Socially Green Nudges: Unveiling the Power of Peer Influence on Green Choices

Zhenyu Gao, Yan Luo, Hao Yang

August 2024

Abstract

This paper explores the role of social interactions in promoting environmentally-friendly behaviors and green investments. Using a unique dataset collected from two renowned programs associated with Alibaba, the Ant Forest, a popular green initiative, and the Ant Fortune, a comprehensive mutual fund platform, the study demonstrates the positive impact of social interactions on individuals' adoption of low-carbon lifestyles and choices in green funds. Furthermore, we find that passive social interactions have a stronger effect in nudging individuals towards more sustainable daily-life and investment decisions than proactive social interactions.

JEL Codes: B55, G11, G50, Q55

Keywords: Social Interactions, Peer Effects, Green Nudges, Sustainable Finance, Digital Technology

---

* Zhenyu Gao is affiliated with CUHK Business School, The Chinese University of Hong Kong, Yan Luo and Hao Yang with Fudan University. The authors acknowledge and appreciate the supports from the Digital Finance Open Research Platform (www.dfor.org.cn). All data is sampled, desensitized, and stored on the Ant Open Research Laboratory in an Ant Group Environment which is only remotely accessible for empirical analysis.

1. Introduction

The combat against climate change and environmental issues necessitates collective efforts from individuals in their daily choices. Social interactions should play a pivotal role in shaping individuals' environmentally friendly behaviors. Surprisingly, this crucial aspect has received limited attention in previous literature, which has predominantly focused on individuals' economic and financial decisions (see Section 2 of the literature view for detailed discussions).

In this paper, we demonstrate a novel mechanism, namely "socially green nudges," utilizing a unique dataset that encompasses both social behaviors and individual environmentally friendly actions. Moreover, by employing an instrumental variable approach, we accurately elucidate the influence of social interactions in nudging individuals towards adopting more sustainable actions in their daily lives and in their financial investments.

We employ individual user data from Ant Forest, a popular green initiative in China. Ant Forest, as an affiliate of Alibaba, is a mini-program integrated into the Alipay app, China's largest third-party mobile and online payment platform. It is dedicated to advocating for low-carbon and green development and has been recognized with the UN Champions of the Earth award in 2019, the United Nations' esteemed global environmental honor. Ant Forest tracks users' daily eco-friendly activities, such as using public transportation or opting out of single-use cutlery for food deliveries. Users earn "green energy" points which estimate the amount of carbon emissions reduced by these activities, and upon reaching a certain threshold, Ant Forest plants a tree on their behalf and provides real-time satellite images of their trees. Moreover, one of the distinctive social mechanisms of Ant Forest involves the concept of "stealing" points, wherein users can steal the accumulated “green energy” points of their Alipay friends, while their own “green energy” points can also be stolen by their friends. Since its launch in August 2016, this social mechanism has sparked extensive online discussions and attracted a significant number of users to join Ant Forest, effectively raising awareness and promoting the adoption of low-carbon lifestyles. It is worth noting that “green energy” points within Ant Forest cannot be exchanged for financial rewards, thus solely influencing individuals’ non-pecuniary decisions regarding pro-environmental practices.

To examine the influence of individual investors’ green social interactions on their daily green actions, we leverage user data from Ant Forest, which includes information on personal-level “green energy” points earned via eco-friendly daily life activities and “green energy” points related social interactions. This unique dataset enables us to dynamically track changes in individuals’ green social interactions, low-carbon lifestyle choices, and tree planting behaviors, facilitating the exploration of the influence of green social interactions on green actions.

In addition, we delve into the examination of the influence of individual investors’ green social interactions on their green investments by matching investors’ Ant Forest accounts with their accounts from the Ant Fortune platform. The Ant Fortune platform provides individual investors with tradable mutual funds that encompass a comprehensive range of public funds in China. We assess the "greenness" of these funds based on their Environmental (E) ratings obtained from the WIND Public Fund ESG Rating Database.

Specifically, we randomly select a total of 200,000 individuals who are members of both Ant Forest and Ant Fortune. From these investors, we obtain monthly data on the “green energy” points a user steals and the “green energy” points stolen by a user’s friends, and “green energy” points acquired through various low-carbon actions. Additionally, we gather monthly information on fund transactions and holdings from the Ant Fortune platform. Basic demographic details such as investors’ age, gender, and city of residence are also collected. The study period for this sample spans from October 2019 to September 2021.

Our primary empirical analysis reveals a significant positive relationship between green social interactions and investors’ adoption of low-carbon lifestyles as well as their green investments. Using both the “green energy” points a user steals as well as the “green energy” points stolen by her friends as proxies, we find that increased green social interactions prompt users to subsequently accumulate more “green energy” points by adopting green lifestyle activities. On average, a one-standard-deviation increase in green social interactions is associated with a 0.26-standard-deviation increase in daily green actions. This is achieved through the adoption of environmentally friendly behaviors such as increased usage of public transportation, reduced plastic usage, energy conservation, recycling, and other similar practices. Users could further redeem their points for tree planting by collecting “green energy” points from those they have earned via their own eco-friendly behaviors in their daily lives or by “stealing” points from their friends. Based on our back-of-envelope estimation, the annual carbon reduction brought by the green social interactions in the Ant Forest is 12.41 billion kg, which accounts for about 0.11% of China’s total carbon emissions in 2020.

We observe that stronger green social interactions also contribute to increased green investment behavior. Specifically, users who have stolen more “green energy” points or experienced losses in “green energy” points due to their friends’ stealing are more inclined to invest in funds with higher Environmental (*E*) ratings in the subsequent month. On average, a one-standard-deviation increase in the users' green social interactions is associated with a 2.35% increase in her net purchase for green funds, conditional on the fund's environmental performance. Additionally, we find that the net purchase of green funds following stronger social interactions does not result in significantly higher returns over various time horizons, including one, three, six, twelve, or twenty-four months. These non-results alleviate concerns that social interactions influence investment choices solely driven by profit motives. Instead, they emphasize the distinct role of green social interactions in shaping investors' preferences for environmentally conscious investments.

Our findings indicate that both proactive social interactions, represented by the "green energy" points that users steal from their friends, as well as passive social interactions, represented by the "green energy" points stolen by their friends, contribute to promoting environmentally friendly behaviors and investment choices. Interestingly, our analysis reveals that passive social interactions have a stronger effect compared to proactive social interactions. Specifically, a one-standard-deviation increase in users' proactive social interactions and passive social interactions would lead to an increase in daily green actions which is equivalent to 0.14 and 0.33 of its standard deviation, respectively, and a one-standard-deviation increase in proactive (passive) social interactions is associated with a 1.69% (3.18%) increase in net purchase for green funds, conditional on the fund's environmental performance. When users experience their "green energy" points being stolen by their friends, it suggests the presence of stronger "peer effects." This emphasizes the influence of users' social networks and underscores the role of peers in facilitating green nudges. In other words, the actions of their friends within the social network have a greater impact on users' decisions to adopt low-carbon lifestyles and engage in green investments.

The identification of the role of social interactions in influencing green behaviors raises potential concerns about endogeneity. While endogeneity poses a significant challenge in identifying the effects of social interactions in existing literature (see, for example, Manski (1993) and Angrist (2014)), we implement several empirical strategies aimed at mitigating this issue. Firstly, in our analysis of the effects of social interactions on green lifestyles, we incorporate both individual and time fixed effects. Individual fixed effects control for homophily, which refers to the tendency for individuals with similar characteristics and preferences to form peer groups. By including individual fixed effects, we account for the possibility that individuals who adopt environmentally friendly lifestyles may also be more inclined to interact with their friends on the Ant Forest platform due to shared traits. Thus, we can examine how the dynamics of social interactions within the same individual influence their green choices when controlling for their time-invariant characteristics associated with homophily. Additionally, we include time fixed effects, which help control for the increasing trend of green awareness and the growing popularity of the Ant Forest platform. These factors can both drive green social interactions and green actions in daily life. By incorporating time fixed effects, we can isolate the impact of social interactions on green behaviors from the overall trends and changes in environmental consciousness during the study period.

Furthermore, in the second part of our baseline tests focusing on green investment, which are conducted at the individual-fund-time level, we extend our analysis by introducing fund-time fixed effects in addition to individual fixed effects. This is particularly relevant as it allows us to address concerns that the potential superior performance of green funds might attract investors who are also active in social interactions. By including fund-time fixed effects, we can control for time-varying characteristics of funds, such as returns and risks, thus mitigating potential confounding effects arising from fund performance.

Although the inclusion of these fixed effects alleviates the identification concerns, it is important to acknowledge that there could still be unobservable variables that we have not accounted for. For example, some unobserved shocks, such as environmental campaign, could both promote green social interactions and green choices of lifestyle and investment. To mitigate these concerns, we employ an instrumental variable strategy based on the unique feature of the Ant Forest program: the Ant Forest program randomly assigns the amount of "green energy" points available for each instance of "stealing." We use the average "green energy" points that the user steals from or that are stolen by their friends as instruments for our measures of green social interactions. Our instrumental variable approach allows us to identify and verify the causal impact of social interactions on individuals' green choices, including their daily-life green behaviors and green investments in mutual fund markets.

Subsequently, we conduct heterogeneity and robustness tests to explore potential variations in the impact of social interactions on green choices. First, we examine whether physical or regulatory climate shocks, which represent primary climate impacts encountered by individuals and investors (Stroebel and Wurgler, 2021; Krueger, Sautner, and Starks, 2020), intensify the social effect on green behaviors. To assess the influence of physical climate shocks, we adopt the method employed by Choi, Gao, and Jiang (2020) and utilize abnormal local temperatures as proxies for physical climate change-related shocks. Our analysis reveals that the effects of green social interactions are more pronounced among individuals residing in cities that experience abnormally high temperatures. This suggests that the impact of social interactions on green choices is heightened in regions where individuals directly face the consequences of climate change through extreme weather events.

We then leverage China's proposition of its "Dual Carbon Targets" (DCT) to capture a time-series shock to climate change awareness of investors related to regulatory shocks. We find that individuals who more actively interact with their friends tend to earn more "green energy" points by reducing their carbon footprints and also increase their portfolio exposure to green mutual funds following the DCT. This provides further evidence that climate and environmental regulations enhance the association between social interactions and green choices, underscoring the influence of regulatory shocks on investor behavior.

Moreover, we find that socially-driven green nudges are significantly more effective for females than males. However, there are no significant differences in effectiveness based on age. In contrast, the effects of social interactions on green investments are particularly pronounced among younger investors. Notably, there are no statistically significant differences in these effects on green investments between male and female investors, likely due to lower financial investment activity among females.

To enhance the robustness of our results, we employ alternative measures to identify green funds, using a textual-based approach based on the investment philosophy section. We find consistent results regarding the social effects on fund choices. Furthermore, we exclude the sample from cities during Covid-19 lockdown periods, and our results for both green lifestyle and green investment remain largely unchanged.

Taken together, these findings provide a comprehensive understanding of the effects of social interactions on green choices and investments. They highlight the role of physical and regulatory climate shocks, as well as individual characteristics such as age and gender, in shaping the relationship between social interactions and sustainability-related behaviors.

Our study makes significant contributions to the existing literature. While previous research has extensively explored the influence of social interactions on individuals' decision-making and behaviors, our paper investigates the social effects on low-carbon behaviors and green investment. This is particularly crucial in the context of addressing climate and environmental challenges, which require collective efforts from society.

One notable aspect of our study is the development of a direct and objective measure for social interactions at the individual level. We are able to link this measure with individuals' low-carbon behaviors and green investment choices. Moreover, we introduce an innovative distinction between proactive and passive social interactions, comparing their statistical and economic significance and providing interpretations of their economic implications. These results highlight the importance of social networks and peer influence in driving sustainable behaviors. They suggest that individuals are more likely to be motivated by observing the green actions of their friends and the potential social pressure to conform to environmentally friendly practices. Therefore, leveraging social networks and peer influence can be an effective strategy for promoting widespread adoption of low-carbon lifestyles and green investment.

Our study also carries important policy implications. We emphasize the role of social interactions in incentivizing individuals to reduce their carbon footprints and engage in green investment. Policy makers can leverage the concept of "green nudges" through social interactions to design effective environmental policies that capture public attention and participation. Additionally, our research sheds light on the significance of digital technology and FinTech in addressing climate change and environmental issues. These innovative technologies have the potential to make a substantial impact in tackling these urgent global concerns.

The remainder of the paper is structured as follows. Section 2 provides the literature review. Section 3 describes our data sources and measure constructions. Section 4 presents the main results of our empirical investigation. Section 5 reports the robustness tests and Section 6 concludes.

2. Literature review

Our paper makes valuable contributions to multiple areas of the literature. First, it is situated within the realm of social economics and finance. Jackson (2008) provides a systematic review of the social impact on people's behaviors, encompassing domains such as crime, employment, voting, and product usage. Hirshleifer (2020) provides a systematic exploration of the influence of social processes on economic and financial outcomes. Kuchler and Stroebel (2021) survey studies on social finance and underscore the crucial role of social interactions in shaping individuals' financial decisions.

Although our randomly selected sample does not provide detailed personal or regional network information, as seen in prior studies such as Banerjee et al. (2013), Bailey et al. (2018), and Kuchler et al. (2022), we are able to dynamically track individuals' social interactions and differentiate between proactive and passive social interactions. The observed stronger effect of passive social interactions underscores the significance of peer influence in our findings. Additionally, we contribute to the literature on the identification of social effects by developing a novel instrumental variable, further enhancing the understanding of the causal impact of social interactions.

Furthermore, our research makes contributions to emerging fields in environmental economics and climate finance, as reflected in review papers such as Hong, Karolyi, and Scheinkman (2020), Giglio et al. (2021), and Starks (2023). Our paper is linked to a companion study that examines the relationship between individuals' non-pecuniary green preferences, as revealed by their low-carbon daily lifestyles, and their green investment decisions (Gao et al. (2023)). In this paper, in addition to leveraging "green energy" data from Ant Forest and fund investment data from Ant Fortune, we also measure individuals' green-related social interactions. This aspect of our study focuses on the social effects on individuals' green actions, which have been understudied in the existing literature.

A notable contribution of our paper is the exploration of the intersection between these two aforementioned fields, investigating the social effects on individuals' green lifestyle and investment choices. This is particularly significant as addressing environmental and climate issues necessitates collective and coordinated efforts from the public society.

Moreover, our study is relevant to the literature on nudges in behavioral economics and psychology, which involves techniques for guiding individuals towards making better decisions (Thaler and Sunstein, 2009; Thaler, 2018). With the growing concerns about climate change and environmental threats, the concept of green nudges, aiming to promote environmentally friendly actions, has garnered increased attention (e.g., Schubert, 2017; Carlsson et al., 2021; He et al., 2023). In our paper, we investigate socially driven green nudges, which exert significant influences on individuals' pro-environmental choices in both daily life and investment contexts.

3. Institutional background, data, and measures

3.1 Institutional background

3.1.1 Ant Forest: green daily actions and social interactions

Ant Forest, which was launched in 2016, has garnered over 500 million users. The program creates a carbon account for every user, which can be accessed through their Alipay app alongside their financial and credit accounts. The program tracks 40 green daily actions of users across five categories, including “green travel” (such as using public transportation like the subway), “travel reduction” (such as paying utility bills online), “paper & plastic reduction” (such as not requiring plastic packaging), “energy saving” (such as using energy-efficient home appliances), and “recycling” (such as donating used clothes and shoes). Each time a user performs a green action, the Ant Forest program estimates the resulting carbon reduction using an algorithm provided by Beijing Environmental Exchange and Nature Conservancy. Users are then rewarded with “green energy” points in their carbon accounts based on the estimated carbon reduction. For instance, a user can earn 52g of “green energy” points for each subway ride, with a maximum of 260g points per day. Similarly, a user can earn 1.8g of “green energy” points per minute for riding a shared bike, with a maximum of 159g points per day.

The “green energy” points granted to users by the Ant Forest do not benefit them financially but can be used to instruct the Ant to undertake environmental protection activities on their behalf. Among the available activities, tree planting is the most popular option and is usually conducted through partnerships with local NGOs. To plant a tree, users need to accumulate enough “green energy” points by either collecting the points they earn or stealing points earned by their friends. Once users have accumulated a certain number of "green energy" points, they can redeem them to instruct Ant to plant a real tree. Additionally, the "green energy" points earned from users' green actions are not automatically credited to their accounts, users must actively collect these points, or they will expire within 72 hours. Even though Ant Forest users do not physically own these trees, they can view their growth in real-time through satellite images. In such a way, the program provides users with non-financial incentives to adopt green behaviors in their daily lives and has gained immense popularity. As of August 2023, seven years after its inception, the program has supported the planting of 475 million real trees in China's arid areas, enhancing local ecological environment.

The Ant Forest program not only motivates users to carry out eco-friendly actions daily but also provides a social networking feature to boost user engagement. Users can steal their Alipay friends' "green energy" points. To become friends on Alipay, users must already have established social connections either in real life or virtually. The program randomly determines the number of points that a user can steal from a friend each time, with a set cap of 50% on the number of daily generated points that can be stolen from a user by friends. Users with more Alipay friends who actively participate in the Ant Forest program can potentially steal more points, but they are also at a higher risk of having their points stolen by friends. Figure 1 illustrates how users can steal "green energy" points from their Alipay friends.

[Insert Figure 1 about here]

3.1.2 Ant Fortune platform

Ant Fortune is a popular wealth management platform in China, operated by the Ant Group. It collaborates with various financial institutions to offer users a variety of mutual fund products. Online investing in mutual funds has become increasingly popular in China, as it offers significantly lower subscription rates to users. By investing in mutual funds through online platforms such as Ant Fortune, users can enjoy great discounts on their subscription rates.

Ant Group acquired the Shumi platform with a mutual fund distribution license in April 2015, enabling it to enter the platform business. Today, Ant Group is the largest online investment services platform in China by AUM matched and distributed through its platform. It has collaborated with around 170 asset managers, including leading insurers, banks, and securities companies in China. As a result, it offers more than 6,000 products covering fixed-income, equity, and balanced mutual funds.

According to publicized data by the Asset Management Association of China, Ant Fortune had a distribution size of RMB 890.1 billion in the first quarter of 2021, securing the top position in the list. During our sample period which ended in September 2021, it was observed that Ant has maintained its leading position in terms of distribution size. It has grown to RMB 1.20 trillion, which is around 40% higher than the second-ranked channel, China Merchants Bank, and over 100% higher than the third-ranked channel, Tiantian Fund Distribution[1].

3.2 Data and measures

Our sample is comprised of 200,000 randomly selected Ant Forest program participants over the period from October 2019 to September 2021. We require sample individuals to have traded non-monetary market products from the online mutual fund distribution platform under the Ant Group, the Ant Fortune, at least once during the sample period to ensure that they are also active investors. Our empirical investigation is remotely

[1] https://www.amac.org.cn/researchstatistics/datastatistics/fundsalesindustrydata/

conducted in the Ant Open Research Laboratory[2] in an Ant Group Environment. All data was sampled, desensitized, and analyzed in the Ant Open Research Laboratory. The laboratory is a sandbox environment where the authors can only remotely conduct empirical analysis and individual identities are invisible.

For each sample individual, we obtain three sets of information, all of which are at the monthly frequency. The first set of information is about the green daily actions of sample individuals revealed by their "green energy" points earned in the Ant Forest program through low-carbon activities. The second set of information pertains to the social interactions between Ant Forest users. In this program, individuals can interact with their friends by stealing "green energy" points from each other. By keeping track of the "green energy" points stolen by and from friends, we can determine the extent of social interactions of sample individuals in the program. The third set of information is about sample individual's mutual fund investment behavior, including the funds being traded and the associated buy and sell volumes[3].

We observe a total of 3,072,891 trades during the sample period, covering 141,875 individuals who are users of both Ant Forest and Ant Fortune, encompassing 4,410 unique mutual funds that have been assigned Environmental (E) ratings by China's largest financial data provider Wind. Among these funds, 3,049 are mixed funds, 817 are index funds, 543 are equity funds and one is a bond fund.[4] Fund monthly return

[2] https://www.deor.org.cn/labstore/laboratory

[3] The number of unique non-money market funds traded by sample individuals in this initial sample is 7,744, which is compatible with the Ant Group's disclosure in its IPO prospectus that its mutual fund distribution platform offers more than 6,000 products to users as of the end of June 2020. According to the Asset Management Association of China, the average number of non-money market funds during our sample period is around 7,217. Collectively, these statistics confirm that the Ant Fortune has covered almost the entire universe of mutual funds in China, and that our sample investors could trade over a wide range of funds that are representative of the whole mutual fund market.

[4] The evaluation of bond funds typically does not include E scores, which limits their number in our sample.

data are also obtained from Wind.

3.2.1 Green daily actions and green social interactions in the Ant Forest program

For each Ant Forest user in each month, we record her total "green energy" points earned through low-carbon activities, denoted as $GreenPoint_{i,t}$. It indicates individual i's activeness in taking green daily actions. Note that $GreenPoint_{i,t}$ only considers those points granted to individual i according to her green daily actions and does not factor in points stolen between users.

As explained in section 3.1.1, users have up to 40 ways to earn "green energy" points during our sample period, which can be grouped into five main categories. Therefore, we collect data not only on the total amount of "green energy" points earned monthly by each sample individual, but also on her points earned within each of the five categories.

Ant Forest program users can interact with their Alipay friends by stealing each other's "green energy" points. We use $GreenSI_{i,t}$ to represent the overall social interactions of individual i in Ant Forest in month t, which is the sum of the "green energy" points she steals from her friends and her points stolen by friends within the month. A user with a higher $GreenSI_{i,t}$ is expected to have more intensive green social interactions in Ant Forest. We also decompose $GreenSI_{i,t}$ into proactive and passive components, or $ProactiveGSI_{it}$ and $PassiveGSI_{it}$. They are captured by the "green energy" points user i steals from friends and her points stolen by her friends in month t, respectively. A higher $ProactiveGSI_{i,t}$ is indicative of user i's greater tendency to actively interact with her friends. A higher $PassiveGSI_{i,t}$ is associated with a stronger influence exerted by friends, or peer effects, that could facilitate green nudges.

3.2.2 Mutual fund investments and post-trading performance

We link Ant Forest program users' green social interactions in the program with their mutual fund investment behavior on the Ant Fortune platform. For individual *i* in month *t*, we calculate her net purchase of fund *j*, or $NetBuy_{i,j,t}$, as the difference between her purchase and sales value of the fund scaled by the sum of the two values. A higher $NetBuy_{i,j,t}$ suggests that individual *i* exhibits a greater preference for fund *j* in month *t*.

$$NetBuy_{i,j,t} = (BuyValue_{i,j,t} - SellValue_{i,j,t}) / (BuyValue_{i,j,t} + SellValue_{i,j,t}) \times 100\%. \quad (1)$$

To assess the trading performance of individual *i* for fund *j* in month *t*, we multiply the net value she invests in the fund in month *t* by fund *j*'s return in the following periods[5]:

$$Profit^{1M}_{i,j,t} = (BuyValue_{i,j,t}, - SellValue_{i,j,t}) \times Ret_{j,t\text{-}t+1}, \quad (2)$$

where $Profit^{1M}_{i,j,t}$ is the profit individual *i* could obtain one month after she invests fund *j* in month *t*, $BuyValue_{i,j,t}$ and $SellValue_{i,j,t}$ represent the values of purchase and sales of the fund respectively, and $Ret_{j,t\text{-}t+1}$ is fund *j*'s return one month after *t*. By analogy, we calculate $Profit^{3M}_{i,j,t}$, $Profit^{6M}_{i,j,t}$, $Profit^{12M}_{i,j,t}$, and $Profit^{24M}_{i,j,t}$, by replacing $Ret_{j,t\text{-}t+1}$ in Eq. (2) with $Ret_{j,t\text{-}t+3}$, $Ret_{j,t\text{-}t+6}$, $Ret_{j,t\text{-}t+12}$, and $Ret_{j,t\text{-}t+24}$, respectively, which represent the profits that the individual could obtain 3-, 6-, 12-, and 24-months after trading fund *j* in month *t*.

We further assess individuals' trading performance conditional on abnormal returns of the funds traded, which is donated as $AbProfit^{nM}_{i,j,t}$. It is calculated by replacing $Ret_{j,t\text{-}}$

[5] Due to the availability of only two years of data on individual investors' holdings and transactions, we are unable to comprehensively track the dynamics of portfolio performance by considering the timing of buying and selling over an extended period. Therefore, we focus our analysis on the "buy and hold" performance of investors across various time horizons. While this approach provides valuable insights into the investors' performance within the given timeframe, we acknowledge the limitations imposed by the data availability.

$_{t+n}$ in Eq. (2) with the abnormal return of fund *j*, which is its raw return over the *n*-month period over its benchmark return during the concurrent period.

In investigating individual *i*'s trading performance, we control for her historical trading performance, or $CumProfit_{i,t}$. It is the cumulated profit she has earned by trading mutual funds on the Ant Fortune platform from her first trading until the end of month *t*, which could reflect her trading ability.

3.2.3 Mutual funds' environmental performance

We obtain each fund's E-scores from Wind, which are released semi-annually, to measure its environmental performance. It is possible that retail investors may not be aware of such sophisticated information, which is usually used by professionals. To address this concern, we propose an additional set of environmental performance measures based on a qualitative analysis of each fund's investment philosophy.

The investment philosophy section of a fund presents its investment targets, principles, and strategies. This section is an essential summary of a fund's important facts taken from its Fundraising report. It is featured prominently on the Ant Fortune app, right below the fund manager's introduction, which ensures easy access by investors. For each fund *j*, we tally the frequency of occurrences of the word "environment" in its investment philosophy section and scale it by the length of the section. This normalized count is denoted as $E\text{-}Count_j$. Funds that prioritize environmental issues in their investment philosophy are likely to focus more on the environmental performance of their investment targets when constructing portfolios. Therefore, funds with a higher $E\text{-}Count_j$ are arguably greener. We also construct $S\text{-}Count_j$ ($G\text{-}Count_j$) based on the scaled count of the word "society" ("governance") in fund *j*'s investment philosophy section, which are used in placebo tests.

We further measure funds' environmental performance using a stricter criterion. We define $E^{\perp}$-$Count_j$ as the normalized frequency of "environment" in fund j's investment philosophy only if "environment" is discussed exclusively without any reference to "social" or "governance." Otherwise, $E^{\perp}$-$Count_j$ is set to be zero. By analogy, $S^{\perp}$-$Count_j$ and $G^{\perp}$-$Count_j$ are constructed for placebo tests.

3.2.4 Physical and regulatory impacts of climate change

Physical and regulatory shocks are primary climate impacts encountered by individuals and investors (Stroebel and Wurgler, 2021; Krueger, Sautner, and Starks, 2020). Accordingly, we construct variables to quantify effects of these two types of shocks.

We use abnormal local temperatures, or $AbTmp_{i,t}$, to capture physical climate shocks. This measure is motivated by Choi, Gao, and Jiang (2020), which show that individuals divest more from brown stocks after experiencing warmer than usual temperatures, as their beliefs about climate change have been revised upwards. We obtain city-level temperature data from the China Meteorological Administration[6]. The variable $AbTmp_{i,t}$ is the temperature of the city where individual i resides in month t minus the city's average temperature in the same month of the year over the past 10 years. A higher $AbTmp_{i,t}$ is indicative of warmer than usual temperature and is expected to be associated with a greater shock of physical climate impact on local individuals.

Governmental environmental commitment helps to boost climate change awareness (e.g., Seltzer, Starks and Zhu, 2022, Bolton and Kacperczyk, 2021). We utilize China's proposition of its DCT to capture the effect of regulatory climate shocks. DCT refers Chinese government's commitment to achieving carbon peak by 2030 and carbon

[6]More information about the data could be found on https://data.cma.cn

neutrality by 2060, and was proposed at the 75th UN General Assembly in September 2020. But DCT started to cause extensive attention only since March 2021, when detailed measures and action plans were unveiled in the annual plenary session of the National People's Congress (NPC), the top legislature of China. Figure IA 1 plots the search volume for "carbon neutrality," the ultimate goal outlined in China's DTC proposition, on China's dominating search engine Baidu. It was low in September 2020 when DCT was initially proposed but surged in March 2021 when the detailed action plans were released. We thus set March 2021 to be the event month. A dummy DCT_t is set to be one for months after the event month to capture the regulatory climate shock.

[Insert Figure IA1 about here]

3.2.5 Instruments based on points randomly assigned by the Ant Forest

In the Ant Forest, the amount of "green energy" points that a participant can steal from her friends is randomly determined by the program's mechanism. This random variable is exogenous and highly correlated with the points that an individual can steal from and that can be stolen by her friends, yet it is not directly related to the individual's green daily actions or her green investments. Thus, the randomly assigned points could serve as an ideal instrument, which allows us to investigate the causal relationship between individuals' green social interactions and their subsequent green daily actions and green investment choices.

Although we cannot observe the exact amount of "green energy" points an individual steals from friends or the points are stolen by friends in each interaction, we do have access to the aggregated total "green energy" points and the frequency of these interactions at the individual and year-month level in the Ant Forest. We posit that the total amount of "green energy" points an individual steals, when scaled by the total number of theft instances, should be random as the amount of "green energy" points stolen in each instance is randomly assigned by the program. We thus construct $Rd\_ProactiveGSI_{i,t}$, $Rd\_PassiveGSI_{i,t}$, and $Rd\_GreenSI_{i,t}$ to act as instruments for $ProactiveGSI_{i,t}$, $PassiveGSI_{i,t}$, and $GreenSI_{i,t}$, respectively:

$$Rd\_ProactiveGSI_{i,t} = ProactiveGSI_{i,t} / \#ProactiveGSI_{i,t}\ , \tag{3}$$

$$Rd\_PassiveGSI_{i,t} = PassiveGSI_{i,t} / \#PassiveGSI_{i,t}\ , \tag{4}$$

$$Rd\_GreenSI_{i,t} = GreenSI_{i,t} / \#GreenSI_{i,t}\ , \tag{5}$$

where $ProactiveGSI_{i,t}$ and $PassiveGSI_{i,t}$ are the "green energy" points that individual i steals from and stolen by her friends in month t, respectively, and $GreenSI_{i,t}$ is the sum of the two. $\#ProactiveGSI_{i,t}$ and $\#PassiveGSI_{i,t}$ represent the total number of times individual i steals "green energy" from her friends and the total number of times her points are stolen by her friends in the Ant Forest in month t, respectively, and $\#GreenSI_{i,t}$ is the sum of the two. We illustrate the distribution of *Rd_GreenSI* in Figure IA2, which appears to follow a normal distribution, thereby supporting our argument for randomness.

4. Empirical results

Table 1 presents summary statistics of the main variables used in our empirical investigation, including sample individuals' retail trading, demographic information, green actions, green social interactions, and features of mutual funds traded by them. Panel A shows that $NetBuy_{i,j,t}$ has a sample mean of 40.82% and a standard deviation of 83.46%. Panel B shows that the average age of our sample individuals is 32.87, and 44.73% of them are female.

[Insert Table 1 about here]

Panel C shows that the monthly average "green energy" points earned by sample Ant Forest users through their eco-friendly behavior, or $GreenPoints_{i,t}$, is 2.25 kg. Note that $GreenPoints_{i,t}$ reflects only "green energy" points obtained by users through green daily actions. It does not account for points stolen from or stolen by friends. The breakdowns of $GreenPoints_{i,t}$ show that the majority of the "green energy" points are earned through green travel. $GreenTravel_{i,t}$ has a sample mean of 1.99 kg, which accounts for around 88% of the total "green energy" points earned by Ant Forest users in our sample.

The sample mean of $GreenSI_{it}$ is around 1.55 kg, which is around 68.65% of that of $GreenPoints_{i,t}$, the points users earn through green daily actions. This implies that the level of green social interactions in the Ant Forest is significant. Upon examining $GreenSI_{it}$'s proactive and passive components, their mean values are around 0.87 kg and 0.68 kg, respectively. These equate to roughly 38.56% and 30.08% of the sample mean of $GreenPoints_{i,t}$.

Panel D shows that the E-scores of sample funds have an average of 3.01 and a standard deviation of 0.98, indicating a relatively poor environmental performance of Chinese funds market as the score ranges from 0 to 10.

4.1 Baseline tests: social interactions as green nudges

4.1.1 Socially green nudge and green daily actions

We perform the following test to examine whether Ant Forest users' green social interactions motivate them to take more green actions in their daily lives:

$$GreenPoints_{i,t} = \beta_0 + \beta_1 GreenSI_{i,t-1} + \sum_i Individual_i + \sum_t Time_t + \varepsilon_{i,t}, \quad (6)$$

where $GreenPoints_{i,t}$ is individual i's "green energy" points earned through her green daily actions in month t. $GreenSI_{i,t-1}$ represents her overall green social interactions in Ant Forest in month $t-1$. Those who are more active in green daily activities may be more enthusiastic about green social interactions. We thus control for individual-fixed effects, in addition to time-fixed effects, in the tests to ensure that β_1 captures the additional effect of green social interactions on individuals' green daily actions. The results are reported in Table 2.

[Insert Table 2 about here]

Column (1) indicates that an individual's green social interactions exhibit a significant effect in nudging her toward being more active in taking green daily actions: β_1 is significantly positive at the 1% level. A one-standard-deviation increase in $GreenSI_{i,t-1}$ (2.87) is associated with an increase in $GreenPoints_{i,t}$ that is equivalent to 0.26 of its standard deviation (2.01). The economic magnitude implies that green social interactions have non-neglectable impacts on promoting green daily actions.

In columns (2) and (3), we separately examine the effects of the proactive and passive components of green social interactions on individuals' green daily actions. The coefficients on both $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are significantly positive at the 1% level. In terms of the economic magnitude, a one-standard-deviation increase in $ProactiveGSI_{i,t-1}$ (2.75) and $PassiveGSI_{i,t-1}$ (0.68) would lead to an increase in $GreenPoints_{i,t}$ which is equivalent to 0.14 and 0.33 of its standard deviation, respectively. When both $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are included in the tests in column (4), the results are similar. Both proactive and passive green social interactions are followed by a significant increase in individuals' green daily actions. However, the economic magnitude of the influence varies between the two types of interactions. A one-standard-deviation increase in passive green social interaction leads to a greater increase in green daily actions, approximately twice the level motivated by a one-standard-deviation increase in proactive green social interaction.

4.1.2 Socially green nudges and carbon reduction - back-of-the-envelope estimation

In this section, we estimate the annual reduction in carbon emissions resulting from the social interactions of 550 million users in the Ant Forest initiative. Several key features of the initiative are crucial for this estimation. First, the "green energy" points (i.e., *GreenPoints*) awarded to an individual directly measure the reduction in carbon dioxide (CO2) emissions achieved through her green actions. Individuals need to collect those points to their account within 72 hours, otherwise they will expire. Individuals can also accrue "green energy" points in their accounts by stealing them from friends. The points can be redeemed to instruct the Ant to participate in pro-environmental activities, with tree planting being the most popular choice. The number of "green energy" points required to plant a tree is equivalent to the amount of CO2 that the tree is expected to absorb over its lifetime.

Green social interactions could contribute to carbon reduction in three dimensions. First, by assuming that all stolen "green energy" points are ultimately redeemed for tree planting, the "green energy" obtained through green social interactions in the Ant Forest will eventually be used to plant trees, thereby contributing to carbon absorption. Since stealing and having energy stolen occur simultaneously during these interactions, we use the mean of *ProactiveGSI* to avoid double counting in this estimation. The monthly average of *ProactiveGSI* for sample individuals is 0.87 kg. Thus, in this dimension, the annual carbon reduction resulting from green social interactions for 550 million Ant Forest users is 0.87 kg × 550 million ×12 months=5.74 billion kg.

Second, as shown in Section 4.1.1, green social interactions promote green daily actions. The monthly average of *ProactiveGSI* and *PassiveGSI* is 0.87kg and 0.68 kg, respectively, and the regression coefficients on the two variables in Table 2 are 0.10 and 0.98. The newly promoted green actions, as a result of green proactive social interactions, would lead to 0.57 billion kg carbon reduction (0.10 × 0.87 kg × 550 million users × 12 months). The green actions promoted by passive social interaction would contribute to 4.40 billion kg carbon reduction (0.98 × 0.68 kg × 550 million × 12 months). The sum of these two is 4.97 billion kg.

Third, the additional "green energy" points generated in the second dimension, due to green daily actions induced by social interactions, can also be collected and used for tree planting. In our sample, the average proportion of "green energy" points generated that is collected is 34.11%. Assuming all the collected points are used for tree planting, the carbon reduction in this dimension is 4.97 billion kg × 34.11% = 1.70 billion kg.

The annual carbon reduction resulting from green social interactions should be the sum of carbon reductions in the three dimensions discussed above, which amounts to 12.41 billion kg. In 2020, China's total annual carbon emissions were 10.9 billion tons[7]. The carbon reduction achieved through green social interactions represents 0.11% of China's total carbon emissions. When the carbon reduction directly resulting from individuals' green daily actions in the Ant Forest is considered, which totals 14.85 billion kg (2.25 kg × 550 million × 12 months)[8], the carbon reduction attributed to green social interactions within the initiative amounts to approximately 83.56% of this value. This evidence implies that the carbon reduction stemming from social

---

[7] https://data.worldbank.org.cn/indicator/EN.ATM.CO2E.KT?locations=CN

[8] Panel C of Table 1 shows that the sample mean of $GreenPoints_{i,t}$ is 2.25kg. This value represents the average monthly carbon reduction achieved by an Ant Forest user through her daily green actions.

interactions in the Ant Forest program is substantial, which highlights the crucial role of social engagement in achieving significant environmental impact.

4.1.3 Socially green nudges and green investments

Gao et al. (2023) show that individuals' green preference, revealed through their low-carbon daily lifestyles, is carried over into their investment decisions in financial markets. If green social interactions indeed induce individuals to be more active in taking green actions in daily life, as shown in Section 4.1.1, we also expect it to nudge individuals toward making more green investments in financial markets.

The unique dataset we have obtained, which links individuals' green daily actions recorded in the Ant Forest program with their mutual fund investments on the Ant Fortune platform, allows us to perform the investigation. We run the following individual-fund-time level regression to examine the influence of individuals' green social interactions on their green investment tendency:

$$NetBuy_{i,j,t} = \beta_0 + \beta_1 GreenSI_{i,t-1} \times E_{j,t-1} + \beta_2 GreenSI_{i,t-1} + \sum_i Individual_i + \sum_{j,t} Fund_j \times Time_t + \varepsilon_{i,j,t}, \quad (7)$$

where $NetBuy_{i,j,t}$ is individual *i*'s net purchase of fund *j* in month *t*, $GreenSI_{i,t-1}$ is her green social interaction in the Ant Forest program in month *t*-1, and $E_{j,t-1}$ is the E-score of fund *j* that captures its environmental performance. We control for individual-fixed effects to isolate the influence of personal characteristics so that we could examine the additional effect induced by green social interactions. In addition, individuals are likely to invest in funds conditional on their past return and risk features. We thus control for fund-year-month fixed effects to isolate the influence of fund characteristics that may vary over time, such as fund returns and risks. If green social interactions induce more active green investments, we expect β_1 to be significantly positive. The results are reported in Table 3.

[Insert Table 3 about here]

Column (1) shows that the coefficient on $GreenSI_{i,t-1} \times E_{j,t-1}$, or β_1 in Eq. (7), is significantly positive at the 1% level. It is consistent with our expectation that more active green social interactions in the Ant Forest program motivate individuals to invest more in mutual funds with better environmental performance in subsequent periods. The coefficient on $GreenSI_{i,t-1}$ itself is significantly negative. It could be driven by the fact that compared to their counterparts, individuals who interact more with their friends in the Ant Forest program are younger and thus have less wealth. As a result, individuals with a higher $GreenSI_{i,t-1}$ are less active in mutual fund investments unconditionally. However, their investment tendency is significantly inflated for funds with better environmental performance.

The effects of proactive and passive green social interactions are examined separately in columns (2) and (3), and jointly in column (4). The results show that both types of green social interactions significantly increase individuals' tendency to invest in green funds. In terms of economic magnitude, passive green social interactions exhibit a greater influence relative to proactive green social interactions. The estimates shown in columns (2) and (3) suggest that a one-standard-deviation increase in $ProactiveGSI_{i,t-1}$ ($PassiveGSI_{i,t-1}$) is associated with a 1.69% (3.18%) increase in $Netbuy_{i,j,t}$, given the sample mean of $E_{j,t-1}$ (3.01) and $Netbuy_{i,j,t}$ (40.82%). The evidence is compatible with our findings in Section 4.1.1 that the magnitude of the incremental daily green action induced by passive green social interactions is about twice that induced by proactive green social interactions.

Though previous results have suggested that green social interactions nudge individuals toward investing in green funds, there is a possibility that the effect is driven by individuals' pecuniary motives rather than their greater preference for green investments induced by green social interactions. The inclusion of fund-year-month fixed effects in the tests could at least partially alleviate such concerns as the influence of time-varying fund characteristics, including past risks and returns, has been controlled. To further address the concern, we assess the post-trading performance of sample individuals. This investigation could provide additional evidence on the pecuniary or non-pecuniary nature of individuals' intensified green investments induced by socially green nudges.

For each fund *j* traded by individual *i* in month *t*, we calculate the profit she could earn 1-, 3-, 6-, 12-, and 24-month after month *t*, which is denoted as $Profit^{1M}_{i,j,t}$, $Profit^{3M}_{i,j,t}$, $Profit^{6M}_{i,j,t}$, $Profit^{12M}_{i,j,t}$, and $Profit^{24M}_{i,j,t}$, respectively. We also calculate the abnormal profit that could be earned 1-, 3-, 6-, 12-, and 24-month after individual *i*'s trading of fund *j* in month *t*, which are denoted as $AbProfit^{1M}_{i,j,t}$, $AbProfit^{3M}_{i,j,t}$, $AbProfit^{6M}_{i,j,t}$, $AbProfit^{12M}_{i,j,t}$, and $AbProfit^{24M}_{i,j,t}$, respectively. The construction details of these variables are described in detail in Section 3.2.2. Based on these measures, we perform the following regression:

$$(Ab)Profit_{i,j,t} = \beta_0 + \beta_1 GreenSI_{i,t} \times E_{j,t-1} + \beta_2 GreenSI_{i,t} + \beta_3 CumProfit_{i,t} + \sum_i Individual_i + \sum_{j,t} Fund_j \times Time_t + \varepsilon_{i,j,t}, \quad (8)$$

where the dependent variable could be one of the eight profit measures mentioned above. The coefficient of interest is β_1, which represents the influence of green social interaction-induced green investments on trading profits. A significantly positive β_1 would suggest that the induced green investments are rewarded by better financial performance, and vice versa. Again, individual and fund-year-month fixed effects are both controlled. We also control for the cumulated profit that individual *i* has earned through trading funds on Ant Fortune since the beginning of the sample period until the end of month *t*, which is denoted by $CumProfit_{i,t}$. It helps to control for individuals' time-varying investment ability. The results are shown in Table 4.

[Insert Table 4 about here]

Panels A and B of Table 4 report the results when post-trading performance is measured using raw and abnormal profit measures, respectively. No matter which post-trading interval is examined or how trading profit is measured, there's no evidence that individuals' green social interaction motivated green investments benefit them financially. The coefficients on $GreenSI_{i,t} \times E_{j,t-1}$ in column (5) in both Panels A and Panel B are significantly negative, suggesting that such green investments even adversely affect individuals' trading profits in longer periods. For robustness, we assess investors' post-trading abnormal profit using DGTW-adjusted returns in Table IA1 in the appendix. The results are similar: the coefficient on the interaction term $GreenSI_{i,t-1} \times E_{j,t-1}$ is insignificant across all five columns when different post-trading intervals are examined.

4.2 Heterogeneity analysis

In this section, we perform heterogeneity analysis conditional physical and regulatory climate shocks as well as individuals' demographic characteristics, including gender and age.

4.2.1 Physical and regulatory climate shocks

We examine the influence exerted by physical and regulatory climate shocks in Table 5. Columns (1) and (2) focus on the effect of socially green nudges on individuals' green daily actions while columns (3) and (4) focus on the effect on green investments.

[Insert Table 5 about here]

Columns (1) and (3) show that after warmer-than-usual temperatures, which capture physical climate shocks, green social interactions' positive influence on individuals' green daily actions and investments is significantly strengthened. Regulatory climate shocks exhibit a similar effect. Columns (2) and (4) show that the green nudging effect, in terms of both individuals' green daily actions and investments, is significantly reinforced after the action plans of China's DCT were unveiled in March 2021.

4.2.2 Demographic characteristics

We further examine the variation in the effect of socially green nudges conditional on demographic characteristics, including age and gender. We classify a sample individual as young if her age is below the sample median (32.87) at the beginning of the sample period, and set a dummy variable $Young_i$ to be one for her. The results are shown in Table 6. Columns (1) and (2) examine the effect on individuals' green daily actions, and columns (3) and (4) examine the effect on individuals' green investments.

[Insert Table 6 about here]

In columns (1) and (2), where individuals' green daily actions are examined, the coefficient on $GreenSI_{i,t-1}$ is significantly positive at the 1% level. It is consistent with our previous findings that green social interactions promote green daily actions overall. Coefficients on interaction terms between $GreenSI_{i,t-1}$ and individual' personal characteristics show that the socially green nudge is significantly more effective for females and young than for males and old.

In columns (3) and (4), the coefficient on $GreenSI_{i,t-1} \times E_{j,t-1}$ is significantly positive, confirming that socially green nudge induces greater green investment. However, there's no significant difference in the effect, between females and males, between the young and old. It is possible that relative to males and the old, females and the young care more about green daily actions, but are less active in financial markets. Thus, socially green nudge is more effective for them in terms of promoting green daily actions but not in the aspect of green investments.

4.3 Detecting causality using randomly assigned points

To confirm the causal relationship between green social interactions and green actions, we employ $Rd\_ProactiveGSI_{i,t}$, $Rd\_PassiveGSI_{i,t}$, and $Rd\_GreenSI_{i,t}$ as instruments for $ProactiveGSI_{i,t}$, $PassiveGSI_{i,t}$, and $GreenSI_{i,t}$, respectively, which are defined in Eqs.(3) to (5). These randomly assigned points, which represent the average amount of "green energy" points individuals steal from their friends or have stolen by their friends in each interaction within a given month, serve as ideal instrumental variables for green social interactions. They are directly associated with the total amount of "green energy" points users steal ($ProactiveGSI_{i,t}$) from their friends and have stolen by their friends ($PassiveGSI_{i,t}$). Importantly, due to the randomness generated by the platform, these points are unlikely to be directly related to our outcome variables of interest (i.e., $GreenPoints_{i,t}$ and $NetBuy_{i,j,t}$).

We estimate the following two-stage tests to examine the causal relationship between green social action and green daily actions:

$$GreenSI_{i,t} = \beta_0 + \beta Rd\_GreenSI_{i,t} + \sum_i Individual_i + \sum_t Time_t + \varepsilon_{i,t}, \quad (9)$$

$$GreenPoints_{i,t} = \beta_0 + \beta_1 Pre(GreenSI_{i,t-1}) + \sum_i Individual_i + \sum_t Time_t + \varepsilon_{i,t}, \quad (10)$$

where *Pre* ($GreenSI_{i,t-1}$) in Eq. (10) is the predicted value of individual *i*'s $GreenSI_{i,t-1}$ estimated using Eq. (9) in the first stage. The second-stage test in Eq. (10) examines how the instrumented individual *i*'s green social interaction affects her subsequent green daily actions. Results of the first- and second-stage tests are reported in Panels A and B of Table 7, respectively. In Panel A, all the three instruments are significantly positively associated with green social interactions at the 1% level, with an *F*-value greater than 10. In Panel B, the coefficients on $Pre(GreenSI_{i,t-1})$, $Pre(ProactiveGSI_{i,t-1})$, and $Pre(PassiveGSI_{i,t-1})$ are all significantly positive at the 1% level. The results confirm that green social interactions causally lead to an increase in green daily actions.

[Insert Table 7 about here]

To avoid the forbidden regression (Wooldridge, 2010), we employ the combination of $Rd\_GreenSI_{i,t} \times E_{j,t-1}$ and $Rd\_GreenSI_{i,t}$ as instruments for $GreenSI_{i,t} \times E_{j,t}$ and $GreenSI_{i,t}$, and estimate the following two-stage tests to examine the causal relationship between green social action and green investments :

$$GreenSI_{i,t} \times E_{j,t} = \beta_0 + \beta_1 Rd\_GreenSI_{i,t} \times E_{j,t} + \beta_2 Rd\_GreenSI_{i,t} + \sum_i Individual_i + \sum_{j,t} Fund_j \times Time_t + \varepsilon_{i,j,t}, \quad (11)$$

$$GreenSI_{i,t} = \beta_0 + \beta_1 Rd\_GreenSI_{i,t} \times E_{j,t} + \beta_2 Rd\_GreenSI_{i,t} + \sum_i Individual_i + \sum_{j,t} Fund_j \times Time_t + \varepsilon_{i,j,t}, \quad (12)$$

$$NetBuy_{i,j,t} = \beta_0 + \beta_1 Pre(GreenSI_{i,t-1} \times E_{j,t-1}) + \beta_2 Pre(GreenSI_{i,t-1}) + \sum_i Individual_i + \sum_{j,t} Fund_j \times Time_t + \varepsilon_{i,j,t}. \quad (13)$$

where *Pre* ($GreenSI_{i,t-1}\times E_{j,t-1}$) and *Pre* ($GreenSI_{i,t-1}$) in Eq. (13) are the predicted values of $GreenSI_{i,t-1}\times E_{j,t-1}$ and $GreenSI_{i,t-1}$ estimated using Eq. (11) and Eq. (12) in the first stage, respectively. *Pre* ($ProactiveGSI_{i,t}\times E_{j,t-1}$), *Pre* ($ProactiveGSI_{i,t}$), *Pre* ($ProactiveGSI_{i,t}\times E_{j,t}$), and *Pre* ($ProactiveGSI_{i,t}$) are estimated by analogy, and the Eqs are suppressed for brevity. The second-stage test in Eq. (13) examines how the instrumented individual *i*'s green social interaction affects her subsequent green investment choices. Results of the first- and second-stage tests are reported in Panels A and B of Table 8. In Panel A, column (1) shows that the coefficient on $Rd\_GreenSI_{i,t}\times E_{j,t}$ is significantly positive at the 1% level with an *F*-value greater than 10, indicating strong explanatory power of the instrumental variables. Columns (2) and (3) present similar results. The results in column (4) indicate that $Rd\_GreenSI_{i,t}$ is significantly associated with $GreenSI_{i,t}$. Similar results in columns (5) and (6) further validate the effectiveness of the instrumental variables. In Panel B, the coefficients on all the three interaction terms are significantly positive at the 1% level, confirming the causal effect of green social interactions on green investment choices.

[Insert Table 8 about here]

5. Further analysis

5.1 Breakdowns of green daily actions

Results in Section 4.1.1 show that green social interactions in the Ant Forest program significantly increase program participants' total "green energy" points, which are indicative of their intensified green daily actions in general. In this section, we further examine how green social interactions affect the dynamics of Ant Forest program participants' "green energy" points earned through each of the five green daily action categories: “green travel,” “travel reduction,” “paper & plastic reduction,” “energy saving,” and “recycling.” Such investigation provides insights into the effectiveness of socially green nudge in promoting different types of green actions. The results are shown in Tale IA2.

[Insert Table IA2 about here]

Panel A shows that the coefficient on $GreenSI_{i,t}$ is significantly positive across all five columns, each representing one type of green daily action. In terms of the economic magnitude, the socially green nudge has the greatest effect in motivating green travel, followed by energy saving, paper and plastic reduction, travel reduction, and recycling.

Panels B to D examine the effects of $ProactiveGSI_{i,t}$ and $PassiveGSI_{i,t}$ separately and jointly. Both proactive and passive green social interactions are effective in promoting green travel, paper and plastic reduction, and travel reduction. The coefficients on both variables are significant at the 1% level. Their effects on individuals' energy saving and recycling, when examined alone, are weak or insignificant. Similar to the effect of $GreenSI_{i,t}$, both proactive and passive green social interactions have the greatest effect over green travel, among all the five types of green daily actions, in terms of the economic magnitude.

5.2 Collection of “green energy” points

Individuals earn “green energy” points through their green daily actions, which is referred to as $GreenPoints_{i,t}$ in our study. Once generated, these points must be collected into their account to be accumulated for future redemption. If the points are not collected within 72 hours of generation, they will expire.

In this section, we examine the influence of individuals' green social interactions on their collection of "green energy" points and report the results in Table IA3. The dependent variable $CollectPoints_{i,t}$ refers to the "green energy" points that individual i collects in month t, which can be accumulated and later redeemed for planting trees. The coefficients on variables representing green social interactions are all significantly positive at the 1% level, indicating that green social interactions enhance participants' propensity to collect their "green energy" points. This further suggests that green social interactions motivate individuals to participate in real tree-planting activities through the Ant platform, as points must be collected before they can be redeemed for tree-planting requests.

[Insert Table IA3 about here]

5.3 Socially green nudges and tree planting

The "green energy" point granting and tree-planting schemes of the Ant Forest program are designed to amplify the carbon reduction effects initiated by participants' green daily actions. Participants earn points based on the CO2 reductions achieved through their green daily actions. These points can then be collected and redeemed for tree planting, providing additional carbon sequestration benefits. Section 5.2 shows that green social interactions in the Ant Forest promote the collection of "green energy" points. In this section, we further examine whether green social interactions indeed lead to participants' greater tendency to request the Ant to plant real trees.

The results are reported in Table IA4. $Tree_{i,t}$ is an indicator that equals one if individual i redeems her "green energy" points for tree planting in month t, and zero otherwise. Coefficients on the green social interaction variables are significantly positive at the 1% level across all the three columns, demonstrating the effectiveness of socially green nudges in promoting the tree-planting behavior. Result in column (1) implies that a one-standard-deviation increase in $GreenSI_{i,t-1}$ (2.87) would lead to a 2.73% increase in tree-planting probability in the next month. Columns (2) and (3) examine the influence of individuals' age and gender on the effect of socially green nudges, respectively. The coefficients on the interaction terms in column (2) and column (3) are significantly positive at the 5% and 1% levels, respectively, suggesting that the effect of socially green nudges is more pronounced among the young and females. This aligns with the results of our heterogeneity analysis in Table 6.

[Insert Table IA4 about here]

The results in Table IA4 confirm that green social interactions in the Ant Forest not only directly encourage participants' green daily actions, as shown in Section 4.1.1, but also increase their tendency to redeem "green energy" points for tree planting. This dual effect amplifies the carbon reduction impact of socially-driven green nudges.

5.4 green funds identified using textual analysis

In our main tests, we use a fund's E-score issued by Wind to define its greenness. As discussed in Section 3.2.3, we construct two alternative environmental performance measures for sample funds, $E\text{-}Count_j$ and $E^{\perp}\text{-}Count_j$. A fund with a higher $E\text{-}Count_j$ or $E^{\perp}\text{-}Count_j$ discusses more environment-related issues in its investment philosophy, and is expected to pay more attention to such issues. Relative to their counterparts, such funds are more likely to consider investment targets' environmental performance in constructing their portfolios and thus have better environmental performance as a result. Similarly, we construct variables $S\text{-}Count_j$, $S^{\perp}\text{-}Count_j$, $G\text{-}Count_j$ and $G^{\perp}\text{-}Count_j$, which focus on funds' discussion of social- or governance-related issues in their investment philosophy and are used in placebo tests.

[Insert Table IA5 about here]

We replace $E_{j,t-1}$ with $E\text{-}Count_j$ and $E^{\perp}\text{-}Count_j$ in Eq. (7) and report the results in column (1) of Panels A and B of Table IA5, respectively. The results remain robust and strong: coefficients on both $GreenSI_{i,t-1} \times E\text{-}Count_j$ and $GreenSI_{i,t-1} \times E^{\perp}\text{-}Count_j$ are significantly positive at the 1% level. In comparison, placebo tests in columns (2) and (3) of both panels show that socially green nudges have insignificant positive impacts on individuals' investments in funds with better social or governance performance.

5.5 Filter out the influence of Covid-19 lockdowns

Our study covers the period from October 2019 to September 2021, during which some cities underwent city-level lockdown measures. Lockdowns could affect individuals' green daily actions, especially those related to outdoor engagement such as green travel. In addition, individuals' social interactions may also be affected by lockdowns, which altered people's lives in many aspects.

Panel A of Table IA6 presents information on city-level lockdowns that took place during our sample period. During this specific period, city-level lockdowns were concentrated in the Hubei province in early 2020. To filter out the influence of lockdowns, we re-perform our baseline tests in Tables 2 and 3 but exclude observations affected by city-level lockdowns. The results are reported in Panels B and C of Table IA6. Again, the results are qualitative similar to those obtained based on the full sample.

[Insert Table IA6 about here]

6. Conclusions

This paper provides valuable insights into the role of social interactions in driving environmentally-friendly behaviors and green investments. By analyzing a unique dataset from two prominent programs affiliated with Alibaba, Ant Forest and Ant Fortune, the study demonstrates the significant positive impact of social interactions on individuals' adoption of low-carbon lifestyles and preferences for green funds.

The findings highlight that passive social interactions, such as having "green energy" stolen by others, have a stronger effect on promoting environmentally-friendly choices compared to proactive interactions, such as stealing "green energy" from others. This suggests that the power of social influence and social norms play a crucial role in shaping individuals' sustainable behaviors and investment decisions.

To address concerns related to endogeneity, we employ instruments for green social interactions using the randomly assigned points when users are interacting with their friends in the Ant Forest. This approach strengthens the causal interpretation of the observed relationships between social interactions and environmentally-friendly behaviors.

The implications of this research are significant for policymakers, organizations, and individuals interested in promoting sustainable practices. By understanding the importance of social interactions, initiatives and interventions can be designed to harness the power of social influence to encourage the adoption of low-carbon lifestyles and investments in green funds. Furthermore, the study provides valuable insights for the design of social platforms and programs that facilitate passive social interactions, enabling individuals to observe and learn from others' sustainable behaviors and investment choices.

References

Angrist JD. (2014). The perils of peer effects. *Labour Econ*. 30:98–108

Banerjee, A., Chandrasekhar, A. G., Duflo, E., & Jackson, M. O. (2013). The diffusion of microfinance. *Science*, 341(6144), 1236498.

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk?. *Journal of financial economics*, 142(2), 517-549.

Carlsson, F., Gravert, C., Johansson-Stenman, O., & Kurz, V. (2021). The use of green nudges as an environmental policy instrument. *Review of Environmental Economics and Policy*, 15(2), 216-237.

Choi, D., Gao, Z., & Jiang, W. (2020). Attention to global warming. *The Review of Financial Studies*, 33(3), 1112-1145.

Gao, Z., Luo, Y., Tian, G., & Yang, H. (2023). Green Preference, Green Investment. *Available at SSRN 4655538*.

Giglio, S., Kelly, B., & Stroebel, J. (2021). Climate finance. *Annual Review of Financial Economics*, 13, 15-36.

He, G., Pan, Y., Park, A., Sawada, Y., & Tan, E. S. (2023). Reducing single-use cutlery with green nudges: Evidence from China’s food-delivery industry. *Science*, 381(6662), eadd9884.

Hirshleifer D. (2020). Presidential address: social transmission bias in economics and finance. *Journal of Finance*, 75(4):1779–1831

Hong, H., Karolyi, G. A., & Scheinkman, J. A. (2020). Climate finance. *The Review of Financial Studies*, 33(3), 1011-1023.

Jackson, M. O. (2008). *Social and economic networks* (Vol. 3). Princeton: Princeton university press.

Kuchler, T., & Stroebel, J. (2021). Social finance. *Annual Review of Financial Economics*, 13, 37-55.

Kuchler, T., Li, Y., Peng, L., Stroebel, J., & Zhou, D. (2022). Social proximity to capital: Implications for investors and firms. *The Review of Financial Studies*, 35(6), 2743-2789.

Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies*, 33(3), 1067-1111.

Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. *The review of economic studies*, 60(3), 531-542.

Schubert, C. (2017). Green nudges: Do they work? Are they ethical?. *Ecological economics*, 132, 329-342.

Seltzer, L. H., Starks, L., & Zhu, Q. (2022). Climate regulatory risk and corporate bonds (No. w29994). *NBER Working Paper*.

Starks, L. T. (2023). Presidential Address: Sustainable Finance and ESG Issues—Value versus Values. *The Journal of Finance*.

Stroebel, J., & Wurgler, J. (2021). What do you think about climate finance?. *Journal of Financial Economics*, 142(2), 487-498.

Thaler, R. H. (2018). From cashews to nudges: The evolution of behavioral economics. *American Economic Review*, 108(6), 1265-1287.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness*. Penguin.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

Appendix Table A1: Variable definition

This table provides definitions for variables used in our empirical analysis.

Variables	Definitions
Retail trading	
$NetBuy_{i,j,t}$	The difference between investor *i*'s purchase and sales value of fund *j* in month *t* scaled by the sum of the two values. The variable is defined in Eq. (1) and expressed in percentage.
Retail investors' demographic information	
$Young_i$	An indicator that equals one for individuals aged below sample median (32) at the beginning of the sample period, and zero otherwise.
Age_i	Age of individual *i* at the beginning of the sample period.
$Female_i$	An indicator that equals one for females, and zero for males.
Ant Forest program-related variables	
$ProactiveGSI_{i,t}$ (in kg)	The "green energy" points stolen by individual *i* from her Alipay friends in month *t* in the Ant Forest program.
$PassiveGSI_{i,t}$ (in kg)	Individual *i*'s "green energy" points stolen by her Alipay friends in month *t* in the Ant Forest program.
$GreenSI_{i,t}$ (in kg)	The sum of $ProactiveGSI_{i,t}$ and $PassiveGSI_{i,t}$.
$GreenPoints_{i,t}$ (in kg)	The total "green energy" points earned by individual *i* in month *t* in the Ant Forest program through her green daily actions in month *t*.
$GreenTravel_{i,t}$ (in kg)	The "green energy" earned by individual *i* under the "green travel" category in the Ant Forest program, though activities such as travelling by public transportation and walking.
$TravelReduction_{i,t}$ (in kg)	The "green energy" points earned by individual *i* under the "travel reduction" category in the Ant Forest program, through activities such as using online services.
$P\&PReduction_{i,t}$ (in kg)	The "green energy" points earned by individual *i* under the "paper & plastic reduction" category in the Ant Forest program, through activities such as requiring no single-use cutlery when using food-delivery services, and requiring electronic receipts instead of printed copies.
$EnergySaving_{i,t}$ (in kg)	The "green energy" points earned by individual *i* under the "energy saving" category in the Ant Forest program, through activities such as purchasing energy-efficient appliances.
$Recycle_{i,t}$ (in kg)	The "green energy" points earned by individual *i* under the "recycle" category in the Ant Forest program, through activities such as recycling used clothes/cell phones/ appliances.
$CollectPoints_{i,t}$ (in kg)	The total "green energy" points collected by individual *i* in month *t* in the Ant Forest program, capped by the total green energy points earned by the individual *i* in month *t* (i.e., $GreenPoints_{i,t}$).
$Tree_{i,t}$	An indicator that equals one if individual *i* redeemed her green points to plant a tree in Ant Forest in month *t*, and

	zero otherwise.
Mutual funds' environmental performance based on rating	
$E_{j,t}$	The E-score of fund *j* issued by Wind, conditional on its environmental performance. The score is updated on a semi-annual basis.
Mutual funds' non-financial performance based on textual analysis	
$E\text{-}Count_j$	The number of times that "environment" is mentioned in the investment philosophy section of fund *j* displayed in the Ant Fortune app, scaled by the length of the section.
$S\text{-}Count_j$ / $G\text{-}Count_j$	The construction is analogous to that of $E\text{-}Count_j$.
$E^{\perp}\text{-}Count_j$	The number of times that "environment" is mentioned in the investment philosophy section of fund *j*, scaled by the length of the section, conditional on mentioning "environment" exclusively in their investment philosophy section, without the mention of "social" or "governance".
$S^{\perp}/G^{\perp}\text{- } Count_j$	The construction is analogous to that of $E^{\perp}\text{-}Count_j$.
Physical and regulatory shock related variables	
$AbTmp_{i,t}$	The abnormal temperature measured following Choi, Gao, and Jiang (2020), which equals to the temperature of the city where individual *i* resides in month *t* minus the city's average temperature in the same month of the year over the past 10 years.
DCT_t	A dummy variable that equals one for months after March 2021, and zero otherwise. In March 2021, China unveiled its measures and action plans to achieve the Dual Carbon Targets in the annual plenary session of the National People's Congress (NPC), the top legislature of China.
Post-trading performance	
$Profit^{1M}_{i,j,t}$ / $Profit^{3M}_{i,j,t}$ /$Profit^{6M}_{i,j,t}$ / $Profit^{12M}_{i,j,t}$ / $Profit^{24M}_{i,j,t}$	$Profit^{1M}_{i,j,t}$ is the profit that individual *i* could obtain one month after her trading of fund *j* in month *t*. It is calculated by multiplying individual *i*'s net purchase of fund *j* (unscaled) in month *t* by fund return 1-month after *t*, as specified in Eq. (2). By analogy, we also construct performance measures for 3-, 6-, 12-, and 24-months after the trading, which are denoted as $Profit^{3M}_{i,j,t}$, $Profit^{6M}_{i,j,t}$, $Profit^{12M}_{i,j,t}$, and $Profit^{24M}_{i,j,t}$, respective.
$AbProfit^{1M}_{i,j,t}$/$AbProfit^{3M}_{i,j,t}$ /$AbProfit^{6M}_{i,j,t}$/$AbProfit^{12M}_{i,j,t}$ $AbProfi^{24M}_{i,j,t}$	$AbProfit^{1M}_{i,j,t}$ is the abnormal profit that individual *i* could obtain one month after her trading of fund *j* in month *t*. It is calculated by multiplying individual *i*'s net purchase of fund *j* (unscaled) in month *t* by the abnormal return of fund *j* 1-month after *t*. The abnormal return of fund *j* is its return over its benchmark return during the concurrent period. By analogy, we also construct abnormal performance measures for 3-, 6-, 12-, and 24-months after the trading, which are denoted as $AbProfit^{3M}_{i,j,t}$, $AbProfit^{6M}_{i,j,t}$, $AbProfit^{12M}_{i,j,t}$, and $AbProfit^{24M}_{i,j,t}$, respective.
$DGTWProfit^{1M}_{i,j,t}$/ $DGTWProfit^{3M}_{i,j,t}$/ $DGTWProfit^{6M}_{i,j,t}$/ $DGTWProfit^{12M}_{i,j,t}$/ $DGTWProfit^{24M}_{i,j,t}$/	$DGTWProfit^{1M}_{i,j,t}$ is the DGTW adjusted profit that investor *i* could obtain one month after her trading of equity fund *j* in month *t*. It is calculated by multiplying investor *i*'s net purchase of equity fund *j* (unscaled) in month *t* by the DGTW adjusted return of equity fund *j* 1-month after *t*. The DGTW adjusted return of equity fund *j*

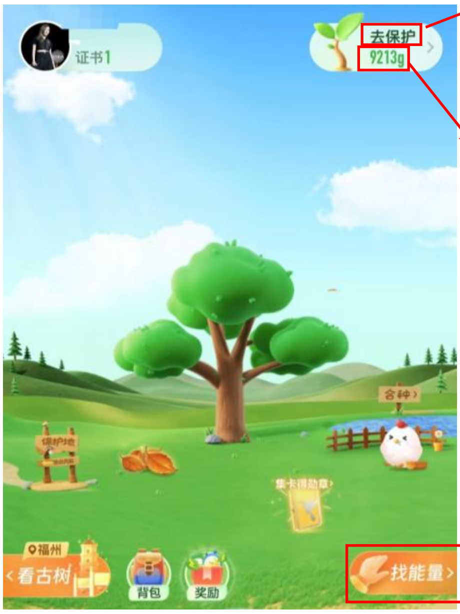
	is its return over its average stock DGTW return weighted by the proportion of stock market value to equity fund *j*'s net asset value during the concurrent period. By analogy, we also construct abnormal performance measures for 3-, 6-, 12-, and 24-months after the trading, which are denoted as $DGTWProfit^{3M}_{i,j,t}$, $DGTWProfit^{6M}_{i,j,t}$, $DGTWProfit^{12M}_{i,j,t}$, and $DGTWProfit^{24M}_{i,j,t}$, respective.
$CumProfit_{i,t}$	The cumulated profit that individual *i* has earned through trading mutual funds on the Ant Fortune platform from the beginning of the sample period until the end of month *t*.
Instrumental variables	
$Rd\_GreenSI_{i,t}$ (in kg)	The sum of "green energy" points individual *i* steals from and stolen by her friends, scaled by the total number of times she steals and is stolen from by her friends in month *t*.
$Rd\_ProactiveGSI_{i,t}$ (in kg)	"Green energy" points individual *i* steals from her friends, scaled by the times she steals in month *t*.
$Rd\_PassiveGSI_{i,t}$ (in kg)	"Green energy" points individual *i* stolen by her friends, scaled by the times she is stolen from by her friends in month *t*.
$\#Rd\_GreenSI_{i,t}$	The sum of the total number of times individual *i* steals "green energy" from her friends and is stolen "green energy" by her friends in Ant Forest in month *t*.
$\#Rd\_ProactiveGSI_{i,t}$	The total number of times individual *i* steals "green energy" from her friends in Ant Forest in month *t*.
$\#Rd\_PassiveGSI_{i,t}$	The total number of times individual *i* is stolen "green energy" by her friends in Ant Forest in month *t*.

Figure 1: Ant Forest program integrated in Alipay.

Participants in Ant Forest can earn “green energy” points through their eco-friendly actions, which can be collected and redeemed to grow virtual trees in the program. Ant Financial will match this by planting real trees. Uncollected points could either be stolen by their Alipay friends or become invalid.

Screenshot of the Ant Forest program

Ant Forest user’s personal homepage



Click here to redeem cumulative “green energy” points to plant trees

Cumulated “green energy” points earned through daily green actions

Click here to steal friends’ “green energy” points

A Friend’s Ant Forest homepage

The friend’s “green energy” points that could be stolen, which is randomly determined by the program

Click here to steal

Click here to steal other friends’ “green energy” points

Table 1: Summary statistics

This table reports summary statistics of the main variables used in the empirical tests. All variables are defined in Table A1.

Variables	No. Obs.	Mean	Std	25%	50%	75%
Panel A: Retail trading						
NetBuy	3,072,891	40.8249	83.4647	-36.6086	100.0000	100.0000
Panel B: Sample individuals' demographic information						
Age	3,072,891	32.8743	9.3083	26.0800	31.0000	37.0000
Female	3,072,891	0.4473	0.4972	0.0000	0.0000	1.0000
Panel C: Green actions and green social interactions in the Ant Forest program						
GreenPoints (in kg)	827,648	2.2538	2.0056	0.7110	1.9010	3.2730
GreenTravel (in kg)	827,648	1.9910	1.7939	0.5360	1.6740	2.9370
TravelReduction (in kg)	827,648	0.1495	0.2713	0.0000	0.0000	0.2620
P&PReduction (in kg)	827,648	0.0914	0.1220	0.0100	0.0460	0.1300
EnergySaving (in kg)	827,648	0.0075	0.1801	0.0000	0.0000	0.0000
Recycle (in kg)	827,648	0.0141	0.5484	0.0000	0.0000	0.0000
CollectPoints (in kg)	827,648	1.0815	1.7243	0.0000	0.2940	1.6330
GreenSI (in kg)	827,648	1.5471	2.8665	0.1670	0.7970	1.7560
ProactiveGSI (in kg)	827,648	0.8691	2.7528	0.0000	0.0000	0.3900
PassiveGSI (in kg)	827,648	0.6779	0.6800	0.1090	0.5020	1.0460
Tree	827,648	0.0534	0.2249	0.0000	0.0000	0.0000
Rd_GreenSI (in kg)	827,648	0.0061	0.0040	0.0041	0.0062	0.0079
Rd_ProactiveGSI (in kg)	827,648	0.0029	0.0040	0.0000	0.0000	0.0061
Rd_PassiveGSI (in kg)	827,648	0.0063	0.0046	0.0035	0.0060	0.0084
#Rd_GreenSI	827,648	219.9717	383.7951	34.0000	125.0000	234.0000
#Rd_ProactiveGSI	827,648	125.4624	371.8189	0.0000	0.0000	62.0000
#Rd_PassiveGSI	827,648	94.5093	83.5025	22.0000	81.0000	147.0000
Panel D: Features of mutual funds traded by sample individuals						
E	3,072,891	3.0097	0.9769	2.4170	2.7833	3.5961
$Profit^{1M}$	3,067,705	-0.0054	1.2117	-0.0210	0.0000	0.0213
$Profit^{3M}$	3,067,705	0.0092	1.8597	-0.0227	0.0008	0.0415
$Profit^{6M}$	3,067,705	0.0266	3.0217	-0.0398	0.0009	0.0653
$Profit^{12M}$	3,067,705	0.0419	4.1226	-0.0698	-0.0002	0.0769
$Profit^{24M}$	3,067,705	-0.0029	4.4532	-0.0019	-0.0047	0.0524
$AbProfit^{1M}$	3,067,705	-0.0046	1.0165	-0.0152	-0.0000	0.0117
$AbProfit^{3M}$	3,067,705	-0.0044	1.4512	-0.0258	-0.0000	0.0218
$AbProfit^{6M}$	3,067,705	-0.0078	2.3296	-0.0439	-0.0006	0.0321
$AbProfit^{12M}$	3,067,705	0.0018	2.9731	-0.0518	-0.0009	0.0387
$AbProfit^{24M}$	3,067,705	-0.0129	3.1501	-0.0682	-0.0025	0.0327
$DGTWProfit^{1M}$	325,513	0.0044	0.8240	-0.0108	0.0005	0.0197
$DGTWProfit^{3M}$	325,513	0.0141	1.4729	-0.0074	0.0030	0.0440
$DGTWProfit^{6M}$	325,513	0.0496	2.7535	-0.0182	0.0086	0.1016
$DGTWProfit^{12M}$	325,513	0.0841	4.0202	-0.0261	0.0063	0.1145
$DGTWProfit^{24M}$	325,513	0.0763	3.7480	-0.0183	0.0047	0.0864
Panel E: Other variables						
AbTmp	3,072,475	0.5351	1.2610	-0.2391	0.5840	1.2923

Table 2: Green social interactions and green daily actions.

This table examines the influence of individuals' green social interactions on their green daily actions. The dependent variable $GreenPoints_{i,t}$ refers to the "green energy" points that individual *i* earns in month *t*, which is used to measure the activeness of her green daily cations. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. Columns (1) to (3) examine the effect of overall green social interactions ($GreenSI_{i,t-1}$), its proactive component ($ProactiveGSI_{i,t-1}$), and its passive component ($PassiveGSI_{i,t-1}$), respectively. Column (4) examines the effects of both proactive and passive green social interactions simultaneously. The variables $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are "green energy" points individual *i* steals from and stolen by her friends in month *t*-1, respectively, and $GreenSI_{i,t-1}$ is the sum of the two variables. All variables are defined in Table A1. Individual- and Year-month-fixed effects are both controlled. Standard errors are clustered at the individual and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1) $GreenPoints_{i,t}$	(2) $GreenPoints_{i,t}$	(3) $GreenPoints_{i,t}$	(4) $GreenPoints_{i,t}$
$GreenSI_{i,t-1}$	0.1794***			
	(9.4717)			
$ProactiveGSI_{i,t-1}$		0.1017***		0.1103***
		(8.0156)		(8.3173)
$PassiveGSI_{i,t-1}$			0.9815***	0.9918***
			(25.6756)	(25.7738)
Individual FE	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES
Adj. R^2	0.6914	0.6823	0.7121	0.7168
No. of Obs.	827,648	827,648	827,648	827,648

Table 3: Green social interactions and green investments.

This table examines the influence of individuals' green social interactions on their mutual fund trading behavior. The dependent variable $NetBuy_{i,j,t}$ is individual i's net purchase of fund j in month t as defined in Eq. (1). Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. Columns (1) to (3) examine the effect of overall green social interactions ($GreenSI_{i,t-1}$), its proactive component ($ProactiveGSI_{i,t-1}$), and its passive component ($PassiveGSI_{i,t-1}$), respectively. Column (4) examines the effects of both proactive and passive green social interactions simultaneously. The variables $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are "green energy" points individual i steals from and stolen by her friends in month t-1, respectively, and $GreenSI_{i,t-1}$ is the sum of the two variables. The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund j provided by Wind. All variables are defined in Table A1. Individual and fund-by-time fixed effects are both controlled. Standard errors are clustered at the fund, individual, and year-month levels. The t-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1) $NetBuy_{i,j,t}$	(2) $NetBuy_{i,j,t}$	(3) $NetBuy_{i,j,t}$	(4) $NetBuy_{i,j,t}$
$GreenSI_{i,t-1} \times E_{j,t-1}$	0.1112***			
	(4.4307)			
$ProactiveGSI_{i,t-1} \times E_{j,t-1}$		0.0830***		0.0828***
		(3.6880)		(2.8935)
$PassiveGSI_{i,t-1} \times E_{j,t-1}$			0.6341***	0.6263***
			(4.2895)	(3.5439)
$GreenSI_{i,t-1}$	-0.7542***			
	(-4.9696)			
$ProactiveGSI_{i,t-1}$		-0.3445***		-0.3881***
		(-2.7796)		(-3.0215)
$PassiveGSI_{i,t-1}$			-5.8648***	-5.8630***
			(-9.5833)	(-10.4479)
Individual FE	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES
Adj. R2	0.1729	0.1729	0.1729	0.1732
No. of Obs.	3,072,891	3,072,891	3,072,891	3,072,891

Table 4: Post-trading performance of green investments motivated by social interactions.

This table examines the post-trading performance of individuals' green investments motivated by green social interactions. The dependent variable $Profit^{1M}_{i,j,t}$ in column (1) of Panel A is the profit that investor *i* could obtain one month after her trading of fund *j* in month *t*, as specified in Eq. (2). Similarly, we assess the profits she could obtain 3-, 6-, 12-, and 24-months after the trading, which are used as the dependent variables in columns (2) to (5), respectively. In Panel B, the dependent variables are the abnormal profits that investor *i* could obtain 1-, 3-, 6-, 12-, and 24- months after trading fund *j* in month *t*, where the fund's abnormal return is calculated relative to its pre-determined performance benchmark. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. The variable $GreenSI_{i,t-1}$ is the sum of the points individual *i* steals from friends and her points stolen by friends in month *t*-1, and is used to capture her overall green social interactions in the month. The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund *j* provided by Wind. $CumProfit_{i,t}$ is the cumulated profit that individual *i* has earned through trading mutual funds on the Ant Fortune platform from the beginning of the sample period until the end of month *t*. All variables are defined in Table A1. Individual and fund-by-time fixed effects are both controlled. Standard errors are clustered at the fund, individual, and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A	(1)	(2)	(3)	(4)	(5)
	$Profit^{1M}_{i,j,t}$	$Profit^{3M}_{i,j,t}$	$Profit^{6M}_{i,j,t}$	$Profit^{12M}_{i,j,t}$	$Profit^{24M}_{i,j,t}$
$GreenSI_{i,t-1} \times E_{j,t-1}$	0.0002	0.0002	-0.0025*	-0.0030	-0.0040*
	(0.6438)	(0.3881)	(-1.9377)	(-1.2802)	(-1.7263)
$GreenSI_{i,t-1}$	-0.0021*	-0.0022*	0.0021	0.0030	0.0072
	(-1.7521)	(-1.8069)	(0.4946)	(0.3796)	(1.0357)
$CumProfit_{i,t}$	-0.0026	-0.0078***	-0.0061	-0.0060	0.0017
	(-1.4788)	(-3.1708)	(-1.3994)	(-0.9142)	(0.3281)
Individual FE	YES	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	-0.0067	-0.0161	-0.0245	-0.0184	-0.0144
No. of Obs.	3,067,705	3,067,705	3,067,705	3,067,705	3,067,705

Panel B	(1)	(2)	(3)	(4)	(5)
	$AbProfit^{1M}_{i,j,t}$	$AbProfit^{3M}_{i,j,t}$	$AbProfit^{6M}_{i,j,t}$	$AbProfit^{12M}_{i,j,t}$	$AbProfit^{24M}_{i,j,t}$
$GreenSI_{i,t-1} \times E_{j,t-1}$	-0.0000	-0.0004	-0.0018***	-0.0020*	-0.0016*
	(-0.0525)	(-1.0663)	(-2.9916)	(-1.6547)	(-1.6487)
$GreenSI_{i,t-1}$	-0.0011	0.0005	0.0036*	0.0045	0.0031
	(-0.9219)	(0.3447)	(1.9249)	(1.1911)	(1.0284)
$CumProfit_{i,t}$	-0.0013	-0.0016**	0.0002	0.0011	0.0055
	(-1.0420)	(-2.3833)	(0.0640)	(0.2798)	(1.4458)
Individual FE	YES	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	-0.0096	-0.0240	-0.0299	-0.0282	-0.0194
No. of Obs.	3,067,705	3,067,705	3,067,705	3,067,705	3,067,705

Table 5: Influence of physical and regulatory climate shocks.

This table the influence of physical and regulatory climate shocks on the effects of socially green nudges. $AbTemp_{i,t-2}$ is the abnormal temperature measured following Choi, Gao, and Jiang (2020), which is the temperature of the city where investor *i* resides in month *t*-2 minus the city's average temperature in the same month of the year over the past 10 years. It is used to measure physical climate shocks. DCT_t is a dummy variable that equals one for periods after China's unveiling of its detail actions plans for achieving DCT in March 2021, and zero otherwise. It is used to capture regulatory climate shocks. In columns (1) and (2), the dependent variable $GreenPoints_{i,t}$ refers to the "green energy" points that individual *i* earns in month *t*, which is used to measure the activeness of her green daily cations. In columns (3) and (4), the dependent variable $NetBuy_{i,j,t}$ is individual *i*'s net purchase of fund *j* in month *t* as defined in Eq. (1), which is used to capture her investment preference. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. The variable $GreenSI_{i,t-1}$ is the sum of the points individual *i* steals from friends and her points stolen by friends in month *t*-1, and is used to capture her overall green social interactions in the month. The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund *j* provided by Wind. All variables are defined in Table A1. In columns (1) and (2), standard errors are clustered at the individual and year-month levels. In columns (3) and (4), standard errors are clustered at the fund, individual, and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$
$GreenSI_{i,t-1} \times AbTemp_{i,t-2}$	0.0068*			
	(1.6510)			
$GreenSI_{i,t-1} \times DCT_t$		0.0310**		
		(2.3956)		
$GreenSI_{i,t-1} \times E_{j,t-1} \times AbTemp_{i,t-2}$			0.0276**	
			(1.9724)	
$GreenSI_{i,t-1} \times E_{j,t-1} \times DCT_t$				0.1405***
				(2.8255)
$GreenSI_{i,t} \times E_{j,t-1}$			0.0985***	0.0241
			(3.9276)	(0.9989)
$GreenSI_{i,t-1}$	0.1770***	0.1701***	-0.7037***	-0.5767***
	(9.4253)	(8.9236)	(-4.6955)	(-4.0170)
$AbTemp_{i,t-2}$	-0.0213**		0.3675	
	(-2.5114)		(1.2214)	
AbTemp/DCT interacted with $E_{j,t-1}$	N/A	N/A	YES	YES
AbTemp/DCT interacted $GreenSI_{i,t-1}$	As shown	As shown	YES	YES
Individual FE	YES	YES	YES	YES
Fund×Year-month FE	N/A	N/A	YES	YES
Year-month FE	YES	YES	N/A	N/A
Adj. R^2	0.6916	0.6918	0.1729	0.1729

No. of Obs.	827,551	827,648	3,072,475	3,072,891

Table 6: Influence of demographic characteristics.

This table examines the influence of individuals' demographic characteristics on the effect of socially green nudges. Columns (1) and (2) examine the effect in terms of motivating green daily actions, where the dependent variable $GreenPoints_{i,t}$ refers to the "green energy" points that individual i earns in month t. Columns (3) and (4) examine the effect in terms of motivating green investments, where the dependent variable $NetBuy_{i,j,t}$ is individual i's net purchase of fund j in month t as defined in Eq. (1). $Young_i$ is an indicator for individuals aged below sample median. $Female_i$ is an indicator for females. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. The variable $GreenSI_{i,t-1}$ is the sum of the points individual i steals from friends and her points stolen by friends in month t-1, and is used to capture her overall green social interactions in the month. The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund j provided by Wind. All variables are defined in Table A1. In columns (1) and (2), standard errors are clustered at the individual and year-month levels. In columns (3) and (4), standard errors are clustered at the fund, individual, and year-month levels. The t-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1) $GreenPoints_{i,t}$	(2) $GreenPoints_{i,t}$	(3) $NetBuy_{i,j,t}$	(4) $NetBuy_{i,j,t}$
$GreenSI_{i,t-1} \times Young_i$	0.0537*			
	(1.7903)			
$GreenSI_{i,t-1} \times Female_i$		0.0570**		
		(2.3690)		
$GreenSI_{i,t-1} \times E_{j,t-1} \times Young_i$			0.0615	
			(1.4199)	
$GreenSI_{i,t-1} \times E_{j,t-1} \times Female_i$				-0.0220
				(-0.8637)
$GreenSI_{i,t} \times E_{j,t-1}$			0.0856***	0.1176***
			(3.0165)	(3.5489)
$GreenSI_{i,t-1}$	0.1516***	0.1629***	-0.5303***	-0.6617***
	(4.9394)	(6.8419)	(-3.7340)	(-4.3847)
Demographic char. interacted with $E_{j,t-1}$	N/A	N/A	YES	YES
Demographic char. interacted with $GreenSI_{i,t-1}$	As shown	As shown	YES	YES
Individual FE	YES	YES	YES	YES
Fund×Year-month FE	N/A	N/A	YES	YES
Year-month FE	YES	YES	N/A	N/A
Adj. R^2	0.6917	0.6917	0.1729	0.1729
No. of Obs.	827,648	827,648	3,072,475	3,072,891

Table 7: Instrumented green social interactions and green daily actions.

This table examines the causal effect of green social interactions on green daily actions. $Rd\_GreenSI_{i,t}$, $Rd\_ProactiveGSI_{i,t}$, and $Rd\_ProactiveGSI_{i,t}$ are instruments for $GreenSI_{i,t}$, $ProactiveGSI_{i,t}$, and *ProactiveGSI*, respectively, as defined in Eqs. (3)-(5). Panel A reports the results of the first-stage tests. Panel B reports the results of the second-stage tests, where the dependent variable $GreenPoints_{i,t}$ is the "green energy" points that individual *i* earns in month *t*. $Pre(GreenSI_{i,t-1})$, $Pre(ProactiveGSI_{i,t-1})$, and $Pre(PassiveGSI_{i,t-1})$ in Panel B are the predicted value of $GreenSI_{i,t-1}$, $ProactiveGSI_{i,t-1}$, and $PassiveGSI_{i,t-1}$ from column (1), (2), and (3) in Panel A, respectively. All variables are defined in Table A1. Standard errors are clustered at the individual and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A	(1)	(2)	(3)
	$GreenSI_{i,t}$	$ProactiveGSI_{i,t}$	$PassiveGSI_{i,t}$
$Rd\_GreenSI_{i,t}$	63.326***		
	(24.407)		
$Rd\_ProactiveGSI_{i,t}$		57.383***	
		(15.932)	
$Rd\_PassiveGSI_{i,t}$			42.374***
			(41.191)
Individual FE	YES	YES	YES
Year-month FE	YES	YES	YES
F statistic	595.68	253.83	1696.7
Adj. R^2	0.8056	0.8037	0.7368
No. of Obs.	827,648	827,648	827,648
Panel B	(1)	(2)	(3)
	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$
$Pre(GreenSI_{i,t-1})$	1.0239***		
	(15.7573)		
$Pre(ProactiveGSI_{i,t-1})$		0.4640***	
		(11.8960)	
$Pre(PassiveGSI_{i,t-1})$			1.5492***
			(17.1708)
Individual FE	YES	YES	YES
Year-month FE	YES	YES	YES
Adj. R^2	0.6868	0.6799	0.6898
No. of Obs.	827,648	827,648	827,648

Table 8: Instrumented green social interactions and green investments.

This table examines the causal effect of green social interactions on green investments. $Rd\_GreenSI_{i,t}$, $Rd\_ProactiveGSI_{i,t}$, and $Rd\_ProactiveGSI_{i,t}$ are instruments for $GreenSI_{i,t}$, $ProactiveGSI_{i,t}$, and *ProactiveGSI*, respectively, as defined in Eqs. (3)-(5). Panels A and B report results of the first- and second-stage tests, respectively. $Pre(GreenSI_{i,t-1}\times E_{j,t-1})$, $Pre(ProactiveGSI_{i,t-1}\times E_{j,t-1})$, $Pre(PassiveGSI_{i,t-1}\times E_{j,t-1})$, $Pre(GreenSI_{i,t-1})$, $Pre(ProactiveGSI_{i,t-1})$, and $Pre(PassiveGSI_{i,t-1})$ in Panel B are the predicted value of $GreenSI_{i,t-1}\times E_{j,t-1}$, $ProactiveGSI_{i,t-1}\times E_{j,t-1}$, $PassiveGSI_{i,t-1}\times E_{j,t-1}$, $GreenSI_{i,t-1}$, $ProactiveGSI_{i,t-}$, $PassiveGSI_{i,t-1}$ in columns (1) to (6) in Panel A, respectively. In Panel B, the dependent variable $NetBuy_{i,j,t}$ is individual *i*'s net purchase of fund *j* in month *t* as defined in Eq. (1). The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund *j* provided by Wind. All variables are defined in Table A1. Standard errors are clustered at the fund, individual, and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A	(1) $GreenSI_{i,t}\times E_{j,t}$	(2) $ProactiveGSI_{i,t}\times E_{j,t}$	(3) $PassiveGSI_{i,t}\times E_{j,t}$	(4) $GreenSI_{i,t}$	(5) $ProactiveGSI_{i,t}$	(6) $PassiveGSI_{i,t}$
$Rd\_GreenSI_{i,t}\times E_{j,t}$	134.92***			-2.0985***		
	(25.323)			(-3.0161)		
$Rd\_ProactiveGSI_{i,t}\times E_{j,t}$		244.68***			-2.5051*	
		(32.859)			(-1.9139)	
$Rd\_PassiveGSI_{i,t}\times E_{j,t}$			66.121***			-0.0753
			(53.825)			(-0.3703)
$Rd\_GreenSI_{i,t}$	-217.81***			70.768***		
	(-23.265)			(22.365)		
$Rd\_ProactiveGSI_{i,t}$		-560.33***			65.675***	
		(-25.548)			(10.861)	
$Rd\_PassiveGSI_{i,t}$			-73.990***			41.987***
			(-25.241)			(38.143)
Individual FE	YES	YES	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES	YES	YES
F statistic	780.82	1176.0	3430.0	618.71	242.80	1599.0
Adj. R^2	0.7765	0.7776	0.7601	0.8358	0.8344	0.7817
No. of Obs.	3,072,891	3,072,891	3,072,891	3,072,891	3,072,891	3,072,891

Panel B	(1) $NetBuy_{i,j,t}$	(2) $NetBuy_{i,j,t}$	(3) $NetBuy_{i,j,t}$
$Pre(GreenSI_{i,t-1}\times E_{j,t-1})$	0.3446***		
	(3.2188)		
$Pre(ProactiveGSI_{i,t-1}\times E_{j,t-1})$		0.2223***	
		(2.6041)	
$Pre(PassiveGSI_{i,t-1}\times E_{j,t-1})$			0.6867***
			(3.1544)
$Pre(GreenSI_{i,t-1})$	-3.8954***		
	(-7.1296)		
$Pre(ProactiveGSI_{i,t-1})$		-2.8893***	
		(-4.9913)	
$Pre(PassiveGSI_{i,t-1})$			-6.0580***
			(-6.4655)
Individual FE	YES	YES	YES
Fund × Year-month FE	YES	YES	YES
Adj. R2	0.1729	0.1729	0.1729
No. of Obs.	3,072,891	3,072,891	3,072,891

Internet Appendix

Figure IA1: Search volume for "carbon neutrality" on Baidu.

This figure plots the monthly search volume for "carbon neutrality," the ultimate goal outlined in China's proposition of DCT, on Baidu, the leading search engine in China. The search volume surges in March 2021, coinciding with China's announcement of detailed measures and action plans for achieving DCT during the annual plenary session of the National People's Congress (NPC), China's top legislative body.

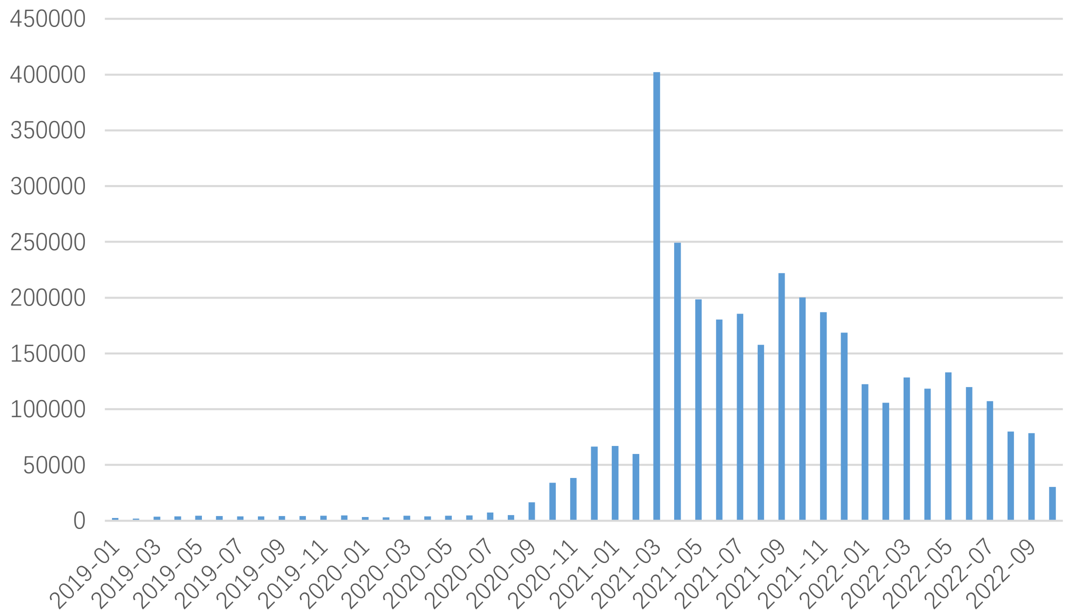


Figure IA2: Distribution of *Rd_GreenSI*.

This figure plots the distribution of $Rd\_GreenSI_{i,t}$, where $Rd\_GreenSI_{i,t}$ is the sum of "green energy" points individual i steals from friends and her points stolen by her friends, scaled by the sum of the total number of times she steals from friends and the total number of times her points are stolen by friends in month t.

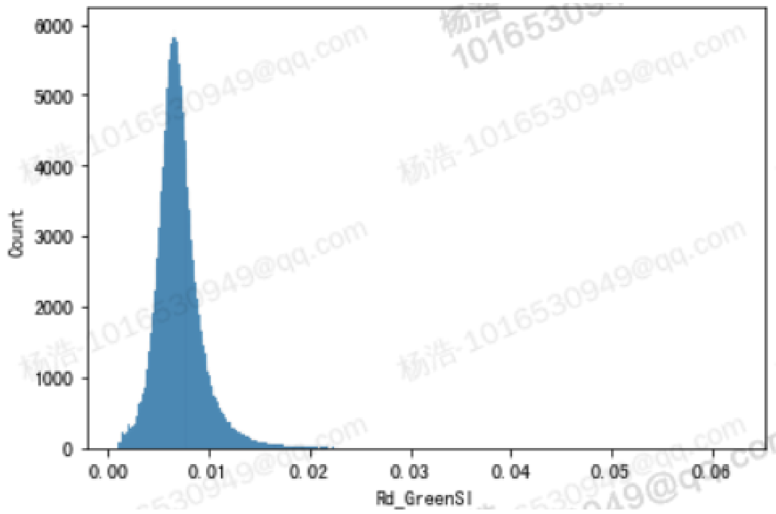


Table IA1: DGTW adjusted investment performance.

This table examines the post-trading performance of individuals' green investments motivated by green social interactions. The regressions are performed at the investor-fund-time level. The dependent variable $DGTWProfit^{1M}_{i,j,t}$ in column (1) is the DGTW adjusted profit that investor *i* could obtain one month after her trading of equity fund *j* in month *t*. It is calculated by multiplying investor *i*'s net purchase of equity fund *j* (unscaled) in month *t* by the DGTW adjusted return of equity fund *j* 1-month after *t*. The DGTW adjusted return of equity fund *j* is its return over its average stock DGTW return weighted by the proportion of stock market value to equity fund *j*'s net asset value during the concurrent period. Similarly, we assess the DGTW adjusted profits she could obtain 3-, 6-, 12-, and 24-months after the trading, which are used as the dependent variables in columns (2) to (5), respectively. The variable $GreenSI_{i,t-1}$ is the sum of the points individual *i* steals from friends and her points stolen by friends in month *t*-1, and is used to capture her overall green social interactions in the month. The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund *j* provided by Wind. $CumProfit_{i,t}$ is the cumulated profit that individual *i* has earned through trading mutual funds on the Ant Fortune platform from the beginning of the sample period until the end of month *t*.All variables are defined in Table A1. Investor fixed effects and fund by time fixed effects are controlled. Standard errors are clustered at the fund, individual, and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	$DGTWProfit^{1M}_{i,j,t}$	$DGTWProfit^{3M}_{i,j,t}$	$DGTWProfit^{6M}_{i,j,t}$	$DGTWProfit^{12M}_{i,j,t}$	$DGTWProfit^{24M}_{i,j,t}$
$GreenSI_{i,t-1} \times E_{j,t-1}$	-0.0003	0.0040	0.0003	0.0003	0.0030
	(-0.6115)	(0.4534)	(0.1250)	(0.1633)	(1.3407)
$GreenSI_{i,t-1}$	0.0001	-0.0029	-0.0042	-0.0078	-0.0167
	(0.0534)	(-0.8169)	(-0.5376)	(-0.8574)	(-1.6063)
$CumProfit_{i,t}$	-0.0031**	-0.0116*	-0.0150**	-0.0154***	-0.0145**
	(-2.3719)	(-1.8552)	(-2.5241)	(-3.2201)	(-4.3760)
Individual FE	YES	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	-0.0070	-0.0480	-0.0624	-0.0885	-0.0829
No. of Obs.	325,513	325,513	325,513	325,513	325,513

Table IA2: Socially green nudges and the breakdowns of green daily actions.

This table examines the influence of individuals' green social interactions on their green daily actions in different aspects. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. Panels A to C examine the effect of overall green social interactions ($GreenSI_{i,t-1}$), its proactive component ($ProactiveGSI_{i,t-1}$), and its passive component ($PassiveGSI_{i,t-1}$), respectively. Panel D examines the effects of both proactive and passive green social interactions simultaneously. The variables $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are "green energy" points individual *i* steals from and stolen by her friends in month *t*-1, respectively, and $GreenSI_{i,t-1}$ is the sum of the two variables. In all four panels, columns (1) to (5) examine individuals' green daily actions in terms of green travel ($Greentravel_{i,t}$), travel reduction ($TravelReduction_{i,t}$), paper and plastic reduction ($P\&PReduction_{i,t}$), energy saving ($EnergySaving_{i,t}$), and recycling ($Recycle_{i,t}$) respectively, which are captured by their "green energy" points earned under each of the five categories defined by the Ant Forest program. Individual- and time-fixed effects are both controlled. Standard errors are clustered at the individual and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A	(1)	(2)	(3)	(4)	(5)
	$GreenTravel_{i,t}$	$TravelReduction_{i,t}$	$P\&PReduction_{i,t}$	$EnergySaving_{i,t}$	$Recycle_{i,t}$
$GreenSI_{i,t-1}$	0.1615***	0.0034***	0.0029***	0.0059***	0.0057
	(10.3438)	(4.0491)	(4.5243)	(4.2450)	(1.3415)
Individual FE	YES	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	0.7311	0.5201	0.6785	0.3152	0.1196
No. of Obs.	827,648	827,648	827,648	827,648	827,648
Panel B	(1)	(2)	(3)	(4)	(5)
	$GreenTravel_{i,t}$	$TravelReduction_{i,t}$	$P\&PReduction_{i,t}$	$EnergySaving_{i,t}$	$Recycle_{i,t}$
$ProactiveGSI_{i,t-1}$	0.0846***	0.0028***	0.0021***	0.0064***	0.0057
	(9.5155)	(3.9024)	(3.5126)	(4.1737)	(1.2658)
Individual FE	YES	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	0.7221	0.5200	0.6780	0.3154	0.1196
No. of Obs.	827,648	827,648	827,648	827,648	827,648
Panel C	(1)	(2)	(3)	(4)	(5)
	$GreenTravel_{i,t}$	$TravelReduction_{i,t}$	$P\&PReduction_{i,t}$	$EnergySaving_{i,t}$	$Recycle_{i,t}$
$PassiveGSI_{i,t-1}$	0.9585***	0.0089***	0.0107***	-0.0011	0.0037*
	(26.5517)	(4.0495)	(8.4997)	(-1.3061)	(1.99154)
Individual FE	YES	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	0.7581	0.5200	0.6786	0.3135	0.1194
No. of Obs.	827,648	827,648	827,648	827,648	827,648

Panel D	(1)	(2)	(3)	(4)	(5)
	$GreenTravel_{i,t}$	$TravelReduction_{i,t}$	$P\&PReduction_{i,t}$	$EnergySaving_{i,t}$	$Recycle_{i,t}$
$ProactiveGSI_{i,t-1}$	0.0929***	0.0029***	0.0022***	0.0064***	0.0058
	(9.7223)	(3.9502)	(3.6122)	(4.1742)	(1.2726)
$PassiveGSI_{i,t-1}$	0.9671***	0.0092***	0.0109***	-0.0005	0.0043**
	(26.6237)	(4.1018)	(8.6039)	(-0.5686)	(2.1305)
Individual FE	YES	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES	YES
Adj. R^2	0.7621	0.5202	0.6791	0.3154	0.1196
No. of Obs.	827,648	827,648	827,648	827,648	827,648

Table IA3: Green social interactions and "green energy" points collection.

This table examines the influence of individuals' green social interactions on their collection of "green energy" points. The dependent variable $CollectPoints_{i,t}$ refers to the "green energy" points that individual *i* collects in month *t*, which can be accumulated and subsequently redeemed for tree planting. Columns (1) to (3) examine the effect of overall green social interactions ($GreenSI_{i,t-1}$), its proactive component ($ProactiveGSI_{i,t-1}$), and its passive component ($PassiveGSI_{i,t-1}$), respectively. Column (4) examines the effects of both proactive and passive green social interactions simultaneously. The variables $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are "green energy" points individual *i* steals from and stolen by her friends in month *t*-1, respectively, and $GreenSI_{i,t-1}$ is the sum of the two. All variables are defined in Table A1. Individual- and Year-month-fixed effects are both controlled. Standard errors are clustered at the individual and year-month levels. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1) $CollectPoints_{i,t}$	(2) $CollectPoints_{i,t}$	(3) $CollectPoints_{i,t}$	(4) $CollectPoints_{i,t}$
$GreenSI_{i,t-1}$	0.1448***			
	(9.1095)			
$ProactiveGSI_{i,t-1}$		0.1357***		0.1377***
		(8.3798)		(8.3173)
$PassiveGSI_{i,t-1}$			0.2166***	0.2294***
			(17.0394)	(19.1686)
Individual FE	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES
Adj. R^2	0.7219	0.7198	0.7217	0.7223
No. of Obs.	827,648	827,648	827,648	827,648

Table IA4: Green social interactions and tree planting.

This table examines the influence of individuals' green social interactions on their tree-planting behavior. The dependent variable $Tree_{i,t}$ is an indicator that equals one if individual i redeems her "green energy" points for tree planting in month t, and zero otherwise. Column (1) examines the effect of overall green social interactions ($GreenSI_{i,t-1}$). The variable $GreenSI_{i,t-1}$ is the sum of the points individual i steals from friends and her points stolen by friends in month t-1, and is used to capture her overall green social interactions in the month. Columns (2) and (3) examine the influence of individuals' age and gender on the effect of socially green nudges, respectively. $Young_i$ is an indicator for individuals aged below sample median. $Female_i$ is an indicator for female. All variables are defined in Table A1. Individual- and Year-month-fixed effects are both controlled. Standard errors are clustered at the individual level and year-month levels. The t-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
	$Tree_{i,t}$	$Tree_{i,t}$	$Tree_{i,t}$
$GreenSI_{i,t-1}$	0.0095***	0.0078***	0.0084***
	(7.9032)	(5.2726)	(6.8531)
$GreenSI_{i,t-1} \times Young_i$		0.0034**	
		(2.4149)	
$GreenSI_{i,t-1} \times Female_i$			0.0039***
			(3.1628)
Individual FE	YES	YES	YES
Year-month FE	YES	YES	YES
Adj. R^2	0.0791	0.0792	0.0792
No. of Obs.	827,648	827,648	827,648

Table IA5: green funds identified using textual analysis.

This table examines the influence of individuals' green social interactions on their green investments, where green funds are identified based on textual analysis of the fund investment philosophy section. The dependent variable $NetBuy_{i,j,t}$ is individual i's net purchase of fund j in month t as defined in Eq. (1). The variable $GreenSI_{i,t-1}$ is the sum of the points individual i steals from friends and her points stolen by friends in month t-1, and is used to capture her overall green social interactions in the month. In Panel A, $E\text{-}Count_j$, $S\text{-}Count_j$, and $G\text{-}Count_j$ represent the normalized frequency of occurrences of "environment," "social," and "governance" in fund j's investment philosophy section, respectively. In Panel B, $E^{\perp}\text{-}Count_j$ equals the normalized frequency of occurrences of "environment" in the investment philology section of fund j only if "environment" is discussed exclusively without any reference to "social" or "governance," and is set to be zero otherwise. $S^{\perp}\text{-}Count_j$ and $G^{\perp}\text{-} Count_j$ are constructed by analogy. The variables $E\text{-}Count_j$ ($E^{\perp}\text{-}Count_j$), $S\text{-}Count_j$ ($S^{\perp}\text{-}Count_j$), and $G\text{-}Count_j$ ($G^{\perp}\text{-}Count_j$) are used to capture fund j's environmental, social, and governance performance, respectively. All variables are defined in Table A1. Individual and fund-by-time fixed effects are both controlled. Standard errors are clustered at the fund, individual, and year-month levels. The t-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A	(1)	(2)	(3)
	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$
$GreenSI_{i,t-1}\times E\text{-}Count_j$	13.3922***		
	(2.8992)		
$GreenSI_{i,t-1}\times S\text{-}Count_j$		29.2220	
		(1.4301)	
$GreenSI_{i,t-1}\times G\text{-}Count_j$			2.8017
			(0.0295)
$GreenSI_{i,t-1}$	-0.4259***	-0.4246***	-0.4234***
	(-3.4386)	(-3.4207)	(-3.4162)
Individual FE	YES	YES	YES
Fund × year-month FE	YES	YES	YES
Adj. R^2	0.1729	0.1729	0.1729
No. of Obs.	3,072,891	3,072,891	3,072,891

Panel B	(1)	(2)	(3)
	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$
$GreenSI_{i,t-1}\times E^{\perp}\text{-}Count_j$	9.4861***		
	(3.1862)		
$GreenSI_{i,t-1}\times S^{\perp}\text{-}Count_j$		-3.1777	
		(-0.2168)	
$GreenSI_{i,t-1}\times G^{\perp}\text{-}Count_j$			-168.6226*
			(-1.6874)
$GreenSI_{i,t-1}$	-0.4251***	-0.4233***	-0.4225***
	(-3.4314)	(-3.4124)	(-3.4118)
Individual FE	YES	YES	YES

Fund × year-month FE	YES	YES	YES
Adj. R^2	0.1729	0.1729	0.1729
No. of Obs.	3,072,891	3,072,891	3,072,891

Table IA6: Filtering out the impact of Covid-19 lockdowns.

Panel A provides details of Chinese cities that underwent city-level lockdowns during the Covid-19 pandemic in our sample period. Panels B and C repeat tests in Tables 2 and 3 respectively, where the effects of social interactions on individuals' green daily actions and investments are examined but observations affected by city-level lockdowns are excluded. In Panel B, the dependent variable $GreenPoints_{i,t}$ refers to the "green energy" points that individual *i* earns in month *t*, which is used to measure the activeness of her green daily cations. Individuals could interact with friends in the Ant Forest program through stealing "green energy" points from each other. Columns (1) to (3) examine the effect of overall green social interactions ($GreenSI_{i,t-1}$), its proactive component ($ProactiveGSI_{i,t-1}$), and its passive component ($PassiveGSI_{i,t-1}$), respectively. Column (4) examines the effects of both proactive and passive green social interactions simultaneously. The variables $ProactiveGSI_{i,t-1}$ and $PassiveGSI_{i,t-1}$ are "green energy" points individual *i* steals from and stolen by her friends in month *t*-1, respectively, and $GreenSI_{i,t-1}$ is the sum of the two variables. Individual- and time-fixed effects are both controlled. Standard errors are clustered at the individual and year-month levels. In Panel C, the dependent variable $NetBuy_{i,j,t}$ is individual *i*'s net purchase of fund *j* in month *t* as defined in Eq. (1). The variable $E_{j,t-1}$ is the most recently available environmental performance score (E-score) of fund *j* provided by Wind. Individual and fund-by-time fixed effects are both controlled. Standard errors are clustered at the fund, individual, and year-month levels. All variables are defined in Table A1. The *t*-statistics are reported in parentheses. *, **, and *** represent significance at 10%, 5%, and 1% level, respectively.

Panel A: Chinese cities that underwent city-level Covid-19 lockdowns during our sample period		
City	Province	Lockdown Period
Wuhan	Hubei	2020,01-2020,04
Xiaogan	Hubei	2020,01-2020,03
Huanggang	Hubei	2020,01-2020,03
Jingzhou	Hubei	2020,01-2020,03
Ezhou	Hubei	2020,01-2020,03
Suizhou	Hubei	2020,01-2020,03
Xiangyang	Hubei	2020,01-2020,03
Huangshi	Hubei	2020,01-2020,03
Yichang	Hubei	2020,01-2020,03
Jingmen	Hubei	2020,01-2020,03
Xianning	Hubei	2020,01-2020,03
Shiyan	Hubei	2020,01-2020,03
Xiantao	Hubei	2020,01-2020,03
Tianmen	Hubei	2020,01-2020,03
Enshi	Hubei	2020,01-2020,03
Qianjiang	Hubei	2020,01-2020,03
Shennongjia	Hubei	2020,01-2020,03
Wenzhou	Zhejiang	2020,02-2020,02
Ürümqi	Xinjiang	2020,07-2020,08
Shijiazhuang	Hebei	2021,01-2021,01

Panel B: Green social interactions and green daily actions

	(1)	(2)	(3)	(4)
	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$	$GreenPoints_{i,t}$
$GreenSI_{i,t-1}$	0.1789***			
	(9.4247)			
$ProactiveGSI_{i,t-1}$		0.1014***		0.1099***
		(7.9802)		(8.2696)
$PassiveGSI_{i,t-1}$			0.9811***	0.9912***
			(25.5345)	(25.6123)
Individual FE	YES	YES	YES	YES
Year-month FE	YES	YES	YES	YES
Adj. R^2	0.6924	0.6834	0.7131	0.7176
No. of Obs.	823,905	823,905	823,905	823,905

Panel C: Green social interactions and green investments

	(1)	(2)	(3)	(4)
	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$	$NetBuy_{i,j,t}$
$E_{j,t-1} \times GreenSI_{i,t-1}$	0.1111***			
	(4.4192)			
$E_{j,t-1} \times ProactiveGSI_{i,t-1}$		0.0832***		0.0830***
		(3.6937)		(3.7214)
$E_{j,t-1} \times PassiveGSI_{i,t-1}$			0.6292***	0.6214***
			(4.2415)	(4.2223)
$GreenSI_{i,t-1}$	-0.7531***			
	(-4.9379)			
$ProactiveGSI_{i,t-1}$		-0.3432***		-0.3869***
		(-2.7589)		(-3.0903)
$PassiveGSI_{i,t-1}$			-5.8778***	-5.8756***
			(-9.6003)	(-9.6035)
Individual FE	YES	YES	YES	YES
Fund × Year-month FE	YES	YES	YES	YES
Adj. R^2	0.1733	0.1733	0.1736	0.1736
No. of Obs.	3,058,617	3,058,617	3,058,617	3,058,617