34.12*** (10.63)	-24.55*** (2.84)
Collect Grams × Badge-Green-Point Ratio	5.01 (18.97)	-16.46*** (5.42)	13.14 (19.47)	-13.11** (5.92)	0.41 (22.31)	-12.26** (5.53)	6.01 (19.44)	-11.45** (5.41)
Rob Grams	1.73 (6.25)	-0.65 (1.72)	-10.36 (6.35)	-2.95* (1.71)	-0.71 (7.37)	-1.56 (1.72)	0.98 (6.40)	-0.30 (1.67)
Rob Grams × Badge-Green-Point Ratio	17.50 (29.64)	11.92 (8.50)	-8.23 (29.61)	1.71 (8.93)	-8.17 (34.09)	13.60 (8.84)	13.43 (30.54)	12.89 (8.36)
Badge-Green-Point Ratio	-0.0007 (0.01)	0.0044*** (0.00)	0.0026 (0.01)	0.0049*** (0.00)	-0.0028 (0.01)	0.0039** (0.00)	-0.0025 (0.01)	0.0032** (0.00)
Adj R^2 /Pseudo R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Panel B: Interaction with Non-Tree Badges								
Collect Grams	-34.52*** (13.36)	-13.07*** (3.82)	-24.35* (13.61)	-12.04*** (3.68)	-30.91** (15.68)	-29.08*** (3.69)	-38.09*** (13.63)	-20.31*** (3.69)
Collect Grams × % of Non-Trees	12.87 (23.33)	-24.03*** (6.53)	13.95 (23.78)	-25.86*** (6.27)	3.71 (27.45)	-22.42*** (6.39)	10.19 (23.81)	-21.96*** (6.37)
Rob Grams	0.98 (9.04)	3.38 (2.57)	-12.73 (9.20)	0.40 (2.45)	-6.17 (10.63)	0.57 (2.48)	-4.09 (9.24)	3.60 (2.46)
Rob Grams × % of Non-Trees	4.10 (17.87)	-5.24 (4.89)	1.14 (18.18)	-5.79 (4.62)	12.72 (21.26)	-0.38 (4.85)	14.74 (18.31)	-5.11 (4.75)
% of Non-Trees	-0.0053 (0.01)	0.0012 (0.00)	0.0038 (0.01)	0.0020 (0.00)	-0.0052* (0.01)	-0.0048 (0.00)	-0.0109 (0.01)	-0.0005 (0.00)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.079	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 7: Effect of Beautiful China Certification

This table reports regression results from Probit and OLS models examining the relationship between collecting green points in Ant Forest and sustainable investment in Ant Fortune, interacted with the number of “Beautiful China” certificates earned (*Beautiful China*). The dependent variables are the same as in Table 2. For demonstration purposes, *Collect Grams* and *Rob Grams* are divided by 10^8 , Total Money by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects and other control variables as in Table 2, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Collect Grams × Beautiful China	-3.19 (5.48)	2.66* (1.50)	-2.62 (5.59)	2.96** (1.44)	0.75 (6.41)	2.63* (1.51)	-3.86 (5.59)	2.64* (1.46)
Collect Grams	-22.98* (12.51)	-24.60*** (3.52)	-12.51 (12.75)	-24.49*** (3.41)	-28.96* (14.78)	-36.32*** (3.44)	-24.93* (12.79)	-30.21*** (3.44)
Rob Grams × Beautiful China	1.08 (2.99)	-0.26 (0.81)	3.12 (3.05)	0.78 (0.78)	0.96 (3.55)	-0.80 (0.81)	1.04 (3.07)	-0.53 (0.79)
Rob Grams	1.36 (10.15)	1.41 (2.79)	-18.30* (10.32)	-5.30** (2.67)	-4.33 (12.04)	4.06 (2.76)	1.00 (10.40)	2.92 (2.72)
Beautiful China	0.0002 (0.00)	-0.0020 (0.00)	-0.0028 (0.00)	-0.0025** (0.00)	-0.0008 (0.01)	-0.0042*** (0.00)	0.0002 (0.00)	-0.0025** (0.00)
<i>Portfolio characteristics</i>								
Sharpe Ratio	5.97*** (1.48)	-6.16*** (0.64)	94.61*** (1.59)	20.10*** (0.63)	95.10*** (1.65)	16.33*** (0.55)	4.42*** (1.47)	-12.59*** (0.61)
Morningstar Rating	-44.31*** (0.42)	4.68*** (0.15)	-52.31*** (0.43)	1.01*** (0.14)	-66.58*** (0.50)	-6.06*** (0.13)	-53.07*** (0.43)	1.82*** (0.14)
Total Money	13.68*** (1.02)	-6.81*** (0.64)	37.97*** (1.18)	-5.44*** (0.51)	10.07*** (1.31)	-8.75*** (0.66)	14.50*** (1.07)	-7.42*** (0.62)
<i>Individual characteristics</i>								
Registered Years	-1.73*** (0.10)	-0.40*** (0.03)	-1.57*** (0.10)	-0.29*** (0.03)	0.32*** (0.12)	-0.37*** (0.03)	-1.33*** (0.10)	-0.48*** (0.03)
Female	-14.35*** (0.62)	-5.82*** (0.18)	-18.10*** (0.63)	-6.28*** (0.17)	-24.91*** (0.74)	-8.68*** (0.17)	-14.57*** (0.64)	-6.39*** (0.17)
Age	-0.35*** (0.04)	-0.12*** (0.01)	-0.40*** (0.04)	0.02 (0.01)	-0.90*** (0.04)	-0.21*** (0.01)	-0.64*** (0.04)	-0.18*** (0.01)
Risk Level	4.16*** (0.20)	-0.87*** (0.06)	4.48*** (0.20)	-0.54*** (0.06)	6.07*** (0.23)	-0.43*** (0.06)	4.97*** (0.20)	-0.84*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table 8: Effect of Earth Day Tree-Planting Event

This table reports regression results from Probit and OLS models examining how the relationship between collecting green points in Ant Forest and sustainable investment in Ant Fortune is affected by the tree-planting promotion event on Earth Day each year. Specifications in Equation 3 and Equation 4. The dependent variables are the same as in Table 2. The independent variables of interest are *Collect Grams* and its interaction with the dummy variable *Post*. The cutoff for *Post* is 2023-03 in Panel A, 2024-04 in Panel B, and 2024-01 in Panel C. For demonstration purposes, *Collect Grams* and *Rob Grams* are divided by 10^8 . Sample construction in subsection IA.1. All columns include city fixed effects and other control variables as in Table 2, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2023 Earth Day								
Collect Grams × Post	-152.92** (65.45)	64.12*** (16.75)	-140.83** (68.38)	47.91*** (16.96)	-154.06** (17.19)	94.00*** (67.84)	-141.31** (65.61)	75.09*** (16.25)
Collect Grams	110.82* (62.15)	-105.55*** (15.81)	134.09** (65.00)	-70.93*** (15.96)	107.22* (16.26)	-141.20*** (64.27)	89.54 (62.28)	-125.39*** (15.31)
Rob Grams × Post	-8.53 (36.76)	-1.84 (9.01)	-4.13 (38.45)	-1.94 (9.11)	-15.14 (38.43)	-12.12 (9.37)	-11.67 (36.99)	2.25 (8.76)
Rob Grams	20.92 (33.66)	0.51 (8.15)	-23.00 (35.24)	-7.87 (8.16)	15.94 (8.49)	7.16 (35.09)	22.27 (33.87)	-3.49 (7.91)
Post	0.06*** (0.01)	0.02*** (0.00)	0.06*** (0.01)	0.01*** (0.00)	0.08*** (0.01)	0.05*** (0.00)	0.04*** (0.01)	0.02*** (0.00)
Pseudo R^2 /Adj R^2	0.015	0.053	0.043	0.042	0.039	0.073	0.019	0.057
Panel B: 2024 Earth Day								
Collect Grams × Post	70.92 (53.72)	17.49 (13.99)	29.51 (54.57)	-6.88 (14.85)	98.60* (55.04)	36.96** (14.43)	98.33* (53.08)	14.70 (13.75)
Collect Grams	-89.88* (47.11)	-79.55*** (12.10)	-30.21 (48.17)	-52.04*** (12.95)	-122.00** (48.01)	-120.11*** (12.52)	-117.90** (46.55)	-83.11*** (11.85)
Rob Grams × Post	-8.63 (33.63)	-4.80 (8.39)	20.59 (34.48)	-3.51 (9.27)	-3.53 (34.66)	-7.77 (8.99)	-12.50 (33.29)	-0.42 (8.27)
Rob Grams	25.56 (28.67)	1.90 (7.04)	-46.67 (29.68)	0.48 (7.84)	2.14 (29.38)	1.49 (7.57)	25.10 (28.38)	-3.03 (6.90)
Post	-0.01 (0.01)	0.03*** (0.00)	0.08*** (0.01)	0.06*** (0.00)	0.04*** (0.01)	0.09*** (0.00)	-0.02*** (0.01)	0.03*** (0.00)
Pseudo R^2 /Adj R^2	0.032	0.040	0.042	0.047	0.059	0.113	0.041	0.063
Panel C: Placebo Tests (Cutoff January, 2024)								
Collect Grams × Post	23.97 (38.89)	6.34 (10.27)	-9.75 (39.89)	-10.59 (10.78)	29.67 (40.59)	17.74* (10.65)	40.75 (38.70)	13.56 (10.10)
Collect Grams	-66.00** (31.32)	-61.67*** (8.12)	-1.71 (32.58)	-35.29*** (8.55)	-75.07** (32.52)	-84.15*** (8.55)	-84.77*** (31.23)	-71.72*** (8.00)
Rob Grams × Post	-1.42 (24.65)	1.16 (6.28)	1.03 (25.52)	0.71 (6.79)	-10.06 (25.85)	-7.57 (6.73)	-8.30 (24.58)	-0.43 (6.17)
Rob Grams	17.02 (19.33)	-1.91 (4.85)	-30.72 (20.35)	-3.99 (5.21)	2.67 (20.17)	2.82 (5.26)	17.73 (19.32)	-2.14 (4.76)
Post	-0.04*** (0.01)	0.00** (0.00)	0.10*** (0.01)	0.06*** (0.00)	0.05*** (0.01)	0.07*** (0.00)	-0.05*** (0.01)	-0.00 (0.00)
Pseudo R^2 /Adj R^2	0.038	0.039	0.050	0.048	0.075	0.094	0.048	0.055
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	359,994	160,017	360,000	116,445	359,998	233,036	359,994	193,366

Appendix

Table A.1: Variable Definitions

Variable	Definition
<i>Panel A: Dependent Variables (Sustainable Investment)</i>	
<i>Note: For each category, we construct both a binary dummy (1 if the user holds at least one such fund) and a continuous variable (proportion of total fund assets invested in such funds).</i>	
Globes 4 or 5	Funds with a Morningstar Sustainability Rating (“Globes”) of 4 or 5.
Sustainable	Funds flagged by the Morningstar “Sustainable Investment” indicator.
Low Carbon	Funds flagged by the Morningstar “Low Carbon Designation” indicator.
ESG Name	Funds whose names contain at least one of the ESG-related keywords (e.g., “carbon neutrality,” “clean energy”) identified via GPT-4 and manual verification.
<i>Panel B: Green Points (Independent Variables)</i>	
Collect Grams	The total amount of green points (in grams) a user actively collected from their own low-carbon activities during the sample period.
Rob Grams	The total amount of green points (in grams) a user collected (“robbed”) from friends’ uncollected points within the Alipay social network.
Produce Grams	The total amount of green points (in grams) generated by a user’s low-carbon behaviors (e.g., walking, subway, digital payment), regardless of whether they were collected.
Redeem Grams	The total amount of green points (in grams) a user redeemed in exchange for badges (trees, reserves, animals) in Ant Forest during the sample period.
Subcategories	The specific sources of green points, including <i>Bill Payment, E-invoice, Train Ticket, Ele.me</i> (food delivery), <i>E-Bill, Offline Payment, Online Payment, Shared Bicycle, Public Bus, Walking, and Subway</i> . Measured in grams.
Green Travel	Aggregated green points from travel subcategories: <i>Walking, Shared Bicycle, Public Bus, and Subway</i> .
Digital Payment	Aggregated green points from payment subcategories: <i>Online Payment, Offline Payment, E-invoice</i> , etc.
PC1 (Produce)	The first principal component extracted from the 11 production subcategories listed above.
<i>Panel C: Badge Redemptions & Interactions (Independent Variables)</i>	
Tree Person	Total green points (grams) redeemed to plant virtual trees individually.
Tree Cooperation	Total green points (grams) redeemed to plant virtual trees in cooperation with other users.
Reserve	Total green points (grams) redeemed to protect biodiversity reserves.
Animal	Total green points (grams) redeemed to protect specific animal species.
Solar	Total green points (grams) redeemed for solar (photovoltaic) desert protection projects.
Beautiful China	The count of “Wild China” certificates earned (does not require green point consumption).
Gold Animal	The count of “Gold Animal” badges earned (does not require green point consumption).
Reserve Patrol Medal	The count of badges earned for “patrolling” a reserve (does not require green point consumption).
Badge-Green-Point Ratio	The total count of badges a user redeemed divided by the total number of green points (grams) consumed during the sample period.
% of Non-Trees	The proportion of green points redeemed for non-tree badges (Reserve, Animal, Solar) relative to the total green points redeemed.
<i>Panel D: Financial Controls & Demographics</i>	
Total Money	The total amount of money (RMB) the user holds in mutual funds in Ant Fortune.
Wealth (Yu’e Bao)	The total amount of money (RMB) in cash-equivalent assets the user holds on Alipay, primarily in the <i>Yu’e Bao</i> money market fund.
Return	The average monthly return of the user’s mutual fund portfolio over the sample period.
Sharpe Ratio	The Sharpe ratio of the user’s mutual fund portfolio, calculated using monthly returns.
Morningstar Rating	The asset-weighted average Morningstar Rating (star rating) of the funds held by the user.
Risk Level	The user’s self-reported risk tolerance level to Alipay (Scale: 1-5).
Registered Years	The number of years since the user registered their Alipay profile.
Age	The user’s age in years.
Female	A dummy variable equaling one if the user is female and zero otherwise.
Post	A dummy variable equaling one for months after the Earth Day tree-planting event (March 2023, April 2024) or the Placebo cutoff (January 2024).

Internet Appendices

Internet Appendix A: Data Construction	Online Appendix-1
Internet Appendix B: More Institutional Details	Online Appendix-4
Internet Appendix C: Additional Tables	Online Appendix-11

Internet Appendix A: Data Construction

IA.1 Ant Forest Sample and Variable Construction

Alipay anonymizes all user information to protect privacy. For most projects conducted through Ant's Open Research Platform, data access is subject to restrictions on both sample size and time coverage, with a maximum of 200,000 users and a maximum sample period of two years. In accordance with these constraints, we draw a randomized sample of 200,000 users, consisting of 180,000 users who are active in both generating green points and participating in Ant Forest, and 20,000 users who are active only in generating green points. Our main analysis focuses on the 180,000 active Ant Forest users. The sample period spans January 2023 to December 2024, which falls after the lockdown and control phases of the COVID-19 pandemic in China.

One potential concern is that our measures may capture variation in Alipay usage rather than differences in environmental preferences. To mitigate this concern, we restrict attention to active Ant Forest users as described above. For example, walking is the most prevalent activity through which users generate green points, but it requires explicit authorization for Alipay to track step counts. An individual may walk extensively yet fail to enable this function. By focusing on users who are active in generating green points, we ensure that low green point accumulation reflects limited interest in Ant Forest contribution rather than lack of app usage. Specifically, following suggestions from Ant Open Research, we define active green-point users as those who generate green points on at least 15 days per month for more than 50% of the months in the sample period. Active Ant Forest users are defined as those who successfully redeemed at least one tree or reserve badge during the sample period.

A related concern is whether our measures capture individuals' preferences for green investments or merely their propensity to invest via Alipay. To address this issue, we further restrict the sample to individuals who hold at least RMB 5,000 in the asset management sub-app Ant Fortune for more than 50% of the months in the sample period. Although we cannot fully rule out the possibility that some individuals invest in green funds outside Alipay, focusing on active mutual fund holders

within the platform allows us to infer individual green investment behavior under the assumption of consistency across platforms—that is, individuals who invest heavily in green funds elsewhere are also likely to hold more green funds through Alipay.

The primary analysis is conducted using a user-level cross-sectional dataset. To harmonize information across data sources, all time-series variables are aggregated to the user level. Behavioral measures—such as `rob grams`, `collect grams`, and “small-category” variables—are summed over the observation window to capture total activity. Financial and fund-holding variables, including asset values and Morningstar indicators, are aggregated using the maximum observed value for each user. Portfolio-level summaries, such as the Sharpe ratio and the overall Morningstar rating, are incorporated as deduplicated user-level snapshots.

We apply a multi-stage data-cleaning procedure to mitigate the influence of extreme values and improve data quality across both behavioral and wealth variables. *Wealth* is winsorized at the 1st and 99th percentiles and subsequently scaled by dividing by 1,000,000. For behavioral measures, we first winsorize the “small-category” variables at the 1st and 99th percentiles. We then aggregate these variables by summation to construct composite behavioral measures. Finally, the aggregated behavioral variables are rescaled (e.g., by 10^8) to facilitate coefficient readability.

IA.2 Fund Name Keyword List

To determine keywords related to ESG, we perform a two-step procedure for reliability, cost savings, and scalability. In the first step, we use the GPT 4o API to judge whether the name of the fund indicates an ESG fund for a sample of around 20,000 funds in our sample. The prompt we use is the following one: *Based on the content of LocalNameCN, determine whether it is an ESG fund; Output in JSON format as: result: ‘Yes/No’, reason: ‘Because ...’.* This step of AI labeling gives us 517 funds whose names are considered ESG by GPT. In the second step, we manually read the fund names and reasons provided by GPT.

This two-step procedure has several advantages over directly using GPT to make a judgment. First, manual detection in the second step improves the reliability of the keyword list. While GPT

makes good judgment in most cases, we disagree with GPT for 23 funds (4.45%). This ensures that our final measure of ESG fund name relies purely on domain knowledge (i.e., the keyword list) even if we use GPT to narrow down the scale of human work. Second, using the GPT API is expensive for large samples, and a combination of GPT and other methods is a good way to lower the cost (for example, Chen et al., 2025, Ding et al., 2024). Third, the keyword list can be easily applied to a new set of fund names without additional cost.

The 41 ESG keywords we identified are the following: new energy, ESG, ESG strategy, photovoltaic industry, green, carbon neutrality, health, climate change, climate, low-carbon technology, new energy vehicles, environmental governance, low-carbon economy, environmentally friendly new energy, environmental protection, environmental protection industry, green power, clean energy, energy innovation, photovoltaics, low-carbon, Yangtze River protection, protection, new materials, green energy, social responsibility, ecology, low-carbon investment, energy saving and environmental protection, energy saving, responsible investment, modern energy, green bonds, environmental themes, sustainable, sustainable development, eco-environmental protection, low-carbon lifestyle, green credit, green inclusive finance, and ecological priority.

IA.3 Interpolation of ESG Fund Indicators

We collect fund-level data from Morningstar between January 2020 and December 2024 and perform an interpolation of missing values for the variables from Morningstar in the following way. We first use the values before the current observation to replace the missing values. If the current observation is still missing, we then use the values afterwards to do the replacement. If the observation remains a missing value after the interpolation, we set it as zero. That is, we assume funds without sustainable ratings/indicators in Morningstar are non-sustainable funds.

Internet Appendix B: More Institutional Details

IB.1 More Institutional Details

Rules for gaining and using green points in the Ant Forest

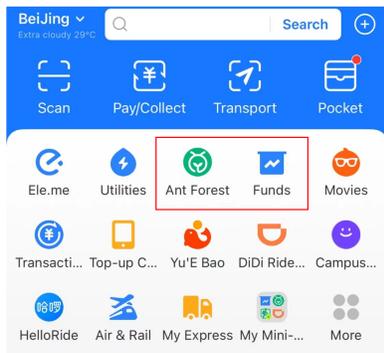
- Rule 1: Green points are generated 24 hours after eco-friendly activities. One needs to collect them within 72 hours and the green points expire if not collected. This is why we focus on collected instead of produced green points.
- Rule 2: Users can collect not only their own green points, but also their Alipay friends' uncollected green points (called "rob" by Ant and in our paper). Users can choose to give back 5g (or not) after collecting one friend's green points.
- Rule 3: Users can voluntarily give their green points to their Alipay friends (called 'donating/watering a friend's tree' by Ant). One user can water one friend's tree three times per day as the maximum. There are four choices for the number of green points to be donated: 10, 18, 33, 66.
- Rule 4: Users can see their Alipay friends' green points and badges, which can serve as a desirable social signaling effect. Unfortunately, the network data are massive and Ant did not store it.
- Rule 5: The calculation of green points is based on carbon reduction and carbon sink equivalence, and 1 green energy gram corresponds to 1g of carbon reduction.
- Rule 6: All trees planted in Ant Forest by users using their accumulated grams will be planted in reality.

Unlike *Collect Grams*, which require active user effort, *Produce Grams* arise passively once users allow Alipay to track their activities for walking and simply when using Alipay in most other cases. but it captures several factors more than the intention to participate in Ant Forest: first, the user's life circumstances—for example, lower-income users may take public transportation more

frequently; second, using Alipay instead of cash, bank cards or competing digital payment platforms. Individuals produce green points regardless of whether they actively participate in Ant Forest, although some behaviors—most notably walking—can be deliberately increased to produce more points. Anecdotal evidence suggests that Ant Forest enthusiasts substantially increase their walking for this purpose. By contrast, it is unlikely that users alter routine bill payments or transportation modes solely to accumulate green points, though they may switch from alternative payment methods (e.g. cash, WeChat Pay, or bank cards) to Alipay when making necessary transactions.

More specifically, the interpretation of several categories is inherently ambiguous. For example, using shared bikes or taking the subway may reflect either cost-saving or environmental preferences, and walking can be motivated by health considerations as much as by environmental concerns. Digital payments are classified as environmentally friendly because they reduce paper usage, yet their adoption is often due to its convenience, and there is even speculation that such features may serve consumption-boosting objectives (Lau and Shan, [2024](#)).

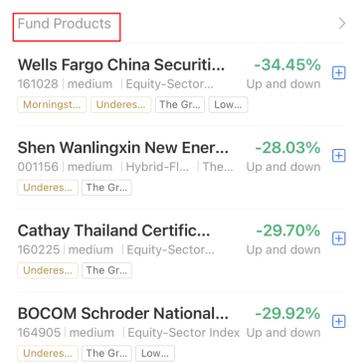
Robbing involves clicking on “bubbles” on friends’ Ant Forest pages to take their unused points, while collecting refers to harvesting one’s own points. Notice that while Alipay uses the word rob for the transfer of green points among friends, it is not necessarily a bad behavior because if these green points are uncollected within 72 hours, they expire. Robbing a friend’s uncollected green points and using them to plant a tree still constitutes a contribution to environmental protection.



(a) Main Screen



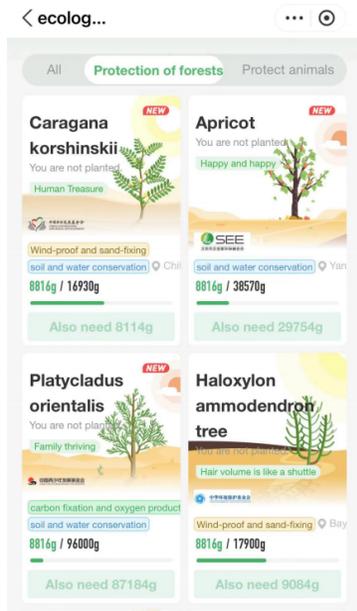
(b) Ant Forest



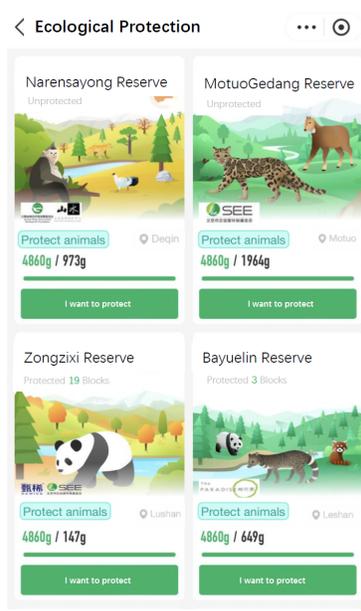
(c) Fund Products

Figure IB.1: Alipay Screens

Note: This figure presents the screens of Alipay. Panel (a) shows the main screen of the Alipay app. Users can navigate to various functional interfaces by clicking on the corresponding icons. Panel (b) shows the screen of Ant Forest, where users can earn green points through daily low-carbon activities and use these points to participate in environmental protection projects. Panel (c) shows the fund selection screen in Alipay, where users can choose and invest in funds of interest.



(a) Tree



(b) Biodiversity Reserve



(c) Badge Collection

Figure IB.2: Environmental Protection Projects in Ant Forest

Note: Panel (a) shows the selection interface for tree projects in Ant Forest. Take the first small panel for example, 8816g represents the number of green points the user has and 16930g are the green points required to redeem for one caragana korshinskii. Panel (b) shows the selection interface for biodiversity protection projects. Take the first small panel for example, 4860g represents the number of green points the user has and 973g are the green points required to redeem for one square meter of protected land in Narensayong Reserve. Panel (c) shows the user's reserve badge collection. In this example, the user holds 19 certificates for Zongzixi Reserve.

Table IB.1: Production of Green Points Category Summary Table

This table shows the full list of 69 subcategories of producing green points that appear in our main sample. The specific small categories are presented in the first column, the five big categories classified by Alipay are presented in the second column, the 99th percentile of usages of each category in the third column, and the maximum number of usages of each category in the fourth column. Carbon emissions are transferred in a uniform unit called *Green Points* using a method co-developed by Alipay and the China Beijing Environmental Exchange (CBEEEX).

Small Category	Big category by Ant	99th p. N.	Max N.
Health Code	-	5	727
Green Appliances	Energy Conservation	0	7
Green Car Insurance	Energy Conservation	0	44
Green Communication	Energy Conservation	0	2
Green Decoration	Energy Conservation	0	2
Low Carbon Route	Energy Conservation	0	33
Near-expiry Food	Energy Conservation	0	26
Parking Payment	Energy Conservation	11	856
Power Bank	Energy Conservation	15	317
Empty Plate Campaign	Energy Conservation	73	731
E-bike Ride	Green Travel	0	336
Green Flight	Green Travel	0	1
New Energy Car Rental	Green Travel	0	4
New Energy Vehicle	Green Travel	0	686
Pure Electric Car Ride	Green Travel	0	398
Shared Rental	Green Travel	0	9
Public Charging Pile	Green Travel	11	105
Shared Bicycle	Green Travel	351	3232
Public Bus	Green Travel	582	2922
Walking	Green Travel	731	731
Subway	Green Travel	864	3584
Book Borrowing	Paper and Plastic Reduction	0	92
Credit Stay	Paper and Plastic Reduction	0	16
Direct Drinking Water	Paper and Plastic Reduction	0	2139
Green Design Product	Paper and Plastic Reduction	0	3
Green Logistics Product	Paper and Plastic Reduction	0	1
Green Manufactured Goods	Paper and Plastic Reduction	0	15
Green Packaging	Paper and Plastic Reduction	0	37
Green Packaging Pro	Paper and Plastic Reduction	0	2
Green Parcel	Paper and Plastic Reduction	0	6
Green Venue	Paper and Plastic Reduction	0	91
LSBG Smart Form Filling	Paper and Plastic Reduction	0	365

Small Category	Big category by Ant	99th p. N.	Max N.
No Return & Exchange	Paper and Plastic Reduction	0	15
Self Pickup	Paper and Plastic Reduction	0	3
Bring Your Own Cup	Paper and Plastic Reduction	1	338
E-signature	Paper and Plastic Reduction	1	710
International Tax Refund	Paper and Plastic Reduction	1	61
QR Code Ticketing	Paper and Plastic Reduction	2	52
E-insurance policy	Paper and Plastic Reduction	2	16
E-boarding Pass	Paper and Plastic Reduction	3	107
Online Loan	Paper and Plastic Reduction	4	3649
Online Delivery	Paper and Plastic Reduction	15	2005
E-receipt	Paper and Plastic Reduction	35	930
QR Code Ordering	Paper and Plastic Reduction	60	3623
Plastic Reduction	Paper and Plastic Reduction	70	582
Paperless Reading	Paper and Plastic Reduction	89	10610
E-invoice	Paper and Plastic Reduction	93	1582
Ele.me	Paper and Plastic Reduction	129	1440
E-Bill	Paper and Plastic Reduction	186	284
Offline Payment	Paper and Plastic Reduction	2212	7320
Online Payment	Paper and Plastic Reduction	2272	7091
Green Check-in	Recycling & Reuse	0	27
Eco Recycling	Recycling & Reuse	0	11
goofish.com(Xianyu)	Recycling & Reuse	4	67
Alipay Labs	Reduced Travel	0	6
Collaborative Office	Reduced Travel	0	862
LSBG Video Conference	Reduced Travel	0	426
LSBG Live Streaming	Reduced Travel	0	77
LSBG Phone Conference	Reduced Travel	0	108
Vehicle Stoppage	Reduced Travel	6	105
DingTalk	Reduced Travel	13	352
Hospital Registration	Reduced Travel	17	1158
Online Ticket Purchase	Reduced Travel	20	235
Credit Card Repayment	Reduced Travel	24	25
Green E-Government	Reduced Travel	35	1176
ETC Toll Payment	Reduced Travel	79	1753
Bill Payment	Reduced Travel	93	240
Train Ticket	Reduced Travel	116	243
Online Window Shopping	Reduced Travel	194	854

Table IB.2: Green Points Badge Summary Table

This table reports the green points (GP) required for the different badges within Ant Forest. The table is organized into three panels: Biodiversity Reserves, Animals, and Trees. The columns present the specific badge name and its corresponding green point cost.

Biodiversity Reserve		Animal		Tree	
Badge Name	GP	Badge Name	GP	Badge Name	GP
Caozixi Reserve	147	Snow Leopard	1,288	Caragana (Peashrub)	16,930
Suojia Yaqu Reserve	540	Giant Panda	1,388	Haloxylon	17,900
Bayuelin Reserve	649	Yunnan Snub-nosed Monkey	1,388	Sea Buckthorn	18,880
Qiuqianjia Reserve	790	Siberian Tiger	1,388	Desert Willow	19,680
Daguping Reserve	869			Huabang shrub	21,310
Wubaoshan Reserve	936			Yangchai shrub	21,310
Nanren Sayong Reserve	973			Forsythia	22,390
Chenhu Reserve	1,181			Tamarisk	22,400
Hunchun Reserve	1,320			Yellow Willow	22,632
Dongning Reserve	1,388			David's Peach	37,980
Motuo Gedang Reserve	1,964			Siberian Apricot	38,570
				Elm	85,760
				Oriental Arborvitae	96,000
				Chinese Pine	114,000
				Chinese Pine (Old)	114,800
				Birch	128,980
				Yellowhorn	128,980
				Maple	144,700
				Mongolian Scotch Pine	146,210
				Armand Pine	185,000
				Spruce	198,000
				Euphrates Poplar	215,680
				Cliff Cypress	220,800
				Fir	330,759

Internet Appendix C: Additional Tables

Table IC.1: Summary Statistics for Green Behaviors (Appendix Variables)

This table reports summary statistics for green behavior variables used in the appendix regression analysis. All variables are in grams of green points, except for PC1 which is a principal component score.

Variables	Num	Mean	S.d.	Min	5th	25th	50th	75th	95th	Max
Panel A: Eleven Subcategories of Produced Green Points (Grams)										
Walking	180000	50980.24	32305.07	0.00	3590.90	28858.75	46110.00	67541.00	112372.10	164071.23
Bill Payment	180000	2.21	43.55	0.00	0.00	0.00	0.00	0.00	55.00	3635.00
Public Bus	180000	2690.20	6955.74	0.00	0.00	0.00	320.00	1760.00	13840.00	46560.00
Offline Payment	180000	2442.63	2297.74	0.00	150.00	700.00	1750.00	3465.00	7225.00	11060.00
Online Payment	180000	2256.72	2451.13	0.00	0.00	50.00	1585.00	3390.00	7295.00	11360.00
Subway	180000	2988.18	7247.21	0.00	0.00	0.00	416.00	2132.00	16016.00	44928.00
Train Ticket	180000	1867.12	2919.38	0.00	0.00	0.00	680.00	2448.00	8024.00	15776.00
E-Bill	180000	533.84	339.10	0.00	10.00	264.00	480.00	752.00	1184.00	1488.00
Shared Bicycle	180000	246.08	889.30	0.00	0.00	0.00	0.00	90.00	1120.00	6805.01
E-invoice	180000	25.66	68.64	0.00	0.00	0.00	0.00	20.00	135.00	465.00
Ele.me	180000	76.45	288.18	0.00	0.00	0.00	0.00	16.00	432.00	2064.00
Panel B: Aggregated Categories (Grams)										
Green Travel	180000	56658.63	34884.00	0.00	5790.90	31983.00	50817.00	75062.25	124038.50	255559.23
Digital Payment	180000	10894.96	7707.36	0.00	1475.95	5108.00	9242.00	14988.25	26074.05	63382.00
Panel C: Principal Component										
PC1 (Produce)	180000	51145.80	32319.97	4.11	3763.45	28998.56	46267.03	67744.16	112536.20	165598.62

Table IC.2: Morningstar Rating for Fund Quality and ESG Indicators

This table reports OLS regression results examining the relationship between fund quality and ESG indicators. The dataset used in Panel A is a fund-month panel where the dependent variable is the *Morningstar Rating*. The dataset used in Panel B is a fund-level cross section in columns (1) to (4) and individual-fund cross section from Ant Fortune in columns (5) to (8). The dependent variable in Panel B is the *Sharpe Ratio* measured over 2023-01 to 2024-12. Panel C uses where the dependent variable is the *Sharpe Ratio*. The independent variables are four indicators of ESG status: Sustainable Fund Indicator, Globes Sustainable Rating, Low Carbon Designation, and ESG name. Fixed effects are denoted in each column. Standard errors are clustered at the fund level and reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Dep. Var.: Morningstar Rating								
Sustainable	-0.15*** (0.02)	-0.15* (0.09)						
Globes			-0.08*** (0.00)	-0.08*** (0.01)				
Low Carbon Designation					-0.31*** (0.01)	-0.31*** (0.03)		
ESG name							0.01 (0.01)	0.01 (0.07)
Month FE		✓		✓		✓		✓
Observations	272,760	272,760	166,968	166,968	277,368	277,368	277,368	277,368
R ²	0.000	0.000	0.005	0.005	0.005	0.005	0.000	0.000
Panel B: Dep. Var.: Sharpe Ratio								
Sustainable	-0.11*** (0.02)				-0.11*** (0.00)			
Globes		0.13*** (0.00)				0.04*** (0.00)		
Low Carbon Designation			0.24*** (0.01)				0.06*** (0.00)	
ESG name				-0.14*** (0.02)				-0.13*** (0.00)
Ind FE					✓	✓	✓	✓
Observations	13,213	13,213	13,213	13,213	52,296,315	52,296,315	52,296,315	52,296,315
R ²	0.002	0.162	0.038	0.004	0.04	0.03	0.04	0.04

Table IC.3: Eleven Subcategories of Produced Green Points and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between producing green points across 11 sub-categories in Alipay and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variables of interest are the 11 categories of produced green points (*Bill Payment* to *Subway*, unit: grams of green points). The number after the variable name denotes the number of times used by the 95th percentile user in our sample, ranking from the largest one to the smallest one. For demonstration purposes, the 11 subcategory variables are divided by 10^5 . The same control variables as in Table 2 are included in all columns. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Offline Payment (1459)	0.14 (0.15)	0.14*** (0.04)	0.20 (0.15)	0.16*** (0.04)	0.07 (0.18)	0.18*** (0.04)	0.03 (0.15)	0.11** (0.04)
Online Payment (1445)	-0.07 (0.14)	-0.15*** (0.04)	-0.09 (0.15)	-0.21*** (0.04)	-0.14 (0.17)	-0.26*** (0.04)	-0.12 (0.15)	-0.26*** (0.04)
Walking (731)	-0.01 (0.01)	-0.02*** (0.00)	-0.01 (0.01)	-0.02*** (0.00)	-0.02 (0.01)	-0.03*** (0.00)	-0.01 (0.01)	-0.02*** (0.00)
Subway (308)	0.00 (0.05)	-0.05*** (0.01)	0.07 (0.05)	-0.01 (0.01)	0.07 (0.06)	0.01 (0.01)	0.03 (0.05)	-0.05*** (0.01)
Public Bus (173)	-0.02 (0.05)	-0.06*** (0.01)	0.03 (0.05)	-0.04*** (0.01)	-0.01 (0.05)	-0.05*** (0.01)	-0.03 (0.05)	-0.07*** (0.01)
E-Bill (148)	-1.48 (0.95)	-1.03*** (0.28)	-1.74* (0.97)	-1.62*** (0.26)	-2.53** (1.12)	-1.25*** (0.27)	-2.30** (0.97)	-0.46* (0.27)
Train Ticket (59)	-0.06 (0.11)	-0.10*** (0.03)	-0.03 (0.11)	-0.13*** (0.03)	0.11 (0.13)	-0.11*** (0.03)	-0.00 (0.11)	-0.10*** (0.03)
Bill Payment (55)	-0.11* (0.07)	-0.05** (0.02)	-0.13* (0.07)	-0.04** (0.02)	-0.07 (0.08)	-0.04** (0.02)	-0.10 (0.07)	-0.04** (0.02)
Shared Bicycle (55)	0.08 (0.35)	-0.38*** (0.10)	0.21 (0.36)	-0.31*** (0.09)	0.31 (0.44)	-0.33*** (0.09)	0.08 (0.36)	-0.34*** (0.09)
E-invoice (27)	-0.75 (4.61)	-6.78*** (1.26)	-0.71 (4.70)	-7.53*** (1.19)	0.80 (5.51)	-7.76*** (1.26)	1.11 (4.71)	-7.64*** (1.23)
Ele.me (27)	-0.75 (1.13)	-0.38 (0.31)	0.78 (1.15)	0.22 (0.29)	0.49 (1.33)	-0.79*** (0.30)	-0.85 (1.15)	-0.84*** (0.30)
Pseudo R^2 /Adj R^2	0.058	0.054	0.096	0.047	0.146	0.066	0.079	0.051
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.4: Produced Green Points (Two Main Categories) and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between producing green points via Alipay, grouped by the two big categories *Green Travel* and *Digital Payment*, and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variables of interest are *Green Travel* and *Digital Payment* (unit: grams of green points) which are the aggregated variables of the 11 subcategories in Table IC.3. For demonstration purposes, *Green Travel* and *Digital Payment* are divided by 10^6 , Total Money by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Green Travel Grams	-0.07 (0.09)	-0.24*** (0.03)	-0.01 (0.09)	-0.21*** (0.03)	-0.09 (0.11)	-0.30*** (0.03)	-0.06 (0.09)	-0.27*** (0.03)
Digital Payment Grams	-0.79* (0.43)	-0.80*** (0.12)	-0.62 (0.44)	-0.88*** (0.12)	-0.42 (0.51)	-0.94*** (0.12)	-0.93** (0.44)	-0.95*** (0.12)
<i>Portfolio characteristics</i>								
Sharpe Ratio	6.05*** (1.48)	-6.14*** (0.63)	94.74*** (1.59)	20.13*** (0.63)	95.19*** (1.65)	16.35*** (0.55)	4.53*** (1.47)	-12.56*** (0.61)
Morningstar Rating	-44.31*** (0.42)	4.68*** (0.15)	-52.22*** (0.43)	1.02*** (0.14)	-66.51*** (0.50)	-6.05*** (0.13)	-53.05*** (0.43)	1.83*** (0.14)
Total Money	13.85*** (1.02)	-6.74*** (0.63)	38.07*** (1.18)	-5.37*** (0.50)	10.14*** (1.31)	-8.68*** (0.65)	14.72*** (1.07)	-7.35*** (0.61)
<i>Individual characteristics</i>								
Registered Years	-1.62*** (0.10)	-0.37*** (0.03)	-1.55*** (0.10)	-0.26*** (0.03)	0.37*** (0.12)	-0.33*** (0.03)	-1.21*** (0.10)	-0.44*** (0.03)
Female	-14.27*** (0.63)	-6.11*** (0.18)	-17.88*** (0.64)	-6.52*** (0.18)	-24.60*** (0.75)	-8.96*** (0.18)	-14.40*** (0.65)	-6.69*** (0.18)
Age	-0.40*** (0.04)	-0.12*** (0.01)	-0.43*** (0.04)	0.01 (0.01)	-0.97*** (0.04)	-0.22*** (0.01)	-0.70*** (0.04)	-0.18*** (0.01)
Risk Level	4.16*** (0.20)	-0.87*** (0.06)	4.47*** (0.20)	-0.54*** (0.06)	6.05*** (0.23)	-0.42*** (0.06)	4.97*** (0.20)	-0.83*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.079	0.050
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.5: Principal Component Analyses of Eleven Subcategories to Produce Green Points

This table reports the results of principal component analyses (PCA) where we decompose the 11 subcategories to produce green points into six orthogonal principal components (i.e., PC1, PC2 to PC6). The upper panel reports the loadings, indicating the extent to which each green point variable contributes to a PC. The bottom panel reports the proportion of variance explained by each PC. Detailed sample and variable construction in [subsection IA.1](#). Standard errors in parentheses are obtained via bootstrap of 1000 times.

Variables	PC1	PC2	PC3	PC4	PC5	PC6
Walking	1.000 (0.000)	-0.018 (0.002)	-0.003 (0.001)	-0.019 (0.000)	-0.006 (0.000)	-0.003 (0.001)
Bill Payment	0.018 (0.000)	-0.009 (0.003)	-0.023 (0.006)	0.996 (0.000)	-0.028 (0.002)	-0.067 (0.002)
Offline Payment	0.017 (0.000)	0.021 (0.001)	-0.006 (0.001)	0.058 (0.001)	0.203 (0.005)	0.336 (0.013)
Public Bus	0.014 (0.001)	0.630 (0.012)	0.776 (0.010)	0.860 (0.014)	-0.021 (0.001)	-0.009 (0.001)
Subway	0.011 (0.000)	0.770 (0.010)	-0.628 (0.012)	0.485 (0.024)	-0.094 (0.002)	-0.059 (0.002)
Train Ticket	0.004 (0.000)	0.070 (0.001)	-0.034 (0.002)	0.040 (0.002)	0.950 (0.002)	-0.281 (0.007)
Shared Bicycle	0.003 (0.000)	0.017 (0.000)	-0.005 (0.001)	0.004 (0.000)	0.033 (0.003)	0.046 (0.002)
E-Bill	0.001 (0.000)	0.001 (0.000)	0.000 (0.000)	0.010 (0.000)	0.012 (0.000)	0.030 (0.000)
Online Payment	0.001 (0.000)	0.070 (0.001)	-0.044 (0.002)	0.053 (0.002)	0.212 (0.007)	0.892 (0.005)
E-invoice	0.000 (0.000)	0.000 (0.001)	-0.001 (0.000)	0.001 (0.000)	0.001 (0.000)	0.004 (0.000)
Ele.me	0.000 (0.000)	0.003 (0.000)	-0.002 (0.000)	0.005 (0.000)	0.007 (0.000)	0.035 (0.001)
Explained	87.6% (0.001)	5.2% (0.000)	3.3% (0.000)	2.2% (0.000)	0.7% (0.000)	0.5% (0.000)

Table IC.6: First Principal Component of Eleven Subcategories to Produce Green Points and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between the top principal component (PC1) in Table IC.5 and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variable of interest is the top principal component (PC1) that explains the largest share of variance in the original variables on producing green points. For demonstration purposes, PC1 is divided by 10^8 , Total Money by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Environmental protection</i>								
PC1 (Produce)	-10.27 (9.90)	-24.81*** (2.88)	-9.97 (10.08)	-23.98*** (2.78)	-15.78 (11.76)	-34.47*** (2.75)	-10.87 (10.13)	-27.96*** (2.77)
<i>Portfolio characteristics</i>								
Sharpe Ratio	6.07*** (1.48)	-6.16*** (0.64)	94.76*** (1.59)	20.10*** (0.63)	95.22*** (1.65)	16.33*** (0.55)	4.57*** (1.47)	-12.58*** (0.61)
Morningstar Rating	-44.30*** (0.42)	4.68*** (0.15)	-52.23*** (0.43)	1.03*** (0.14)	-66.51*** (0.50)	-6.05*** (0.13)	-53.04*** (0.43)	1.83*** (0.14)
Total Money	13.62*** (1.02)	-6.82*** (0.64)	37.87*** (1.17)	-5.45*** (0.51)	9.98*** (1.31)	-8.77*** (0.66)	14.43*** (1.07)	-7.44*** (0.62)
<i>Individual characteristics</i>								
Registered Years	-1.74*** (0.10)	-0.41*** (0.03)	-1.65*** (0.10)	-0.30*** (0.03)	0.27** (0.12)	-0.38*** (0.03)	-1.36*** (0.10)	-0.49*** (0.03)
Female	-14.17*** (0.64)	-6.04*** (0.18)	-18.05*** (0.65)	-6.48*** (0.18)	-24.90*** (0.76)	-8.95*** (0.18)	-14.31*** (0.65)	-6.62*** (0.18)
Age	-0.40*** (0.04)	-0.12*** (0.01)	-0.42*** (0.04)	0.02 (0.01)	-0.95*** (0.04)	-0.21*** (0.01)	-0.69*** (0.04)	-0.18*** (0.01)
Risk Level	4.13*** (0.19)	-0.88*** (0.06)	4.45*** (0.20)	-0.55*** (0.06)	6.04*** (0.23)	-0.44*** (0.06)	4.94*** (0.20)	-0.84*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.045	0.147	0.064	0.080	0.049
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.7: Principal Component Analyses of Subcategories of Redeemed Badges

This table reports the results of principal component analyses (PCA) where we decompose the eight categories of badges (unit: grams of green points) into six orthogonal principal components (i.e., PC1, PC2 to PC6). The upper panel reports the loadings, indicating the extent to which each badge variable contributes to a PC. The bottom panel reports the proportion of variance explained by each PC. All variables are winsorized at the 99th percentile prior to the PCA process. Detailed sample and variable construction in [subsection IA.1](#). Standard errors in parentheses are obtained via bootstrap of 1000 times.

Variables	PC1	PC2	PC3	PC4	PC5	PC6
Tree Person	0.483 (0.007)	0.875 (0.004)	-0.028 (0.001)	-0.023 (0.000)	-0.001 (0.000)	0.000 (0.000)
Animal	0.031 (0.000)	0.010 (0.001)	0.109 (0.005)	0.900 (0.003)	-0.421 (0.006)	0.000 (0.000)
Solar	0.020 (0.000)	0.017 (0.001)	0.987 (0.001)	-0.149 (0.005)	-0.062 (0.002)	0.000 (0.000)
Tree Cooperation	0.018 (0.004)	-0.484 (0.007)	-0.013 (0.000)	-0.024 (0.000)	0.002 (0.000)	0.000 (0.000)
Reserve	0.018 (0.000)	0.006 (0.006)	0.118 (0.003)	0.408 (0.006)	0.905 (0.003)	0.000 (0.000)
Beautiful China	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.078 (0.003)
Gold Animal	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.003 (0.000)
Reserve Patrol Medal	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.997 (0.000)
<i>Explained</i>	66.7% (0.002)	32.3% (0.002)	0.6% (0.000)	0.2% (0.000)	0.1% (0.000)	0.0% (0.000)

Table IC.8: First Principal Component of Subcategories of Redeemed Badges and ESG Investments

This table reports regression results from Probit and OLS models examining the relationship between the top principal component (PC1) in Table IC.7 and sustainable investment in Ant Fortune. The dependent variables are the same as in Table 2. The independent variable of interest is the top principal component (PC1) that explains the largest share of variance in the original variables on redeemed badges. For demonstration purposes, PC1 is divided by 10^8 , Total Money by 10^6 , and other control variables by 100. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Environmental protection</i>								
PC1 (Badges)	-4.16 (2.57)	-4.87*** (0.70)	-5.87** (2.62)	-6.06*** (0.66)	-3.07 (3.04)	-7.23*** (0.69)	-4.02 (2.63)	-6.10*** (0.68)
<i>Portfolio characteristics</i>								
Sharpe Ratio	6.07*** (1.48)	-6.18*** (0.64)	94.77*** (1.59)	20.11*** (0.63)	95.21*** (1.65)	16.32*** (0.55)	4.57*** (1.47)	-12.60*** (0.61)
Morningstar Rating	-44.30*** (0.42)	4.70*** (0.15)	-52.23*** (0.43)	1.03*** (0.14)	-66.47*** (0.50)	-6.03*** (0.13)	-53.03*** (0.43)	1.84*** (0.14)
Total Money	13.62*** (1.02)	-6.81*** (0.64)	37.87*** (1.17)	-5.44*** (0.51)	9.93*** (1.31)	-8.77*** (0.66)	14.41*** (1.07)	-7.43*** (0.62)
<i>Individual characteristics</i>								
Registered Years	-1.70*** (0.10)	-0.39*** (0.03)	-1.60*** (0.10)	-0.28*** (0.03)	0.32*** (0.12)	-0.36*** (0.03)	-1.32*** (0.10)	-0.46*** (0.03)
Female	-13.76*** (0.62)	-5.64*** (0.18)	-17.66*** (0.63)	-6.11*** (0.17)	-23.89*** (0.73)	-8.41*** (0.17)	-13.85*** (0.63)	-6.18*** (0.17)
Age	-0.41*** (0.03)	-0.13*** (0.01)	-0.43*** (0.04)	0.00 (0.01)	-0.98*** (0.04)	-0.23*** (0.01)	-0.71*** (0.04)	-0.20*** (0.01)
Risk Level	4.14*** (0.20)	-0.88*** (0.06)	4.47*** (0.20)	-0.55*** (0.06)	6.03*** (0.23)	-0.44*** (0.06)	4.94*** (0.20)	-0.84*** (0.06)
Pseudo R^2 /Adj R^2	0.058	0.052	0.096	0.045	0.147	0.064	0.080	0.049
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.9: Robustness Check: Delete Outliers

This table reports results of regressions as in [Table 2](#), [Table 3](#), and [Table 4](#) for the sample where we delete outliers. Outliers are identified as individuals who have at least one subcategory of green point or badge variables that is larger than 1.1 times the 99th percentile of the variable. The dependent variables are the same as in [Table 2](#). Panel A reports the results using *Collect Grams* and *Rob Grams* as independent variables, Panel B using *Produce Grams*, and Panel C using *Redeem Grams*. For demonstration purposes, *Collect Grams*, *Rob Grams*, *Produce Grams*, and *Redeem Grams* are divided by 10^8 . The same control variables as in [Table 2](#) are included in all columns but omitted from the table for brevity. Detailed sample and variable construction in [subsection IA.1](#). All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Collect and Rob Green Points								
Collect Grams	-34.85** (13.73)	-23.93*** (3.99)	-19.47 (13.97)	-21.31*** (3.89)	-32.36** (16.20)	-38.74*** (3.82)	-31.90** (14.04)	-31.15*** (3.87)
Rob Grams	8.29 (13.23)	-0.62 (3.74)	-22.31* (13.43)	-3.84 (3.71)	-3.93 (15.60)	3.27 (3.65)	3.40 (13.54)	2.89 (3.63)
Panel B: Sum of Produced Green Points								
Produce Grams	-7.49 (5.16)	-11.89*** (1.49)	-9.03* (5.24)	-11.32*** (1.45)	-9.74 (6.11)	-14.87*** (1.43)	-7.44 (5.28)	-12.79*** (1.45)
Panel C: Sum of Redeemed Green Points								
Redeem Grams	-5.32 (4.67)	-6.17*** (1.32)	-8.77* (4.75)	-5.54*** (1.27)	-4.12 (5.51)	-7.98*** (1.27)	-3.94 (4.78)	-6.78*** (1.28)
Pseudo R^2 /Adj R^2	0.059	0.052	0.095	0.046	0.150	0.068	0.081	0.050
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	136,845	69,580	136,851	69,994	136,828	106,472	136,838	81,534

Table IC.10: Robustness Check: Alternative Fund Classifications (Exclude Missing)

This table reports results of regressions as in [Table 2](#), [Table 3](#), and [Table 4](#) using alternative fund classifications where we exclude funds without the corresponding Morningstar sustainable ratings/indicators. The dependent variables are the same as in [Table 2](#). Panel A reports the results using *Collect Grams* and *Rob Grams* as independent variables, Panel B using *Produce Grams*, and Panel C using *Redeem Grams*. For demonstration purposes, the green-point variables are divided by 10^8 . The same control variables as in [Table 2](#) are included in all columns but omitted from the table for brevity. Detailed sample and variable construction in [subsection IA.1](#). All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Collect and Rob Green Points						
Collect Grams	-29.41*** (9.22)	-22.73*** (2.64)	-16.07* (9.38)	-22.80*** (2.89)	-28.92*** (10.75)	-34.86*** (2.58)
Rob Grams	3.01 (5.65)	1.02 (1.57)	-8.27 (5.74)	-3.67** (1.77)	-0.86 (6.64)	-0.86 (1.56)
Pseudo R^2 /Adj R^2	0.056	0.053	0.081	0.056	0.139	0.055
Panel B: Sum of Produced Green Points						
Produce Grams	-6.30** (2.66)	-7.36*** (0.76)	-6.77** (2.70)	-9.45*** (0.84)	-7.66** (3.10)	-11.28*** (0.74)
Pseudo R^2 /Adj R^2	0.056	0.053	0.081	0.056	0.139	0.055
Panel C: Sum of Redeemed Green Points						
Redeem Grams	-3.41* (1.76)	-3.57*** (0.49)	-4.42** (1.79)	-4.96*** (0.55)	-2.88 (2.06)	-5.65*** (0.49)
Pseudo R^2 /Adj R^2	0.056	0.053	0.081	0.056	0.139	0.054
Controls	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,524	179,985	139,430

Table IC.11: Robustness Check: Less-active Users

This table reports results of regressions as in Table 2, Table 3, and Table IC.4 for the sample of less-active Ant Forest but active green points producing users. Less-active Ant Forest users refer to those who neither redeem a tree nor redeem a reserve during our sample period. The dependent variables are the same as in Table 2. Panel A reports the results using *Collect Grams* and *Rob Grams* as independent variables, Panel B using *Produce Grams*, and Panel C using *Green Travel Grams* and *Digital Payment Grams*. For demonstration purposes, the green-point variables are divided by 10^8 . The same control variables as in Table 2 are included in all columns but omitted from the table for brevity. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Collect and Rob Green Points								
Collect Grams	-53.52 (74.44)	-36.58* (20.40)	-56.73 (60.84)	-43.22** (18.78)	-68.23 (120.07)	-62.51*** (15.63)	-67.03 (98.16)	-46.77** (19.20)
Rob Grams	20.18 (222.58)	-37.42 (62.86)	15.31 (156.85)	-4.09 (46.93)	75.14 (449.98)	-44.64 (64.50)	-18.49 (303.97)	-35.15 (58.87)
Pseudo R^2 /Adj R^2	0.063	0.054	0.095	0.039	0.155	0.064	0.086	0.047
Panel B: Sum of Produced Green Points								
Produce Grams	1.09 (24.48)	-24.75*** (7.10)	-4.40 (24.91)	-13.78** (6.85)	-4.29 (29.89)	-27.55*** (6.74)	-4.33 (25.19)	-25.79*** (6.88)
Pseudo R^2 /Adj R^2	0.063	0.054	0.095	0.039	0.155	0.064	0.086	0.047
Panel C: Produced Green Points (Two Main Categories)								
Green Travel Grams	0.30 (0.34)	-0.22** (0.10)	0.12 (0.34)	-0.12 (0.10)	0.09 (0.41)	-0.24*** (0.09)	0.24 (0.35)	-0.20** (0.10)
Digital Payment Grams	-2.20 (1.50)	-1.89*** (0.47)	-0.69 (1.53)	-0.19 (0.43)	-0.34 (1.82)	-1.01** (0.42)	-1.81 (1.54)	-2.12*** (0.44)
Pseudo R^2 /Adj R^2	0.063	0.054	0.095	0.039	0.155	0.063	0.086	0.047
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	19,962	10,367	19,932	10,644	19,840	15,867	19,952	12,173

Table IC.12: Produce/Redeem Green Points Interacted with Liquid Wealth on Alipay

This table reports regression results from Probit and OLS models examining the relationship between producing and redeeming green points and sustainable investment, interacted with liquid wealth (*Wealth (bao)*). That is, the table provides robustness checks for Panel A Table 5. *Wealth (Yu'e Bao)* is the amount of liquid assets the user holds on Alipay, primarily in *Yu'e Bao*. The dependent variables are the same as in Table 2. Panel A reports the results for *Produce Grams*. Panel B reports the results for *Redeem Grams*. For demonstration purposes, *Produce Grams* and *Redeem Grams* are divided by 10^8 , and *Wealth (bao)* by 10^6 . The same control variables as in Table 2 are included in all columns. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Sum of Produced Green Points								
Produce Grams	-5.10 (3.46)	-8.61*** (0.96)	-8.39** (3.53)	-11.00*** (0.94)	-6.11 (4.12)	-13.30*** (0.94)	-6.15* (3.54)	-10.53*** (0.93)
Produce Grams × Wealth (bao)	-12.75 (25.87)	17.58** (7.70)	-15.88 (26.40)	31.76*** (7.51)	-16.47 (29.56)	25.44*** (7.59)	-13.29 (26.26)	21.84*** (7.41)
Wealth (bao)	-0.13*** (0.05)	0.07*** (0.02)	-0.12** (0.05)	0.03 (0.02)	-0.13** (0.06)	0.04** (0.02)	-0.16*** (0.05)	0.06*** (0.02)
Pseudo R^2 /Adj R^2	0.058	0.053	0.095	0.046	0.146	0.065	0.079	0.050
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846
Panel B: Sum of Redeemed Green Points								
Redeem Grams	-3.37 (2.30)	-4.03*** (2.35)	-4.95** (0.62)	-5.59*** (0.59)	-2.16 (2.74)	-6.53*** (0.61)	-3.38 (2.36)	-5.30*** (0.60)
Redeem Grams × Wealth (bao)	0.20 (17.64)	6.60 (17.97)	-3.62 (4.99)	15.31*** (5.02)	-8.26 (20.14)	11.09** (5.12)	-1.01 (17.91)	10.13** (4.92)
Wealth (bao)	-0.15*** (0.04)	0.08*** (0.04)	-0.14*** (0.02)	0.05*** (0.01)	-0.15*** (0.05)	0.07*** (0.02)	-0.18*** (0.04)	0.08*** (0.02)
Pseudo R^2 /Adj R^2	0.058	0.053	0.095	0.046	0.146	0.065	0.079	0.050
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.13: Produce/Redeem Green Points Interacted with Portfolio Sharpe Ratio

This table reports regression results from Probit and OLS models examining the relationship between producing and redeeming green points and sustainable investment, interacted with portfolio Sharpe ratio. That is, the table provides robustness checks for Panel B Table 5. *Sharpe Ratio* is Sharpe ratio of the user's mutual fund portfolio over the sample period. The dependent variables are the same as in Table 2. Panel A reports the results for *Produce Grams*. Panel B reports the results for *Redeem Grams*. For demonstration purposes, *Produce Grams* and *Redeem Grams* are divided by 10^8 . The same control variables as in Table 2 are included in all columns. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Sum of Produced Green Points								
Produce Grams	-6.88** (3.05)	-6.60*** (0.98)	-8.91*** (3.12)	-6.82*** (0.90)	-7.85** (3.67)	-9.73*** (0.88)	-7.94** (3.10)	-7.63*** (0.94)
Produce Grams × Sharpe Ratio	-5.47 (12.94)	5.08 (5.61)	8.04 (14.16)	17.56*** (5.70)	-1.21 (14.39)	14.67*** (4.94)	-4.87 (12.86)	9.78* (5.33)
Sharpe Ratio	0.08*** (0.02)	-0.07*** (0.01)	0.92*** (0.02)	0.18*** (0.01)	0.96*** (0.02)	0.14*** (0.01)	0.06*** (0.02)	-0.14*** (0.01)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846
Panel B: Sum of Redeemed Green Points								
Redeem Grams	-3.92* (2.02)	-2.78*** (0.63)	-4.52** (2.06)	-3.25*** (0.57)	-3.45 (2.42)	-4.80*** (0.58)	-4.02* (2.05)	-3.42*** (0.61)
Redeem Grams × Sharpe Ratio	-4.83 (8.75)	6.58* (3.70)	7.04 (9.55)	13.46*** (3.72)	-4.00 (9.60)	8.49*** (3.24)	-4.67 (8.68)	9.70*** (3.60)
Sharpe Ratio	0.07*** (0.02)	-0.07*** (0.01)	0.93*** (0.02)	0.19*** (0.01)	0.97*** (0.02)	0.16*** (0.01)	0.06*** (0.02)	-0.14*** (0.01)
Pseudo R^2 /Adj R^2	0.058	0.052	0.096	0.045	0.147	0.064	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.14: Produce Green Points Interacted with Badge Redemption Ratios

This table reports regression results from Probit and OLS models examining the relationship between producing green points in Ant Forest and sustainable investment in Ant Fortune, interacted with badge to green point ratio in Panel A and with % of non-tree badges in Panel B. That is, the table provides robustness checks for Table 6. *Badge-Green-Point Ratio* equals the number of badges a user redeemed divided by total number of green points consumed during the sample period. *% of Non-Trees* equals the number of green points a user redeemed for non-tree badges divided by the green points redeemed for all badges during the sample period. The dependent variables are the same as in Table 2. For demonstration purposes, *Produce Grams* is divided by 10^8 , and *Badge-Green-Point Ratio* multiplied by 1000. The same control variables as in Table 2 are included in all columns. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Interaction with Badge-Green-Point Ratio								
Produce Grams	-6.39** (2.98)	-5.56*** (0.84)	-9.67*** (3.03)	-6.87*** (0.81)	-7.76** (3.50)	-9.54*** (0.82)	-7.75** (3.04)	-7.43*** (0.81)
Produce Grams × Badge-Green-Point Ratio	3.89 (7.47)	-8.10*** (2.17)	6.09 (7.62)	-5.97*** (2.23)	-1.37 (8.81)	-7.41*** (2.18)	3.57 (7.66)	-6.34*** (2.13)
Badge-Green-Point Ratio	-0.0006 (0.01)	0.01*** (0.00)	0.0010 (0.01)	0.01*** (0.00)	-0.0005 (0.01)	0.01*** (0.00)	-0.0019 (0.01)	0.01*** (0.00)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846
Panel B: Interaction with Non-Tree Badges								
Produce Grams	-8.74** (4.29)	-3.09** (1.24)	-11.16** (4.37)	-3.85*** (1.17)	-10.14** (5.05)	-7.86*** (1.18)	-11.57*** (4.38)	-4.89*** (1.19)
Produce Grams × % of Non-Trees	5.86 (7.68)	-10.11*** (2.17)	4.31 (7.81)	-10.87*** (2.04)	5.48 (9.08)	-8.85*** (2.10)	9.13 (7.85)	-9.65*** (2.09)
% of Non-Trees	-0.0052 (0.01)	0.0051 (0.00)	0.0040 (0.01)	0.0060 (0.00)	-0.0061 (0.01)	-0.0001 (0.00)	-0.0131 (0.01)	0.0039 (0.00)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.146	0.065	0.079	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.15: Produce/Redeem Green Points Interacted with Beautiful China

This table reports regression results from Probit and OLS models examining the relationship between producing and redeeming green points in Ant Forest and sustainable investment in Ant Fortune, interacted with the number of “Beautiful China” certificates earned (*Beautiful China*). That is, the table provides robustness checks for Table 7. The dependent variables are the same as in Table 2. Panel A reports the results for *Produce Grams*. Panel B reports the results for *Redeem Grams*. For demonstration purposes, *Produce Grams* and *Redeem Grams* are divided by 10^8 . The same control variables as in Table 2 are included in all columns. Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)	Probit (D)	OLS (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Produce Green Points								
Produce Grams × Beautiful China	0.31 (1.39)	1.58*** (0.39)	0.04 (1.42)	1.74*** (0.39)	0.90 (1.64)	1.48*** (0.38)	0.07 (1.42)	1.58*** (0.38)
Produce Grams	-5.45 (4.27)	-10.46*** (1.21)	-6.70 (4.34)	-11.80*** (1.15)	-8.70* (5.06)	-12.20*** (1.17)	-5.58 (4.36)	-11.56*** (1.17)
Beautiful China	-0.0027 (0.00)	-0.0030** (0.00)	-0.0047 (0.00)	-0.0035*** (0.00)	-0.0031 (0.01)	-0.0059*** (0.00)	-0.0029 (0.00)	-0.0037*** (0.00)
Pseudo R^2 /Adj R^2	0.058	0.053	0.096	0.046	0.147	0.065	0.080	0.049
Panel B: Redeem Green Points								
Redeem Grams × Beautiful China	1.01 (0.90)	0.67*** (0.25)	0.61 (0.91)	0.72*** (0.24)	0.31 (1.06)	0.75*** (0.24)	0.72 (0.92)	0.83*** (0.24)
Redeem Grams	-4.30 (3.14)	-4.63*** (0.88)	-3.67 (3.20)	-5.56*** (0.81)	-1.66 (3.74)	-5.03*** (0.84)	-2.90 (3.21)	-5.63*** (0.84)
Beautiful China	-0.0054 (0.00)	-0.0024** (0.00)	-0.0078** (0.00)	-0.0025*** (0.00)	-0.0049 (0.00)	-0.0067*** (0.00)	-0.0065* (0.00)	-0.0036*** (0.00)
Pseudo R^2 /Adj R^2	0.058	0.052	0.096	0.045	0.147	0.064	0.080	0.049
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	179,997	91,047	179,999	91,891	179,985	140,129	179,997	106,846

Table IC.16: Produce Green Points and Earth Day Tree-Planting Event

This table reports regression results from Probit and OLS models examining how the relationship between producing green points in Ant Forest and sustainable investment in Ant Fortune is affected by the tree-planting promotion event on Earth Day each year. That is, the table provides robustness checks for Table 8. Specifications in Equation 3 and Equation 4. The dependent variables are the same as in Table 2. The independent variables of interest are *Produce Grams* and its interaction with the dummy variable *Post*. The cutoff for *Post* is 2023-03 in Panel A, 2024-04 in Panel B, and 2024-01 in Panel C. For demonstration purposes, *Produce Grams* are divided by 10^8 . Detailed sample and variable construction in subsection IA.1. All columns include city fixed effects and other control variables as in Table 2, and robust standard errors clustered at the city level are reported in parentheses. *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels, respectively.

Dep. Var.	Sustainable		Globes 4 or 5		Low Carbon		ESG name	
	Probit (D)	OLS (%)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2023 Earth Day								
Produce Grams × Post	-319.37*** (63.31)	110.26*** (16.70)	-291.74*** (66.17)	75.23*** (16.57)	-377.84*** (65.67)	114.49*** (16.79)	-350.65*** (63.45)	121.24*** (16.16)
Produce Grams	341.96*** (60.98)	-157.82*** (16.05)	326.00*** (63.79)	-106.10*** (15.86)	385.71*** (63.11)	-157.60*** (16.12)	367.76*** (61.10)	-174.67*** (15.50)
Post	0.05*** (0.01)	0.02*** (0.00)	0.07*** (0.01)	0.01*** (0.00)	0.10*** (0.01)	0.05*** (0.00)	0.05*** (0.01)	0.02*** (0.00)
Pseudo R^2 /Adj R^2	0.014	0.053	0.041	0.042	0.034	0.073	0.018	0.057
Panel B: 2024 Earth Day								
Produce Grams × Post	28.18 (49.76)	36.56*** (13.33)	16.86 (50.53)	12.00 (14.07)	58.11 (51.24)	60.72*** (13.60)	39.27 (49.19)	41.16*** (12.94)
Produce Grams	-1.09 (45.20)	-115.98*** (11.98)	26.46 (46.13)	-74.90*** (12.79)	-4.88 (46.36)	-135.75*** (12.28)	-7.99 (44.69)	-125.38*** (11.60)
Post	-0.01 (0.01)	0.03*** (0.00)	0.07*** (0.01)	0.06*** (0.00)	0.04*** (0.01)	0.09*** (0.00)	-0.02*** (0.01)	0.03*** (0.00)
Pseudo R^2 /Adj R^2	0.032	0.041	0.041	0.047	0.059	0.113	0.041	0.063
Panel C: Placebo Tests (Cutoff January, 2024)								
Produce Grams × Post	-4.20 (35.41)	6.17 (9.64)	-21.34 (36.35)	-2.63 (10.05)	13.93 (37.14)	20.67** (9.83)	1.13 (35.27)	9.94 (9.39)
Produce Grams	8.04 (29.70)	-76.35*** (7.97)	42.77 (30.85)	-49.94*** (8.38)	3.77 (30.99)	-84.28*** (8.22)	4.26 (29.65)	-83.97*** (7.77)
Post	-0.04*** (0.01)	0.01*** (0.00)	0.10*** (0.01)	0.07*** (0.00)	0.05*** (0.01)	0.08*** (0.00)	-0.05*** (0.01)	0.00 (0.00)
Pseudo R^2 /Adj R^2	0.039	0.039	0.049	0.049	0.074	0.094	0.049	0.055
Controls	✓	✓	✓	✓	✓	✓	✓	✓
City FE	✓	✓	✓	✓	✓	✓	✓	✓
N. Obs.	359,996	140,875	359,996	124,518	359,986	238,597	359,996	168,991